BRITISH COUNCIL

CBSE

Competency-based education for CBSE

Item bank:

Maths class 10

September 2021

Content created by AlphaPlus

Introduction for teachers

A bank of resources has been created to support teachers to develop and administer end-of-class tests. These resources should be used together. You can view and download the following resources from http://cbseacademic.nic.in

- Learning ladder for maths
- Assessment specification for maths
- Sample lesson plans

This document is a compilation of the sample items for maths Class 10. There are 100 items. This item bank is supported by the assessment specification, which sets out the end-of-class assessment requirements and the learning ladder for the subject, which maps the CBSE syllabi content to the NCERT curriculum. The item index (page six) shows how each item maps to the learning ladder content and the assessment objectives.

What these assessment items can be used for

You can use the bank of questions in whatever way you wish, but three main purposes have been identified:

- Create end-of-class assessments using the items from the bank to meet the requirements set out in the assessment specifications.
- Create end-of-topic tests using the items from the bank for when you finish teaching a topic.
- Use individual or groups of questions from the bank to create or add to worksheets for class and homework use.

What is in this document

You will find linked questions and single questions covering different aspects of the learning ladder content and different assessment objectives. You can use these questions to create your own assessments.

Each item in this document begins with the metadata (see Figure 1). The metadata gives details of the content, assessment objective coverage, and the number of marks.

There is then a section showing any source material needed, followed by the questions themselves and finally the mark scheme for the questions.

Item identity	AO1 marks	AO2 marks	C/N/E*	Content reference from the learning ladder	Marks
Maths6AS1	1		N	6A1a Form and use algebraic expressions (up to 2 variables, including use of brackets)	1

*C = Calculator required, N = Calculator not allowed, E = Either

Figure 1: Example of metadata

How to use the assessment items

You can peruse the bank of items by flicking through this document and selecting questions you wish to use. However, if you are assessing specific content, you can use the learning ladder to identify this content and then use the item index (page 6) to find any items which cover that content.

Please note that not all of the content will have items. The item bank is only a sample of the questions that could be created, so you may need to write questions of your own to fill gaps.

When you find a relevant assessment item in this document, you can copy and paste the question(s) and any source material into a new Word document which will form the assessment or worksheet. Other questions from the bank can be copied and pasted to this document and an assessment or worksheet covering a range of items created. The questions can then easily be edited in the new document using Word, and you can add any questions you write to best meet the needs of your classes.

Once the questions have been pasted into the new document, the numbering of the items can be changed so that they run through one, two, etc. There should be no need to change the numbering of parts (a), (b), etc., unless a question has been deleted.

You can create the mark schemes in the same way by copying the relevant section of the item documents and pasting them into a separate Word document, forming the mark scheme. Again, the question numbering will need to be amended. You can use these mark schemes to ensure that the marking is standardized, particularly if more than one teacher uses the assessment.

When creating an end-of-class test, the teacher should use the assessment specification to identify the number of marks and questions needed, the balance of content to be covered, and the weighting of the assessment objectives needed. You can then select items from the bank to build a test that meets the assessment specification and then logically order these to allow the students to work through the assessment. You should also add a front page with the assessment name and details of the number of marks and the assessment length. Again, the mark scheme can be created simultaneously, and question numbers will need to be amended.

When copying items from the bank, care needs to be taken to keep the format and style of the items consistent, including the spacing, layout, and ensuring that the number of marks available for each question is linked to the question.

Assessment objectives

This document sets out the assessment objectives for CBSE mathematics and their percentage weighting for the CBSE end-of-year tests for the different classes from VI to X.

		Class				
No.	**Description of Assessment Objective**	**VI**	**VII**	**VIII**	**IX**	**X**
AO1	Demonstrate knowledge and understanding of mathematical ideas, techniques, and procedures.	50 - 65	50 - 65	50 - 65	40 – 55	40 – 55
AO2	Apply knowledge and understanding of mathematical ideas, techniques, and procedures to the classroom and real-world situations	35 - 50	35 - 50	35 - 50	45 - 60	45 - 60

Demonstrate knowledge and understanding of mathematical ideas, techniques, and procedures.

Students should be able to recall and apply mathematical knowledge, terminology, and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations. At appropriate class levels, this would include:

- working accurately with the information presented in words, tables, graphs, and diagrams
- using and interpreting mathematical notation correctly
- using a calculator to perform calculations where appropriate
- understanding and using systems of measurement in everyday use
- estimating, approximating, and working to appropriate levels of accuracy, and converting between equivalent numerical forms
- using geometrical instruments to measure and to draw to appropriate levels of accuracy
- recognizing and using spatial relationships in two and three dimensions

Apply knowledge and understanding of mathematical ideas, techniques, and procedures to the classroom and real-world situations.

Students should be able to reason, interpret and communicate mathematically when solving problems. They should be able to analyze a problem, select a suitable strategy and apply appropriate techniques. At appropriate class levels, this would include:

- presenting arguments and chains of reasoning in a logical and structured way
- assessing the validity of an argument
- interpreting and communicating information accurately, and changing from one form of presentation to another
- solving unstructured problems by putting them into a structured form
- recognizing patterns in a variety of situations and forming generalizations
- applying combinations of mathematical skills and techniques using connections between different areas of mathematics

- making logical deductions, making inferences, and drawing conclusions from given mathematical information, including statistical data
- interpreting results in the context of a given problem

Note: proportions for these AOs are presented as ranges. We suggest that the initial balance might use the high end of AO1 with the low end of AO2, moving over time towards increasing the proportion of AO2 over time as the new pedagogical approach is embedded.

Item Index

Topic ID	Topic	File name	Question ID	AO1	AO2
10A1a	Algebra	Maths10PS2	Maths10PS2	1	
10A1a	Algebra	Maths10AS2	Maths10AS2	1	
10A1a	Algebra	Maths10SS8	Maths10SS8	1	
10A1a	Algebra	Maths10AR1	Maths10AR1	1	
10A1a	Algebra	Maths10AKP10	Maths10AKP10	2	
10A1a	Algebra	Maths10RK1	Maths10RK1		1
10A2a	Algebra	Maths10SS7	Maths10SS7	1	
10A2a	Algebra	Maths10AR8	Maths10AR8a	2	
10A2a	Algebra	Maths10RK5	Maths10RK5a	3	
10A2a	Algebra	Maths10RK5	Maths10RK5b	3	
10A2a	Algebra	Maths10RK2	Maths10RK2		1
10A2a	Algebra	Maths10AR8	Maths10AR8b		6
10A2b	Algebra	Maths10PS8	Maths10PS8b	2	
10A2b	Algebra	Maths10SK8	Maths10SK8	2	
10A2b	Algebra	Maths10RK6	Maths10RK6b	2	
10A2b	Algebra	Maths10RK6	Maths10RK6c	2	
10A2b	Algebra	Maths10RK6	Maths10RK6a	2	1
10A2b	Algebra	Maths10GS6	Maths10GS6		4
10A2c	Algebra	Maths10PS8	Maths10PS8a	1	
10A2c	Algebra	Maths10SK7	Maths10SK7a	1	
10A2c	Algebra	Maths10SS5	Maths10SS5b	2	
10A2c	Algebra	Maths10SS6	Maths10SS6b	2	
10A2c	Algebra	Maths10RM8	Maths10RM8b	2	
10A2c	Algebra	Maths10RM8	Maths10RM8a	2	2
10A2c	Algebra	Maths10SK7	Maths10SK7b		3
10A2c	Algebra	Maths10SS5	Maths10SS5a		4
10A2c	Algebra	Maths10SS6	Maths10SS6a		4
10A3a	Algebra	Maths10RK3	Maths10RK3		1
10A3a	Algebra	Maths10PS10	Maths10PS10	1	2
10A3a	Algebra	Maths10RM5	Maths10RM5a	1	3
10A3b	Algebra	Maths10PS3	Maths10PS3	1	
10A3b	Algebra	Maths10SS9	Maths10SS9	1	
10A3b	Algebra	Maths10AR10	Maths10AR10	2	
10A3b	Algebra	Maths10SK9	Maths10SK9	1	1
10A3c	Algebra	Maths10RM5	Maths10RM5b	2	
10A4a	Algebra	Maths10AS6	Maths10AS6a	1	

10A4a	Algebra	Maths10SK1	Maths10SK1	1	
10A4a	Algebra	Maths10SK11	Maths10SK11	1	
10A4a	Algebra	Maths10RM2	Maths10RM2	1	
10A4a	Algebra	Maths10GS5	Maths10GS5a	1	
610A4a	Algebra	Maths10GS5	Maths10GS5c	1	
10A4a	Algebra	Maths10AR9	Maths10AR9	2	
10A4a	Algebra	Maths10RK4	Maths10RK4		1
10A4a	Algebra	Maths10GS5	Maths10GS5b		2
10A4a	Algebra	Maths10AS6	Maths10AS6b		3
10A4a	Algebra	Maths10RM9	Maths10RM9		3
10A4b	Algebra	Maths10RM1	Maths10RM1	1	
10G1a	Geometry	Maths10GS3	Maths10GS3	1	
10G1a	Geometry	Maths10AD10	Maths10AD10	3	
10G1a	Geometry	Maths10PS7	Maths10PS7	1	1
10G1a	Geometry	Maths10SR7	Maths10SR7a		3
10G1c	Geometry	Maths10AD1	Maths10AD1	1	
10G1c	Geometry	Maths10ASR11	Maths10ASR11b	2	2
10G1c	Geometry	Maths10PR6	Maths10PR6a		3
10G1c	Geometry	Maths10PR6	Maths10PR6b		3
10G1c	Geometry	Maths10SR7	Maths10SR7b		3
10G1e	Geometry	Maths10ASR4	Maths10ASR4	1	
10G1e	Geometry	Maths10AKP6	Maths10AKP6	3	
10G1f	Geometry	Maths10ASR11	Maths10ASR11a		2
10G1g	Geometry	Maths10ASR7	Maths10ASR7b	1	
10G1g	Geometry	Maths10ASR7	Maths10ASR7a		2
10G1h	Geometry	Maths10SR4	Maths10SR4		1
10G1h	Geometry	Maths10PS6	Maths10PS6	1	1
10G1h	Geometry	Maths10AKP9	Maths10AKP9		2
10G1h	Geometry	Maths10PR7	Maths10PR7b	1	2
10G2a	Geometry	Maths10AS3	Maths10AS3	1	
10G2a	Geometry	Maths10MM8	Maths10MM8	2	
10G2a	Geometry	Maths10PR2	Maths10PR2		1
10G2a	Geometry	Maths10MM6	Maths10MM6a	1	1
10G2a	Geometry	Maths10MM7	Maths10MM7		2
10G2a	Geometry	Maths10ASR6	Maths10ASR6	1	2
10G2b	Geometry	Maths10MM6	Maths10MM6b	1	2
10G2b	Geometry	Maths10AD9	Maths10AD9		5
10G3a	Geometry	Maths10SR6	Maths10SR6		4
10M1B	Mensuration	Maths10AS8	Maths10AS8a	1	

10M1B	Mensuration	Maths10ASR2	Maths10ASR2	1	
10M1B	Mensuration	Maths10AR3	Maths10AR3	1	
10M1B	Mensuration	Maths10AS8	Maths10AS8b		2
10M1B	Mensuration	Maths10AD5	Maths10AD5b		2
10M1B	Mensuration	Maths10ASR10	Maths10ASR10a	1	2
10M1B	Mensuration	Maths10ASR10	Maths10ASR10b	1	2
10M1B	Mensuration	Maths10AD5	Maths10AD5a		4
10M2a	Mensuration	Maths10MM3_5	Maths10MM3_5b	1	
10M2a	Mensuration	Maths10MM3_5	Maths10MM3_5c	1	
10M2a	Mensuration	Maths10AKP1	Maths10AKP1	1	
10M2a	Mensuration	Maths10AKP12	Maths10AKP12	1	
10M2a	Mensuration	Maths10SR2	Maths10SR2	1	
10M2a	Mensuration	Maths10SR8	Maths10SR8a	3	
10M2a	Mensuration	Maths10SR8	Maths10SR8b	3	
10M2a	Mensuration	Maths10MM3_5	Maths10MM3_5a	1	1
10M2a	Mensuration	Maths10PR3	Maths10PR3	1	1
10M2a	Mensuration	Maths10MM3_5	Maths10MM3_5d	1	2
10M2a	Mensuration	Maths10AS7	Maths10AS7		3
10M2a	Mensuration	Maths10PR7	Maths10PR7a	2	3
10M2a	Mensuration	Maths10AKP8	Maths10AKP8		4
10M2a	Mensuration	Maths10GS8	Maths10GS8		4
10M2a	Mensuration	Maths10AR7	Maths10AR7		4
10M2b	Mensuration	Maths10AD3	Maths10AD3	1	
10N1a	Number systems	Maths10PS1	Maths10PS1	1	
10N1a	Number systems	Maths10GS1	Maths10GS1	1	
10N1a	Number systems	Maths10SR1	Maths10SR1		1
10N1a	Number systems	Maths10AS9	Maths10AS9		2
10N1a	Number systems	Maths10SR5	Maths10SR5		2
10N1a	Number systems	Maths10AKP5	Maths10AKP5		3
10N1c	Number systems	Maths10MM1	Maths10MM1	1	
10N1c	Number systems	Maths10MM2	Maths10MM2	1	
10N1c	Number systems	Maths10PR5	Maths10PR5b	2	
10N1c	Number systems	Maths10PR1	Maths10PR1		1
10N1c	Number systems	Maths10PR5	Maths10PR5a	2	1
10N1c	Number systems	Maths10MM9	Maths10MM9		2
10N1c	Number systems	Maths10MM10	Maths10MM10		2
10N1c	Number systems	Maths10ASR5	Maths10ASR5		2
10N1c	Number systems	Maths10AD8	Maths10AD8		4
10N1d	Number systems	Maths10AS1	Maths10AS1	1	

10N1d	Number systems	Maths10AD2	Maths10AD2	1	
10N1d	Number systems	Maths10ASR1	Maths10ASR1	1	
10S1a	Mensuration	Maths10AKP4	Maths10AKP4a	1	
10S1a	Mensuration	Maths10SR9	Maths10SR9b	1	
10S1a	Mensuration	Maths10AD6	Maths10AD6a	3	
10S1a	Mensuration	Maths10AD6	Maths10AD6b	3	
10S1a	Mensuration	Maths10ASR12	Maths10ASR12	3	
10S1a	Mensuration	Maths10SR9	Maths10SR9a	3	
10S1a	Mensuration	Maths10PR8	Maths10PR8b		2
10S1a	Mensuration	Maths10AKP4	Maths10AKP4b	2	2
10S1a	Mensuration	Maths10PR8	Maths10PR8a	2	2
10S1a	Mensuration	Maths10AKP2	Maths10AKP2		3
10S1a	Mensuration	Maths10AKP3	Maths10AKP3		3
10S2a	Mensuration	Maths10SM7	Maths10SM7b	1	
10S2a	Mensuration	Maths10PS4	Maths10PS4	1	
10S2a	Mensuration	Maths10AS4	Maths10AS4	1	
10S2a	Mensuration	Maths10AKP7	Maths10AKP7a	1	
10S2a	Mensuration	Maths10AKP7	Maths10AKP7b	1	
10S2a	Mensuration	Maths10GS2	Maths10GS2	1	
10S2a	Mensuration	Maths10SR3	Maths10SR3	1	
10S2a	Mensuration	Maths10NK4	Maths10NK4		1
10S2a	Mensuration	Maths10AKP7	Maths10AKP7c		1
10S2a	Mensuration	Maths10AKP7	Maths10AKP7d		1
10S2a	Mensuration	Maths10SM4	Maths10SM4	1	1
10S2a	Mensuration	Maths10SM7	Maths10SM7a	1	1
10S2a	Mensuration	Maths10DP6	Maths10DP6a	1	1
10S2a	Mensuration	Maths10DP6	Maths10DP6b	1	1
10S2b	Mensuration	Maths10AKP11	Maths10AKP11	1	
10S2b	Mensuration	Maths10ASR3	Maths10ASR3	1	
10S2b	Mensuration	Maths10PR4	Maths10PR4	1	
10S2b	Mensuration	Maths10PR8	Maths10PR8c	1	
10T1a	Trigonometry	Maths10SK3	Maths10SK3	1	
10T1a	Trigonometry	Maths10SS1	Maths10SS1b	2	
10T1a	Trigonometry	Maths10PS9	Maths10PS9a	1	1
10T1a	Trigonometry	Maths10PS9	Maths10PS9b		2
10T1a	Trigonometry	Maths10SS1	Maths10SS1a		3
10T1b	Trigonometry	Maths10AS5	Maths10AS5b	1	
10T1b	Trigonometry	Maths10SK2	Maths10SK2	1	
10T1b	Trigonometry	Maths10GS4	Maths10GS4	1	

10T1b	Trigonometry	Maths10SS2	Maths10SS2	2	
10T1b	Trigonometry	Maths10PS5	Maths10PS5	1	1
10T1b	Trigonometry	Maths10AS5	Maths10AS5a		3
10T1c	Trigonometry	Maths10AR4	Maths10AR4	1	
10T1c	Trigonometry	Maths10AR6	Maths10AR6a	2	
10T1c	Trigonometry	Maths10SS3	Maths10SS3		3
10T2a	Trigonometry	Maths10SK5	Maths10SK5		2
10T3a	Trigonometry	Maths10AR2	Maths10AR2	1	
10T3a	Trigonometry	Maths10RK7	Maths10RK7a	3	
10T3a	Trigonometry	Maths10RK7	Maths10RK7b	3	
10T3a	Trigonometry	Maths10RM3	Maths10RM3		1
10T3a	Trigonometry	Maths10RK8	Maths10RK8	2	1
10T3a	Trigonometry	Maths10RM6	Maths10RM6a		2
10T3a	Trigonometry	Maths10RM6	Maths10RM6b		2
10T3a	Trigonometry	Maths10RM6	Maths10RM6c		2
10T3a	Trigonometry	Maths10RM7	Maths10RM7b		2
10T3a	Trigonometry	Maths10RM7	Maths10RM7a		3
10T3a	Trigonometry	Maths10SS4	Maths10SS4		4
10T3a	Trigonometry	Maths10SK6	Maths10SK6		4
10T3a	Trigonometry	Maths10AR6	Maths10AR6b		4
Class 9		Maths10SK10	Maths10SK10a	2	
Class 9		Maths10SK10	Maths10SK10b		1

Maths10PS2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS2	1		N	10A1a Use the relationship between zeros and coefficients of quadratic polynomials	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to determine the value of the zero by using the relationship between the zeroes and coefficient of the quadratic polynomial.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 The product of the zeroes of a quadratic polynomial, $2x^2 - 5x + m$ is 4. Find the value of m.

(1 mark)

(Total marks 1)

Mark scheme

1. The product of the zeroes of a quadratic polynomial, $2x^2 - 5x + m$ is 4. Find the value of m.	
Answer	Guidance
8 $\alpha\beta = \frac{c}{a}$ ⇨ $4 = \frac{m}{2}$ ⇨ m = 8	A1 for the correct answer

Maths10AS2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS2	1		E	10A1a Use the relationship between zeroes and coefficients of quadratic polynomials	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the use of the relationship between zeroes and coefficients of quadratic polynomials.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 If the sum of the zeroes of the quadratic polynomial $5x^2 – kx + 7$ is 4, ten find the value of ‘k.’

A. 20
B. 21
C. 18
D. 19

(1 mark)

(Total marks 1)

Mark scheme

1 If the sum of the zeroes of the quadratic polynomial $5x^2 – kx + 7$ is 4, ten find the value of ‘k’. A. 20 B. 21 C. 18 D. 19	
Answer	Guidance
A. 20 Sum of Zeroes = $-\frac{b}{a}$ 4 = $-\frac{(-k)}{5}$, ∴ k = 20	A1 1 mark for the correct answer

Maths10SS8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS8	1		N	10A1a Use the relationship between zeros and coefficients of quadratic polynomials	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the use of the relationship between zeros and coefficients of quadratic polynomials

Question

1 If α and β are the zeroes of a polynomial $x^2 - 4\sqrt{3}$x + 3, then find the value of $\alpha + \beta - \alpha\beta$

A. $4\sqrt{3}$
B. -3
C. $4\sqrt{3}$ - 3.
D. - $4\sqrt{3}$ - 3.

(1 mark)

(Total marks 1)

Mark scheme

1. If α and β are the zeroes of a polynomial $x^2 - 4\sqrt{3}$x + 3, then find the value of $\alpha + \beta - \alpha\beta$.

A. $4\sqrt{3}$
B. -3
C. $4\sqrt{3}$ - 3.
D. - $4\sqrt{3}$ - 3.

Answer	Guidance
C. $4\sqrt{3}$ - 3	A1 for writing the correct option or answer

Maths10AR1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR1	1		E	10A1a Use the relationship between zeros and coefficients of quadratic polynomials	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to relate the coefficient of the quadratic polynomial with the zeros of the polynomial

Sources and diagrams

Question(s)

1 The sum of the zeros of the quadratic polynomial x^2+x-12 is

A. 1
B. 12
C. -1
D. -12

(1 mark)

(Total marks 1)

Mark scheme

1 The sum of the zeros of the quadratic polynomial x^2+x-12 is A. 1 B. 12 C. -1 D. -12	
Answer	Guidance

C. -1	M1-to use the relation that sum of the roots of a given quadratic equation of the form ax+by+c=0 is –b/a M2 to identify the coefficients from the given equation A1 using the relation to get the value as -1by substituting the value of the coefficient as -1/1 A2 to write the correct option as (C). Full credit for the correct answer.

Maths10AKP10

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP10	2		N	10A1a Use the relationship between zeros and coefficients of quadratic polynomials	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge polynomials

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 If α and β are the zeros of the quadratic polynomial $2x^2 - 8x + 5$, find the value of $\left(\alpha + \frac{1}{\beta}\right) \times \left(\beta + \frac{1}{\alpha}\right)$

(2 marks)

(Total marks 2)

Mark scheme

1 If α and β are the zeros of the quadratic polynomial $2x^2 - 8x + 5$, find the value of $\left(\alpha + \frac{1}{\beta}\right) \times \left(\beta + \frac{1}{\alpha}\right)$

Answer	Guidance
Here sum of zeros = $\alpha + \beta = 4$ Product of zeros = $\alpha\,\beta = \frac{5}{2}$ $\left(\alpha + \frac{1}{\beta}\right) \times \left(\beta + \frac{1}{\alpha}\right) = \alpha\,\beta + \alpha.\frac{1}{\alpha} + \beta.\frac{1}{\beta} + \frac{1}{\beta}.\frac{1}{\alpha}$ $= \alpha\,\beta + 1 + 1 + \frac{1}{\alpha\beta}$ $= \frac{5}{2} + 2 + \frac{2}{5}$ $= \frac{49}{10}$	M1 taking out the value of α , β 1 mark for the final answer

Maths10RK1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK 1		1	E	10A1a Use the relationship between zeros and coefficients of quadratic polynomials	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge and application of quadratic polynomial and its zeros.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 What is the quadratic polynomial whose sum and the product of zeroes is $\sqrt{2}$, $\frac{1}{3}$, respectively?

A. $3x^2-3\sqrt{2}x+1$

B. $3x^2+3\sqrt{2}x+1$

C. $2x^2+3\sqrt{2}x-1$

D. $2x^2+3\sqrt{2}x-1$

(1 mark)

(Total marks 1)

Mark scheme

1 What is the quadratic polynomial whose sum and the product of zeroes is $\sqrt{2}$, $\frac{1}{3}$ respectively?

A. $3x^2-3\sqrt{2}x+1$ B. $3x^2+3\sqrt{2}x+1$ C. $2x^2+3\sqrt{2}x-1$ D. $2x^2+3\sqrt{2}x-1$	
Answer	Guidance
A. $3x^2-3\sqrt{2}x+1$	Sum of zeroes = $\alpha + \beta = \sqrt{2}$ Product of zeroes = $\alpha\beta = 1/3$ ∴ If α and β are zeroes of any quadratic polynomial, then the polynomial is; $x^2-(\alpha+\beta)x+\alpha\beta$ $= x^2-(\sqrt{2})x + (1/3)$ $= 3x^2-3\sqrt{2}x+1$

Maths10SS7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks

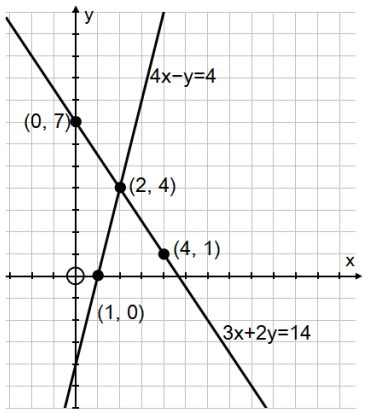
Maths10SS7	1		N	10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines)	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines)

Sources and diagrams



Question(s)

1 The solution for the given system of equations $4x - y = 4$ and $3x + 2y = 14$ from the graph shown above can be determined as:

A. (0,7)
B. (2,4)
C. (4,1)
D. (1,0)

(1 mark)

(Total marks 1)

Mark scheme

The solution for the given system of equations $4x - y = 4$ and $3x + 2y = 14$ from the graph shown above can be determined as:

A. (0,7)
B. (2,4)

C. (4,1) D. (1,0)	
Answer	Guidance
B. (2,4) The graphs of two lines intersect at (2,4). Hence the solution is (2,4)	A1 for the correct answer (B) or (2,4) Do not deduct marks for writing (B) only or (2,4) only

Maths10AR8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks

Maths10AR8 a	2		C	10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines)	2
Maths10AR8b		6	E	10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines)	6
Total marks	**2**	**6**			**8**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to solve the equations in two variables graphically /without solving to find the nature of the solution

Sources

Question(s)

1 (a) Given below are the three equations; a pair of them have infinite solutions. Find the pair among the three equations given below

i. 3x-2y=4
ii. 6x+2y=8
iii. 12x-4y=16 (2 marks)

1 (b) Draw the graph of

2x-y-2=0

4x+3y-24=0

Y+4=0

Obtain the vertices of the triangle formed by the three lines given above.

(6 marks)

(Total marks 8)

Mark scheme

Point based

1 (a) Given below are the three equations; a pair of them have infinite solutions. Find the pair among the three equations given below

i. 3x-2y=4
ii. 6x+2y=8
iii. 12x-4y=16

Answer	Guidance
$a_1/b_1 = a_2/b_2 = c_1/c_2$ for the equations (i) and (ii), 3/6 =-2/2=4/8 which do not satisfy the condition For equations (ii) and (iii), the ratio is 6/12 =2/-4=8/16 do not satisfy the condition For the third pair of equations (i) and (iii), The ratio is 3/12 =-2/-4 =4/16 =1/4 so the correct pair of equations is (i) and (iii)	M1 Identifying the coefficients and comparing the co -efficient taking two equations at a time and check the ratios -1 mark M2 identifying the correct pair after verification -- 1mark A1 $a_1/b_1 = a_2/b_2 = c_1/c_2$ A2 using the condition and verifying the ratios for pair of equations and to get the pair as represented by i and iii Full credit if the method is shown and arrived at the correct solution. Otherwise, a method mark can be awarded.

1 (b) Draw the graph of

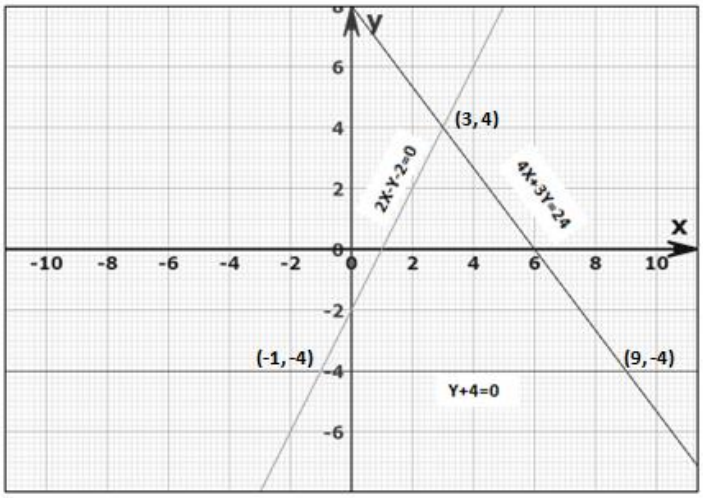
2x-y-2=0

4x+3y-24=0

Y+4=0

Obtain the vertices of the triangle formed by the three lines given above.

Answer	Guidance

	M1 to draw the graph of three straight lines individually by plotting the points on the graph –for each line on the graph –1 mark—total 3 marks M2 finding the intersection of pair of equations writing the three intersecting points as vertices –for each pair – 1mark each A1 the graph is drawn for each equation A2 the vertices are found as (3,4), (9,4), and (-1,4)

Maths10RK5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK5 a	3		E	10A2a Identify graphically the solutions of a pair of linear equations in two variables,	3
Maths10RK5 b	3		E	10A2a Identify graphically the solutions of a pair of linear equations in two variables,	3
Total marks	**6**				**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge and application of pair of linear equations in two variables in a real-life situation.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 For the given pair of linear equations
$2x + y = 6$, $2x = y + 2$

1 (a) Draw the graph of two equations on the same graph paper.

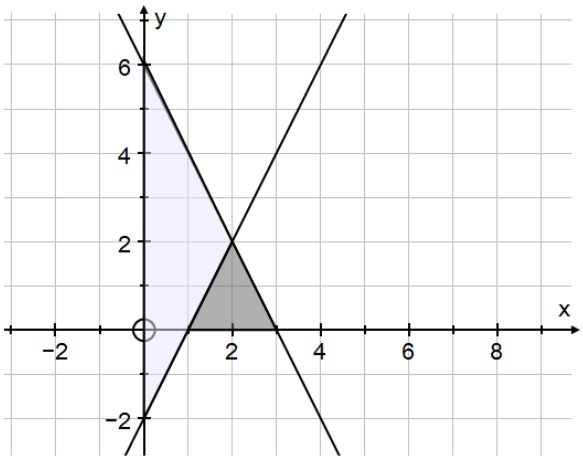
(3 marks)

1 (b) Find the ratio of the areas of two triangles, formed by the given lines with x-axis and with the y-axis.

(3 marks)
(Total marks 6)

Mark scheme

1 (a) Draw the graph of two equations on the same graph paper.	
Answer	Guidance

	M1 To find the points of the equations A1 To draw the graph A1 intersecting lines

1 (b) Find the ratio of the areas of two triangles formed by the given lines with the x-axis and y-axis.

Answer	Guidance
1:4	M1 Vertices of △ABC are A(2,2), B(1,0) and C(3,0) Vertices of △ADE are A(2,2),D(0,6) and E(0,-2) A1 Area of △ABC = 2 sq units Area of △ADE= 8 sq units A1 Ratio areas of two triangles formed by the lines representing these equations with the x-axis and lines with the y-axis. = 2:8 =1:4

Maths10RK2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK2		1	N	10A2a Identify graphically the solutions of a pair of linear equations in two variables, including where the equations are inconsistent (parallel lines)	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge and application of pair of linear equations in two variables, including where the equations are inconsistent (parallel lines) lines

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 f the lines 3x+2ky – 2 = 0 and 2x+5y+1 = 0 are parallel, then the value of k is

A. 4/15

B. 15/4

C. 4/5

D. 5/4 (1 mark)

(Total marks 1)

Mark scheme

1 If the lines 3x+2ky – 2 = 0 and 2x+5y+1 = 0 are parallel, then the value of k is

A. 4/15

B. 15/4

C. 4/5

D. 5/4

Answer	Guidance
B. 15/4	The condition for parallel lines is: $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ Hence, 3/2 = 2k/5 k=15/4

Maths10PS8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS8a	1		N	10A2c Solve problems from real-life where a pair of linear equations occur	1
Maths10PS8b	2		N	10A2b Solve a pair of linear equations in two variables using algebraic methods: by substitution, by elimination	2
Total marks	**3**				**3**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to frame a pair of linear equations and solve the same.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 *Two numbers, x and y (x > y), have a difference of 6 and an average of 4.*

1 (a) *Frame a pair of linear equations in two variables.*

(1 mark)

1 (b) *Determine the values of the two numbers.*

(2 marks)

(Total marks 3)

Mark scheme

1 *Two numbers have a difference of 6 and an average of 4.*

(a) *Frame a pair of linear equations in two variables.*

Answer	Guidance
$x - y = 6$ *and* $\frac{(x+y)}{2} = 4$	A1 for framing two equations. Alternatively, A1 for framing x – y = 6 and x + y = 8
1 (b) Determine *the values of the two numbers.*	
Answer	Guidance
$x = 7, y = 1$ $x - y = 6$ ⇨ $x = y + 6$ *Substituting* $x = y + 6$ *in* $\frac{(x+y)}{2} = 4$ ⇨ $(y + 6 + y) = 8$ ⇨ $y = 1$ *and* $x = 7$	M1 for using Substitution Method A1 for correctly determining the values of x and y Alternatively, M1 for using Elimination Method x = 1 and y = 7 is also correct.

Maths10SK8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK8	2		N	10A2b Solve a pair of linear equations in two variables using algebraic methods: by substitution, by elimination	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of how to solve linear equations

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 Solve 2x – y – 3 = 0, 4 x – y – 5 = 0 using the substitution method. Show your working. (2 marks)

(Total marks 2)

Mark scheme

1 Solve 2x – y – 3 = 0, 4 x – y – 5 = 0 by substitution method.	
Answer	Guidance
y = 2x-3 4x – (2x – 3) – 5 = 0 x = 1 y = 2(1– 3) = –1 x = 1, y = –1	M1 for obtaining substitution A1 correct answer

Maths10RK6

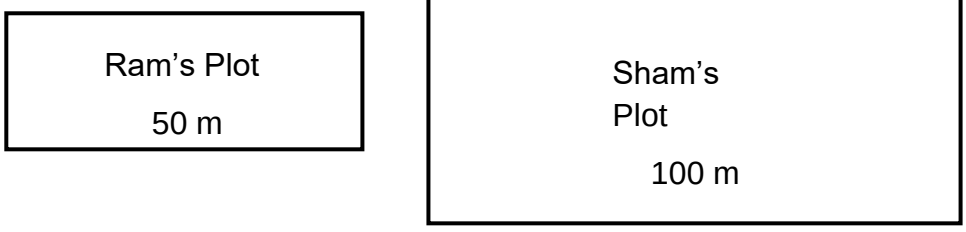
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK6a	2	1	E	10A2b Solve a pair of linear equations in two variables using algebraic methods: by elimination	3
Maths10RK6b	2		E	10A2b Solve a pair of linear equations in two variables using algebraic methods: by elimination	2
Maths10RK6c	2		E	10A2b Solve a pair of linear equations in two variables using algebraic methods: by elimination	2
Total	**6**	**1**			**7**

*C = Calculator required, N = Calculator not allowed, E=Either

Item purpose

The question assesses the knowledge and application of pair of linear equations in two variables in a real-life situation.

Sources and diagrams



Not to scale

Question(s)

1 Ram and Sham are two friends in a town; both have their own plots.
Ram is an owner of a rectangular plot whose perimeter is 50m and Sham is also the owner of a rectangular plot whose perimeter is 100m.
Sham's plot has a length twice that of Ram's plot and breadth is 5m more than that of Ram's plot.

Answers the following questions.

1 (a) Write the linear equations for both the plots (3 marks)

1 (b) Find the dimensions of Ram's plot (2 marks)

1 (c) Find the dimensions of Sham's plot (2 marks)

(Total marks 7)

Mark scheme

1 (a) Write the linear equations for both the plots	
Answer	Guidance
1(a) x+y=25 2x+(y+5) =50	M1 let x m be the length and y m be the breadth of Ram's plot and 2x m be the length, and (y+5) m be the breadth of Sham's plot M1 Apply the formula of the perimeter of the rectangle A1 2(x+y) =50 and 2(2x+y+5) =100 x+y =25…..(1) 2x+y = 45 ……. (2)
1 (b) Find the dimensions of Ram's plot	
Answer	Guidance
x= 20, y=5 Length =20m, breadth= 5m	M1 find the dimensions by elimination method A1 x(length)=20m and y(breadth)= 5m
1 (c) Find the dimensions of Sham's plot	
Answer	Guidance

Length = 40m Breadth = 10m	M1 using substitution method A1 length= 40m Breadth = 10m

Maths10GS6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS6		4	E	10A2b Solve a pair of linear equations in two variables using algebraic methods: by substitution and by elimination	4
Total marks		**4**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses solving a pair of linear equations in two variables.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 There are two classrooms, A and B. If 5 students are shifted from Room A to Room B, the resulting number of students in the two rooms becomes equal.

If 5 students are shifted from Room B to Room A, the resulting number of students in Room A becomes double the number of students left in Room B.

Find the original number of students in the two rooms separately.

(4 marks)

(Total marks 4)

Mark scheme

1

There are two classrooms, A and B. If 5 students are shifted from Room A to Room B, the resulting number of students in the two rooms becomes equal.

If 5 students are shifted from Room B to Room A, the resulting number of students in Room A becomes double the number of students left in Room B.

Find the original number of students in the two rooms separately.

Answer	Guidance
Let x and y be the number of students in Room A and Room B. Then x – 5 = y + 5 ----------(1) x + 5 = 2(y – 5) ----------(2) Simplify the equations (1) and (2), x – y = 10 ----------(3) x – 2y = -15 ----------(4) Solve equations (3) and (4) & eliminate the values of x and y x = 35 and y = 25 No. of students in Room A = 35 No. of students in Room B = 25	M1 for forming equations according to the conditions given in the question as equations (1) and (2). M2 for correctly simplifying equations like (3) and (4) by any method M3 for determining the values of x and y A1 for the correct answer

Maths10SK7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK7a	1		N	10A2c Solve problems from real-life where a pair of linear equations occur	1
Maths10SK7b		3	N	10A2c Solve problems from real-life where a pair of linear equations occur	3
Total marks	**1**	**3**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of linear equations

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 The taxi chares in a city consist of a fixed charge together with the charge for the di covered.

For a distance of 10km, the charge paid is Rs105, and for a journey of 15km, the ch paid is Rs 155.

1 (a) What are the fixed charges and charges per kilometre?

(1 mark)

1 (b) How much does a person have to pay for travelling a distance of 25Km?

(3 marks)

(Total marks 4)

Mark scheme

1 (a) What are the fixed charges and charges per kilometre?	
Answer	Guidance
Fixed charge Rs 5 Charge per Km Rs 10	M1 1 mark A1 let fixed charge is x and charge per Km is y X+10y=105 X+15y=155 A1 solve and get y=10 And substitute to get x=5
1 (b) How much does a person have to pay for travelling a distance of 25Km?	
Answer	Guidance
Rs 255	A1 for the correct answer

Maths10SS5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS5a		4	E	10A2c Solve problems from real-life where a pair of linear equations occur	4
Maths10SS5b	2		E	10A2c Solve problems from real-life where a pair of linear equations occur	2
Total marks	**2**	**4**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to solve problems from real-life where a pair of linear equations occur.

Sources and diagrams

Question(s)

1 Jodhpur is the second-largest city in the Indian state of Rajasthan and officially the second metropolitan city of the state. Jodhpur is a popular tourist destination, featuring many palaces, forts, and temples set in the stark landscape of the Thar Desert. It is popularly known as the “Blue City” among the people of Rajasthan and all over India.

Last year Rahul visited Jodhpur with a group of 25 friends. When they went to Mehrangarh fort, they found the following fare for the ride:

Ride	Normal Hours Fare (per person)	Peak Hours Fare (per person)
Horse	Rs 50	Rs 150
Elephant	Rs 100	Rs 200

1 (a) On their first day, they rode in normal hours and paid Rs 1950 for the ride. Let x be the number of horses hired, and y be the number of elephants hired. Find the number of horses and elephants hired by Rahul and his friends.

(4 marks)

1 (b) The Fort occupies a very large area, and they could not see it entirely on the first day. So, they decided to revisit the next day, but they were in peak hours on their second visit. Calculate the increase in charges they have to pay due to peak hours.

(2 marks)

(Total marks 6)

Mark scheme

1 (a) On their first day, they rode in normal hours and paid Rs 1950 for the ride. Let x be the number of horses hired and y be the number of elephants hired. Find the number of horses and elephants hired by Rahul and his friends.	
Answer	Guidance
Number of horses hired = 11 Number of elephants hired = 14 Let x be the number of horses hired and y be the number of elephants hired, then we have M1 $x + y = 25$ M1 and $50x + 100y = 1950$ & $x + 2y = 39$ (do not deduct marks if the student writes $50x + 100y = 1950$) M1 Solving equations $x + y = 25$ and $x + 2y = 39$ A1 $x = 11$ and $y = 14$. Number of horses hired = 11 Number of elephants hired = 14	M1 For applying his knowledge of algebra and writing the first equation M1 For applying his knowledge of algebra and writing solving the equation M1 For using any method for finding the solution of the given pair of linear equations A1 For correct answer only Number of horses hired = 11 Number of elephants hired = 14. (Student can choose any algebraic method for solving the equations)
1 (b) The Fort occupies a very large area and they could not see it entirely on the first day. So, they decided to visit the next day again, but they hired horse and elephants in peak hours on their second visit. Calculate the increase in charges they have to pay due to peak hours.	
Answer	Guidance

Rs. 2500 For horse riding fare = 150 x 11 = Rs 1650. For elephant ride fare = 200 x 14 = Rs 2800 Total fare = 1650 + 2800 = Rs 4450 Total fare in normal hour = Rs.1950 Total fare in peak hour = Rs.4450 Extra fare = 4450 - 1950 = Rs. 2500	M1 For calculating the total fare in peak hours A1 For the correct answer only Do not deduct marks for units

Maths10SS6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS6a		4	C	10A2c Solve problems from real-life where a pair of linear equations occur	4
Maths10SS6b	1		C	10A2c Solve problems from real-life where a pair of linear equations occur	1
Total marks	**1**	**4**			**5**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to solve problems from real-life where a pair of linear equations occur

Sources and diagrams

Question(s)

1 Mrs. Renu Sharma is the owner of a famous amusement park in Delhi. The ticket charge for the park is Rs 150 for children and Rs 400 for adults. Generally, she does not go to the park, and her team of staff manages it. One day she decided to check the park randomly. When she checked the cash counter, she found that 750 tickets were sold and Rs 212,500 was collected.

1 (a) Find the number of children that visited the amusement park on that day. Also, find the number of adults who visited the amusement park on the same day.

(4 marks)

1 (b) Compute the total amount collected if 415 children and 150 adults visited the park.

(1 mark)

(Total marks 5)

Mark scheme

<table>
<tr><td colspan="2">1 (a) Find the number of children that visited the amusement park on that day. Also, find the number of adults who visited the amusement park on the same day.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>Number of children = 350
Number of adults = 400

Let the number of children visited be x and the number of adults visited be y
Since 750 people visited, x + y = 750.

Collected amount is Rs 212500 thus
150x + 400y = 212500
3x + 8y = 4250

Multiplying x+ y= 750 by 3 and solving we get
Number of children = 350
Number of adults = 400</td><td>M1 equation for people
M1 equation for ticket income
M1 solving equation by any method
A1 correct answers</td></tr>
<tr><td colspan="2">1 (b) Compute the total amount collected if 415 children and 150 adults visited the park.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>Rs 122250
415 x 150 + 150 x400
= 62250 + 60000 = Rs 122250</td><td>A1 For the correct answer only
No marks to be deducted for units</td></tr>
</table>

Maths10RM8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM8a	2	2	C	10A2c Solve problems from real-life where a pair of linear equations occur	4
Maths10RM8b	2		C	10A2c Solve problems from real-life where a pair of linear equations occur	2
Total marks	**4**	**2**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses students' ability to visualise linear equations in two variables or to find their solution.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1

Mr. Singh is the owner of a famous amusement park in Delhi. Generally, he does not go to the park, and it is managed by a team of staff. The ticket charge for the park is Rs 150 for children and Rs 400 for adults.

One day Mr Singh decided to visit the park for a random check. When he checked the cash counter, he found that 480 tickets were sold, and Rs 134500 was collected.

Let the number of children visited be x and the number of adults visited be y.

1 (a) How many children visited the park on that particular day?

(4 marks)

1 (b) How much would be collected if 300 children and 350 adults visited the park?

(2 marks)

(Total marks 6)

Mark scheme

1 (a) How many children visited the park on that particular day?	
Answer	Guidance
Since 480 people visited thus x + y = 480. Collected amount is Rs 134500 thus 150x + 400 y = 134500 & 3x + 8 y = 2690 Solving the equations x + y = 480 and 3x + 8 y = 2690 we get x = 230 \ Number of children attended = 230	M1 for the equations M1 any method of solving simultaneous equations A1 correct intermediate stage of solution A1 finding the value of x
1 (b) How much would be collected if 300 children and 350 adults visited the park?	
Answer	Guidance
Amount = 300x + 350y = 150 × 300 + 400 × 350 = 185000	M1 for expressing in two variables A1 for calculating 2 marks for only the correct answer shown

Maths10RK3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK 3		1	N	10A3a Solve quadratic equations by factorisation and by using the quadratic formula (where roots are real)	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of the roots of quadratic equations.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 If ½ is a root of the quadratic equation x^2-mx-5/4=0, then the value of m is:

A. 2

B. -2

C. -3

D. 3

(1 mark)
(Total marks 1)

Mark scheme

1 If ½ is a root of the quadratic equation x^2-mx-5/4=0, then the value of m is: A. 2 B. -2 C. -3 D. 3	
Answer	Guidance
B. -2	Given x=½ as root of equation x^2-mx-5/4=0.

	$(½)^2 – m(½) – 5/4 = 0$ ¼-m/2-5/4=0 m=-2

Maths10PS10

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS10	1	2	N	10A3b Know and use the relationship between the discriminant and the nature of the roots 10A3a Solve quadratic equations by factorisation and by using the quadratic formula (where roots are real)	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to determine the value of the unknown in a quadratic equation whose roots are real and equal

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 For which, value(s) of k will the roots of $6x^2 + 6 = 4kx$ be real and equal?

(3 marks)

(Total marks 3)

Mark scheme

1 For which value(s) of k will the roots of the quadratic equation $6x^2 + 6 = 4kx$ be real and equal?	
Answer	Guidance
k = 3 or k = -3 For roots to be real and equal, $b^2 – 4ac = 0$ a = 6; b = −4k; c = 6	M1 for correctly identifying the values of a, b, and c. M1 for correctly calculating the value of the discriminant. A1 for the correct answer

=> $(-4k)^2 - 4(6)(6) = 0$ => $16(k^2 - 9) = 0$ => $(k + 3)(k - 3) = 0$ => $k = 3$ or $k = -3$	

Maths10RM5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM5a	1	3	C	10A3a Solve quadratic equations by factorisation and by using the quadratic formula (where roots are real)	4
Maths10RM5b	2		C	10A3c Solve problems from real-life where a quadratic equation occurs	2
Total marks	**3**	**3**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the students' ability to use quadratic equations to solve real-life problems through different strategies, such as quadratic formula, etc

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Kapoor Travel Agency has sent an AC bus and a minibus with passengers on a trip to Shimla. The AC bus travels at x km/hr while the minibus travels at a speed of 10 km/hr more than the AC bus. The AC bus took 2 hrs more than the minibus in covering 600 km.

1 (a) What is the speed of the AC bus?

(4 marks)

1 (b) How much time did the minibus take to travel 600 km?

(2 marks)

(Total marks 6)

Mark scheme

1(a) What is the speed of the AC bus?

Answer	Guidance
The AC bus travels x km/h while the non-AC bus travels at 5 km/h more than the AC bus. Thus, the speed of the non-AC bus is (x + 5) km/hr. As per the question, $\frac{600}{x}-\frac{600}{x+10}=2$ $600(x+10)-600x=2x(x+10)$ $2x^2+20x-6000=0$ $x^2+10x-3000=0$ $(x+60)(x-50)=0$ x = 50, − 60 hence x = 50km/hr	M1 for expressing the condition correctly M1 for framing the quadratic equation M1 for factorisation A1 for rejecting the negative value and writing the correct answer
1(b) How much time did the minibus take to travel 600 km?	
Answer	Guidance
Speed of minibus = 50 + 10 = 60 km/hour Time Taken = $\frac{600}{60}$ = 10 hours	M1 for finding the speed of minibus A1 for finding the time taken

Maths10PS3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS3	1		N	10A3b Know and use the relationship between the discriminant and the nature of the roots	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to determine the nature of the roots of a quadratic equation.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 *Find the nature of the roots for the quadratic equation* $x^2 - 3x + 11 = 0$

A. *No roots*
B. *No real roots*
C. *Two equal roots*
D. *Two distinct real roots*

(1 mark)

(Total marks 1)

Mark scheme

1 Find *the nature of the roots for the quadratic equation* $x^2 - 3x + 11 = 0$

A. *No roots*
B. *No real roots*
C. *Two equal roots*
D. *Two distinct real roots*

Answer	Guidance
B. *No real roots*	A1 for the correct answer As $b^2-4ac = -44 < 0$

Maths10SS9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS9	1		N	10A3b Know and use the relationship between the discriminant and the nature of the roots	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge and use of the relationship between the discriminant and the nature of the roots.

Question

1 The values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots are:

A. 8 and 2
B. 0 and 2
C. -8 and 0
D. 0 and 8

(1 mark)

(Total marks 1)

Mark scheme

1 The values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots are: A. 8 and 2 B. 0 and 2 C. -8 and 0 D. 0 and 8	
Answer	Guidance
D. 0 and 8 For equal roots, the discriminant must be zero. Thus $b^2 - 4ac = 0$ $K^2 - 8k = 0$ $K(k - 8) = 0$ & $k = 0, 8$	A1 For writing (D) or 0 and 8 Do not deduct marks if only (D) or 0 and 8 are written

Maths10AR10

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR10	2		E	10A3b Know and use the relationship between the discriminant and the nature of the roots	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to relate the coefficient of the quadratic polynomial with the zeros of the polynomial,

Sources and diagrams

Question(s)

1 Write the nature of roots of the quadratic equation $4x^2 + 4\sqrt{3}x + 3 = 0$.

(3 marks)

(Total marks 3)

Mark scheme

1 Write the nature of roots of quadratic equation $4x^2 + 4\sqrt{3}x + 3 = 0$	
Answer real and equal	Guidance
b = $4\sqrt{3}$, a = 4, c = 3 $b^2 - 4ac = \left(4\sqrt{3}\right)^2 - 4 \times 4 \times 3 = 0$ Hence the roots are real and equal	M1 identifying the coefficients and substituting the values in $b^2 - 4ac$ A1 correct value for $b^2 - 4ac$ A1 correct statement of nature of roots

Maths10SK9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK9	1	1	C	10A3b Know and use the relationship between the discriminant and the nature of the roots	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of the nature of roots of quadratic equations

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 Find the nature of the roots of the quadratic equation: $3x^2 + 5x - 7 = 0$

(2 marks)

(Total marks 2)

Mark scheme

1 Find the nature of roots of quadratic equations: 3x2 +5x-7=0.	
Answer Real and unequal	Guidance
Discriminant $=b^2-4ac$ $= (5)^2 -4*3(-7) = 109 >0$ Real and Unequal	M1 find discriminant A1 correct answer

Maths10AS6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS6a	1		N	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	1
Maths10AS6b		3	N	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	3
Total marks	**1**	**3**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses that the students know how to calculate the nth term and the sum of the first n terms of an Arithmetic Progression.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Amrya's school organised a tree fest in the month of August.

The authorities got 5 feet of area cleared up all along the school boundary. It was decided that every section of each class would plant twice as many as the class standard. There were 3 sections of each standard from 1 to 12.

So, if there are three sections in class 1, say 1A,1 B, and 1 C, then each sectior would plant 2 trees. Similarly, each section of class 2 would plant 4 trees and sc on.

1 (a) How many trees were planted by the students of all sections of class 8? (1 mark)

1 (b) Find the total number of trees planted by students. (3 marks)

(Total marks 4)

Mark scheme

<table>
<tr><td colspan="2">1(a) How many trees were planted by the students of all sections of class 8?</td></tr>
<tr><td>Answer
48 trees

One section of Class 8 will plant 16 trees
∴ 3 sections of Class 8 will plant 16 × 3 = 48 trees</td><td>Guidance
A1 Correct answer – 1 mark

Total part (a) = 1 mark</td></tr>
<tr><td colspan="2">1 (b) Find the total number of trees planted by students.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>468

Number of trees planted by different classes
6, 12, 18, 24, ….
∴ The terms are in A.P

Total trees planted = 6 + 12 + 18 + 24 + …
n = 12; d = 6 ; a = 6
$S_n = \frac{n}{2}[2a + (n-1)d]$
$S_n = \frac{12}{2}[2\times 6 + (12-1)6]$
$= 6(12 + 66) = 6\times 78 = 468$</td><td>

M1 – forming the A.P

M1 – writing the correct formula for sum.

A1 – finding total number of trees

Total part (b) = 3 marks</td></tr>
</table>

Maths10SK1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK1	1		N	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of Nth term in Arithmetic progression.

Sources and diagrams

Source information: book/journal, author, publisher, website link etc.

Question(s)

1 The 6^{th} term from the of the A. P -11, -8, -5… is

A. -7
B. 4
C. 7
D. 16

(1 mark)

(Total marks 1)

Mark scheme

1 The 6th term of the A. P -11, -8, -5… is A. -7 B. 4 C. 7 D. 16	
Answer	Guidance
B. 4	$A_6 = a+5d$ $= -11+15=4$

Maths10SK11

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK11	1		C	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of Arithmetic progression.

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 Which term of the AP 3, 12, 21, 30, ... will be 90 more than its 50th term.

(2 marks)

(Total marks 2)

Mark scheme

1 Which term of the AP 3, 12, 21, 30, ... will be 90 more than its 50th term.	
Answer 60th term	Guidance
The difference is 9, so it will take 10 further terms to increase by 90. So, the 60th term	M1 for using the common difference to calculate how many more terms are needed A1 correct answer

Maths10RM2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM2	1		E	10A4a Be able to calculate the nth term of an AP	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the students' ability to develop strategies to apply the concept of A.P.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 If the common difference of an AP is 7, then find the value of $a_7 - a_4$

A. 7
B. 14
C. 21
D. 24

(1 mark)

(Total marks 1)

Mark scheme

1 If the common difference of an AP is 7, then find the value of $a_7 - a_4$ A. 7 B. 14 C. 21 D. 24	
Answer	Guidance
C. 21	A1 for the correct answer.

Maths10GS5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS5a	1		C	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	1
Maths10GS5b		2	C	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	2
Maths10GS5c	1		C	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	1
Total marks	**2**	**2**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses how to calculate the nth term and sum of the first n terms of an Arithmetic Progression.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 My friend wants to buy a car and plans to take a loan from a bank for his car.

He repays his loan starting with the first installment of Rs. 1000.

If he increases his installment by Rs.200 every month, then answer the following questions:

1(a) What is the amount paid by him in the 30^{th} installment? (1 mark)

1(b) Find the total amount paid by him in the 30 installments. (2 marks)

1(c) If there are 40 installments in total, then what is the amount paid in the last installment? (1 mark)

(Total marks 4)

Mark scheme

1 (a) What is the amount paid by him in the 30th installment?	
Answer	Guidance
$a_n = a + (n-1)d$ $a_{30} = 1000 + (30-1)200$ $a_{30} = 1000 + 29 \times 200$ $a_{30} = 6800$	A1 Correct answer = 6800
1 (b) Find the amount paid by him in the 30 installments.	
Answer	Guidance
$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{30} = \frac{30}{2}[2 \times 1000 + (30-1)200]$ $S_{30} = 15(2000 + 29 \times 200)$ $S_{30} = 15(2000 + 5800)$ $S_{30} = 15 \times 7800$ $S_{30} = 117,000$	M1 for applying correct formula and substituting correct values A1 Correct answer = 117,000
1 (c) If there are 40 installments in total, then what is the amount paid in the last installment?	
Answer	Guidance
$a_{40} = 1000 + (40-1)200$ $a_{40} = 1000 + 39 \times 200$ $a_{40} = 8800$	A1 Correct answer = 8800

Maths10AR9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR9	2		E	10A4a Be able to calculate nth term and sum to first n terms of an arithmetic progression	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to identify the terms, finding the terms, and use the formula for finding the sum of the terms which are in Arithmetic progression

Sources and diagrams

Question(s)

1 If the first three terms of an A.P is 15,13.5,12. Find the sum of the first 10 terms

(2 marks)

(Total marks 2)

Mark scheme

Point-based

1 If the first three terms of an A.P is 15,13.5,12. Find the sum of the first 10 terms	
Answer	Guidance
a=15d=-1.5. A_{10}= a + (10-1) d =15+9(-1.5) =1.5 sum to 10 terms = 15 + 13.5 + 12 + ... + 1.5 =82.5	M1 Finding the 10th term M2 Finding Sum to 10 terms A1 Getting the 10th term correctly ---1 mark A2 finding the sum to 10 terms – 1 mark

Maths10RK4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK 4		1	E	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge terms of arithmetic progression.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 If m-2 ,2m-3 and m+3 are three consecutive terms of an A.P, then the value of m is:

A. 2.5
B. 3
C. 1.5
D. 3.5

(1 mark)
(Total marks 1)

Mark Scheme

1 If m-2,2m-3 and m+3 are three consecutive terms of an A.P, then the value of m is A. 2.5 B. 3 C. 1.5 D. 3.5	
Answer	Guidance
D. 3.5	A1 as the terms are consecutive in an AP, so the common difference is same (2m-3) -(m-2) = (m+3) - (2m-3) m-1=-m+6 m+m=6+1

	2m = 7 m=3.5

Maths10RM9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM9		3	C	10A4a Be able to calculate the nth term and the sum of the first n terms of an Arithmetic Progression	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses students' ability to apply the concept of Arithmetic Progression in real-life situation

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The nth term of an AP is 18. Its first term and common difference are 50 and −4, respectively. Find the sum of first n terms of the AP

(3 marks)

(Total marks 3)

Mark scheme

1. The nth term of an AP is 18. Its first term and common difference are 50 and −4, respectively. Find the sum of first n terms of the AP.	
Answer	Guidance
Sol: a=50, d=−4,a_n=18 a_n=a+(n−1)d 18 = 50 + (n−1)(−4) 18 = 50 − 4n + 4 = 54 − 4n 4n = 54 − 18 = 36 n = 36 /4 = 9 S_n = n/2(2a + (n−1)d) =9/2(100+(8×−4)) =9/2(100−32) =9/2×68 = 9×34 = 306 S_n = 306	M1 for a, d, and a_n and substituting in the formula M1 for finding n A1 for s_n

Maths10RM1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM1	1		E	10A4b Be able to identify and use Arithmetic Progressions	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the students' ability to develop strategies to apply the concept of Arithmetic progressions

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The next term of the AP $\sqrt{3}$, $\sqrt{12}$, $\sqrt{27}$, …… is:

A. $\sqrt{9}$
B. $\sqrt{15}$
C. $\sqrt{48}$
D. $\sqrt{12}$

(1 mark)

(Total marks 1)

Mark scheme

1 The next term of the AP $\sqrt{3}$, $\sqrt{12}$, $\sqrt{27}$, …… is : A. $\sqrt{9}$ B. $\sqrt{15}$ C. $\sqrt{48}$ D. $\sqrt{12}$	
Answer	Guidance
C. $\sqrt{48}$ AP is: $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, 4\sqrt{3}.....$ $4\sqrt{3} = \sqrt{48}$	A1 for the correct answer

Maths10GS3

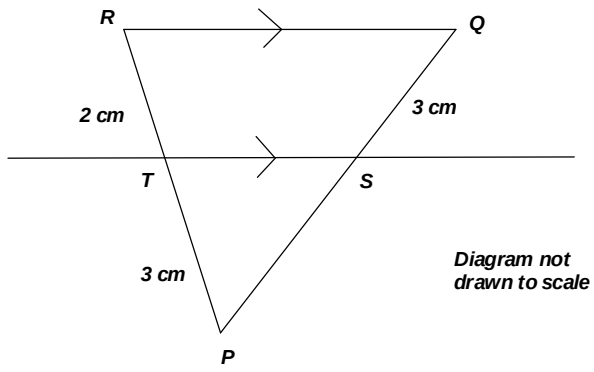
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS3	1		N	10G1a Be able to prove and use the fact that: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the concept of the Basic Proportionality Theorem.

Sources and diagrams



Question(s)

1 In the above figure, ST is parallel to QR. What is the length of SP?

A. 2 cm
B. 3 cm
C. 4 cm
D. 4.5 cm

(1 mark)

(Total marks 1)

Mark scheme

1 In the above figure, ST is parallel to QR. What is the length of SP?	
Answer	Guidance

SP = 4.5 cm PQR and PTS are similar since ST and QR are parallel, so $\frac{RT}{TP} = \frac{QS}{SP} \Rightarrow \frac{2}{3} = \frac{3}{SP} \Rightarrow SP = 4.5$	A1 Correct answer – 1 mark

Maths10AD10

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD10	3		N	10G1a Be able to prove and use the fact that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the use of the fact that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Sources and diagrams

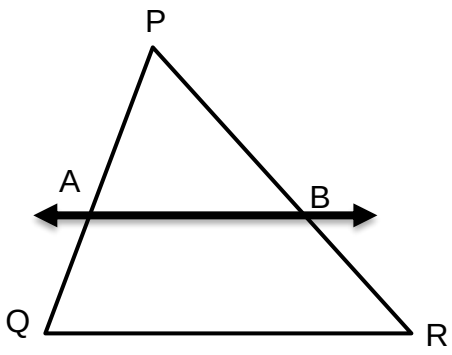


Diagram not to scale

Question(s)

1 A line intersects sides PQ and PR of Δ PQR at A and B, respectively, and is parallel to QR, as shown in the figure. Prove that $\frac{AQ}{PQ} = \frac{BR}{PR}$.

(3 marks)

(Total marks 3)

Mark Scheme

1. A line intersects sides PQ and PR of Δ PQR at A and B, respectively, parallel to QR, as shown in the figure. Prove that $\frac{AQ}{PQ} = \frac{BR}{PR}$.	
Answer	Guidance
Given: Δ PQR, in which AB intersects PQ and PR at A and B, respectively. Also, AB ∥ QR To Prove: $\frac{AQ}{PQ} = \frac{BR}{PR}$. Proof: since AB ∥ QR So, $\frac{PA}{AQ} = \frac{PB}{BR}$ (By Thales theorem or by BPT) $\Rightarrow \frac{AQ}{PA} = \frac{BR}{PB}$ $\Rightarrow \frac{AQ}{PA} + 1 = \frac{BR}{PB} + 1$ $\Rightarrow \frac{AQ+PA}{PA} = \frac{BR+PB}{PB}$ $\Rightarrow \frac{PQ}{PA} = \frac{PR}{PB}$ $\Rightarrow \frac{PA}{PQ} = \frac{PB}{PR}$ $\Rightarrow \frac{PQ-AQ}{PQ} = \frac{PR-BR}{PR}$ $\Rightarrow 1 - \frac{AQ}{PQ} = 1 - \frac{BR}{PR}$ $\Rightarrow \frac{AQ}{PQ} = \frac{BR}{PR}$ Hence Proved	M1 Writing the given information and to prove along with the figure M1 Applying Thales theorem to prove $\frac{PQ}{PA} = \frac{PR}{PB}$ A1 proving that $\frac{AQ}{PQ} = \frac{BR}{PR}$

Maths10PS7

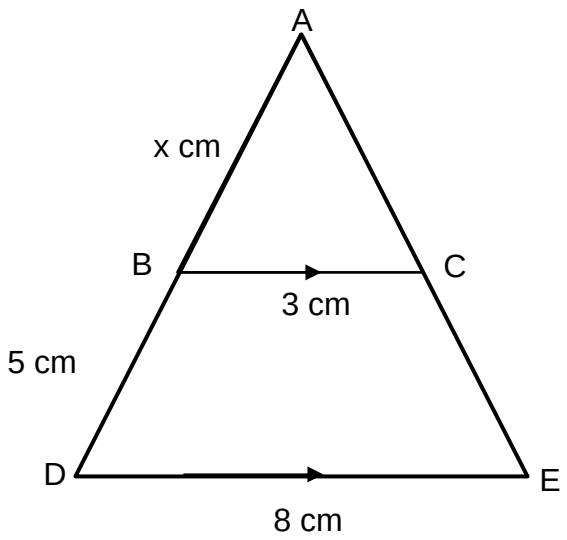
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS7	1	1	N	10G1a Be able to prove and use the fact that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to determine the value of the unknown side when the lengths of the parallel sides and other two sides in distinct points divided in the same ratio are given.

Sources and diagrams



The diagram alongside has not been drawn to scale. BC is parallel to DE.

Question(s)

1 *In the above figure, line BC is drawn parallel to DE to intersect side AD and EA of triangle ABC at distinct points B and C. Given that AB = x cm, BD = 5 cm, BC = 3 cm and DE = 8 cm. Find the value of x.*

(2 marks)

(Total marks 2)

Mark scheme

1. *In the above figure, line BC is drawn parallel to DE to intersect side AD and EA of triangle ABC at distinct points B and C. Given that AB = x cm, BD = 5 cm, BC = 3 cm and DE = 8 cm. Find the value of x.*	
Answer	Guidance
x = 3 (cm) $\frac{x}{x+5} = \frac{3}{8}$ ⇨ *x = 3 cm*	*M1 for writing the correct ratios as per the concept* *A1 for the correct answer* *Alternatively,* *M1 for writing the ratios as* $\frac{x+5}{x} = \frac{8}{3}$ *Note:* *A1 for the correct answer.* *Do not penalise if the units are not written.*

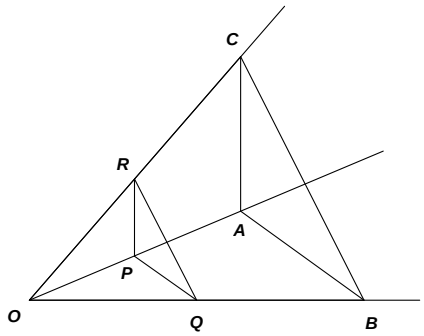
Maths10SR7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR7a		3	N	10G1a Be able to prove and use the fact that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio	3
Maths10SR7b		3	N	10G1c Use the fact that: If in two triangles, the corresponding angles are equal, their corresponding sides are proportional, and the triangles are similar	3
Total marks		**6**			**6**

Item purpose

The question assesses the ability to apply the basic proportionality theorem and criteria for similar triangles

Sources and diagrams



Question(s)

1 In the figure given above PR II AC and PQ II AB

1(a) Prove that QR II BC (3 marks)

1(b) Prove that $\Delta ABC \sim \Delta PQR$ (3 Marks)

(Total marks 6)

Mark scheme

1 (a) Prove that QR II BC	
Answer	Guidance
Given that PR II AC. So, from $\Delta OAC,$ by Basic Proportionality Theorem, we have $\frac{CP}{PA} = \frac{OR}{RC}$ ……. (1) PQ II AB, so from $\Delta OAB,$ we have $\frac{CQ}{QB} = \frac{CP}{PA}$ ……. (2) From equations (1) and (2), we get $$\frac{CQ}{QB} = \frac{OR}{RC}$$ So, by the converse of the Basic Proportionality theorem, QRIIBC	M1. Using Basic Proportionality Theorem in triangle OAC we have CP/PA =OR/RC……. (1) M1. $\frac{CQ}{QB} = \frac{CP}{PA}$ ……. A1. COMPARING AND GETTING QR II BC ----1 MARK USING CONVERSE OF BPT So, by the converse of the Basic Proportionality theorem, QRIIBC
1 (b) Prove that $\Delta ABC \sim \Delta PQR$	
Answer	Guidance
PR II AC gives $< ORP =< OCA$ …… (1) QR II BC gives $< ORP = OCB$ …….. (2) (2) – (1) Gives $< PRQ =< ACB$ …….. (3) PQ II AB Gives $< OQP =< OBA$ …….. (4) QR II BC Gives $< OQR =< OBC$ …….. (5) (4) – (3) Gives $< PQR =< ABC$…….. (6) From (3) and (6), we get $\Delta ABC \sim \Delta PQR$ (By AA similarity criteria)	M1. $< PRQ =< ACB$ USING THE PROPERTY CORRESPONDING ANGLES ARE EQUAL and arriving the answer M1. $< PQR =< ABC$ SAME PROPERTY A1. $\Delta ABC \sim \Delta PQR$ (by AA similarity criteria)

Maths10AD1

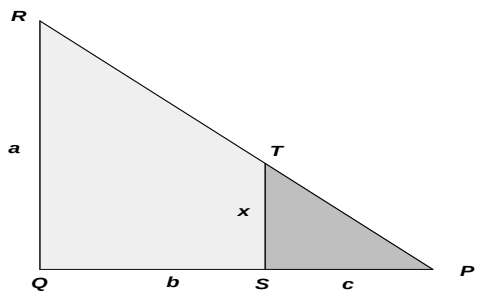
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD1	1		N	10G1c Use the fact that: If in two triangles, the corresponding angles are equal, their corresponding sides are proportional, and the triangles are similar	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the learner's understanding of the properties of similar triangles.

Sources and diagrams



Question

1 In the figure shown above, QR is parallel to ST. QR = a, QS = b, SP = c and ST = x.

The correct relationship between x, a, b and c is given as

A. $x = \frac{a(b+c)}{c}$

B. $x = \frac{a(b+c)}{b}$

C. $x = \frac{ac}{b+c}$

D. $x = \frac{a(b-c)}{b}$

(1 mark)

(Total marks 1)

Mark scheme

1 With reference to the figure shown above, the correct relationship between x, a, b and c is given as

A. $x = \frac{a(b+c)}{c}$

B. $x = \frac{a(b+c)}{b}$

C. $x = \frac{ac}{b+c}$

D. $x = \frac{a(b-c)}{b}$

Answer	Guidance
C. $x = \frac{ac}{b+c}$ $\frac{ST}{QR} = \frac{SP}{QP} \Rightarrow \frac{x}{a} = \frac{c}{b+c}$ $\Rightarrow x = \frac{ac}{b+c}$	A1 for the correct answer only Do not penalise if only (C) or only the answer $x = \frac{ac}{b+c}$ is written.

Maths10ASR11

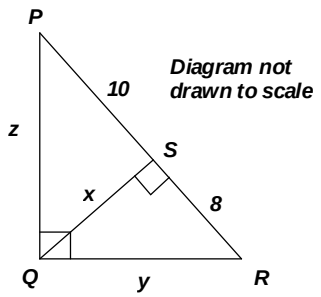
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10ASR11a		2	N	10G1f To prove If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other	2
Maths10ASR11b	2	2	E	10G1c Use the fact that if the corresponding angles are equal in two triangles, their corresponding sides are proportional	4
Total marks	**2**	**4**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses students' ability to establish properties for similarity of two triangles logically using different geometric criteria.

Sources and diagrams



Question(s)

1 In $\Delta PQR, \angle PQR = 90°,$ QS $\perp$ PR

1 (a) Prove that $\Delta PSQ \sim \Delta QSR$. (2 marks)

1 (b) Find the values of x, y, and z. (4 marks)

(Total marks)

Mark scheme

1 (a) Prove that $\Delta PSQ \sim \Delta QSR$.	
Answer	Guidance
In $\Delta PQS \text{ and } \Delta PQR$, $\angle PSQ = \angle PQR$ …..each 90° $\angle QPS = \angle QPR$ ……common angle Therefore, $\Delta PSQ \sim \Delta PQR$ ……$AA\ test$ …(i) Similarly, $\Delta QSR \sim \Delta PQR$…. AA test….. (ii) From (i) and (ii) $\Delta PSQ \sim \Delta QSR$.	M1: To prove the similarity of $\Delta PQS \text{ and } \Delta PQR$ (Or $\Delta QSR \sim \Delta PQR$) M2: To prove the similarity of $\Delta PSQ \text{ and } \Delta QSR$.
1 (b) Find the values of x, y, and z.	
Answer	
Since $\Delta PSQ \sim \Delta QSR$. $\frac{PS}{QS} = \frac{QS}{SR}$……. CSST $QS^2 = PS \times SR$ $x^2 = 10 \times 8$ $x^2 = 80$ $x = 4\sqrt{5}$ In ΔPQS, $z^2 = 10^2 + x^2$ ….. By Pythagoras theorem $= 100 + 80 = 180$ $z = 6\sqrt{5}$ Similarly, $In\ \Delta QSR$, $y^2 = 8^2 + x^2$ $y^2 = 64 + 80$ $y^2 = 144$ $y = 12$	M1 A1: use similar triangle ratios to find *x*. M1 A1: use Pythagoras to find *y, z* (or use proportionality again)

Maths10PR6

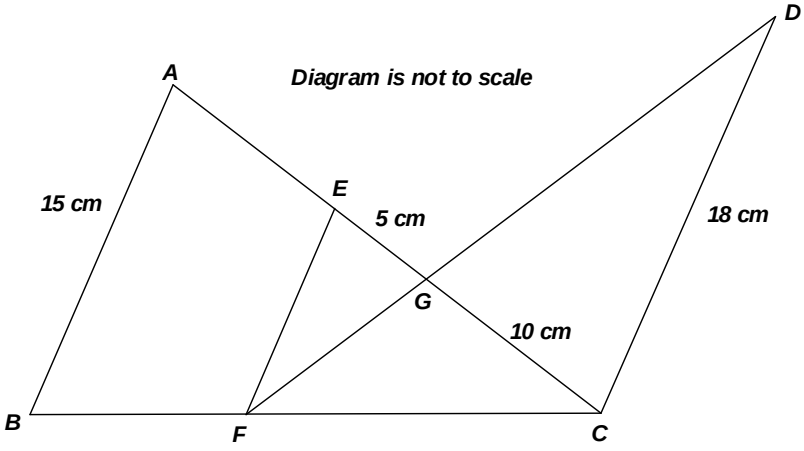
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR6a		3	E	10G1c Use the fact that: If in two triangles, the corresponding angles are equal, their corresponding sides are proportional, and the triangles are similar.	3
Maths10PR6b		3	E	10G1c Use the fact that: If in two triangles, the corresponding angles are equal, their corresponding sides are proportional, and the triangles are similar.	3
Total marks		**6**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the properties of similar triangles and applying them.

Sources and diagrams



Question(s)

1 In the figure shown above, $BA, FE,$ and CD are parallel lines.

Given that $EG = 5\ cm, GC = 10\ cm, AB = 15\ cm\ and\ DC = 18cm.$

Calculate:

1 (a) EF (3 marks)

1 (b) AC (3 marks)

(Total marks 6)

Mark scheme

1 (a) EF	
Answer	Guidance
9 cm	M1 In $\Delta EFG \text{ and } \Delta CDG$, we have $\angle GFE = \angle GDC$ (alt. int angles; $EF \parallel DC$ and $FD \text{ is tranversal}$) $\angle EGF = \angle CGD$ (vert. opp. Angles) $\Delta EFG \sim \Delta CDG$ by AA similarity criterion M1 corresponding sides are in the same ratio A1 $\frac{EF}{EG} = \frac{CD}{CG} \Longrightarrow \frac{EF}{5} = \frac{18}{10} \Longrightarrow EF = 9\ cm.$
1 (b) AC	
Answer	Guidance
25 cm	M1 In $\Delta CAB \text{ and } \Delta CEF$, we have $\angle CAB = \angle CEF$ (corresponding angles; AB$\parallel EF$ and $AC \text{ is tranversal}$) $\angle C = \angle C$ (common angle) By AA similarity criterion, $\Delta CAB \sim \Delta CEF$ M1 corresponding sides are in the same ratio $\frac{AC}{CE} = \frac{AB}{EF} \Longrightarrow \frac{AC}{15} = \frac{15}{9}$ $(CE = GC + EG = 10\ cm + 5\ cm = 15\ cm)$ A1 $AC = 25\ cm$

Maths10ASR4

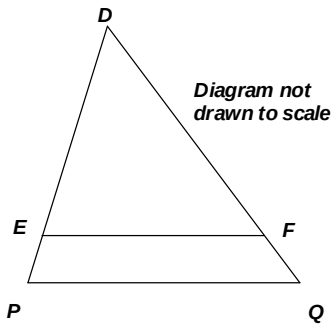
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Mark
Maths10ASR4	1		C	10G1e Triangles Applications of the Similar triangles	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to apply the relation between the areas of similar triangles and the ratio of their sides.

Sources and diagrams



Question

1 In the above figure, $\Delta DPQ \sim \Delta DEF$, ar$(\Delta DEF) = 144cm^2$, ar$(\Delta DPQ) = 196cm^2$DP= 24.5cm, then find the length of DE.

(3 marks)

(Total marks 3)

Mark scheme

1 In the above figure, $\Delta DPQ \sim \Delta DEF$, ar$(\Delta DEF) = 144cm^2$, ar$(\Delta DPQ) = 196cm^2$, DP= 24.5cm.	
Answer	Guidance
21cm The area ratio is 196: 144, so the length ratio is 14: 12 So DE = $\frac{12}{14} \times 24.5 = 21$	M1 is taking the square root of the area ratio for the length ratio. A1 correct length ratio A1 mark for the correct answer for DE Do not penalise for no units

Maths10AKP6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP6	3		N	10G1e Use the fact that: If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of solid geometry

Sources and diagrams

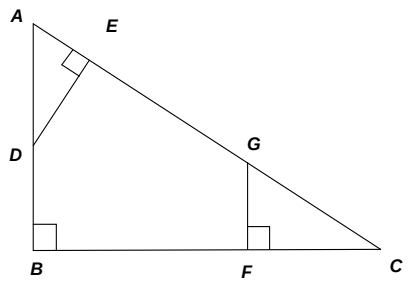


Diagram not to scale

Question

1 In the above figure, AB $\perp BC, DE \perp AC$ *and* $GF \perp BC$.
Prove that $\triangle ADE \sim \triangle GCF$

(3 marks)
(Total marks 3)

Mark scheme

1 In the above figure, AB $\perp BC, DE \perp AC$ *and* $GF \perp BC$. Prove that $\triangle ADE \sim \triangle GCF$	
Answer	Guidance
In △ADE and △ACB Angle A = Angle A (common) Angle AED = Angle ABC (90^0) $\triangle ADE \sim \triangle ACB$ (AA) -------(i) In △ACB and △GCF Angle C =Angle C (common)	M1 for using the concept of similarity 1 mark

Angle ABC = Angle GFC (90^0) $\triangle ACB \sim \triangle GCF$ (AA) ----------(ii) From (i) and (ii) $\triangle ADE \sim \triangle GCF$	1 mark 1 mark

Maths10ASR7

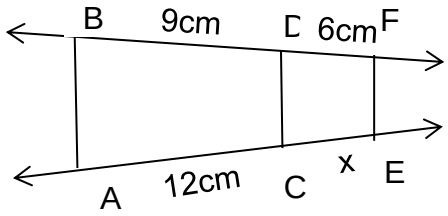
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10ASR7a		2	E	10G1g Be able to prove and use the fact that: The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides	2
Maths10ASR7b	1		E	10G1g Be able to prove and use the fact that: The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides	1
Total marks	**1**	**2**			**3**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of students to apply BPT by doing necessary construction.

Sources and diagrams



Question(s)

1 In the above figure AB || CD || EF.

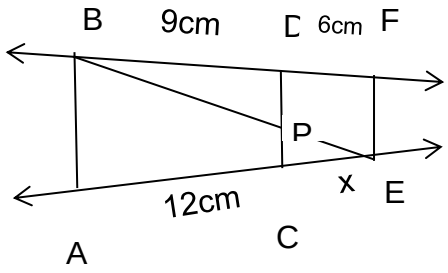
AC =12cm, BD = 9cm, DF = 6cm, CE = x

1 (a) Find x (2 marks)

1 (b) Find AE (1 mark)

(Total marks 3)

Mark scheme

<table>
<tr><td colspan="2">1 (a) Find x</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td> 

Construction: Join BE
In ΔABE PC ll AB,
By BPT,
$\frac{EP}{PB} = \frac{EC}{CA}$……..i)
Similarly,
In $\Delta\ BEF, PD \| \| EF,$
$\frac{EP}{PB} = \frac{FD}{DB}$……..ii)
From equations (i) and (ii),
$\frac{EC}{CA} = \frac{FD}{DB}$
$\frac{x}{12} = \frac{6}{9}$
$x = 8$ cm</td><td>M1:
1 mark for applying Basic Proportionality theorem correctly for $\Delta ABE\ and\ \Delta\ BEF$ and for proving $\frac{EC}{CA} = \frac{FD}{DB}$
A1:
1 mark to find the answer correctly.
(If the relation $\frac{EC}{CA} = \frac{FD}{DB}$ is used without proving and found the correct answer student will get 1 mark.
Do not penalise if the unit(cm) is omitted</td></tr>
<tr><td colspan="2">1 (b) Find AE</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>AE= AC + CE
= 12+ 8
=20cm</td><td>A1:
1 mark for calculating the length of AE = 20 cm.
Do not penalise if the unit(cm) is omitted</td></tr>
</table>

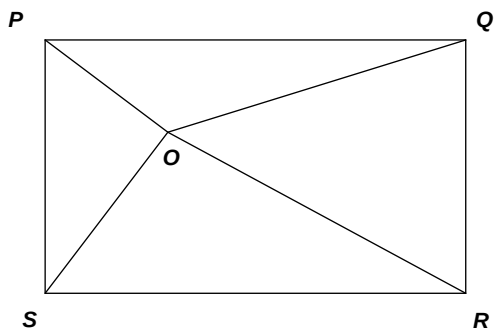
Maths10SR4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR4		1	N	10G1h Be able to prove and use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.	1

Item purpose

The question assesses the understanding of Pythagoras theorem

Sources and diagrams



Question(s)

1 A point O in the interior of a rectangle PQRS is joined with each of vertices P, Q, R, and S.

Then $OP^2 + OR^2$ is

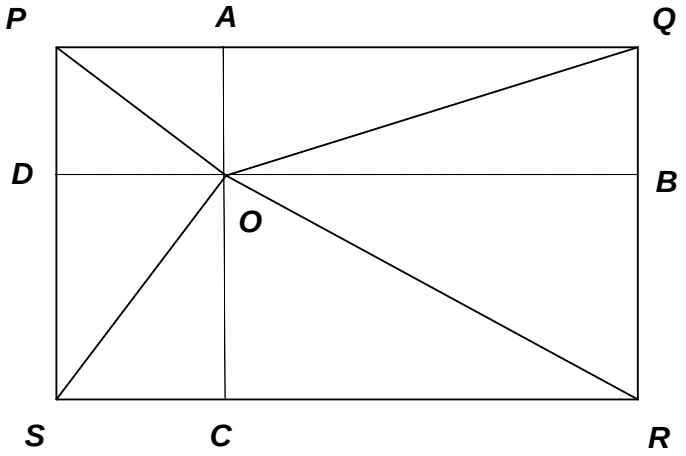
A. $OQ \times OS$
B. $OQ^2 + OS^2$
C. OQ +OS
D. $\frac{OQ^2}{OS^2}$

(1 mark)
(Total marks 1)

Mark scheme

1 A point O in the interior of a rectangle PQRS is joined with each of vertices P, Q, R, and S. Then $OP^2 + OR^2$ is

A. $OQ \times OS$
B. $OQ^2 \times OS^2$
C. OQ +OS
D. $\frac{OQ^2}{OS^2}$

Answer B. $OQ^2 \times OS^2$	Guidance
 Create right-angled triangles with OP, OQ, OR, OS as hypotenuse, using points A, B, C, D on the sides as shown. Then $OP^2 + OR^2 = (OA^2 + AP^2) + (OB^2 + BR^2)$ $OS^2 + OQ^2 = (OC^2 + CS^2) + (OA^2 + AQ^2)$ $AP^2 = CS^2$; $OB^2 = AQ^2$; $BR^2 = OC^2$ So $OP^2 + OR^2 = OS^2 + OQ^2$	A1 For the correct answer

Maths10PS6

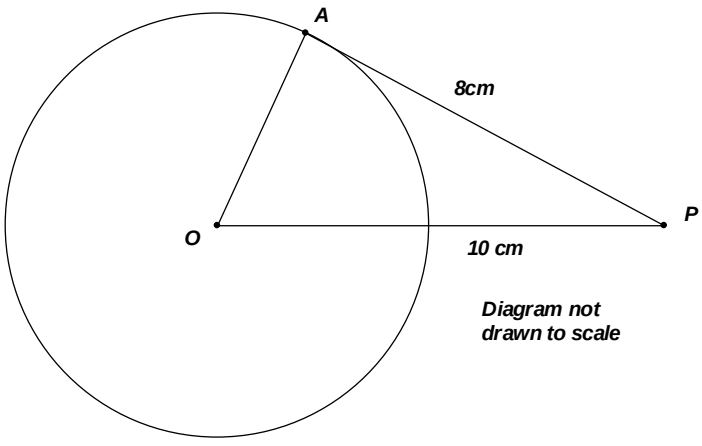
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS6	1	1	N	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact 10G1h Be able to prove and use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student that tangent at any point of a circle is perpendicular to the radius through the point of contact and applies the Pythagoras Theorem to determine the radius and hence the diameter of the circle.

Sources and diagrams



Question(s)

1 From an external point P, the length of the tangent PA to a circle is 8 cm. The distance from the centre O to the external point P is 10 cm. Find the diameter of the circle. (2 marks)

(Total marks 2)

Mark scheme

1. From an external point P, the length of the tangent PA to a circle is 8 cm. The distance from the centre O to the external point P is 10 cm. Find the diameter of the circle.	
Answer	Guidance
12(cm) OA is perpendicular to AP Applying Pythagoras Theorem: $OP^2 = OA^2 + AP^2$ ⇨ OA = $\sqrt{100 - 64}$ ⇨ OA = $\sqrt{36}$ ⇨ OA = 6 cm = radius Diameter = 2r ⇨ D = 12 cm	M1 for identifying the use of Pythagoras Theorem and radius being perpendicular to a tangent drawn from an external point and determining the value of radius. A1 for the correct answer Alternatively, M1 For using Pythagorean Triplets (as 6, 8, 10) to determine the radius value. A1 for directly writing the correct answer. Note: A1 Consider 12 or 12 cm as the correct answer. Do not penalise for omitting the units.

Maths10AKP9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP9		2	E	10G1h Be able to prove and to use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of Pythagoras Theorem and its use

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 Find the perimeter of an isosceles right triangle, the length of whose hypotenuse is 10 cm.

(2 marks)

(Total marks 2)

Mark scheme

1 Find the perimeter of an isosceles right triangle, the length of whose hypotenuse is 10 cm.	
Answer	Guidance
Since, triangle is isosceles right triangle $a^2 + a^2 = (10)^2$. $2\ a^2 = 100$ $\therefore a^2 = 50$ $\therefore a = 5\sqrt{2}$ cm Perimeter of the triangle $= 10 + 5\sqrt{2} + 5\sqrt{2} = 10\ (\sqrt{2} + 1\ )$ cm	M1 for the concept of Pythagoras theorem 1 mark for finding perimeter

Maths10PR7

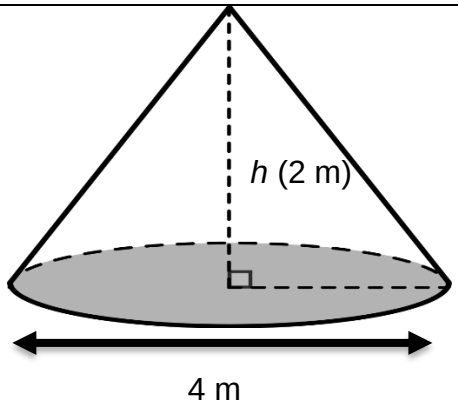
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR7a	2	3	C	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	5
Maths10PR7b	1	2	C	10G1h Be able to prove and use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides	3
Total marks	**3**	**5**			**8**

*C = Calculator required, N = Calculator not allowed, E = Either

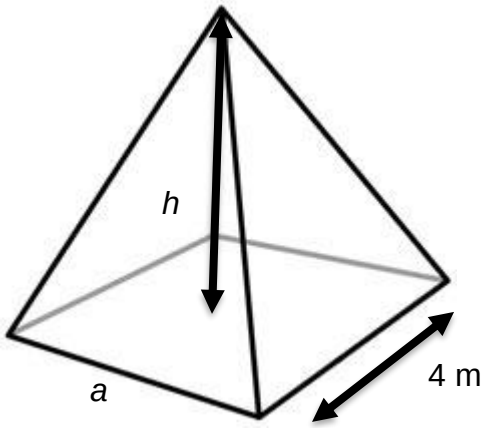
Item purpose

The question assesses the application of Pythagoras theorem in the surface area of solids

Sources and diagrams



Seerat's tent



Kaju's tent

Not to scale

Question(s)

1 As shown in the diagram, Kaju and Seerat planned to place kidder's tent of the same height in their respective rooms.

Kaju's tent is a square-based pyramid, and Seerat's tent is conical in shape.

1 (a) Kaju plans to use green printed cloth for his tent, and Seerat uses a pink printed cloth for her tent. The base is the floor of the room, so the cloth is used for the sides only.

Find the difference in m^2 in the two cloths used by Kaju and Seerat.

Take $\pi = \frac{22}{7}$

(5 marks)

1 (b) Kaju also plans to fix the light wire on the edges of his tent.

Find the total cost, to the nearest rupee, of the light wire at the rate of Rs 65 per metre.

(3 marks)

(Total marks 8)

Mark scheme

1 (a) Kaju plans to use green printed cloth for his tent, and Seerat uses a pink printed cloth for her tent. The base is the floor of the room, so the cloth is used for the sides only. Find the difference in m^2 in the two cloths used by Kaju and Seerat.	
Answer	Guidance
14.84 (m^2) Allow the answer between 14.8 to 14.9	M1 For Kaju: Quantity of cloth used $=4 \times area\ of\ the\ side\ triangular\ faces$ $= 4 \times \frac{1}{2} \times b \times s$ $b = 4m,$ $s = hypotenuse\ with\ height\ perpendicular$ $to\ the\ base\ which\ is\ half\ of\ the\ side\ of\ the\ square\ base$ M1 Using Pythagoras theorem, $(2)^2 + (2)^2 = s^2$ $\Longrightarrow s^2 = 8 \Longrightarrow s = 2.83m$ Area of cloth used = $4 \times \frac{1}{2} \times 4 \times 2.83 = 22.64\ m^2$ M1 For Seerat: Area of cloth used = CSA of cone $= \pi rl = \frac{22}{7} \times 2\sqrt{(2^2 + 2^2)}$=17.78$m^2$.

	A1 area of cloth used by Seerat = 17.78 m^2 A1 difference of areas = $22.64 - 17.78 = 4.86\ m^2$
1 (b) Kaju also plans to fix the light wire on the edges of his tent. Find the total cost, to the nearest rupee, of the light wire at the rate of Rs 65 per metre.	
Answer	Guidance
Rs 900 (allow reasonable leeway)	M1 edge = side of an isosceles triangle where height is 2.83 m and half of the side is 2 m Using Pythagoras theorem, $(edge)^2 = \left(\sqrt{8}\right)^2 + (2)^2$ $edge = \sqrt{12} = 3.46\ m$ **Alternate method** using height and half of the diagonal of the square base: M1 total length of light wire = $4 \times edge = 4 \times 3.46$ $= 13.84\ m$ The total cost of wire = $13.84 \times 65 = 900.66.. \approx 900$ A1 Rs 900

Maths10AS3

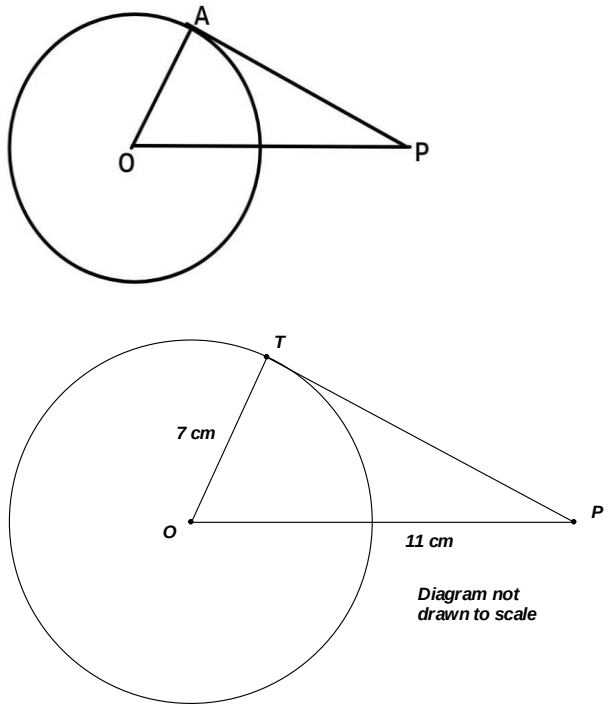
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS3	1		C	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the application of the theorem the tangent at any point of a circle is perpendicular to the radius through the point of contact.

Sources and diagrams



Question(s)

1 PT is tangent to the circle of radius 7 cm. If OP = 11 cm, then find the length of the tangent, correct to 1 decimal place.

A. 4.0 cm
B. 8.5 cm
C. 13.0 cm
D. 18.0 cm

(1 mark)

(Total marks 1)

Mark scheme

1. PT is tangent to the circle of radius 7 cm. If OP = 11 cm, then find the length of the tangent, correct to 1 decimal place. 1 4.0 cm 2 8.5 cm 3 13.0 cm 4 18.0 cm	
Answer	Guidance
B. 6 cm OA $\perp$ PA $OP^2 = OA^2 + PA^2$ $11^2 = 7^2 + PA^2$ $121 - 49 = PA^2 = 72$ $\therefore$ PA = 8.5 cm	A1 Correct answer

Math10MM8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Math10MM8	2		N	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact. 10G2b Be able to prove and use the fact that: The lengths of tangents drawn from an external point to a circle are equal	2
Total marks	**2**				**2**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to understand that the tangent at any point of a circle is perpendicular to the radius through the point of contact, and the lengths of tangents drawn from an external point to a circle are equal.

Sources and diagrams

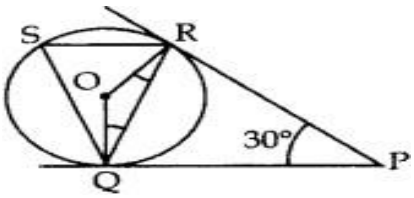


Figure 1

Not drawn to scale. PQ and PR are the tangents to a circle of centre O.

Question(s)

1. In figure 1 given above, O is the centre, PQ and PR are the two tangents, RQ is the chord. If ∠RPQ = 30°, then find ∠RQP and ∠RSQ.

(2 marks)

(Total marks 2)

Mark scheme

1 In figure1given above, O is the centre, PQ and PR are the two tangents, RQ is the chord. If ∠RPQ = 30°, then find ∠RQP and ∠RSQ.	
Answer	Guidance
∠QOP = 180° – 30° = 150° In triangle ORQ OQ = OR (Radius) ∠OQR = ∠ORQ = 15° (Angle sum property of a triangle) ∠OQP = 90° (Tangent makes an angle of 90° with the radius) ∠RQP = 90° - 15° = 75° ∠RQP = 75° ∠QOP = 180° – 30° = 150° ∠RSQ = 75° (Angle at the centre is double)	M1 ∠QOP = 180° – 30° = 150° In triangle ORQ OQ = OR (Radius) ∠OQR = ∠ORQ = 15° (Angle sum property of a triangle) ∠OQP = 90° (Tangent makes an angle of 90° with the radius) ∠RQP = 90° - 15° = 75° ∠RQP = 75° A1- ∠RQP = 75° Do not penalise if degree symbol is omitted. M1 ∠QOP = 180° – 30° = 150° ∠RSQ = 75° (Angle at the centre is double) A1- ∠RSQ = 75° Do not penalise if degree symbol is omitted.

Maths10PR2

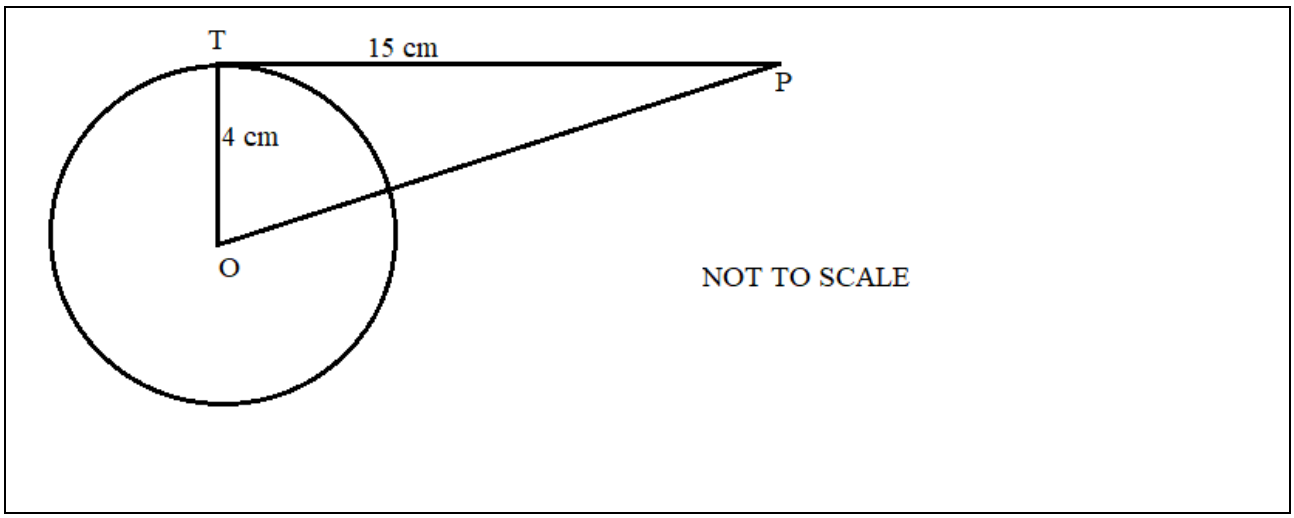
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR2		1	C	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the relationship between the tangent and the radius of a circle.

Sources and diagrams



Question(s)

1 In the given diagram, $OT = 4cm$, is the radius of the circle with centre O, and a tangent PT is drawn from a point P such that $PT = 15cm$.

The length of OP to correct two decimal places is

A. 11.00 cm
B. 10.44 cm
C. 15.52 cm
D. 19.00 cm

(1 mark)

(Total marks 1)

Mark scheme

<table>
<tr><td colspan="2">1. In the given diagram, $OT = 4cm$, is the radius of the circle with centre O, and a tangent PT is drawn from a point P such that $PT = 15cm$.

The length of OP to correct two decimal places is

A. 11.00 cm
B. 10.44 cm
C. 15.52 cm
D. 19.00 cm</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>C. 15.52 cm</td><td>As the tangent from an external point is perpendicular to the radius at the point of contact and using the Pythagoras theorem of right triangle OTP, $OP = \sqrt{15^2 + 4^2} = \sqrt{225 + 16} = \sqrt{241} = 15.52$</td></tr>
</table>

Maths10MM6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10MM6a	1	1	N	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact	2
Maths10MM6b	1	2	N	10G2b Be able to prove and use the fact that: The lengths of tangents drawn from an external point to a circle are equal	3
Total marks	**2**	**3**			**5**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to understand that the tangent at any point of a circle is perpendicular to the radius through the point of contact, and the lengths of tangents drawn from an external point to a circle are equal.

Sources and diagrams

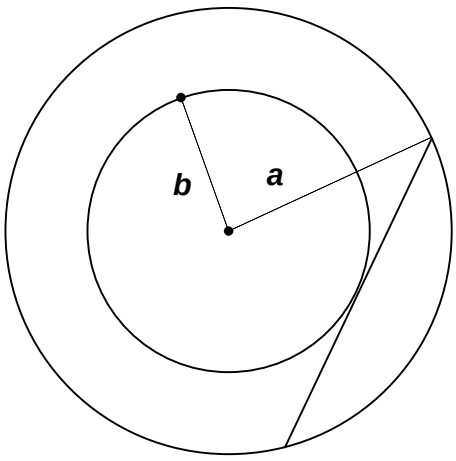


Fig.1a

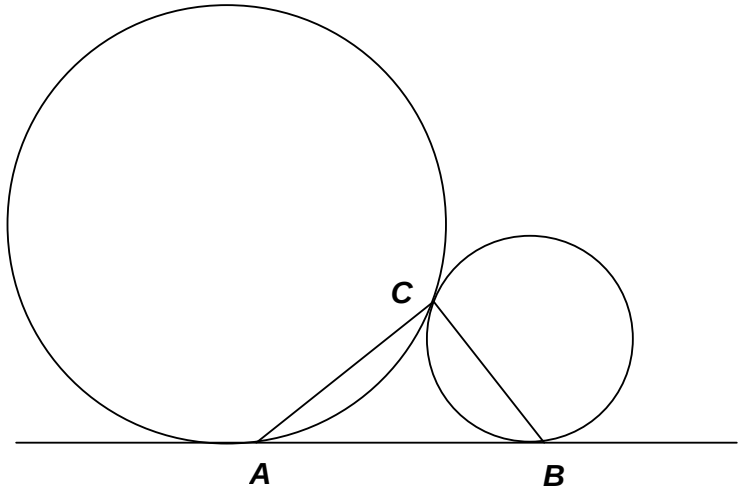


Fig.1b

Question(s)

1 (a) Two concentric circles of radii a and b (a > b) are given. Find the length of the chord of the larger circle which touches, the smaller circle.

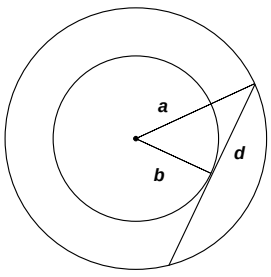
(2 marks)

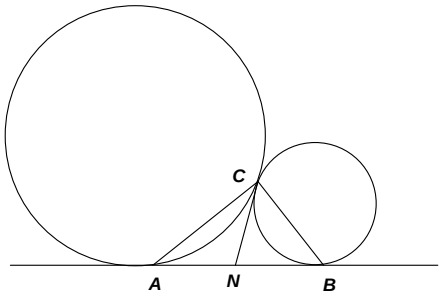
1 (b) In figure 1 above, two circles touch each other externally at C, and AB is a common tangent of circles, then find ∠ACB.

(3 marks)

(Total marks 5)

Mark scheme

1(a) Two concentric circles of radii a and b (a > b) are given. Find the length of the chord of the larger circle which touches, the smaller circle.	
Answer	Guidance
$2\sqrt{a^2 - b^2}$  	M1 – tangent at any point of a circle is perpendicular to the radius, so $d^2 + b^2 = a^2$ using Pythagoras to find d, which is half the chord length. A1 chord $= 2\sqrt{a^2 - b^2}$ Allow 2 marks for the correct answer only.

1(b) In figure 1(b) given above, two circles touch each other externally at C, and AB is the common tangent of circles, then find ∠ACB.	
Answer	Guidance
⇒∠ACB = 90° Use construction of common tangent at the common point C – let N be where common tangent intersects AB. CN = AN and CN = BN {the lengths of tangents drawn from an external point to a circle are equal}  We also know that angle opposite to equal sides is equal. Therefore ∠NCA = ∠NAC and ∠NCB = ∠NBC ∠NCA + ∠NCB = ∠NAC + ∠NBC ∠NCA + ∠NCB + ∠NAC + ∠NBC = 180° ∠NCA + ∠NCB = 90°	M1 construct tangent M1 identify ANC and BNC as isosceles triangles (equal tangents) A1 ∠ACB = 90° Do not penalise if degree symbol is omitted.

Maths10MM7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10MM7		2	N	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to understand that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

Sources and diagrams

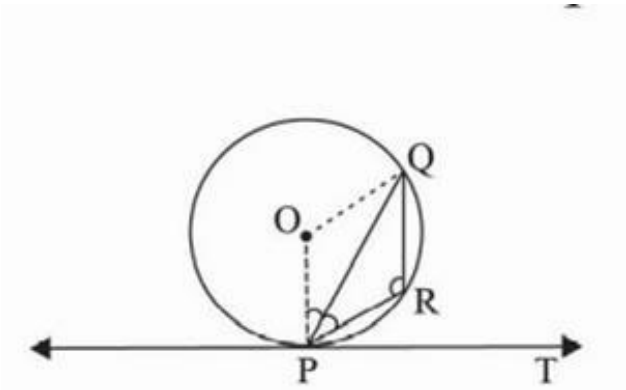


Figure 1

The diagram is not drawn to scale. PT is the tangent to a circle of centre O.

Question(s)

1 In the given figure 1 above, PQ is a chord of a circle with center O, and PT is a tangent. If ∠QPT = 60°, find ∠PRQ.

(2 marks)

(Total marks 2)

Mark scheme

1 In the given figure 1 above, PQ is a chord of a circle with center O, and PT is a tangent. If ∠QPT = 60°, find ∠PRQ.	
Answer	Guidance

∠OPT = 90°---- {tangent at any point of a circle is perpendicular to the radius} ∠QPT = 60° ---- {given} ⇒∠OPQ = 30°= ∠OQP ⇒∠POQ = 120°{Angle sum property of a triangle} ⇒∠PRQ = 120°	M1- ∠OPT = 90°---- {tangent at any point of a circle is perpendicular to the radius} A1 ∠OPT = 90° M1 ∠OPQ = 30°= ∠OQP ∠POQ = 120°{Angle sum property of a triangle} A1 - ∠PRQ = 120° Do not penalise if degree symbol is omitted.

Maths10ASR6

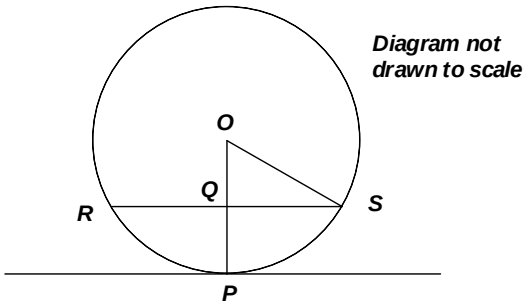
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10ASR6	1	2	E	10G2a Use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to apply the properties and theorems of circles.

Sources and diagrams



Question(s)

1 In the above figure, RQS is a line parallel to the tangent to the circle at P. Q is the midpoint of the radius OP if RS = 12cm, find the radius of the circle.

(3 marks)

(Total marks 3)

Mark scheme

1 In the above figure, line l touches the circle with centre O at point P. Q is the mid-point of radius OP. RS is a chord through Q such that chords RS || line l. If RS = 12cm, find the radius of the circle.	
Answer	Guidance
Radius = $4\sqrt{3}$ cm Let the radius of circle OP= r	M1 Identify sides as 6, *r,* and ½*r*. M1 use of Pythagoras A1 correct answer

OP is perpendicular to the tangent l. Therefore, OP is perpendicular to RS. Therefore, QS = $\frac{1}{2}$ RS = 6cm. (Perpendicular drawn from centre to the chord bisects the chord) In Δ OQS, $$OS^2 = OQ^2 + QS^2$$ $$r^2 = (\frac{r}{2})^2 + 6^2$$ $$r^2 - \frac{r^2}{4} = 36$$ $$\frac{3r^2}{4} = 36$$ $$r^2 = 48$$ r = $4\sqrt{3}$ cm	

Maths10AD9

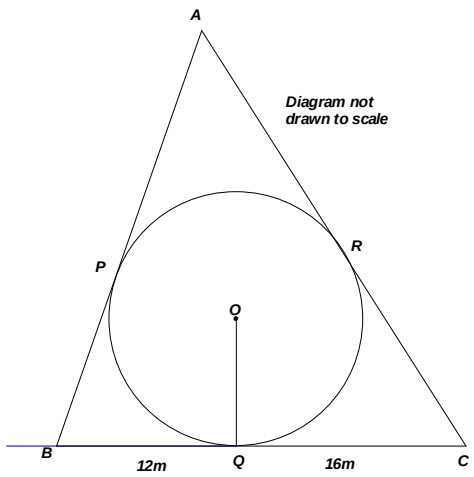
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD9		5	C	10G2a Be able to prove and use the fact that: The tangent at any point of a circle is perpendicular to the radius through the point of contact 10G2b Be able to prove and use the fact that: The lengths of tangents drawn from an external point to a circle are equal	5

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the learner's ability to apply the theorems of tangents to a circle in solving problems related to a real-life context.

Sources and diagrams



Question(s)

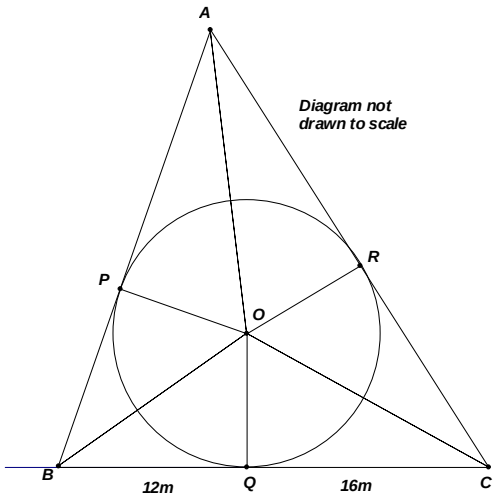
1 In an amusement park, a triangular path circumscribing a circular pond centred at O with radius 8 m is to be constructed, as shown in the figure above.

Find the cost of fencing the triangular path at the rate of Rs 55 per meter.

(5 marks)

(Total marks 5)

Mark scheme

1. In an amusement park, a triangular path circumscribing a circular pond centred at O with radius 8 m is to be constructed, as shown in the figure above. Find the cost of fencing the triangular path at the rate of Rs 55 per meter.	
Answer	Guidance
Cost of fencing = Rs 4620 Since the length of tangents from an external point to a circle are equal  ∴ In ΔABC,PB = QB = 12 m, RC = QC = 16 m and AP = AR = x (say) Also, the radius is perpendicular to the tangent at the point of contact. ∴ ar(ΔABC) = ar(ΔAOB) + ar(ΔOBC) + ar(ΔAOC) $= \frac{1}{2} \times 8 \times (28 + 12 + x + 16 + x) = 8\ (28 + x)$ square meters……..(1) Also, semi perimeter ‘s’ of ΔABC = (28 + x) And by Heron’s formula, ar(ΔABC) = $\sqrt{s(s-a)(s-b)(s-c)}$	M1 applying the theorems of circles that length of tangents to a circle from an external point are equal and the radius is perpendicular to the tangent at the point of contact M1 finding area of triangle ABC as the sum of areas of triangles AOB, BOC and COA M1 Finding area of a triangle using Heron’s formula M1 equating the two areas and to solve them to find the perimeter as 84 m A1, the cost of fencing = Rs. 4620

$= \sqrt{(28+x) \times x \times 12 \times 16}$ $= 4\sqrt{(28+x) \times x \times 3 \times 4}$ $= 4\sqrt{(28+x) \times x \times 12}$ square meters ……(2) Now, from equations (1) and (2), we get $8\ (28 + x) = 4\sqrt{(28+x) \times x \times 12}$ Taking square on both the sides, we get $4(28 + x)^2 = 12x\ (28 + x)$ $\Rightarrow (28 + x)\ (28 + x – 3x) = 0$ $\Rightarrow x = -28$, or $x = 14$ Since, length cannot be negative, $\therefore x = 14$ Hence the perimeter of the triangular park = $2\ (28 + x) = 2 \times 42 = 84$ meters And the cost of fencing = Rs 55×84 = Rs 4620	Do not penalise if the unit of length (m) is not written or (Rs) is not written

Maths10SR6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR6		4	N	10G3a Construct the division of a line segment in a given ratio (internally)	4

Item purpose

The question assesses understanding and skill in applying section formula

Question(s)

1 The line segment joining the points A (3a-2, 2 +a) and (4 – 3a, a-1) is trisected by the points P and Q. If P lies on the line 2x-3y + 5 = 0, find a

(4 marks)

(Total marks 4)

Mark scheme

1 The line segment joining the points A (3a-2, 2 +a) and (4 – 3a, a-1) is trisected by the points P and Q. If P lies on the line 2x-3y + 5 = 0, find a	
Answer	Guidance
The ratio by which P divide AB is 1:2 coordinates of P are given by P $\left(\frac{4-3a+6a-4}{3}, \frac{a-1+4+2a}{3}\right)$ = P$\left(\frac{3a}{3}, \frac{3a+3}{3}\right)$ = P (a, a+1) So 2a – 3(a+1) +5 = 0 -a + 2 = 0 a = 2	M1. the ratio by which P divide AB is 1:2 M1. P $\left(\frac{4-3a+6a-4}{3}, \frac{a-1+4+2a}{3}\right)$ A1. P (a, a+1) A1. a=2

Maths10AS8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS8a	1		E	10M1b Solve problems based on areas and perimeter/circumference of plane figures involving triangles, simple quadrilaterals, and circles.	1
Maths10AS8b		2	E	10M1b Solve problems based on areas and perimeter/circumference of plane figures involving triangles, simple quadrilaterals, and circles.	2
Total marks	**1**	**2**			**3**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses how a student is able to calculate the perimeter/circumference of plane figures involving triangles, simple quadrilaterals, and circles.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The area of a circular playground is 9856 m^2.

1 (a) Find the radius of the circular field. (Using $\pi = \frac{22}{7}$) (1 mark)

1 (b) Find the cost of fencing this ground at the rate of Rs 50 per m. (2 marks)

(Total marks 3)

Mark scheme

1(a) Find the radius of the circular field. (Using $\pi = \frac{22}{7}$)	
Answer	Guidance
56 m Area = πr^2	A1 Correct answer – 1 mark Don't deduct marks for units.

$\Rightarrow 9856 = \frac{22}{7} \times r^2$ $\Rightarrow r^2 = 3136$ $\therefore\ r = 56\ m$	
1 (b) Find the cost of fencing this ground at the rate of Rs 50 per m.	
Answer	Guidance
Rs. 8800 Cost of fencing the ground = Perimeter of the ground × cost per m. = $2\pi r \times 50$ = $2 \times \frac{22}{7} \times 56 \times 50$ = Rs. 8800	M1 – Writing the correct formula A1 – finding the correct cost of fencing. Do not deduct marks for units.

Maths10ASR2

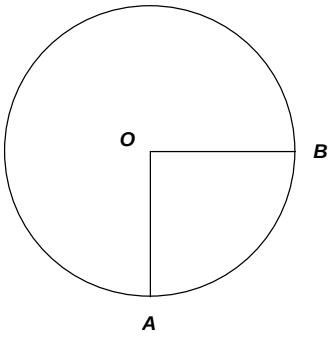
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Mark
Maths10ASR2	1		C	10M1b Solve problems based on and perimeter/circumference of plane figures involving triangles, simple quadrilaterals, and circles	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to apply the concept of perimeter and quadrant of a circle.

Sources and diagrams



Question

1 What is the perimeter of a quadrant of a circle (OAB) whose diameter is 10cm?

(Use $\pi = 3.14$)

A. 7.85cm
B. 17.85cm
C. 27.85cm
D. 37.85cm

(1 mark)

(Total marks 1)

Mark scheme

1 What is the perimeter of a quadrant of a circle whose diameter is 10cm? A. 7.85cm B. 17.85cm C. 27.85cm D. 37.85cm	
Answer	Guidance
B. 17.85cm	The perimeter of a quadrant= 2*radii + length of an arc of a quadrant. (No mark for method) A1 mark for the correct answer

Maths10AR3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR3	1		C	10M1b Solve problems based on areas and perimeter/circumference of plane figures	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to solve problems based on areas.

Sources and diagrams

Question(s)

1 The area of a rhombus whose diagonals have lengths of 12 cm and 6.4 cm is

A. 768.0 cm^2
B. 384 cm^2
C. 38.4 cm^2
D. 76.8 cm^2

(1 mark)

(Total marks 1)

Mark scheme

1 The area of a rhombus whose diagonals have lengths of 12 cm and 6.4 cm is

A. 768.0 cm^2
B. 384 cm^2
C. 38.4 cm^2
D. 76.8 cm^2

Answer	Guidance
C. 38.4 cm^2	A1 correct answer

Maths10AD5

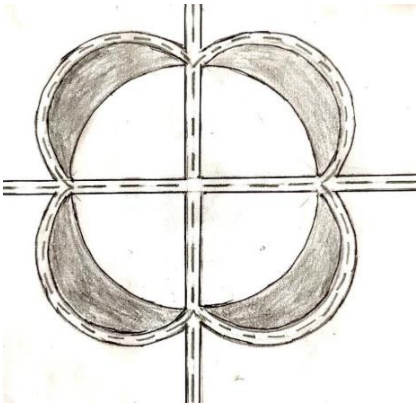
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD 5a		4	C	10M1b Solve problems based on areas and perimeter/circumference of plane figures involving triangles, simple quadrilaterals, and circles	4
Maths10AD 5b		2	C	10M1b Solve problems based on areas and perimeter/circumference of plane figures involving triangles, simple quadrilaterals, and circles	2
Total marks		**6**			**6**

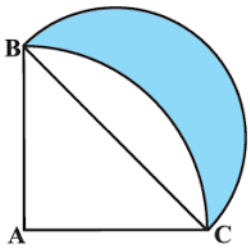
*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the student's ability to apply the knowledge of finding areas and perimeters of plane figures in solving problems related to daily life contexts.

Sources and diagrams





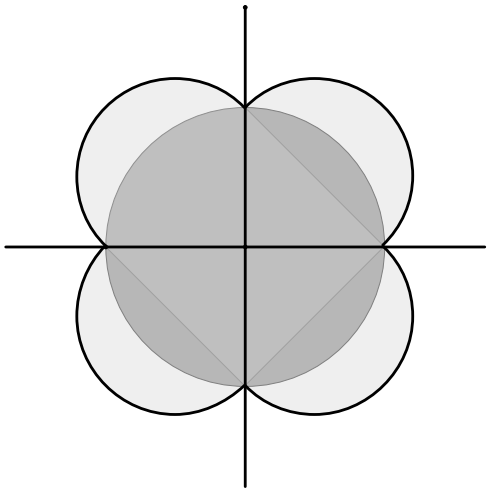


fig. i

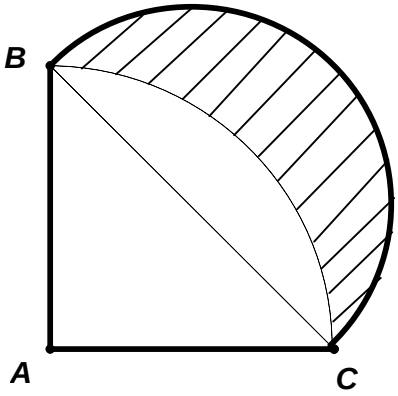


fig. ii

Question(s)

1 "4-Clover Leaf" interchanges are the structured freeways that contain 'sectors of circles' with additional portions as shown in fig.i. Each leaf of this freeway is in the form of a quadrant of a circle of radius 98 ft (i.e., AB in figure ii is 98 ft). A semicircle is drawn with a diameter equal to BC as labeled in fig. ii. (Take $\pi = \frac{22}{7}$)

1(a) The lighter shaded region of all the leaves in figure i needs to be landscaped. Find the total area to be landscaped.

(4 marks)

1(b) A mettled road is to be constructed along the outer edge of the clover leaves. Find the cost of construction of the road along one leaf shown in fig-ii at the rate of Rs. 50 per ft.

(2 marks)

(Total marks 6)

Mark scheme

1 (a) The lighter shaded region of all the leaves in figure (i) needs to be landscaped. Find the total area to be landscaped.

Answer	Guidance
19,208 sq. feet Required area = 4 × shaded area of one cloverleaf Now, the Radius of the quadrant ABC of circle 'R' = 98 ft AB = AC = 98 ft BC is the diameter of the semicircle. ABC is a right-angled triangle. By Pythagoras theorem in ΔABC, $BC^2 = AB^2 + AC^2$ ⇒ BC = 98√2 ft Radius of semicircle 'r' = BC/2 = 49√2 ft Area of ΔABC = $\frac{1}{2} \times 98 \times 98$ = 4802 sq. feet Area of quadrant = $\frac{1}{4} \pi R^2$ = $\frac{1}{4} \times \frac{22}{7} \times 98 \times 98$ = 7546 sq. ft Area of the semicircle = $\frac{1}{2} \pi r^2$ = $\frac{1}{2} \times \frac{22}{7} \times 49\sqrt{2} \times 49\sqrt{2}$ = 7546 sq. ft Area of the shaded region =Area of the semicircle + Area of ΔABC – Area of quadrant = 7546 + 4802 – 7546 = 4802 sq. ft Hence total area to be landscaped = 4 × 4802 = 19,208 sq. ft	M1 Finding radius of the semicircle as 49√2 ft and area of semi-circle 4802 sq. feet M1 finding areas of right triangle and area of a quadrant of a circle as 4802 sq. ft and 7546 sq. ft, respectively M1 finding the shaded area of 1 cloverleaf as 4802 sq. ft A1 Area to be landscaped as 19,208 sq. ft Do not deduct method marks if the formula of finding areas is not written Do not penalise if the unit of area is not written

1 (b) Mettled road is to be constructed along the outer edge of the clover leaves. Find the cost of construction of the road along one leaf shown in figure ii at the rate of Rs. 50 per foot.	
Answer	Guidance
Rs 10,900 Length of road along with one cloverleaf = length of outer arc BC (semi-circle on BC as diameter) $= \frac{1}{2} \times 2\pi r$ $= \frac{1}{2} \times 2 \times \frac{22}{7} \times 49\sqrt{2}$ = 218 ft. Cost of construction of road along one clover leaf = Rs 50 × 218 = Rs 10,900	M1 finding length of road along with one cloverleaf as 218 ft A1 cost of construction as Rs 10.900 Do not penalise if Rs or unit of length is not written.

Maths10ASR10

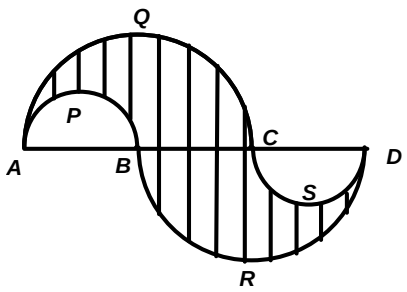
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10ASR10a	1	2	E	10M1b Solve problems based on areas and perimeter / circumference of plane figures like circles.	3
Maths10ASR10b	1	2	E	10M1b Solve problems based on areas and perimeter / circumference of plane figures like circles.	3
Total marks	**2**	**4**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of students to derive formulae to establish relations for geometrical shapes in the context of a coordinate plane, such as to find the area of a given shape

Sources and diagrams



Question(s)

1 APB, AQC, CSD, BRD are semicircles where AB = BC = CD= 7cm. (Use $\pi = \frac{22}{7}$)

1 (a) Find the perimeter of the shaded region

(3 marks)

1 (b) Find the area of the shaded region

(3 marks)

(Total marks 6)

Mark scheme

1 (a) Find the perimeter of the shaded region	
Answer	Guidance
Let radius of bigger semicircle = R = 7 cm Let radius of smaller semicircle = r = 7 cm Perimeter of shaded region = length of arc (APB + AQC + CSD + BRD) = $\pi r + \pi R + \pi r + \pi R$ = $2(\pi r + \pi R)$ = $2\pi(r + R)$ = $2 \times \frac{22}{7}(3.5 + 7)$ =$2 \times \frac{22}{7} \times (10.5)$ = 66 cm.	M1: Identify what the perimeter consists of. M1: Apply formula for the circumference of at least one of the circles. A1: correct answer. Do not penalise if the unit(cm) is omitted
1 (b) Find the area of the shaded region.	
Answer	Guidance
Area of the shaded region = 2 (area of the bigger semicircle – area of the smaller semicircle) = $2\left(\frac{\pi R^2}{2} - \frac{\pi r^2}{2}\right)$ = $\pi(R^2 - r^2)$ = $\frac{22}{7} \times (49 - 12.25)$ = 115.5 cm^2	M1: Identify what the shaded area consists of. M1: Apply formula for the area of at least one of the circles. A1: Correct answer Do not penalise if the unit(cm^2) is omitted.

Maths10MM3_5

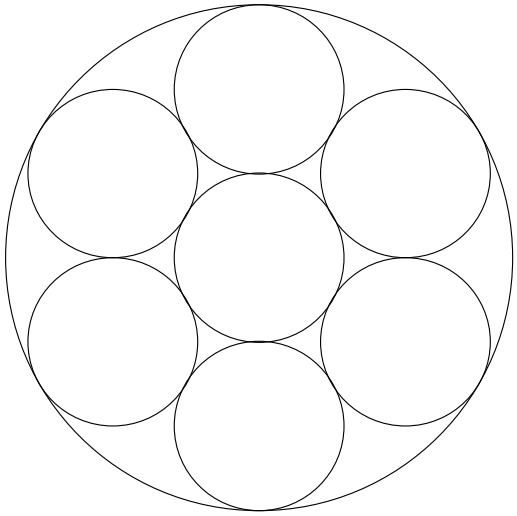
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10MM3_5a	1	1	C	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones.	2
Maths10MM3_5b	1		C		1
Maths10MM3_5c	1		C		1
Maths10MM3_5d	1	2	C		3
Total marks	**4**	**3**			**7**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to differentiate between the surface area and volume and then apply the same to solve the questions.

Sources and diagrams



Question(s)

1 Kanupriya runs a bakery shop. The amount of mixture required to make one biscuit is 18 cm^3. After the biscuit is cooked, it becomes a cylinder of radius 3 cm and height 0.7 cm and has some air trapped inside it.

Biscuits are packed in a cylindrical card box of height 14 cm. The arrangement of biscuits is shown above.

Based on this information, answer the following questions:

1 (a) How many biscuits will be there in a box? (2 marks)

1 (b) Find the volume of one biscuit after it is cooked.

A. 17.8 cm^3
B. 18.7 cm^3
C. 19.8 cm^3
D. 21.2 cm^3

(1 mark)

1 (c) Find the volume of air trapped in the biscuit.

A. 0.7 cm^3
B. 1.5 cm^3
C. 1.8 cm^3
D. 3.2 cm^3

(1 mark)

1 (d) How much space is vacant in the box after biscuits are packed?

(3 marks)

(Total marks 7)

Mark scheme

1(a) How many biscuits will be there in a box?	
Answer	Guidance
In a layer, 7 biscuits are arranged whose height is 0.7 cm. Total layer in box = 14/0.7 = 20 Number of biscuits in the box = 20 x 7 = 140	M1 A1 – 20 layers x 7 biscuits = 140
1(b) Find the volume of one biscuit after it is cooked. A. 17.8 cm^3 B. 18.7 cm^3 C. 19.8 cm^3 D. 21.2 cm^3	
Answer	Guidance
C. 19.8 cm^3 (Volume of cylinder = $\pi r^2 h$)	A1 – 19.8 cm^3 Correct answer only

1(c) Find the volume of air trapped in the biscuit. A. 0.7 cm^3 B. 1.5 cm^3 C. 1.8 cm^3 D. 3.2 cm^3	
Answer	Guidance
C. 1.8 cm^3 Volume of air trap= Volume of biscuit−Volume of sphere = 19.8 −18 = 1.8 cm^3	A1 - 1.8 cm^3 Correct answer only
1(d) How much space is vacant in the box after biscuits are packed?	
Answer	Guidance
Volume of box = $\pi R^2 h = \frac{22}{7} \times 9 \times 9 \times 14 = 3564\ cm^3$ Volume of 140 biscuits = 140 x 19.8 = 2772 cm^3 Vacant Volume = 3564 - 2772 = 792 cm^3	M1 – To find the volume of a box M1 – To find the volume of 140 biscuits A1 – 792 cm^3 Note Follow through with candidate values for credit.

Maths10AKP1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP1	1		E	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of solid geometry

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The area of a circular coin is 3.14 cm^2. the radius of it will be

A. 0.01 cm
B. 0.1 cm
C. 1 cm
D. 10 cm

(1 mark)
(Total marks 1)

Mark scheme

1 The area of the coin is 3.14 cm^2. the radius of it will be (use $\pi = 3.14$) A. 0.01 cm B. 0.1 cm C. 1 cm D. 10 cm	
Answer	Guidance
1 cm	Area of coin = area of circle = 3.14 cm^2 πr^2 = 3.14 3.14r^2= 3.14 r^2= 1 Radius = 1cm

Maths10AKP12

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP12	1		E	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones,	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of solid geometry

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The area of a circular cap is $25\pi cm^2$. The circumference of the cap will be

A. 0.0314 cm
B. 0.314 cm
C. 3.14 cm
D. 31.4 cm

(1 mark)
(Total marks 1)

Mark scheme

1 The area of a circular cap is $25\pi cm^2$. The circumference of the cap will be A. 0.0314 cm B. 0.314 cm C. 3.14 cm D. 31.4 cm	
Answer	Guidance
31.4 cm	1 mark

Maths10SR2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR2	1		E	9M2a Calculate the surface areas and volumes of cubes, cuboids, spheres	1

Item purpose

The question assesses the knowledge of finding the volume of a sphere

Question(s)

1 What is the volume of the greatest sphere which can be cut out from a cube of? volume 216cm^3 ($\pi = 3.14$)

A. 37.68cm^3
B. 56.52cm^3
C. 113.04cm^3
D. 452.16cm^3

(1 mark)
(Total marks 1)

Mark scheme

1 What is the volume of the greatest sphere which can be cut out from a cube of volume 216cm^3 ($\pi = 3.14$) A. 37.68cm^3 B. 56.52cm^3 C. 113.04cm^3 D. 452.16cm^3	
Answer	Guidance
Radius of the largest sphere= 3cm Volume of the sphere = 113.04cm^3	Full mark only for the answer A1 for the answer

Maths10SR8

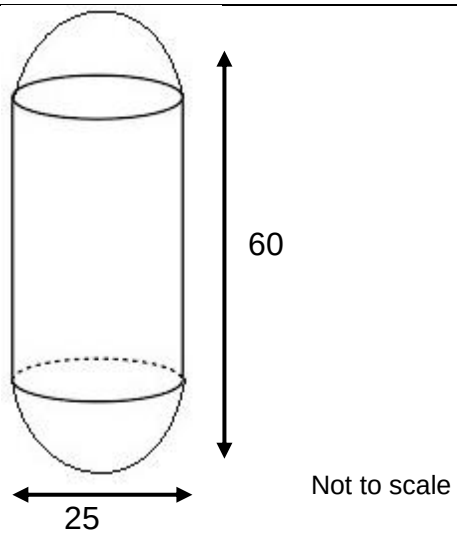
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR8a	3		C	10M2a Calculate the volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	3
Maths10SR8b	3		C	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	3
Total marks	**6**				**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to calculate volumes and surface areas

Sources and diagrams



Question(s)

1 A jackfruit is in the shape of a cylinder with two hemispherical ends. If the total length jack fruit is 60cm and diameter is 25cm

1 (a) Find the volume of the jack fruit (take $\pi = 3.14$) (3 marks)

1 (b) A person orders a jackfruit through Amazon. Amazon wants to pack the jack fruit in a cuboidal container. What is the volume of the smallest such box?

(3 marks)

(Total marks 6)

Mark scheme

1 (a) Find the volume of the jack fruit (take $\pi = 3.14$)	
Answer	Guidance
Volume of the jack fruit = volume of cylinder + volume of sphere $= \pi r^2 h + \frac{4}{3}\pi r^3 = \pi r^2 \left(h + \frac{2}{3}r\right)$ $= 3.14 \times 12.5 \times 12.5 \left(35 + \frac{2}{3} \times 12.5\right)$ =21,260.42 cm^3	M1. Identifying or writing the volume of the jackfruit Volume of the jack fruit = volume of cylinder + volume of sphereM1. finding volume of hemispherical ends $= 3.14 \times 12.5 \times 12.5 \left(35 + \frac{2}{3} \times 12.5\right)$ A1 Volume of the jackfruit = 21,260. 42cm^3 (Any value lying between 21260 and 21261 acceptable)
1 (b) A person orders for a jackfruit through Amazon. Amazon wants to pack the jack fruit in a cuboidal container. What is the volume of the smallest such box?	
Answer	Guidance
Volume of the box =lbh= $60 \times 25 \times 25$ = 37,500cm^3	M1. Length of the box = 60cm, breadth= 25cm, height = 25cm M1 volume =$60 \times 25 \times 25$ A1 required volume = 37,500cm^3

Maths10PR3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR3	1	1	C	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones, and the frustum of a cone.	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge in the conversion of units in volume.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The area of the base of a rectangular tank is $7200\ cm^2$ and the volume of water contained in it is $3\ m^3$. Find the height of water in the tank.

(2 marks)

(Total marks 2)

Mark scheme

1 The area of the base of a rectangular tank is $7200\ cm^2$ and the volume of water contained in it is $3\ m^3$. Find the height of water in the tank.	
Answer	Guidance
$4.16\ m \quad or \quad 416.67\ cm$	M1 A1 $height = \frac{3\times100\times100\times100}{7200} = 416.67\ cm$ Allow 4.1 – 4.2 m or 416 – 417 cm.

Maths10AS7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS7		3	E	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	3
Total marks		**3**			**3**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses that the students know how to calculate the volume of a given solid and apply it in real-world situations.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Ramesh has recently built his house and installed a cylindrical water tank.

The dimensions of the tank are as follows: Radius 50 cm and Height 175 cm

If water is filled in the tank at the rate of 11 litres per minute, how long will it take for the tank to be completely filled?

(3 marks)

(Total marks 3)

Mark scheme

1 Ramesh has recently built his house and installed a cylindrical water tank. The dimensions of the tank are as follows: Radius 50 cm and Height 175 cm If water is filled in the tank at the rate of 11 litres per minute, how long will it take for the tank to be completely filled?	
Answer	Guidance

125 minutes Volume of water in the overhead tank $= \pi r^2 h = \frac{22}{7} \times \frac{1}{2} \times \frac{1}{2} \times \frac{7}{4}$ $= \frac{11}{8} \times 1000 \; litres$ Time taken to fill the tank completely $= \frac{11}{8} \times 1000 \times \frac{1}{11}$ = 125 min	M1 – writing the correct formula for sum finding the volume M1 – Finding the correct volume. A1 – finding time taken

Maths10AKP8

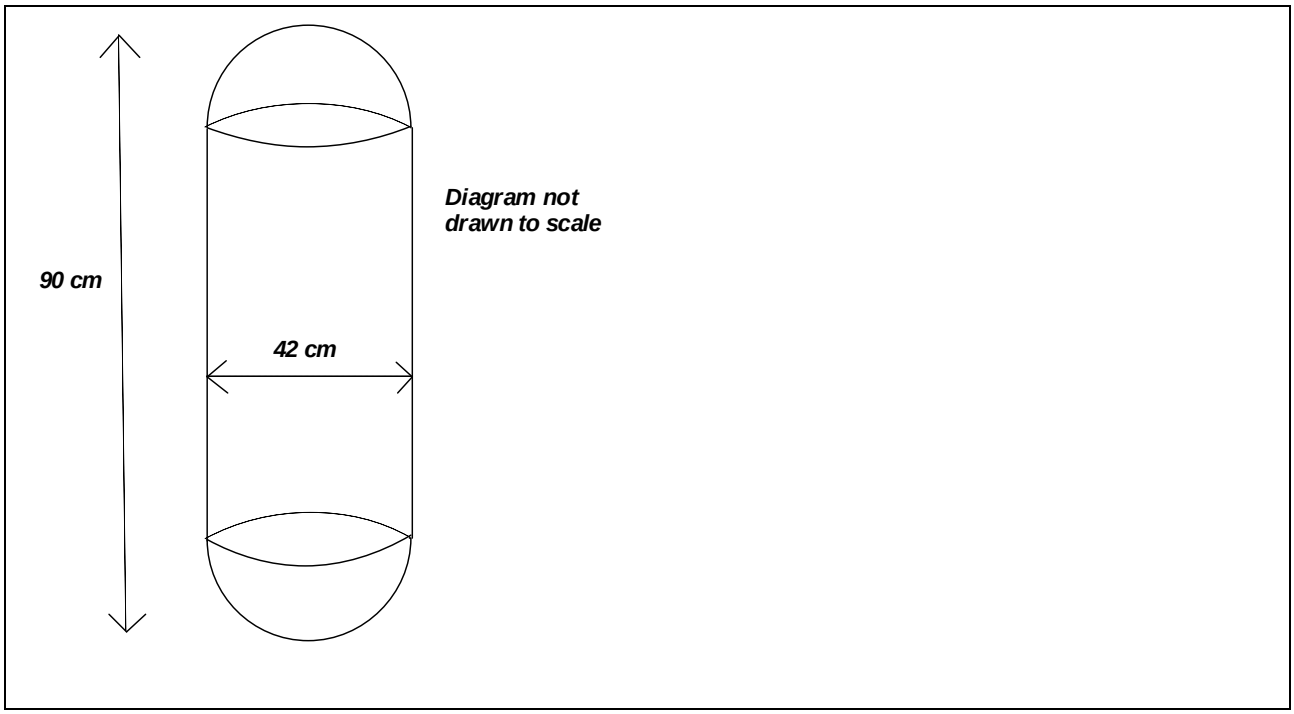
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
MathsAKP8		4	C	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	4

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of solid geometry

Sources and diagrams



Question(s)

1 A toy is in the form of a cylinder with hemispherical ends.

If the whole length of the toy is 90 cm and its diameter is 42 cm, find the cost of painting the toy at the rate of 70 paise per square cm.

(4 marks)

(Total marks 4)

Mark scheme

1. A toy is in the form of a cylinder with hemispherical ends. If the whole length of the toy is 90 cm and its diameter is 42 cm, find the cost of painting the toy at the rate of 70 paise per square cm.	
Answer	Guidance
Length of the cylinder = (90 – 42) cm = 48 cm Area to be painted = C.S. A of cylinder + C.S.A of 2 hemispheres $= 2\pi rh + 4\ \pi r^2 = 2\pi r(h + 2r)$ $= 2 \times \frac{22}{7} \times 21(48 + 2 \times 21)$ $=2 \times 22 \times 3\ (90)\ cm^2$ Cost of painting the toy = $\frac{132 \times 90 \times 70}{100}$ = Rs. 8316	M1 for the correct understanding of the toy 1 mark 1 mark for the correct formula 1 mark for the correct answer for total SA of toy 1 mark for correct amount calculated

Maths10GS8

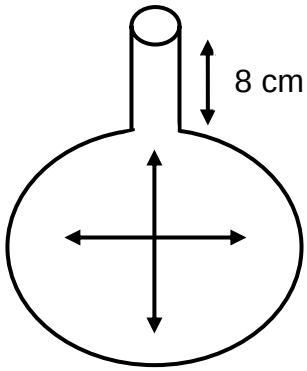
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS8		4	E	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	4
Total marks		**4**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the volume of combinations of cylinder and sphere.

Sources and diagrams



Not to scale

Question(s)

1 A spherical glass vessel has a cylindrical neck 8 cm long 2 cm in diameter, and the diameter of the spherical part is 8.5 cm.

By measuring the amount of water, it holds, a child finds its volume to be 345 cu cm.

Check whether he is correct, taking the above as the inside measurements and π = 3.14.

(4 marks)

(Total marks 4)

Mark scheme

<table>
<tr><td colspan="2">1. A spherical glass vessel has a cylindrical neck 8 cm long 2 cm in diameter, and the diameter of the spherical part is 8.5 cm.

By measuring the amount of water, it holds, a child finds its volume to be 345 cu cm.

Check whether he is correct, taking the above as the inside measurements and π = 3.14.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>Volume of the cylindrical part = $\pi r^2 h$
= 3.14 × 1 × 1 × 8
= 3.14 × 8
= 25.12 cu cm.

Volume of the spherical part = $\frac{4}{3}\pi r^3$
= $\frac{4}{3}$ × 3.14 × $(4.25)^3$
= 321.4 cu cm.

Total volume of water in the vessel
= (25.12 + 321.4) cu cm
= 346.52 cu cm

So, the child’s answer is not correct.</td><td>M1 to calculate the volume of the cylindrical part

M2 to calculate the volume of the spherical part

M3 to calculate the total volume of water in the vessel.

A1 to write the correct answer.</td></tr>
</table>

Maths10AR7

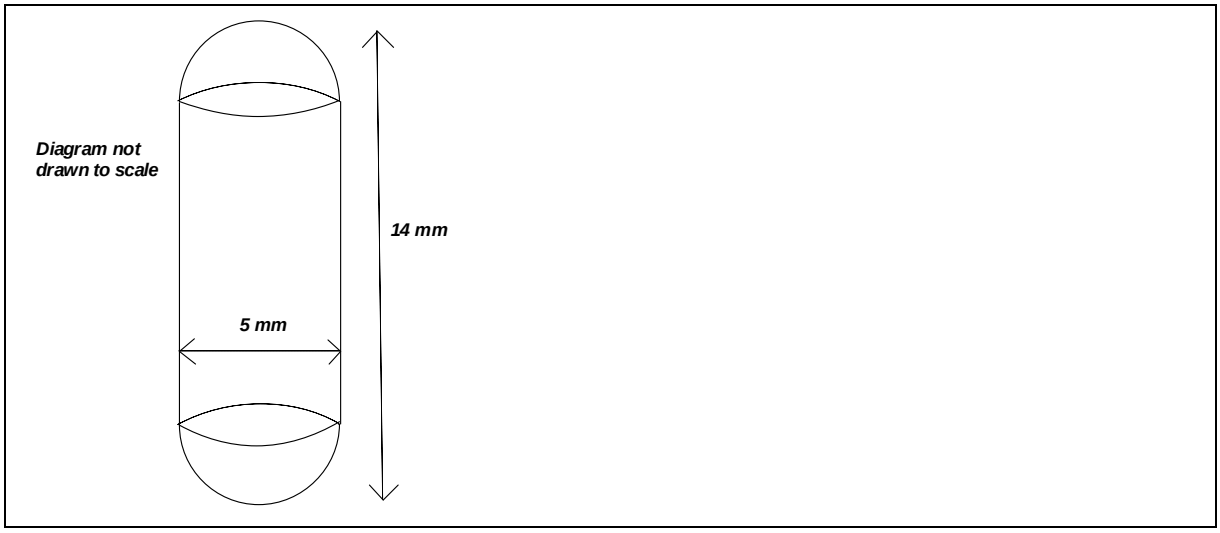
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR7		4	C	10M2a Calculate the surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones	4

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to calculate the volume and surface areas of solid figures and a combination of different solids.

Sources and diagrams



Question(s)

1 A medicine capsule is in the shape of a cylinder with two hemispherical ends, as shown in the diagram.

The length of the capsule is 14 mm, and the thickness is 5 mm.

Find its surface area (take π = 22/7)

(4 marks)

(Total marks 4)

Mark scheme

1 A medicine capsule is in the shape of a cylinder with two hemispherical ends. The length of the capsule is 14 mm, and the thickness is 5 mm. Find its surface area (take π = 22/7)	
Answer C.S.A of capsule = C.S.A of 2 hemispheres + C.S.A of cylinder Radius of cylinder= radius of hemisphere = half of thickness =5/2=2.5 mm C.S.A of cylinder=2 **π rh** =2 x 22 x 9 x 5 ———————— 7 x 2 = 990/7=141.43 C.S.A of 2 hemispheres=2x2 **π r^2** = 2 x 2 x 22 x5 x5 ———————— 7x2 x2 =550/7= 78.57 C.S.A of capsule =141.43+78.57=220.00 or =990/7 + 550/7=220	Guidance M1 identify SA as cylinder + sphere M1 use correct formulae for both shapes A1 for the correct value of SA for at least one of the cylinders and sphere A1 correct answer Do not penalise if the unit is not written. The C.S.A of cylinder and hemispheres can be kept as fractions or in decimal.

Maths10AD3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD3	1		N	10M2b Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids)	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses knowledge of comparison of the volume of a cone in relation to another cone.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Two cones of equal heights have their radii in the ratio 3: 2. The ratio of their volumes will be equal to

A. 3: 2
B. 9: 4
C. 27: 8
D. 81: 16

(1 mark)

(Total marks 1)

Mark scheme

1 Two cones of equal heights have their radii in the ratio 3: 2. The ratio of their volumes will be equal to

A. 3: 2
B. 9: 4
C. 27: 8
D. 81: 16

Answer	Guidance
B. 9: 4	$\frac{\frac{1}{3}\pi R^2 h}{\frac{1}{3}\pi r^2 h}$ = 9: 4 A1 for the correct answer only. Do not penalise if only B. or 9: 4 is written

Maths10PS1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS1	1		N	10N1a Use the Fundamental theorem of Arithmetic to find the (unique) prime factorisation of numbers	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to identify a terminating decimal expansion from the given rational numbers using prime factorisation of numbers.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 *Which among the given rational numbers represents a terminating decimal expansion?*

A. $\frac{2}{11}$
B. $\frac{8}{21}$
C. $\frac{1}{13^3}$
D. $\frac{3}{2^4 \times 5^3}$

(1 mark)

(Total marks 1)

Mark scheme

1 Which *among the given rational numbers represents a terminating decimal expansion?*

A. $\frac{2}{11}$
B. $\frac{8}{21}$
C. $\frac{1}{13^3}$
D. $\frac{3}{2^4 \times 5^3}$

Answer	Guidance
D. $\frac{3}{2^4 \times 5^3}$ *Prime factors of the numerator are only 2 or 5*	A1 for the correct answer

Maths10GS1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS1	1		E	10N1a Use the Fundamental Theorem of arithmetic to find the (unique) prime factorisation of numbers	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the prime factorisation of numbers.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Express 255 as a product of prime factors.

(1 mark)

(Total marks 1)

Mark scheme

1 Express 255 as a product of prime factors.	
Answer	Guidance
255 = 3 × 5 × 17	A1 Correct answer – 1 mark

Maths10SR1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR1		1	E	10N1a Use the Fundamental Theorem of Arithmetic to find the (unique) prime factorisation of numbers 10N1c Apply 10N1a to solve problems related to real-life contexts.	1

Item purpose

The question assesses the skill in applying the fundamental theorem of arithmetic and finding hcf and lcm

Question(s)

1 Three cubical warehouses of volume $165m^3$, $195m^3$, and $285m^3$ are to be used for storage.

What is the volume of the greatest cubical box that can be kept in the warehouse so that no space is left vacant?

A. $6m^3$
B. $15m^3$
C. $5m^3$
D. $3m^3$

(1 mark)
(Total marks 1)

Mark scheme

1 Three cubical warehouses of volume $165m^3$, $195m^3$ and $285m^3$ are to be used for storage.

What is the volume of the greatest cubical box that can be kept in the warehouse so that no space is left vacant?

A. $6m^3$
B. $15m^3$
C. $5m^3$
D. $3m^3$

Answer	Guidance
Required volume= HCF (165,195,285) $=15m^3$	A1 for the answer

Maths10AS9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS9		2	E	10N1a Use the Fundamental Theorem of Arithmetic to find the (unique) prime factorisation of numbers	2
Total marks		**2**			**2**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the prime factorization of a number.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Find the sum of exponents of prime factors in the prime factorization of 21600

(2 marks)

(Total marks 2)

Mark scheme

1. Find the sum of exponents of prime factors in the prime factorization of 21600	
Answer	Guidance
10 Prime Factorization of 21600 = $2^5 \times 3^3 \times 5^2$ Sum of exponents = 10	M1 – finding the prime factors A1 – finding the correct sum. Total marks = 2 marks

Maths10SR5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR5		2	E	10N1a Use the Fundamental theorem of Arithmetic to find the (unique) prime factorisation of numbers	2

Item purpose

The question assesses skill in finding lcm of number

Question(s)

1 LED light arrangements are made in a marriage function.

Yellow lights will flicker every 3 seconds, red lights will flicker every 4 seconds, and green lights will flicker every 5 seconds.

How many times all the three lights will flicker together in 30 minutes

(2 marks)

(Total marks 2)

Mark scheme

1 LED light arrangements are made in a marriage function. Yellow lights will flicker every 3 seconds, red lights will flicker every 4 seconds, and green lights will flicker every 5 seconds. How many times all the three lights will flicker together in 30 minutes	
Answer	Guidance
30 times Lcm (3,4,5) = 60 The three lights will flicker together after every 1 min The number of times the lights will flicker in 30 min = 30	M1 to find the LCM of 3, 4, and 5 seconds A1 30 times

Maths10AKP5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP5		3	E	10N1a Use the Fundamental theorem of Arithmetic to find the (unique) prime factorisation of numbers	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of solid geometry

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 There are 156, 208 and 260 students in a group A, B, and C respectively. Buses are hired for an educational trip. Find the minimum number of buses to be hired if all buses have the same number of students.

(3 marks)

(Total marks 3)

Mark scheme

1 There are 156, 208 and 260 students in a group A, B, and C respectively. Buses are hired for an educational trip. Find the minimum number of buses to be hired if all buses have the same number of students.	
Answer	Guidance
Since all buses have equal no. of students. The number of students could be a common factor of the numbers 156, 208 and 260 Since the number of buses have to be minimum. So, the number of students should be HCF of 156, 208 and 260. $156 = 2^2 \times 3 \times 13$ $208 = 2^4 \times 13$ $260 = 2^2 \times 5 \times 13$ ∴ HCF = 2^2 x 13 = 52 So, 52 students would be in each bus	M1 Students should state why HCF is required to find for the concept A1 correct HCF A1 correct final answer

∴ number of buses = (156+208+260)÷ 52 = 624 ÷ 52 = 12	

Maths10MM1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10MM1	1		N	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to relate the questions with real-life situations and solve them.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Shilpi wants to organize a party. She has 36 kiwis and 60 oranges at home and decided to distribute them equally among all. She decides to add 42 apples also. In this case, how many maximum guests can she invite?

A. 6
B. 12
C. 120
D. 180

(1 mark)

(Total marks 1)

Mark scheme

1. Shilpi wants to organize a party. She has 36 kiwis and 60 oranges at home and decided to distribute them equally among all. She decides to add 42 apples also. In this case, how many maximum guests can she invite? A. 6 B. 12 C. 120 D. 180	
Answer	Guidance
A. 6 HCF of 36, 60 and 42 is 6	A1 6 Correct Answer only.

Maths10MM2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10MM2	1		N	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of students to relate the questions to a real-life situation.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Shweta wants to organize a party. She has 336 guavas and 54 oranges at home and decided to distribute them equally among all. How many maximum guests can she invite?

A. 6
B. 9
C. 56
D. 3024

(1 mark)

(Total marks 1)

Mark scheme

1. Shweta wants to organize a party. She has 336 guavas and 54 oranges at home and decided to distribute them equally among all. How many maximum guests can she invite? A. 6 B. 9 C. 56 D. 3024	
Answer	Guidance
A. 6	A1 6

336 = 56 x 6, 54 = 9 x 6, so 6 is HCF	Correct Answer only.

Maths10PR5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR5a	2	1	E	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts.	3
Maths10PR5b	2		E	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts.	2
Total marks	**4**	**1**			**5**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge and application of HCF in a real-life situation.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Radha has 30 English books and 54 Mathematics books.

1 (a) She wants to stack them in such a way that each stack has the same number of books of a single subject.
Find the minimum number of stacks possible in this arrangement.

(3 marks)

1 (b) Her friend, Sona, brings 70 Science books and arranges them in the same manner with the same number of books in each stack as they were for English and Mathematics.
How many science books are left over after they are arranged in stacks of the same number as for English and mathematics?

(2 marks)

(Total marks 5)

Mark scheme

<table>
<tr><td colspan="2">1 (a) Radha has 30 English books and 54 mathematics books.

She wants to stack them in such a way so that each stack has the same number of books on a single subject.

Find the minimum number of stacks possible in this arrangement.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>14</td><td>M1 $30 = 2 \times 3 \times 5$

$54 = 2 \times 3 \times 3 \times 3$

$HCF = 2 \times 3 = 6$

A1 no. of stacks in English = $30 \div 6 = 5$

No. of stacks in Mathematics = $54 \div 6 = 9$

A1 Total stacks = 5 + 9 = 14</td></tr>
<tr><td colspan="2">1 (b) Her friend, Sona, brings 70 Science books and arranges them in the same manner with the number of books same in each stack as they were for English and Mathematics.

How many Science books are left over after they are arranged in the stacks of the same number as for English and Mathematics?</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>4</td><td>M1 $70 \div 6 = 11\ r\ 4$

A1 4 Science books are remaining.</td></tr>
</table>

Maths10PR1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR1		1	E	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge and application of LCM in a real-life situation.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 There are five bells placed at different swings in a park, which toll at intervals of 2, 3, 5, 6, and 10 minutes, respectively. They all toll together when the park is open for visitors at 10:00 AM.

How many more times do they all toll together till the park is closed at 8:00 PM?

A. 10
B. 20
C. 30
D. 60

(1 mark)

(Total marks 1)

Mark scheme

1 How many more times do they all toll together till the park is closed at 8:00 PM? A. 10 B. 20 C. 30 D. 60	
Answer	Guidance
B. 20	LCM of 2, 3, 5, 6, 10 is 30. Five bells will toll together after every 30 minutes. 10:00 AM to 8:00 PM is 10 hours.

	1st time at 10.30, then 11, etc., until 8 PM.

Math10MM9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Math10MM9		2	N	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts.	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the students to relate the questions with a real-life situation and differentiate between LCM and HCF.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The traffic lights at three different road crossings change after every 48 sec, 72 sec and 108 sec respectively. If they all change simultaneously at 9:20:00 hrs, when will they again change simultaneously?

(2 marks)

(Total marks 2)

Mark scheme

1 The traffic lights at three different road crossings change after every 48 sec, 72 sec, and 108 sec respectively. If they all change simultaneously at 9:20:00 hrs, when will they again change simultaneously?	
Answer	Guidance
L.C.M of (48,72,108) is 432 seconds = 7 min 12 sec At 9:20:00 hrs, if all the three signals change simultaneously, again, they will change simultaneously after 7 min 12 sec. That is at 9:27:12 hrs.	M1- Find the correct LCM A1- LCM (48,72,108) = 432 M1- 432sec = 7min 12 sec 9 hr 20 min + 7min 12 sec = 9:27:12 hrs

	A1- They will again change simultaneously at 9:27:12 hrs.

Maths10MM10

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10MM10		2	N	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts.	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to relate their questions to a real-life situation and differentiate between LCM and HCF.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 In a conference, the number of participants in the Army, Navy, and Airforce are 60,84 and 108, respectively. Find the minimum number of rooms required if the same number of participants are to be seated in each room and all of them being in the same department.

(2 marks)

(Total marks 2)

Mark scheme

1 In a conference, the number of participants in the Army, Navy, and Airforce are 60,84 and 108, respectively. Find the minimum number of rooms required if the same number of participants are to be seated in each room and all of them being in the same department.	
Answer	Guidance
HCF of 60, 84 and 108 = 12 Number of rooms required = Total number of participants/ HCF = {(60 + 84 + 108)/12} = 21	M1- Find the correct HCF A1 – HCF (60,84,108) = 12

	M1- Number of rooms required = Total number of participants/ HCF = {60 + 84 + 108) / 12} A1- Number of rooms required = 21

Maths10ASR5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10ASR5		2	E	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to relate the real-life situation to the concept of HCF.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question

1 Bhargav has 455 erasers and 210 pencils. He wants to distribute them in groups, each with the same combination of erasers and pencils, with none left over.

What is the greatest number of groups Bhargav can distribute?

(2 marks)

(Total marks 2)

Mark scheme

1. Bhargav has 455 erasers and 210 pencils. He wants to distribute them in groups, each with the same combination of erasers and pencils, with none left over. What is the greatest number of groups Bhargav can distribute?	
Answer	Guidance

Answer: 35. 455 = $5 \times 7 \times 13$ 210= $2 \times 3 \times 5 \times 7$ Therefore, HCF (455, 210) = $5 \times 7 = 35$ The greatest number of group in which Bhargav can distribute pencils and erasers is 35.	1 mark for correctly expressing 455 and 210 into the product form of prime numbers. 1 mark for correctly calculating HCF. (Note: If HCF is calculated directly without showing the prime factorisation then also 2 marks will be credited.)

Maths10AD8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD8		4	E	10N1c Apply 10N1a and 10N1b to solve problems related to real-life contexts	4

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the analysing and applying the concept of LCM and HCF of given numbers to solve problems related to real-life contexts.

Sources and diagrams

Type of Books	Number of Books
Hindi story	117
English story	135

Question(s)

1 People of a society thought of donating books to an orphanage. The details of books they could collect are tabulated above. The books are to be stacked in such a manner that each stack has the same number of books, all of the same language, and with as small a number of stacks as possible.

Find the number of books that can be placed in each stack for this purpose.

Also, find the number of stacks of each type of book formed in his arrangement.

(4 marks)

(Total marks 4)

Mark scheme

1 Find the number of books that can be placed in each stack for this purpose. Also, find the number of stacks of each type of books formed in his arrangement.	
Answer	Guidance
No. of books in each stack = 9 No. of stacks of Hindi story books = 13	M1 for correctly identifying that in the given situation HCF is to be obtained.

No. of stacks of English storybooks = 15 To find the number of books in each stack, we find HCF (117, 135) **By Euclid's Algorithm**, we have: $135 = 117 \times 1 + 18$ $117 = 18 \times 6 + 9$ $18 = 9 \times 2 + 0$ Here, the remainder is zero, and at this stage, the divisor is 9. $\Rightarrow$ HCF (117, 135) = 9 **Alternatively** HCF (117, 135) can be obtained by **factorisation method** as follows: $117 = 3 \times 3 \times 13 = 3^2 \times 13$ $135 = 3 \times 3 \times 3 \times 5 = 3^3 \times 5$ HCF (117, 135) $= 3^2 = 9$ Hence the Number of books in each stack = 9 so that the area covered is the least. Also, the number of Stacks of Hindi storybooks $= \frac{117}{9} = 13$ And number of Stacks of English story books $= \frac{135}{9} = 15$	M1 for applying Euclid's division algorithm to 135 and 117 **OR** M1 for finding the prime factorisation of 117 and 135 A1 for finding the number of books in each stack is 9 A1 for finding the number of stacks of Hindi storybooks and English storybooks as 13 and 15, respectively.

Maths10AS1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS1	1		E	10N1d Prove that a decimal which is not recurring or terminating cannot be a rational number	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the decimal representation of a rational number.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1. The decimal representation of $\frac{7}{62500}$ will terminate after how many places of decimals?

A. 4
B. 5
C. 6
D. 3

(1 mark)

(Total marks 1)

Mark scheme

1 The decimal representation of $\frac{7}{62500}$ will terminate after how many places of decimals?

A. 4
B. 5
C. 6
D. 3

Answer	Guidance
C. 6 $\frac{7}{62500} = \frac{7}{5^6\,2^2} = \frac{7 \times 2^4}{10^6}$	A1 Correct answer – 1 mark

Maths10AD2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD2	1		N	10N1d Prove that a decimal which is not recurring or terminating cannot be a rational number	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses understanding of decimal expansions of rational numbers.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The decimal expansion of the rational number $\frac{11323}{250}$ will terminate after

A. one decimal place
B. two decimal places
C. three decimal places
D. four decimal places

(1 mark)
(Total marks 1)

Mark scheme

1. The decimal expansion of the rational number $\frac{11323}{250}$ will terminate after

A. one decimal place
B. two decimal places
C. three decimal places
D. four decimal places

Answer	Guidance
C. Three decimal places	A1 for the correct answer only Do not penalise if only C. or only answer 'three places of decimal' is written

Maths10ASR1

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Mark
Maths10ASR1	1		E	10N1d Decimal expansion of rational number is either terminating or non-terminating but recurring	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to identify the rational number between given two irrational numbers.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link etc.

Question(s)

1 Which of these rational number lie between $\sqrt{2}$ and $\sqrt{3}$?

A. 0.25
B. $1.\overline{23}$
C. 1.5214….
D. $1.\overline{64}$

(1 mark)

(Total marks 1)

Mark scheme

1 Which of the rational number lie between $\sqrt{2}$ and $\sqrt{3}$? A. 0.25 B. $1.\overline{23}$ C. 1.5214…. D. $1.\overline{64}$	
Answer: D. 1.64	Guidance A1 For the correct answer.

Maths10AKP4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP4a	1		N	10S1a Calculate mean, median and mode of grouped data	1
Maths10AKP4b	2	2	C	10S1a Calculate mean, median and mode of grouped data	4
Total marks	**1**	**4**			**5**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of different types of measures of central tendency in real-life

Sources and diagrams:

Age (in years)	5 – 14	15 – 24	25 – 34	35 – 44	45 – 54	55 – 64
Number of cases	6	11	21	23	14	5

Question(s)

1 The Indian Council of Medical Research wants to analyse the age group of people affected by a certain disease. The above table shows the age distribution of patients with a certain disease admitted to a hospital.
Based on the above, answer the questions:

1 (a) The most highly affected age group is:

i. 15 – 24
ii. 25 – 34
iii. 35 – 44
iv. 55 – 64

(1 mark)

1 (b) Find the mean age of the people.

(4 marks)

(Total marks 5)

Mark scheme

<table>
<tr><td colspan="2">1 (a) The highly affected age-group is
i) 15 – 24
ii) 25 – 34
iii) 35 – 44
iv) 55 – 64</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>iii) 35 - 44</td><td>M1 Students should know that the highest frequency indicates the answer</td></tr>
<tr><td colspan="2">1 (b) Find the mean age of the patients with this disease.</td></tr>
<tr><td>Answer 35.375</td><td>Guidance</td></tr>
<tr><td>Mean age of the people
$\frac{10\times6+20\times11+30\times21+40\times23+50\times14+60\times5}{80} = \frac{2830}{80} = 35.375$</td><td>M1 midpoints of age groups as 10, 20, etc. (52-31 years old ends on 15th birthday)
M1 calculating midpoint x frequencies
A1 accuracy of at least groups (or correct statement of the full list – as shown here)
A1 correct answer</td></tr>
</table>

Maths10SR9

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR9a	3		C	10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided).	3
Maths10SR9b	1		C	10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided).	1
Total marks	**4**				**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of finding median and mode

Sources and diagrams

Height	140 -145	150- 155	155-160	160-165	165-170	170-175
Number of students	5	15	25	30	15	10

Question(s)

1 The above table gives the heights of 100 students in cm of a class.

1(a) Find the median height of the students

(3 marks)

1(b) Find the modal class of the given data

(1 mark)

(Total marks 4)

Mark scheme

<table>
<tr><td colspan="2">1 (a) find median heights of the students</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>
<table>
<tr><td>Cum .freq</td><td>5</td><td>20</td><td>45</td><td>75</td><td>90</td><td>100</td></tr>
</table>
Median class: 160- 165
Median = 160 + $\frac{(50-45)5}{30}$
= 160 + 0.83
= 160.83
</td><td>M1 for the cumulative frequency table calculation
M1. Identifying the correct formula –1 mark
Median = 160 + $\frac{(50-45)5}{30}$
A1. median = 160.83</td></tr>
<tr><td colspan="2">1 (b) Find the Mode of the data</td></tr>
<tr><td>Answer Modal class:160-165</td><td>Guidance</td></tr>
<tr><td>160-165 has the largest frequency</td><td>A1 correct answer</td></tr>
</table>

Maths10AD6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AD6a	3		C	10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided).	3
Maths10AD6b	3		C	10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided).	3
Total marks	**6**				**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses understanding of finding the average of the given grouped data and change in average with respect to change in the given observations

Sources and diagrams

Length (in mm)	Number of baby corns
30 - 39	5
40 - 49	2
50 - 59	6
60 - 69	8
70 - 79	9
80 - 89	11
90 - 99	6
100 - 109	3

Question(s)

1 Rosy, a farmer, grew fifty baby corn by developing the method of organic farming in her field. On harvesting, she measured the lengths of the baby corns (to the nearest mm) and grouped the results as tabulated above:

1 (a) Find the average length of baby corns using the direct method. (3 marks)

1 (b) Find the modal length of baby corn. (3 marks)

(Total marks 6)

Mark scheme

1 (a) Find the average length of baby corns using the direct method.

Answer	Guidance
72.06 mm	M1 For finding the values of $x_i f_i$ in the table. M1 Applying the correct formula of finding mean using the direct method. A1 for correct average as 72.06 mm only. Do not penalise if the unit of length 'mm' is not written. Give only A1 for the correct answer if any other method of finding mean is applied, and do not give the method mark in such a case.

Length (in mm)	**Number of baby corns (fi)**	**Class Marks (xi)**	
30 - 39	5	34.5	172.5
40 - 49	2	44.5	89
50 - 59	6	54.5	327
60 - 69	8	64.5	516
70 - 79	9	74.5	670.5
80 - 89	11	84.5	929.5
90 - 99	6	94.5	576
100 - 109	3	104.5	313.5
Total	50		3603

The mean is given as $\bar{x} = \frac{\sum x_i f_i}{\sum f_i}$

$= \frac{3603}{50}$

= 72.06 mm

1 (b) Find the modal length of baby corn.

Answer	Guidance

82.36 mm

Length (in mm)	Length (in mm) (Continuous class intervals)	Number of baby corns
30 - 39	29.5 – 39.5	5
40 - 49	39.5 – 49.5	2
50 - 59	49.5 - 59.5	6
60 - 69	59.5 – 69.5	8
70 - 79	69.5 – 79.5	9 f_0
80 - 89	79.5 – 89.5	11 f_1
90 - 99	89.5 – 99.5	6 f_2
100 - 109	99.5 – 109.5	3

Mode is given as:

$z = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$= 79.5 + \frac{11-9}{22-9-6} \times 10$

$= 79.5 + 2.86$

$= 82.36$ mm

M1 Writing continuous class intervals and identifying the modal class as 79.5 – 89.5

M1 Applying correct formula of mode

A1 for correct modal length as 82.36 mm.

Do not penalise if the unit of length ‘mm’ is not written.

Maths10ASR12

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10ASR12	3		C	10S1a Calculate mean, median and mode of grouped data	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to calculate the median for different sets of data related to real-life contexts.

Age (Years)	No of persons
Less than 10	3
Less than 20	10
Less than 30	22
Less than 40	40
Less than 50	54
Less than 60	71

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The above table shows the ages of persons who visited a museum on a certain day.

Find the median age of the person visiting the museum.

(3 marks)

(Total marks 3)

Mark scheme

1 The above table shows the ages of persons who visited a museum on a certain day.

Find the median age of the person visiting the museum.

Answer	Guidance

Classes	No of persons	Cumulative frequency
0-10	3	3
10-20	7	10
20-30	12	22
30-40	18	40
40-50	14	54
50-60	17	71

N= 71, $\frac{n}{2} = \frac{71}{2} = 35.5$

Median class: 30- 40

$l = 30, h = 10, f = 18, cf = 22$

Median = $l + (\frac{\frac{n}{2} - cf}{f}) \times h$

$= 30 + (\frac{35.5 - 22}{18}) \times 10$

= 30 + 7.5

=37.5

The median age of the person visiting the museum is 37.5 years.

Guidance

M1: using cumulative frequencies

M1: use of the median formula

A1: the correct answer

(No marks will be deducted for not writing the unit for the final answer)

Maths10PR8

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR8a	2	2	C	10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided)	4
Maths10PR8b		2	C	10S1a Calculate mean, median and mode of grouped data (bimodal situation to be avoided)	2
Maths10PR8c	1		C	10S2b Calculate probabilities of an event in simple problems	1
Total marks	**3**	**4**			**7**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the data interpretation and probability.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Given below is a table of marks obtained by 85 students in a class in a Mathematics assessment.

Marks obtained by a student	Number of students
Below 10	5
Below 20	9
Below 30	17
Below 40	29
Below 50	45
Below 60	60
Below 70	70
Below 80	78
Below 90	83
Below 100	85

1 (a) Find the mean marks (4 marks)

1 (b) Find the median marks (2 marks)

1 (c) Find the probability of students who secured at least 60 marks (1 mark)

(Total marks 7)

Mark scheme

1 (a) Find the mean marks.

Answer	Guidance
47.91	M 2

Marks	Mid value (x_i)	$f_i x_i$	$f_i x_i$
0-9	4.5	5	22.5
10-19	14.5	4	58
20-29	24.5	8	196
30-39	34.5	12	414
40-49	44.5	16	712
50-59	54.5	15	817.5
60-69	64.5	10	645
70-79	74.5	8	596
80-89	84.5	5	422.5
90-99	94.5	2	189

M1 A1 mean = $\frac{\sum f_i x_i}{\sum f_i} = \frac{4072.5}{85} = 47.91$

Using the assumed mean method will give the same answer

Taking assumed mean $a = 54.5, h = 10$

Mean = $a + \frac{\sum f_i d_i}{\sum f_i} \times h = 545 + \frac{-56}{85} \times 10$

$= 54.5 - 6.59 = 47.91$

	4 marks Deduct 1 mark if use mid-values as 5, 15 etc.
1 (b) Find the median marks.	
Answer	Guidance
48.75	M1 for median class; $\frac{N+1}{2} = \frac{86}{2} = 43$ Median class = 40 - 50 Median = $l +$ $\frac{\frac{N}{2} - cf\ of\ previous\ class\ to\ the\ median\ class}{freq\ of\ median\ class} \times h$ $= 40 + \frac{43-29}{16} \times 10 = 40 + \frac{14}{16} \times 10 = 40 + \frac{135}{16}$ A1 $40 + 8.75 = 48.75$ Accept using 42.5th value as median (gives 48.44)
1 (c) Find the probability of students who secured at least 60 marks.	
Answer	Guidance
0.29 Allow 0.29 – 0.30	A1 Probability $= \frac{10+8+5+2}{85} = \frac{25}{85} = 0.294$

Maths10AKP2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP2		3	C	10S1a Calculate mean, median, and mode of grouped data (bimodal situation to be avoided	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the concept of finding mean in real-life situations

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 The mean of 25 observations is 48. If the mean of the first 13 observations is 42 and that of the last 13 observations is 53, find the 13th observation.

(3 marks)

(Total marks 3)

Mark scheme

1 The mean of 25 observations is 48. If the mean of the first 13 observations is 42 and that of the last 13 observations is 53, find the 13th observation	
Answer	Guidance
Mean of 25 observations = 48 So, total values of 25 observations = 48 x 25 = 1200 Mean of first 13 observations = 42 x 13 = 546 Mean of last 13 observations = 53 x 13 = 689 ∴ 13th observation = mean of first 13 observations + mean of last 13 observations – mean of 25 observations = 546 + 689 – 1200 = 35 Hence the 13th observation is 35	M1 can use the formula to find Mean = sum of obs**/** no. of obs. A1 using the same concept Getting final result

Maths10AKP3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP3		3	C	10S1a Calculate mean, median, and mode of grouped data (bimodal situation to be avoided	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the concept of finding mean in real-life situations

Sources and diagrams

No. of Accident	No. of drivers
0	46
1	p
2	q
3	25
4	10
5	5
Total	200

Question(s)

1 The mean of the above distribution is 1.46; find the values of p and q.

(3 marks)

(Total marks 3)

Mark scheme

1 The mean of the above distribution is 1.46; find the values of p and q

Answer	Guidance
x | f | fx 0 | 46 | 0 1 | p | p 2 | q = (114 – p) | 2(114 – p) =228 – 2p 3 | 25 | 75 4 | 10 | 40 5 | 5 | 25 Total | $\sum f$ = 200 | 368 – p 46 + p + q + 25 + 10 + 5 = 200	M1 using the concept of finding the sum of frequencies 1 mark and equating with total f

86 + p + q = 200 p + q = 114 p = 114 – q $\text{Mean} = \frac{\sum fx}{\sum f}$ 1.46 = $\frac{368-p}{200}$ 1.46 x 200 = 368 – p 292 = 368 – p p= 368 – 292 = 76 q = 114 – p q = 114 – 76= 38 hence p = 76 and q = 38	

Maths10SM7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SM7a	1	1	N	10S2a Calculate probabilities based on scenarios involving equally likely outcomes	2
Maths10SM7b	1		N	10S2a Calculate probabilities based on scenarios involving equally likely outcomes	1
Total marks	**2**	**1**			**3**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the estimated probability of an event

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 In the large box full of doughnuts, 13 of the 52 doughnuts are chocolate, and the rest are strawberry doughnuts.

Leena takes a doughnut from the box at random.

1(a) Find the probability that Leena's doughnut is chocolate. (2 marks)

Give your answer as a fraction in its lowest terms.

1(b) Find the probability that Leena's doughnut is not chocolate. (2 marks)

(Total marks 4)

Mark scheme

1 (a) Find the probability that Leena's doughnut is chocolate. Give your answer as a fraction in its lowest terms.	
Answer	Guidance
$\frac{13}{52}$ (1) = ¼ (1)	M1 for correct probability in any form A1 for expressing it in the lowest form. ¼ gets both marks
1 (b) Find the probability that Leena's doughnut is not chocolate.	
Answer	Guidance
52-13 =39 P(E) = $\frac{39}{52}$ = ¾	A1 for calculating complementary probability. (Accept 39/52)

Maths10PS4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS4	1		N	10S2a Calculate probabilities based on scenarios involving equally likely outcomes	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to determine the probability of the complement of an event.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 If R is the event that it will rain tomorrow, such that P(R) = 0.03, then $P(\overline{R})$ =

A. 0.07
B. 0.09
C. 0.79
D. 0.97

(1 mark)

(Total marks 1)

Mark scheme

1. If R is the event that it will rain tomorrow, such that P(R) = 0.03, then $P(\overline{R})$ =

A. 0.07
B. 0.09
C. 0.79
D. 0.97

Answer	Guidance
D. 0.97	A1 for the correct answer

Maths10AS4

Item Identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS4	1		E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses how to calculate probabilities of equally likely events.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1. Cards numbered 7 to 40 were put in a box. Anish selects a card at random. What is the probability that the selected card is a multiple of 7?

A. $\frac{7}{34}$
B. $\frac{5}{34}$
C. $\frac{6}{35}$
D. $\frac{7}{35}$

(1 mark)

(Total marks 1)

Mark scheme

Cards numbered 7 to 40 were put in a box. Anish selects a card at random. What is the probability that the selected card is a multiple of 7?

A. $\frac{7}{34}$
B. $\frac{5}{34}$
C. $\frac{6}{35}$

D. $\frac{7}{35}$	
Answer	Guidance
B. $\frac{5}{34}$ Total possible outcomes = 34 Favourable outcomes (Card is a multiple of 7) = 5 (7, 14, 21, 28, 35) P(card being a multiple of 7) = $\frac{Favouable\ outcomes}{Total\ possible outcomes} = \frac{5}{34}$	A1 Correct answer – 1 mark

Maths10AKP7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP7a	1		N	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	1
Maths10AKP7b	1		E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	1
Maths10AKP7c		1	E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	1
Maths10AKP7d		1	E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	1
Total marks	**2**	**2**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the concept of drawing an event and finding the probability of it

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 From a well-shuffled deck of playing cards if a card is drawn at random. Based on a standard deck of cards, answer the following questions:

1 (a) What is the probability for the card to be a face card?

(1 mark)

1 (b) Which of the following cannot be the probability of an event?

i. $\frac{-5}{7}$
ii. 0
iii. 19%
iv. 1

(1 mark)

1 (c) If all cards of diamond are removed from the deck, find the probability that a card drawn at random from the deck is a red jack

(1 mark)

1 (d) What is the probability that the card drawn is a jack or an ace?

(1 mark)

(Total marks 4)

Mark scheme

1 (a) What is the probability for the card to be a face card?	
Answer	Guidance
Since there are 12 face cards Therefore, P(a face card) = $\frac{12}{52}$	1 mark
1 (b) Which of the following cannot be the probability of an event? i) $\frac{-5}{7}$ ii) 0 iii) 19% iv) 1	
Answer	Guidance
i) $\frac{-5}{7}$	Since Probability cannot be less than 0 1 mark
1 (c) If all cards of diamond are removed from the deck, find that a card drawn at random from the deck, is a red jack	
Answer	Guidance
Since, Total diamond card = 13 Therefore, after removing all diamond cards = 52 – 13 = 39 Since, 1 red jack is there Therefore, P (a red jack) = $\frac{1}{39}$	1 mark
1 (d) What is the probability that the card drawn is a jack or an ace	
Answer	Guidance
There are 4 aces and 4 jack cards Therefore, P(a jack or a face card) = $\frac{8}{52}$	1 mark

Maths10GS2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS2	1		E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses probabilities involving equally likely outcomes.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 A card is drawn at random from a pack of well-shuffled 52 cards. What is the probability that the card drawn is not an ace?

A. $\frac{1}{13}$

B. $\frac{4}{13}$

C. $\frac{9}{13}$

D. $\frac{12}{13}$

(1 mark)

(Total marks 1)

Mark scheme

1 A card is drawn at random from a pack of well-shuffled 52 cards. What is the probability that the card drawn is not an ace?	
Answer	Guidance
P(not an ace) = $\frac{12}{13}$	A1 Correct answer – 1 mark

Maths10SR3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SR3	1		N	10S2a Calculate probabilities based on scenarios involving equally likely outcomes	1

Item purpose

The question assesses the knowledge of finding the probability of an event

Question(s)

1 What is the probability of choosing a black card or a ten from a deck of playing cards?

A. ½
B. $\frac{7}{13}$
C. $\frac{1}{13}$
D. $\frac{2}{13}$

(1 mark)

(Total marks 1)

Mark scheme

1 What is the probability of choosing a black card or a ten from a deck of playing cards? A. ½ B. $\frac{7}{13}$ C. $\frac{1}{13}$ D. $\frac{2}{13}$	
Answer	Guidance
A. $\frac{7}{13}$	A1 for the answer

Maths10NK4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths9NK4		1	N	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the understanding of the probability of events in real-life applications

Sources and diagrams

Source information if copied:

Question(s)

1 T-shirts marked with numbers 2 to 101 are placed in a box. Sarita is fond of numbers which are perfect squares.

When her turn comes, she randomly takes out a T-shirt from this box; what is the probability of getting her favourite T-shirt?

A. 9/100

B. 3/10

C. 1/10

D. 19/100

(1 mark)

(Total marks 1)

Mark Scheme

1 t-shirt marked with numbers 2 to 101 is placed in a box. Sarita is fond of numbers which are perfect squares. When her turn comes, she randomly takes out a T-shirt from this box; what is the probability of getting her favourite T-shirt?

A. 9/100 B. 3/10 C. 1/10 D. 19/100	
Answer	Guidance
A. 9/100	M1 – Perfect squares – 4,9,16,25,36,49,64,81,100 (9 of them) Number of T shirts (101 -2= 99) +1 = 100 P(perfect square) = 9/100 A1 – 1 mark for correct answer

Maths10SM4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SM4	1	1	E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the estimation of the probability of an event.

Question(s)

1 A bag contains 10 cards. Each card is labelled with a different number from 1 to 10. A card is chosen from the bag at random.

Write down the probability that the chosen card is of a prime number.

(1 mark)

(Total marks 1)

Mark scheme

1. A bag contains 10 cards. Each card is labelled with a different number from 1 to 10. A card is chosen from the bag at random. Write down the probability that the chosen card is of a prime number.	
Answer	Guidance
$\frac{2}{5}$	M1 for attempting to identify primes (2, 3, 5, and 7) A1 for the correct answer Correct answer only scores 2 marks.

Maths10DP6

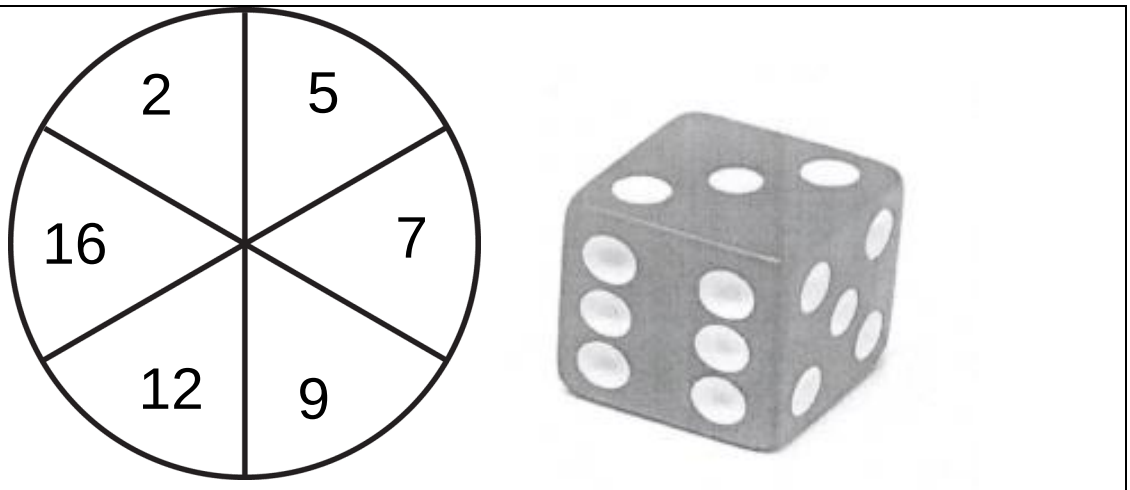
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths9DP6a	1	1	E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	2
Maths9DP6b	1	1	E	10S2a Calculate probabilities based on scenarios involving equally likely outcomes.	2
Total marks	**2**	**2**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

This question assesses the ability of the student to estimate probability from the given observations.

Sources and diagrams



Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Diwali Fest is an annual South Asian arts & culture festival produced by the Diwali Celebration Society. In the Diwali fest, a game is played with a fair spinner, shown above. The numbers on the spinner are 2, 5, 7, 9, 12, 16. Sometimes the owner will invite a player who does not win with the spinner to throw the dice as a free bonus.

1(a) What is the probability that a player will get a special prize because the spinner stops on a perfect square?

(2 marks)

1(b) If the player gets a chance to throw a dice, what is the probability of getting a multiple of 2 on the dice?

(2 marks)

(Total marks 4)

Mark scheme

1 (a) What is the probability that a player will get a special prize if the spinner stops on a perfect square? Show your working.	
Answer	Guidance
2/6 OR 1/3 (1) OR 0.33 (1)	M1 identifying perfect squares (4 and 9) A1 giving an answer as a fraction or decimal
1 (b) If the player gets a chance to throw a dice, what is the probability of getting a multiple of 2 on dice? Show your working.	
Answer	Guidance
3/6 OR ½ (1) OR 0.5 (1)	M1 identifying outcomes 2, 4 and 6 A1 giving an answer as a fraction or decimal Correct answer scores both marks.

Maths10AKP11

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AKP11	1		E	10S2b calculate probabilities of an event in simple problems	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of probability

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 A number x is chosen at random from the numbers $-2, -1, 0, 1, 2$. Then the probability of $x^2 < 2$.

A. $\frac{1}{5}$.
B. $\frac{2}{5}$.
C. $\frac{3}{5}$.
D. $\frac{4}{5}$.

(1 mark)
(Total marks 1)

Mark scheme

1 A number x is chosen at random from the numbers $-2, -1, 0, 1, 2$. Then the probability of $x^2 < 2$.

A. $\frac{1}{5}$.
B. $\frac{2}{5}$.
C. $\frac{3}{5}$.
D. $\frac{4}{5}$.

Answer	Guidance
$\frac{3}{5}$.	(1 mark)

Maths10ASR3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Mark
Maths10ASR3	1		E	10S2b Calculate probabilities of an event in simple problems.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to find the probability of an event when two coins are tossed.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Two fair coins are tossed together. What is the probability of getting at least one head?

A. 25%
B. 50%
C. 75%
D. 100%

(1 mark)

(Total marks 1)

Mark scheme

1 Two fair coins are tossed together. What is the probability of getting at least one head? A. 25% B. 50% C. 75% D. 100%	
Answer	Guidance
C. 75%	A1 mark for the correct answer

Maths10PR4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PR4	1		E	10S2b Calculate probabilities of an event in simple problems	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of probability

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 A coin is tossed, and a die is rolled simultaneously.

What is the probability of getting a head or an even number in the event?

A. 0.25
B. 0.5
C. 0.75
D. 1

(1 mark)

(Total marks 1)

Mark scheme

1. A coin is tossed, and a die is rolled simultaneously.

What is the probability of getting a head or an even number in the event?

A. 0.25
B. 0.5
C. 0.75
D. 1

Answer	Guidance
C. 0.75	Sample space = {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6} = 12 outcomes Favourable outcomes are H1, H2, H3, H4, H5, H6, T2, T4, T6 = 9 outcomes $probability = \frac{9}{12} = \frac{3}{4} = 0.75$

Maths10SK3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK3	1		N	10T1a Calculate and use the trigonometric ratios of an acute angle of a right-angled triangle	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of trigonometric ratios.

Sources

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 In right-angled ∆ABC, AB=13cm, BC=5cm and AC =12cm, what is the value of CosB

A. 5/12
B. 5/13
C. 12/13
D. 13/12

(1 mark)

(Total mark 1)

Mark scheme

1 In right-angled ∆ABC, AB=13cm, BC=5cm and AC =12cm, what is the value of CosB A. 5/12 B. 5/13 C. 12/13 D. 13/12	
Answer	Guidance
B. 5/13	Cos B = B/H =5/13

Maths10SS1

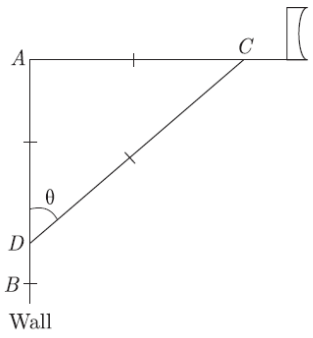
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS1a		3	E	10T1a Calculate and use the trigonometric ratios of an acute angle of a right-angled triangle	3
Maths10SS1b	2		C	10T1a Calculate and use the trigonometric ratios of an acute angle of a right-angled triangle	2
Total marks	**2**	**3**			**5**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to calculate and use the trigonometric ratios of an acute angle of a right-angled triangle.

Sources and diagrams



Question(s)

1 The rod of the TV disc antenna is fixed at the right angle to wall AB and a rod CD supports the disc, as shown in Figure. If *AC* = 1.5 m long and *CD* = 3 m.

1 (a) Find the length of the rod AD. (3 marks)

1 (b) Compute the value of Sec θ + cosec θ . (2 marks)

(Total marks 5)

Mark scheme

<table>
<tr><td colspan="2">1 (a) The rod of the TV disc antenna is fixed at the right angle to wall AB, and a rod CD supports the disc as shown in Figure. If AC = 1.5 m long and CD = 3 m,
Find the length of the rod CD.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>2.6 m or 2.59 m
Using Pythagoras Theorem
$AD^2 + AC^2 = DC^2$
$AD^2 + (1.5)^2 = (3)^2$
$AD^2 = 9 - 2.25 = 6.75$
$AD = 6.75 = 2.6$ m (Approx.)</td><td>M1 To find the length of AD by applying Pythagoras theorem
A1 AD = 6.75 = 2.6 m (Approx.)
Marks can be given for 2.59m or 2.59 or 2.6 also (without units also full marks are to be allotted)</td></tr>
<tr><td colspan="2">1 (b) Compute the value of Sec θ + cosec θ</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>$\frac{41}{13}$</td><td>M1 Sec $\theta = \frac{CD}{AD} = \frac{3}{2.6}$
M1 cosec $\theta = \frac{CD}{AC} = \frac{3}{1.5}$
A1 $\frac{3}{2.6} + \frac{3}{1.5} = \frac{41}{13}$</td></tr>
</table>

Maths10PS9

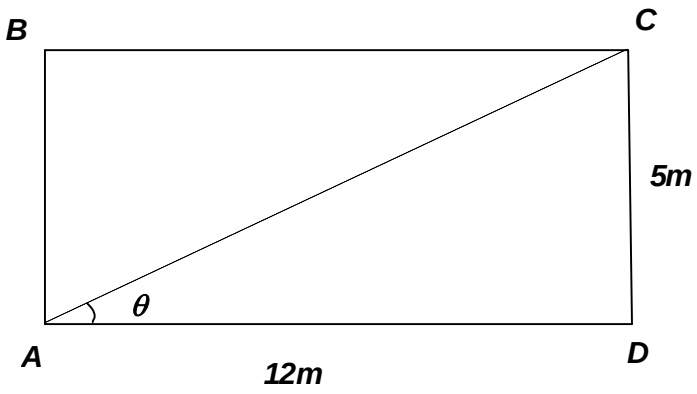
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS9a	1	1	N	10T1a Calculate and use the trigonometric ratios of an acute angle of a right-angled triangle. 10T1c Know and use the relationships between the ratios	2
Maths10PS9b		2		10T1a Calculate and use the trigonometric ratios of an acute angle of a right-angled triangle	2
Total marks	**1**	**2**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to apply the trigonometric ratios of an acute angle of a right-angled triangle, verify the result and calculate its value as per the ratios asked.

Sources and diagrams



Question(s)

1 A rectangular-shaped gardening block measures 12 m by 5 m and angle CAD = θ (theta) .

1 (a) Determine the value of 12 tan θ. . (2 marks)

1 (b) Determine the value of $\frac{1-tan^2\theta}{1+tan^2\theta}$. (2 marks)

(Total marks 4)

Mark scheme

1 (a) Determine the value of 12 tan θ .	
Answer	Guidance
5 tan θ = $\frac{opposite\ side}{adjacent\ side}$ = $\frac{CD}{AD}$ = $\frac{5}{12}$ 12 tan θ = 12 × $\frac{5}{12}$ = 5	M1 for determining the correct value of tan θ A1 for getting the correct answer. Alternatively, A 1 for directly writing the answer Note: A1 for answering the trigonometric ratios without writing their adjacent/opposite sides. Do not penalise for not writing the sides of the ratios. Accept the ratio as numbers
1 (b) Determine the value of $\frac{1-tan^2\theta}{1+tan^2\theta}$.	
Answer	Guidance
$\frac{119}{169}$ or 0.704 Tan^2 θ = $\left(\frac{5}{12}\right)^2$ = $\frac{25}{144}$ Thus, ⇨ $\left[1-\left(\frac{5}{12}\right)^2\right] \div \left[1+\left(\frac{5}{12}\right)^2\right]$ ⇨ $\frac{1-\frac{25}{144}}{1+\frac{25}{144}}$ ⇨ $\frac{144-25}{144+25}$ ⇨ $\frac{119}{169}$ or 0.704	M1 for writing the correct values of the square of the trigonometric ratios and simplification. A1 for the correct answer. Note: Decimal values up to two/three decimal places can also be considered, i.e., 0.70 or 0.704

Maths10AS5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AS5a		3	N	10T1b Know and use the values of the trigonometric ratios of 30^0, 45^0 and 60^0	3
Maths10AS5b	1		N	10T1b Know and use the values of the trigonometric ratios of 30^0, 45^0 and 60^0	1
Total marks	**1**	**3**			**4**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses that the students know the trigonometric values of some specific angles.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 If $\sin (A - B) = ½$ and $\cos (A + B) = ½$, where $(A + B) \leq 90^0$ and $A > B$.

1 (a) Find the values of A and B.

(3 marks)

1 (b) Find the value of tan 2A.

(1 mark)

(Total marks 4)

Mark scheme

<table>
<tr><td colspan="2">1(a) Find the values of A and B.</td></tr>
<tr><td>Answer
$A = 45^0$; $B = 15^0$

Sin (A – B) = ½ $\Rightarrow$ sin (A – B) = sin 30^0
$\Rightarrow$A – B = 30 ------(i)
Cos (A + B) = ½ $\Rightarrow$ cos(A + B) = cos 60^0
$\Rightarrow$A + B = 60 -------(ii)

Solving (i) and (ii) $A = 45^0$; $B = 15^0$</td><td>Guidance

M1 – forming the first equation

M1 – forming the second equation

A1 – finding the values of A and B

Do not deduct marks if the degree sign is missing.
Total part (a) = 3 marks</td></tr>
<tr><td colspan="2">1 (b) Find the value of tan 2A</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>tan 2A = tan $30^0 = \frac{1}{\sqrt{3}}$</td><td>A1 Correct answer – 1 mark
Total part (b) = 1 mark</td></tr>
</table>

Maths10SK2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK2	1		N	10T1b Know and use the values of the trigonometric ratios of 30º, 45º and 60º	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of trigonometry

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 The value of θ, for which Sin2θ=1/2; 0º<θ<90º is

A. 15º
B. 30º
C. 45º
D. 60º

(1 mark)

(Total marks 1)

Mark scheme

1 The value of θ, for which Sin2θ=1/2; 0º<θ<90º is A. 15º B. 30º C. 45º D. 60º	
Answer	Guidance
A. 15º	Sin2θ=1/2 2θ=30º θ =15º

Maths10GS4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10GS4	1		E	10T1b Know and use the values of the trigonometric ratios of 30^0, 45^0 and 60^0	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses how to use the values of the trigonometric ratios.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link, etc.

Question(s)

1 Evaluate in the simplest form: cos60º. cos30º - sin60º. sin30º

(1 mark)

(Total marks 1)

Mark scheme

1 Evaluate in the simplest form: cos60º. cos30º - sin60º. sin30º	
Answer	Guidance
cos60º. cos30º - sin60º. sin30º $= \frac{1}{2} \times \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \times \frac{1}{2} = 0$	A1 Correct Answer – 1 mark

Maths10SS2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS2	2		E	10T1b Know and use the values of the trigonometric ratios of 30º, 45º and 60º	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to know and use the values of the trigonometric ratios of 30º, 45º and 60º

Sources and diagrams

Question(s)

1 Evaluate $\sin^2 60º - 2\tan 45º - \cos^2 30º$

(2 marks)

(Total marks 2)

Mark scheme

1 Evaluate $\sin^2 60º - 2\tan 45º - \cos^2 30º$	
Answer	Guidance
-2	M1 To substitute correct values of the t ratios $(\frac{\sqrt{3}}{2})^2 - 2(1) - (\frac{\sqrt{3}}{2})^2$ A1 = -2

Maths10PS5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10PS5	1	1	N	10T1b Know and use the values of the trigonometric ratios of 30^0, 45^0 and 60^0 10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°.	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to determine the height of a pole when distance and an angle are given by using the value of Tan 45º.

Sources and diagrams

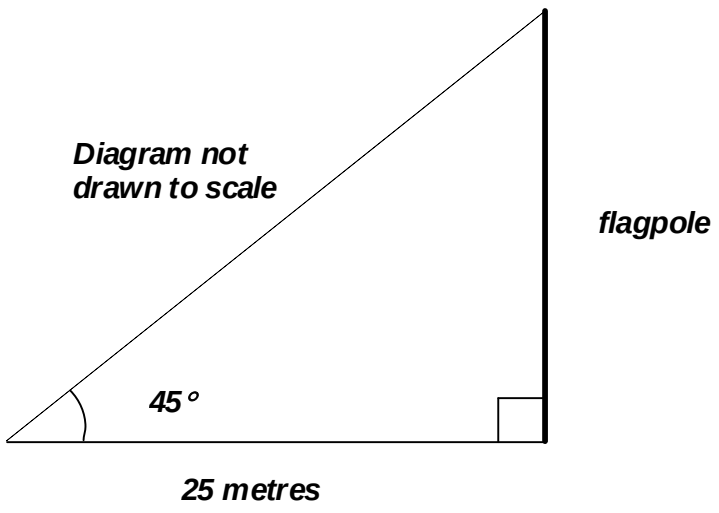


Figure not to scale. The flagpole is perpendicular to the base of the triangle.

Question(s)

1 A flagpole casts its shadow that is 25 m long, on the ground. The angle made by the tip of the flagpole and the tip of its shadow on the ground is 45º. Find the height of the flagpole. (2 marks)

(Total marks 2)

Mark scheme

1. A flagpole casts its shadow that is 25 m long on the ground. The angle made by the tip of the flagpole and the tip of its shadow on the ground is 45^o. Find the height of the flagpole.	
Answer	Guidance
25 (metres) Tan $45^0 = \frac{\text{Opposite side}}{\text{Adjacent side}} = \frac{\text{Height of the flag pole}}{25}$ $1 = \frac{\text{Height of the flag pole}}{25}$ Height of the flagpole = 25 m	M1 for correctly identifying the trigonometric ratio and its value A1 for the correct answer. Alternatively, A2 for directly writing the correct answer. Consider 25 or 25 m as the correct answer. Do not penalise for omitting the units.

Maths10AR4

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR4	1		C	10T1c Know and use the relationships between the ratios. 10G1h Be able to prove, and to use the fact that: In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to use the trigonometric ratio in a real-life situation

Sources and diagrams

Question(s)

1 If tanA=3/4, then CosA equals to

A. 4/5
B. 3/5
C. 4/3
D. 3/4

(1 mark)

(Total marks 1)

Mark scheme

1 If tanA=3/4, then CosA equals

A. 4/5
B. 3/5
C. 4/3
D. 3/4

Answer	Guidance
A. 4/5	A1 correct answer

Maths10AR6

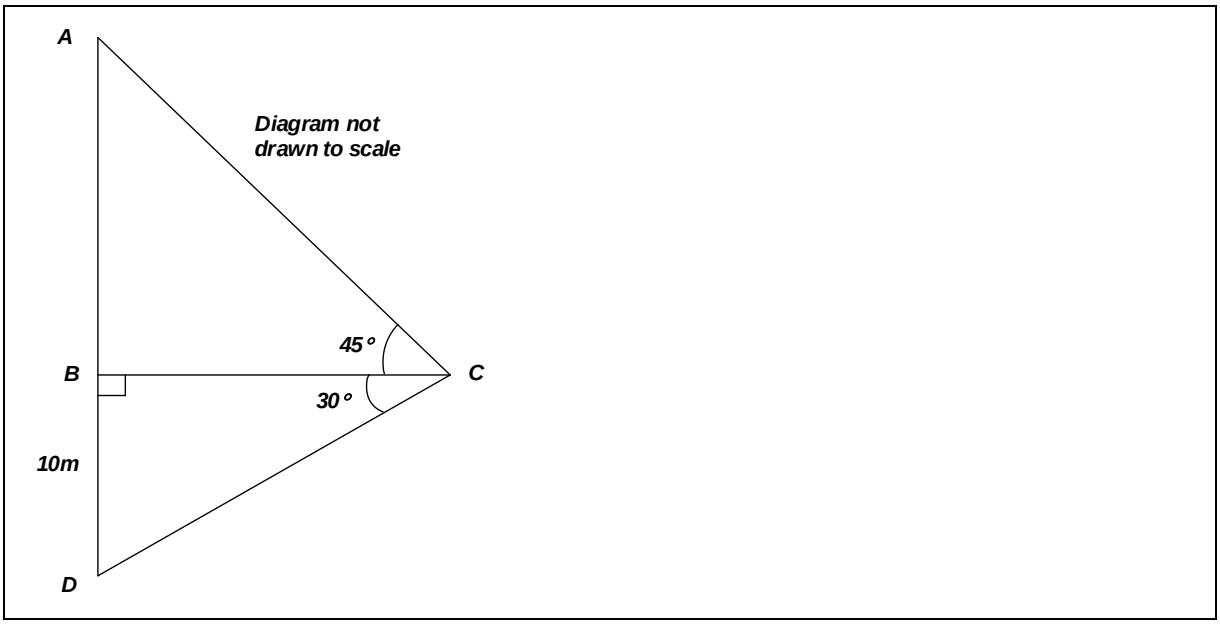
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR6a	2		C	10T2a Be able to prove, and to use the identity $\sin^2 A + \cos^2 A \equiv 1$ 10T1c Know and use the relationships between the ratios.	2
Maths10AR6b		4	C	10T3a Simple problems on heights and distances.	4
Total marks	**2**	**4**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to know and use basic trigonometric identities, determine all trigonometric ratios with respect to a given acute angle (of a right triangle), and uses them in finding heights of different structures or distance from them

Sources and diagrams



Question(s)

1(a) Prove that

$$\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = 2 \tan x \sec x$$

(2 marks)

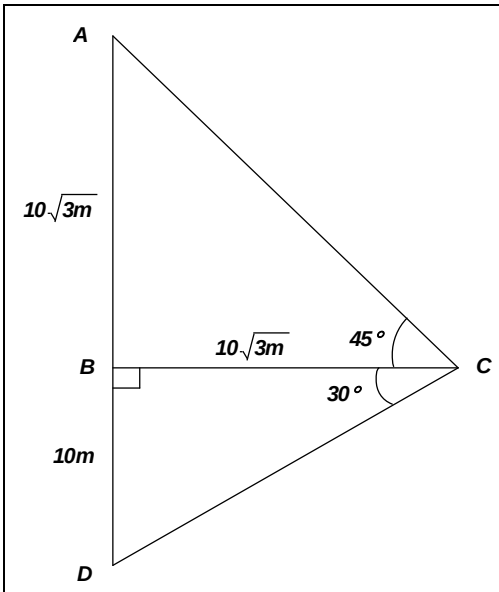
1(b) In the diagram above, BC is perpendicular to AD, and BD is 10 m, $\angle ACB = 45^0$ and $\angle BCD = 30^0$. Find AB.

(4 marks)
(Total marks 6)

Mark scheme

Point based

1 (a) Prove that $\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = 2 \tan x \sec x$	
Answer	Guidance
LCM=$1-\sin^2 x$ $\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = \frac{2 \sin x}{1-\sin^2 x}$ $= \frac{2 \sin x}{\cos^2 x}$ $= \frac{2 \sin x}{\cos x} \times \frac{1}{\cos x}$ $= 2 \tan x \sec x$	M1 finding LCM and simplifying the numerator M1 showing $\frac{\sin x}{\cos x} = \tan x$ and $\frac{1}{\cos x} = \sec x$
1 (b) In the diagram above, BC is perpendicular to AD, BD is 10 m, $\angle ACB = 45^0$ and $\angle BCD = 30^0$. Find AB.	
Answer	Guidance
	M1 A1 using tan 30 to find BC M1 A1 using tan 45 to find AB (follow-through from their BC, i.e., AB = their BC gets the marks)



From the given data
Tan 30º=10/BC
BC=10√3 m
In ABC, ∠ACB =45º
Tan45º=AB/BC
1=AB/ BC
AB =10√3
The height of the building is 10√3 m.

If the answer is written as 17.32 m, it also can be accepted

Maths10SS3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS3		3	N	10T1c Know and use the relationships between the ratios.	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to know and use the relationships between the ratios.

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 If $k + 1 = \sec^2\theta(1 + \sin\theta)(1- \sin\theta)$, find the value of k.

(3 marks)

(Total marks 3)

Mark scheme

1 If $k + 1 = \sec^2\theta(1 + \sin\theta)(1- \sin\theta)$, find the value of k.	
Answer	Guidance
0	$k + 1 = \sec^2\theta(1 + \sin\theta)(1- \sin\theta)$ $= \sec^2\theta(1- sin^2\theta)$ M1 $= \sec^2\theta \cos^2\theta$ M1 $= \frac{1}{cos^2\theta} \times \cos^2\theta = 1$ $k + 1 = 1$ & $k = 1 - 1 = 0$ *A1* Thus $k = 0$

Maths10SK5

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK5		2	N	10T2a Be able to prove, and to use the identity $\sin^2 A + \cos^2 A \equiv 1$	2

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of coordinate geometry

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 Simplify the following expression. Show your working.

$$\frac{sin^3\theta + cos^3\theta}{sin\theta + cos\theta}$$

(2 marks)

(Total marks 2)

Mark scheme

1 Simplify the following expression. Show your workings. $\frac{sin^3\theta+cos^3\theta}{sin\theta+cos\theta}$	
Answer	Guidance
$(1 - sin\theta\ cos\theta)$	M1 $\frac{(sin\theta+cos\theta)(sin^2\theta-sin\theta cos\theta+cos^2\theta)}{sin\theta+cos\theta}$ A1 $\frac{(sin\theta+cos\theta)(1-sin\theta cos\theta)}{sin\theta+cos\theta}$ $(1 - sin\theta\ cos\theta)$

Maths10AR2

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10AR2	1		C	10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°.	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability of the student to find the distance between the two points in a plane

Sources and diagrams

Question(s)

1 The distance between the points (12,1) and (4, -5) is

A. 9
B. 10
C. -10
D. 8

(1 mark)

(Total marks 1)

Mark scheme

1 The distance between the points (12,1) and (4, -5) is A. 9 B. 10 C. -10 D.	
Answer	Guidance
B. 10	A1 Correct answer

Maths10RK7

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK7 a	3		E	10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°	3
Maths10RK7 b	3		E	10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°	3
Total	**6**				**6**

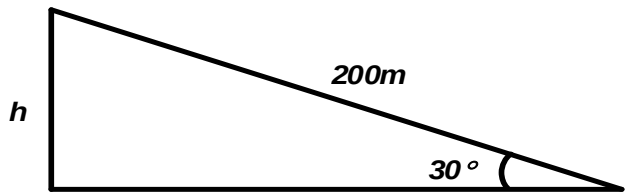
*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

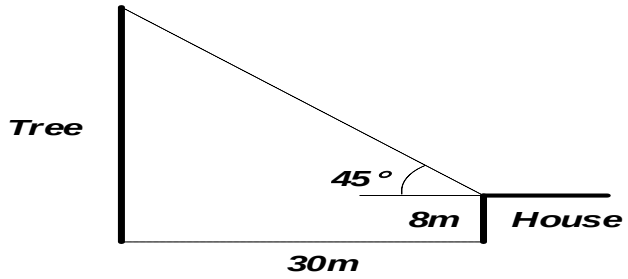
The question assesses the knowledge and application of trigonometric problems of height and distances in a real-life situation.

Sources and diagrams

1a.



1b.



Question(s)

1 (a) A laser rangefinder shows that the top of a tower is 200 meters from a point on the ground. It is at an angle of elevation of 30^0. Find the height of the tower.

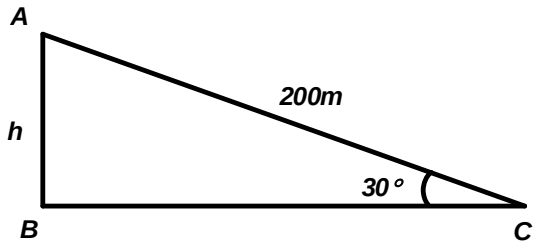
(3 marks)

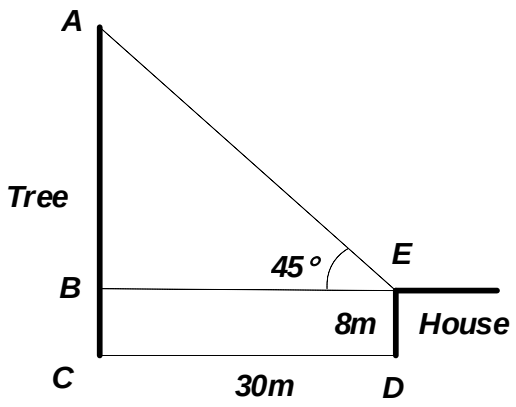
1 (b) The rooftop of your house is 8m above the ground. The base of a tree is 30m away (along the ground) at the ground level of your house. From the nearest point of the rooftop of your house, the top of the tree is at an angle of elevation of 45^o. Find the height of the tree.

(3 marks)

(Total marks 6)

Mark Scheme

<table>
<tr><td colspan="2">1 (a) A laser rangefinder shows that the top of a tower is 200 meters from a point on the ground. It is at an angle of elevation of 30^0. Find the height of the tower.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>100 m
 
</td><td>Let C be the point on the ground; A be the top of the tower, and B be the base of the tower.
M1: In ABC, sin 30 = AB / 200
M1, A1: AB = 200 x sin 30 = 100m</td></tr>
<tr><td colspan="2">1 (b) The rooftop of your house is 8m above the ground.
The base of a tree is 30m away (along the ground) at the ground level of your house.
From the nearest point of the rooftop of your house, the top of the tree is at an angle of elevation of 45^o. Find the height of the tree.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
</table>

height of the tree = 38m  	M1 Let AC be the tree and DE be the side of the house CD=BE = 30m M1 In △ABE AB/BE = tan 45^o A1: so, AB = 30m Therefore, the height of the tree (AC) = 38m

Maths10RM3

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM3		1	E	10T3a Simple problems on heights and distances	1

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses students' ability to determine all trigonometric ratios with respect to a given acute angle (of a right triangle) and use them in solving problems in daily life contexts like finding heights of different structures or distance from them.

Sources and diagrams

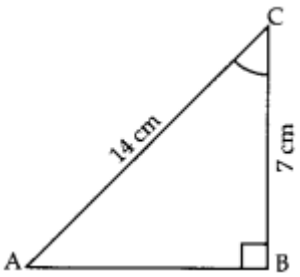


Figure not to scale

Question

1 Find the value of ĐC from the figure given above

A. 90°
B. 45°
C. 30°
D. 60°

(1 mark)

(Total marks 1)

Mark scheme

1 Find the value of ĐC from the figure given above A. 90° B. 45° C. 30° D. 60°	
Answer	Guidance
D. 60°	A1 for the correct answer

Maths10RK8

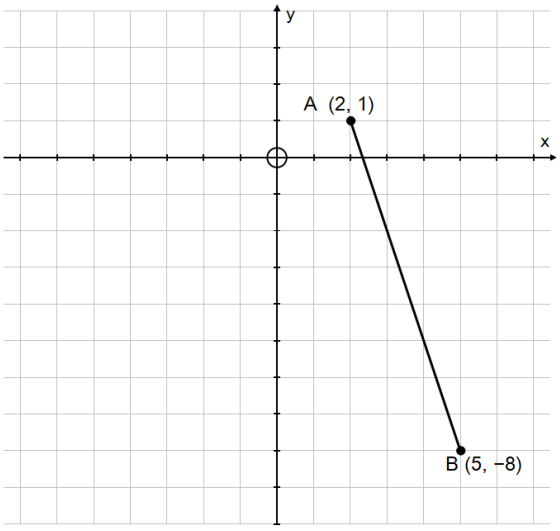
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RK8	2	1	N	10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°	3

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the ability to solve simple problems on heights and distances.

Sources and diagrams



Question(s)

1 The line segment joining A(2,1) and B(5,-8) is trisected at the points P and Q.

If P is closer to point A and lies on the line 2x – y + k = 0, find the value of k.

(3 marks)

(Total marks 3)

Mark scheme

1. The line segment joining A(2,1) and B(5,-8) is trisected at the points P and Q. If P is closer to point A and lies on the line 2x – y + k = 0, find the value of k	
Answer	Guidance
k = -8	M1 For point P $m_1 : m_2$ = AP:PB=1:2 $(x_1, y_1 = (5, -8)) = A(2,1) and (x_2, y_2)$ A1 Point P = $[\frac{1X5+2X2}{1+2}, \frac{1X-8+2X1}{1+2}]$ =(3,-2) A1 P(3,-2) lies on line 2x-y+k=0 k=-8

Maths10RM6

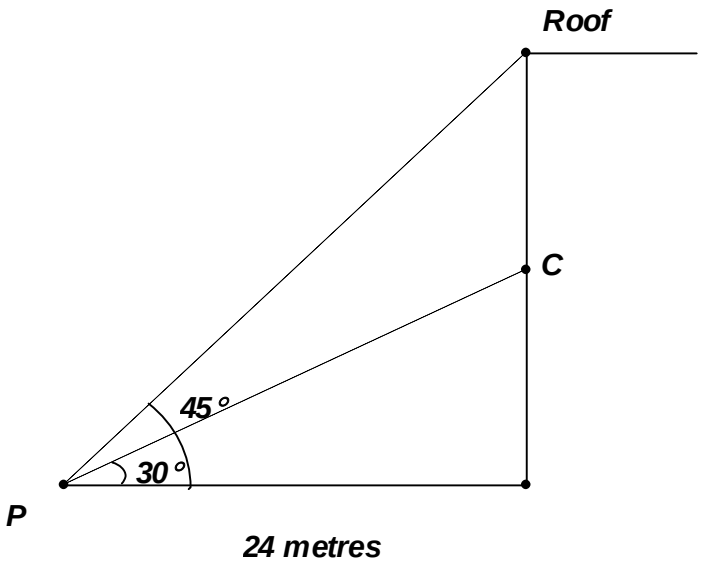
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM6a		2	C	10T3 Heights and distances, angles of elevation and depression	2
Maths10RM6b		2	C	10T3a Simple problems on heights and distances.	2
Maths10RM6c		2	C	10T3a Simple problems on heights and distances.	2
Total marks		**6**			**6**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the students' ability to use trigonometric ratios with respect to a given acute angle in solving problems in daily life contexts like finding heights of different structures or distance from them.

Sources and diagrams



Question(s)

1 Ravi got a clinometer from his school's maths lab and started measuring various angles of elevation in his surroundings. He saw a corporate building on which the company logo is painted on a wall of the building.

From a point P on the ground level, 24 metres from the base of the building, the angle of elevation of the roof of the building is 45°. The angle of elevation of C, the centre of the logo, is 30^0.

1(a) What is the height of the centre of the logo from the ground?

(2 marks)

1(b) What is the distance between the roof and the centre of the logo?

(2 marks)

1(c) If the point of observation P is moved 16m towards the base of the building, find the angle of elevation of the logo on the building.

(2 marks)

(Total marks 6)

Mark scheme

1(a) What is the height of the centre of the logo from the ground?	
Answer	Guidance
Tan 30° = $\frac{h}{x}$ Þ $\frac{h}{24} = \frac{1}{\sqrt{3}}$ H = $8\sqrt{3}$ = 8 × 1.73 = 13.84m	M1 for trigonometric ratio M1 for calculation
1 (b) What is the distance between the roof and the centre of the logo?	
Answer	Guidance
Height of centre of logo = 13.84m Let the height of the roof be H	M1 for the height of the roof M1 for subtraction

Tan 45° = $\frac{H}{x}$ Þ $\frac{H}{24}$ = 1 H = 24m the distance between the roof and the centre of the logo = 24 – 13.84 = 10.16m	

1 (c) If the point of observation P is moved 16m towards the base of the building, find the angle of elevation of the logo on the building.

Answer	Guidance
Distance of point P from the base of building = 24 – 16= 8m Tan ϕ° = $\frac{H}{x}$ Tan ϕ° = $\frac{8\sqrt{3}}{8}$ = $\sqrt{3}$ ϕ = 60°	M1 for subtraction and for trigonometric ratio M1 for angle

Maths10RM7

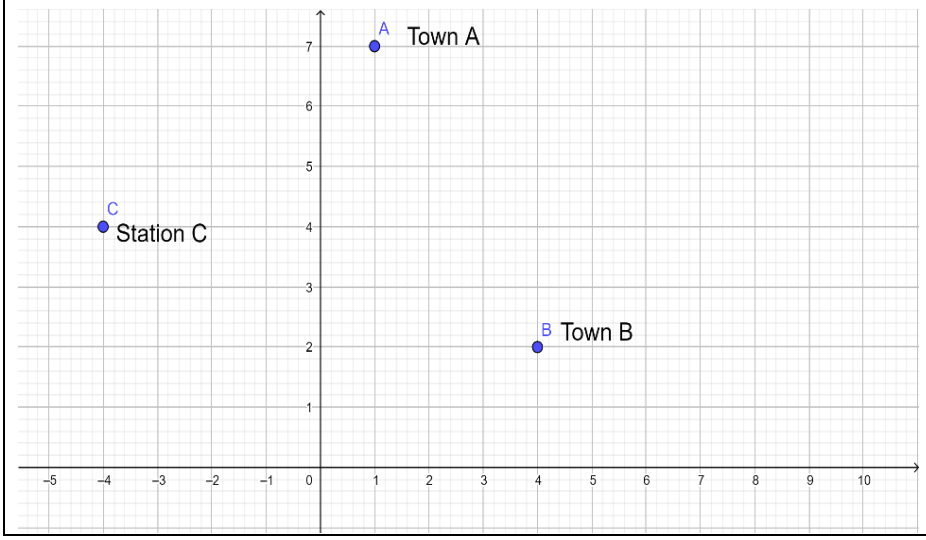
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10RM7a		3	C	10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°	3
Maths10RM7b		2	C	10T3a Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation or depression should be only 30°, 45°, 60°	2
Total marks		**5**			**5**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses students' ability to apply the distance formula, midpoint formula.

Sources and diagrams



Question(s)

1 Two friends Seema and Aditya study at a boarding school in Shimla. During Christmas vacations, both decided to go to their hometowns represented by Town A and Town B, respectively, in the figure given below. Town A and Town B are connected by trains from the same station C (in the given figure) in Shimla.

1(a) Who will travel a larger distance to reach their hometown? (3 marks)

1(b) On the day, they plan to meet at a location situated at a point D which is at the mid-point of the line joining the point represented by Town A and Town B. Find the coordinates of D.

(2 marks)

(Total marks 5)

Mark scheme

1 (a) Who will travel a larger distance to reach their hometown?	
Answer	Guidance
Coordinates of A (1,7) Coordinates of town B (4,2) Coordinates of station C (-4,4) Distance AC = $\sqrt{(1+4)^2}+(7-4)^2$ $= \sqrt{5^2+3^2} = \sqrt{34}$ Distance BC = $\sqrt{(4+4)^2+(4-2)}$ $= \sqrt{64+4} = \sqrt{68}$ Aditya will travel more distance	M1 for writing coordinates M1 for calculating AC M1 for calculating BC and specifying that Aditya will travel more distance.
1 (b) On the day, they plan to meet at a location situated at a point D which is at the mid-point of the line joining the point represented by Town A and Town B. Find the coordinates of D	
Answer	Guidance
D is the mid-point of AB $= \left(\frac{1+4}{2}.\frac{7+4}{2}\right)$ = (2.5, 5.5)	M1 for mid-point and formula M1 for the correct value

Maths10SS4

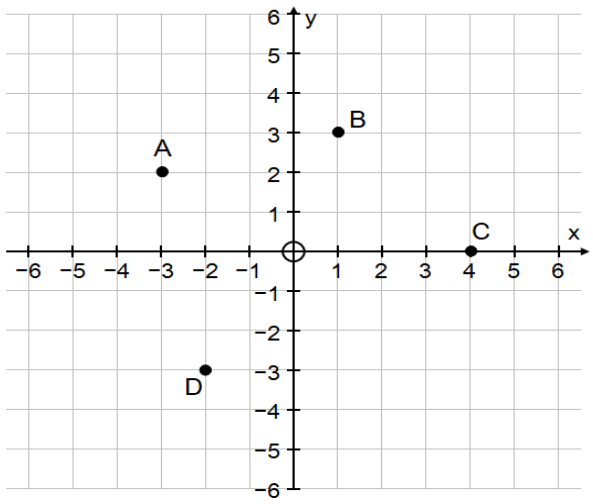
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SS4		4	C	10T3a Uses distance formula to calculate distance between two points.	4

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses applying the distance formula in real-life situations

Sources and diagrams



Question(s)

1 Two friends Ravi and Arjun work in the same office at Chandigarh. Both decided to go to their hometowns represented by A and B respectively in the figure given above during the Christmas vacations.

Town A and Town B are connected by trains from the same station C in Chandigarh and a bus station at D.

Ravi and Arjun met at the bus station D and then went together to board the train from station C for their respective hometowns.

Who travelled further and by how much?

(4 marks)

(Total marks 4)

Mark scheme

1. Ravi and Arjun met at the bus station D and then went together to board the train from station C for their respective hometowns. Who travelled more distance and by how much?	
Answer	Guidance
Ravi by 3.1 units A (-3,2), B(1,3), C (4,0), D (-2,-3) Distance travelled by Ravi DC + CA = $\sqrt{36+9}$ + $\sqrt{49+4}$ = 6.7 + 7.3 units = 14.0 units Distance travelled by Arjun DC +CB = $\sqrt{36+9}$ + $\sqrt{9+9}$ = $\sqrt{45}$ + $\sqrt{18}$ = 6.7 + 4.2 units = 10.9 units 14.0 - 10.9 = 3.1units Ravi travelled more by 3.1 units (Or ignore DC for both as they travel together)	M1 identifies coordinates of (at least) A, B, C M1 use distance formula A1 calculate at least one distance correctly A1 correct answer (Ravi by 3.1 units) No marks are to be allotted for the last step if Ravi or 3.1 is missing. (Without units also full marks are to be allotted)

Maths10SK6

Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK6		4	N	10T3a Heights and distances, angles of elevation and depression	4

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of trigonometric ratios.

Sources and diagrams

Source information: book/journal, author, publisher, website link, etc.

Question(s)

1 A tree stands vertically on the bank of a river. From a point on the other bank directly opposite the tree, the angle of elevation of the top of the tree is 60º.

From a point, 20m behind this point O, the same bank, the angle of elevation of the tree is 30.

Find the height of the tree and the width of the river. Take $\sqrt{3}=1.73$

(4 marks)

(Total marks 4)

Mark scheme

1 A tree stands vertically on the bank of a river. From a point on the other bank directly opposite the tree, the angle of elevation of the top of the tree is 60º. From a point, 20m behind this point O, the same bank, the angle of elevation of the tree is 30. Find the height of the tree and width of the river (take $\sqrt{3}=1.73$)	
Answer	Guidance
height of tree =17.3m	M1 figure M1 In ΔPBQ PQ/AQ= tan 60º $h=x\sqrt{3}$ M1 In ΔPBQ PQ/BQ= tan30º

	h=(x+20)/√3 x=10m A1 height of tree = 10√3=17.3m

Maths10SK10

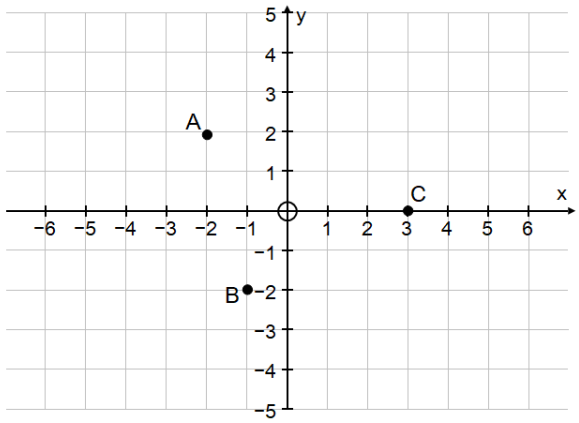
Item identity	AO1 marks	AO2 marks	C/N/E*	Content Reference(s)	Marks
Maths10SK10a	2		C	9C1a Use standard notations and plot points in the plane. Its uses in real-life	2
Maths10SK10b		1	C	9C1a Use standard notations and plot points in the plane. Its uses in real-life	1
Total marks	**2**	**1**			**3**

*C = Calculator required, N = Calculator not allowed, E = Either

Item purpose

The question assesses the knowledge of coordinate geometry

Sources and diagrams



Question(s)

1 Ajay, Bhigu, and Colin have been friends since childhood. They always want to sit in a row in the classroom, but the teacher does not allow them and rotate the seats by row every day. Bhigu is very good at maths, and he does a distance calculation every day. He considers the centre of class as the origin and marks their position on the paper in a coordinate system. One day Bhigu makes the above diagram of their seating position.

1 What is the distance of point A from the origin?

(2 marks)

1(b) What is the distance between B and C?

(1 mark)

(Total marks 3)

Mark scheme

1 (a) What is the distance of point A from the origin?	
Answer $2\sqrt{2}$	Guidance
$OA = \sqrt{2^2 + 2^2} = 2\sqrt{2}$	M1 use of distance formula A1 correct answer
1 (b) What is the distance between B and C?	
Answer $2\sqrt{5}$	Guidance
BC = $\sqrt{(-1-3)^2 + (-2-0)^2}$ = $\sqrt{4^2 + 4^2} = 2\sqrt{5}$	A1 correct answer