

Sample assessment materials

GCSE

Edexcel GCSE in Methods in Mathematics



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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, ie if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of, QWC is being assessed. The strands are as follows:

i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear.

Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) select and use a form and style of writing appropriate to purpose and to complex subject matter.

Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

Guidance on the use of codes within this mark scheme

M1 - method mark

A1 - accuracy mark

B1 - working mark

C1 - communication mark

QWC - quality of written communication

oe - or equivalent

cao - correct answer only

ft - follow through

Unit 1: Methods 1

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Foundation Tier

Sample Assessment Material

Time: 1 hour 45 minutes

Paper Reference

5MM1F/01

You must have:

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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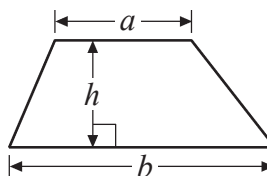
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GCSE Mathematics 2MM01

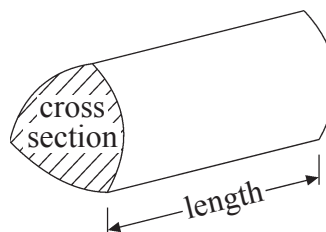
Formulae: Foundation Tier

**You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.**

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section $\times$ length



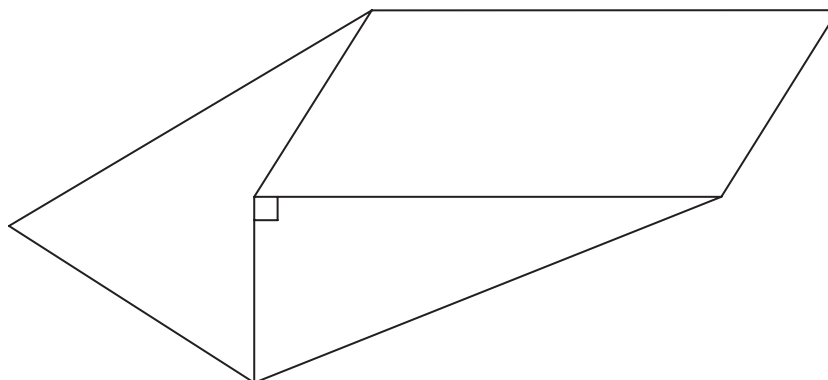
Answer ALL questions.

Write all your answers in the spaces provided.

You must write down all stages in your working.

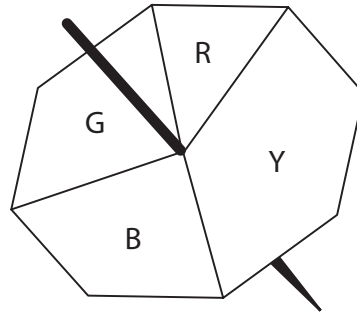
You must NOT use a calculator.

- 1** The shape is made from a right-angled triangle, a parallelogram and a quadrilateral.



- (a) Mark with arrows ($>>$) a pair of parallel lines. (1)
- (b) Mark with the letter A an acute angle. (1)
- (c) Mark with the letter R a reflex angle. (1)

(Total for Question 1 = 3 marks)



The diagram shows a spinner as an 8 sided shape.
Part of the spinner is coloured red, part is coloured green, part is coloured blue and the rest is coloured yellow.

The spinner is spun once and lands on one colour.

(a) Which colour is the most likely? You must explain your answer.

(1)

(b) Write down the probability of getting a red or a yellow.

(1)

Jas spins the spinner once. He gets a yellow.

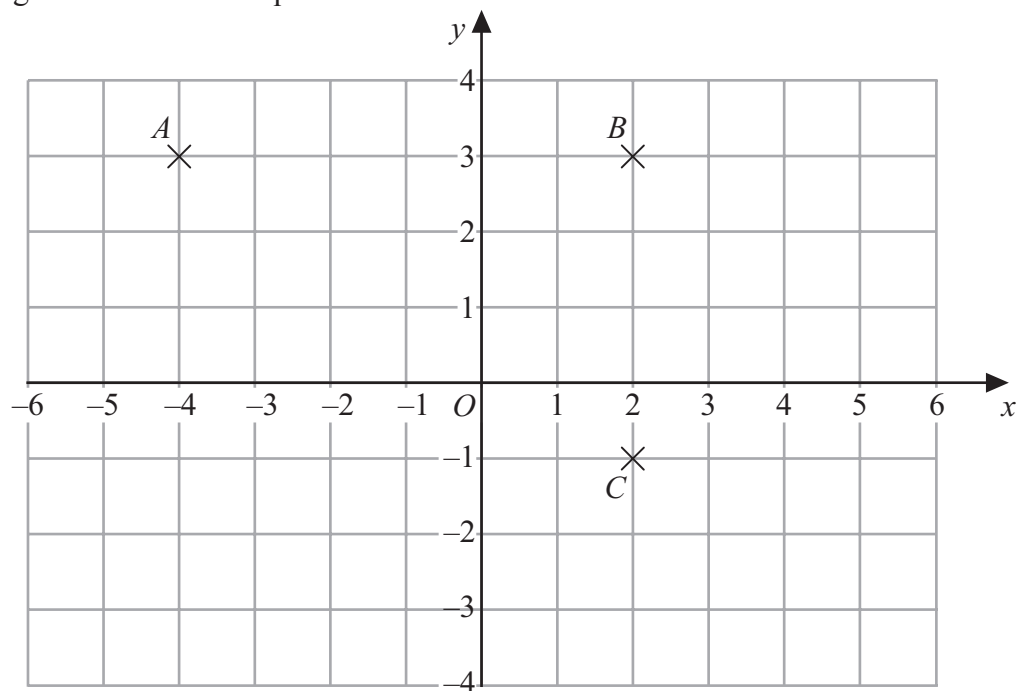
Yusuf then spins the spinner once.

(c) Has Yusuf got a greater chance, the same chance or a smaller chance of getting yellow than Jas had? You must explain your answer.

(1)

(Total for Question 2 = 3 marks)

3 Here is a grid of centimetre squares.



(a) Write down the coordinates of the point

(i) B ,

(1)

(.....,)

(ii) C .

(1)

(.....,)

$ABCD$ is a quadrilateral.

The area of $ABCD$ is 24 cm^2 .

(b) Write down the coordinates of D .

(2)

(.....,)

E is another point on the grid.

The coordinates of the midpoint of AE are $(-1, 2)$.

(c) Find the coordinates of E .

(2)

(.....,)

(Total for Question 3 = 6 marks)

4 Here is a list of eight numbers.

11 16 18 36 68 69 82 88

(a) Write down two numbers from the list with a sum of 87

(1)

.....,

(b) Write down a number from the list which is

(i) a multiple of 9

(1)

.....

(ii) a square number.

(1)

.....

cube

multiple

factor

product

(c) Use a word from the above box to complete this sentence correctly.

(1)

11 is a of 88

Here are the same 8 numbers drawn larger.

11 16 18 36
68 69 82 88

(d) From these numbers, write down a number which has

(i) exactly one line of symmetry,

(1)

.....

(ii) two lines of symmetry and rotational symmetry of order 2,

(1)

.....

(iii) rotational symmetry of order 2 but no lines of symmetry.

(1)

.....

(Total for Question 4 = 7 marks)

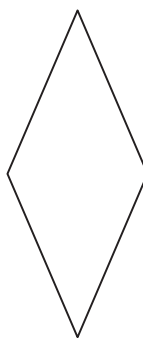
5 Here are four shapes. The shapes have been drawn accurately.



A



B



C



D

(a) Write down the mathematical name of shape **C**.

(1)

Neel makes the shapes accurately out of card.

Two of the shapes can be fitted together without overlapping to make a trapezium.

(b) Show how this can be done.

(1)

Two of the shapes can be fitted together without overlapping to make a hexagon.

(c) Show how this can be done.

(1)

(Total for Question 5 = 3 marks)

*6

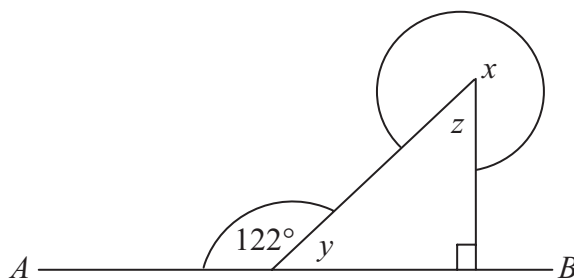


Diagram **NOT**
accurately drawn

AB is a straight line.

Pinkal is trying to find the value of the angle marked x

This is what she does.

$y = 38^\circ$ because the angles next to each other on a straight line add up to 160°

$z = 52^\circ$ because $y + z$ comes to 90°

$x = 318$ because angles around a point add up to 360°

Pinkal has made some mistakes.

Find the mistakes and work out the correct value of x .

$x = \dots\dots\dots^\circ$

(Total for Question 6 = 3 marks)

- 7 Dwayne has a bag of counters. The counters are either blue or green.
There are 10 blue counters and 2 green counters.

Dwayne takes a counter at random from his bag.

- (a) Write down the probability it is green.

(1)

.....

Mario has a bag of counters. The counters are either blue or green.
There are twice as many blue counters as green counters.

Mario takes a counter at random from his bag.

- (b) Write down the probability it is blue.

(1)

.....

Both boys put back the counter they took out.

They empty the counters from both bags into a vase.

Dwayne says that the probability of taking a blue counter from the vase is $\frac{13}{18}$

- (c) What is the probability of taking a green counter from the vase?

(1)

.....

Dwayne knows that there are between 20 and 50 counters in the bag.

- (d) Work out the number of counters there are in the bag.

(1)

.....

(Total for Question 7 = 4 marks)

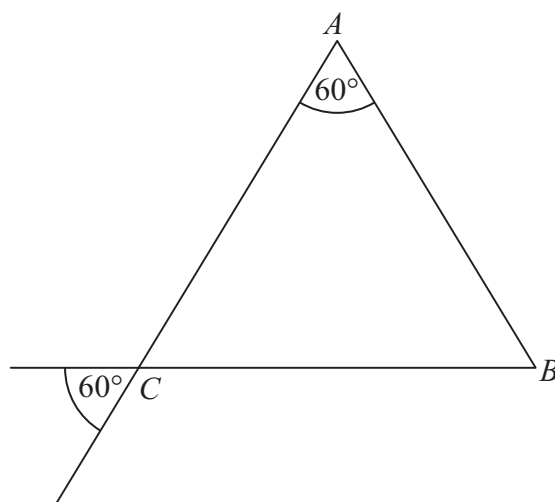
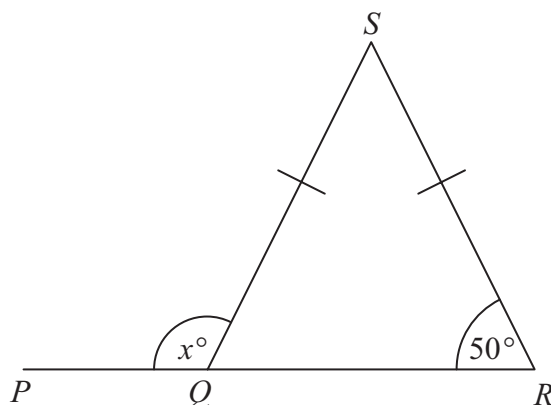


Diagram **NOT**
accurately drawn

(a) Triangle ABC is equilateral.

Explain why.

(2)



PQR is a straight line.

$SQ = SR$.

(b) (i) Work out the size of the angle marked x° .

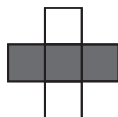
(1)

(ii) Give reasons for your answer.

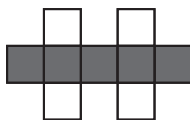
(2)

(Total for Question 8 = 5 marks)

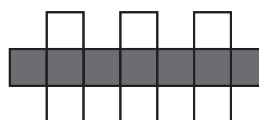
9 Here are some patterns made from squares.



Pattern number 1



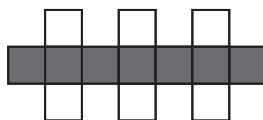
Pattern number 2



Pattern number 3

- (a) The diagram below shows part of Pattern number 4
Complete the diagram for Pattern number 4

(1)



Pattern number 4

- (b) Find the number of squares used for Pattern number 10

You must explain your answer.

(2)

One pattern has 31 black squares.

- (c) Work out the total number of squares that this pattern has.
You must show clearly how you obtained your answer.

(2)

- (d) Find a rule to find the number of squares, s , in terms of the Pattern number, n .

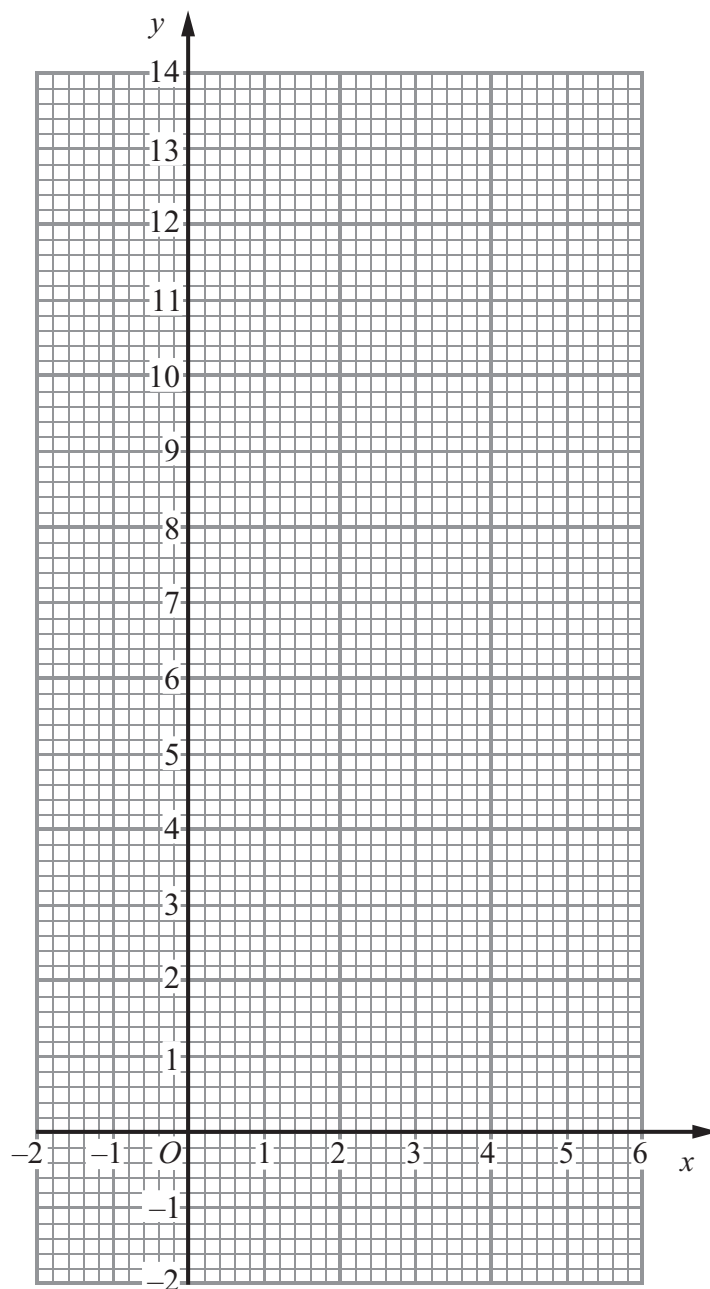
(2)

$s = \dots\dots\dots$

(Total for Question 9 = 7 marks)

10 (a) On the grid, plot the graph of $y + 2x = 10$ for values of x from -1 to 5

(3)



(b) Use your graph to find

(i) the value of y when $x = -0.7$

(1)

$y = \dots\dots\dots$

(ii) the value of x when $y = 5.4$

(1)

$x = \dots\dots\dots$

(Total for Question 10 = 5 marks)

11 Simplify

(a) $c + c + c$

(1)

(b) $2a + 3a - a$

(1)

(c) $2xy + 3xy - 6xy$

(1)

(d) $3a + 5b - a + 2b + 8$

(2)

(Total for Question 11 = 5 marks)

12 Beth says $20 - 5 \times 3$ is 45

Pat says $20 - 5 \times 3$ is 5

(a) Who is right?
Give a reason for your answer.

(1)

(b) Work out $(12 + 9) \div 3$

(1)

(c) Put in brackets to make the following calculation correct.

(3)

$$5 + 8 \times 3 - 4 + 2 = 13$$

(Total for Question 12 = 3 marks)

13 Here are two fractions, $\frac{3}{4}$ and $\frac{4}{5}$

Which is the larger fraction?

You must show clearly how you obtained your answer.

(Total for Question 13 = 3 marks)

14 There are some beads in a bag. The beads are either green, blue or yellow.

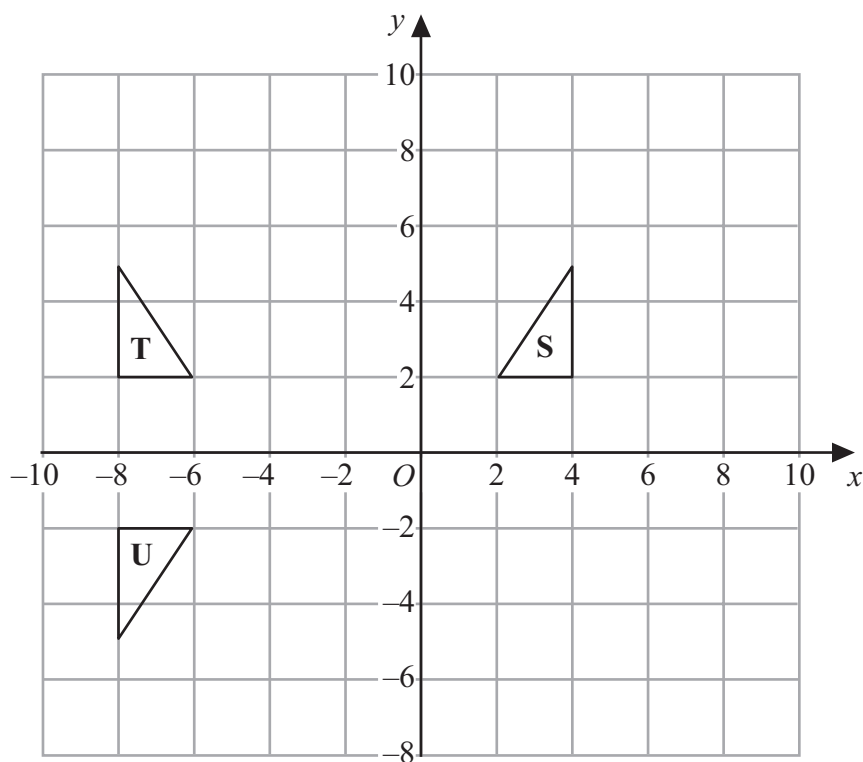
A bead is selected at random from the bag.

The probability that the bead is blue is twice the probability that the bead is green.

The probability that the bead is yellow is 0.1 more than the probability that the bead is green.

Work out the smallest number of beads there could be in the bag.

.....
(Total for Question 14 = 3 marks)



- (a) Enlarge shape **S**, scale factor 2, centre $(0, 2)$.

(2)

- (b) Describe fully the single transformation that maps shape **S** onto shape **T**.

(2)

Shape **S** can be transformed to shape **U** by a rotation followed by a translation.

- (c) Describe the rotation and the translation fully.

(2)

(Total for Question 15 = 6 marks)

- 16** Greg thinks that he has a biased dice. He throws the dice 200 times and records the score on the dice each time.

Information about the scores on the dice is shown in the table.

Score on the dice	1	2	3	4	5	6
Frequency	23	37	33	35	20	52

- (a) Is the dice biased? You must show clearly how you obtained your answer.

(2)

.....

Tess has a different dice which is known to be biased.

The probability that Tess throws the biased dice once and gets a 6 is 0.7

Tess throws the biased dice 250 times.

- (b) Work out an estimate for the number of times she should get a 6.

(2)

.....

(Total for Question 16 = 4 marks)

17

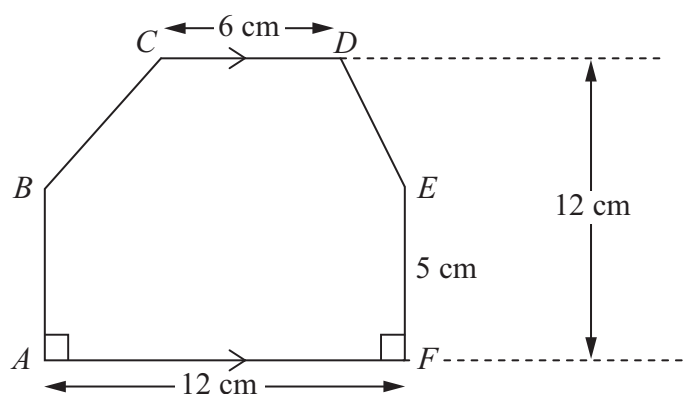


Diagram **NOT**
accurately drawn

$ABCDEF$ is a hexagon with one line of symmetry.

CD is parallel to AF .

The distance between CD and AF is 12 cm.

The interior angles at A and F are right angles.

$EF = 5$ cm

$AF = 12$ cm

Calculate the area of the hexagon.

..... cm^2

(Total for Question 17 = 4 marks)

18 (a) Solve $4t + 1 = 19$

(2)

$t = \dots\dots\dots$

(b) Solve $4w + 8 = 2w + 7$

(2)

$w = \dots\dots\dots$

Matt has £ x
Sunil has twice as much as Matt.
Catrin has £5 more than Sunil.

The total amount of money they have altogether is 7 times what Matt has.

(c) Work out how much Catrin has.

(2)

£ $\dots\dots\dots$

(Total for Question 18 = 6 marks)

19 Given that $15.8 \times 6.8 = 107.44$

work out the values of

(a) 0.158×6.8

.....

(b) $1074.4 \div 0.158$

.....

(Total for Question 19 = 2 marks)

20 Jim has two ordinary dice.

On both dice the even numbers are coloured blue and the odd numbers are coloured red.

Each dice is thrown once.

(a) Work out the probability that the numbers on the two dice are the same.

(3)

(b) Work out the probability of getting a blue number or the number 1

(3)

(Total for Question 20 = 6 marks)

21 What is the largest value of x for which $\frac{2}{3} + x$ is less than or equal to $\frac{3}{4}$?

Give your answer in its simplest form.

.....
(Total for Question 21 = 3 marks)

22 The n th term of a sequence is $n^2 + 4$

(a) Show that when n is odd, not all the terms of the sequence are prime numbers.

(2)

(b) Show that when n is even, then those terms of the sequence are multiples of 4

(2)

(Total for Question 22 = 4 marks)

23 This is some information about a class.

There are 35 students in a class.

17 of the students study History.

20 of the students study Geography.

8 of the students study both History and Geography.

*(a) Draw a suitable diagram that shows all this information.

(4)

A student is chosen at random from the class.

(b) Find the probability that this student studies neither History nor Geography.

(1)

(Total for Question 23 = 5 marks)

TOTAL FOR PAPER = 100 MARKS

5MM1F					Additional Guidance	
Question	Working	Answer	Mark			
1. (a)		parallel lines marked	1		B1 cao	
(b)		acute angle A	1		B1 cao acute angle marked with A	
(c)		reflex angle R	1		B1 cao reflex angle marked with R	
Total for Question: 3 marks						
2. (a)		Yellow, biggest region	1		B1 cao yellow because it is the biggest region	
(b)		0.5	1		B1 cao	
(c)		same	1		B1 cao same because the situation is exactly the same	
Total for Question: 3 marks						
3. (a)(i)		(2,3)	2		B1 cao	
(a)(ii)		(2, -1)			B1 cao	
(b)		D marked (-4, -1)	2		M1 $CD = 24 \div 4$ or D placed correctly A1 cao	
(c)		(2, 1)	2		M1 for any clear process to find E, eg clearly states or shows 3 along and 1 down from the midpoint or $\frac{x-4}{2}, \frac{3+y}{2}$ used A1 cao	
Total for Question: 6 marks						
4. (a)		18 & 69	1		B1 for both	
(b)(i)		18 or 36	2		B1 for either or both	
(b)(ii)		16 or 36			B1 for either or both	
(c)		factor	1		B1 cao	
(d)(i)		18	3		B1 cao	
(d)(ii)		88 or 11			B1 for either or both	
(d)(iii)		69			B1 cao	
Total for Question: 7 marks						
5. (a)		Rhombus	1		B1 cao	
(b)		See diagram	1		B1 cao	
(c)		See diagram	1		B1 cao	
Total for Question: 3 marks						

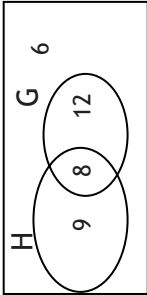
5MM1F				
Question	Working	Answer	Mark	Additional Guidance
6. QWC (ii)		angles on a line sum to 180° $360 - 52$ is not 318	3	C1 for angles on a line sum to 180° QWC statement is supported by reason C1 for $360 - 52$ is not 318 QWC: statement is supported by reason B1 for the correct answer following correct working
				Total for Question: 3 marks
7.	(a)	$\frac{10}{12}$	1	B1 cao
	(b)	$\frac{2}{3}$	1	B1 cao
	(c)	$\frac{5}{18}$	1	B1 cao
	(d)	36	1	B1 cao
				Total for Question: 4 marks
8.	(a)	All angles are the same	2	B1 cao showing that all interior angles are 60° C1 for conclusion following correct reasoning.
	(b)(i) (b)(ii)	130° Isosceles triangle and angles on a straight line	3	M1 for identification of angle SQR as 50° A1 cao C1 reasons
				Total for Question: 5 marks
9.	(a)	Diagram	1	B1 diagram
	(b)	41	2	B1 cao C1 add on 4 more squares until you get to pattern number 10, or start with pattern number 4 and add on 24, or a complete set of the number of squares from at least 17 to 41 or correct use of an algebraic formula
	(c)	There is always 1 less white square than black so $31 + 30 = -61$	2	B1 cao C1 there is always 1 less white square than black or $31 + 30 = 61$
	(d)	$4n+1$	2	B2 for $4n + 1$ (B1 for $4n + k$ where k is a constant $\neq 1$)
				Total for Question: 7 marks

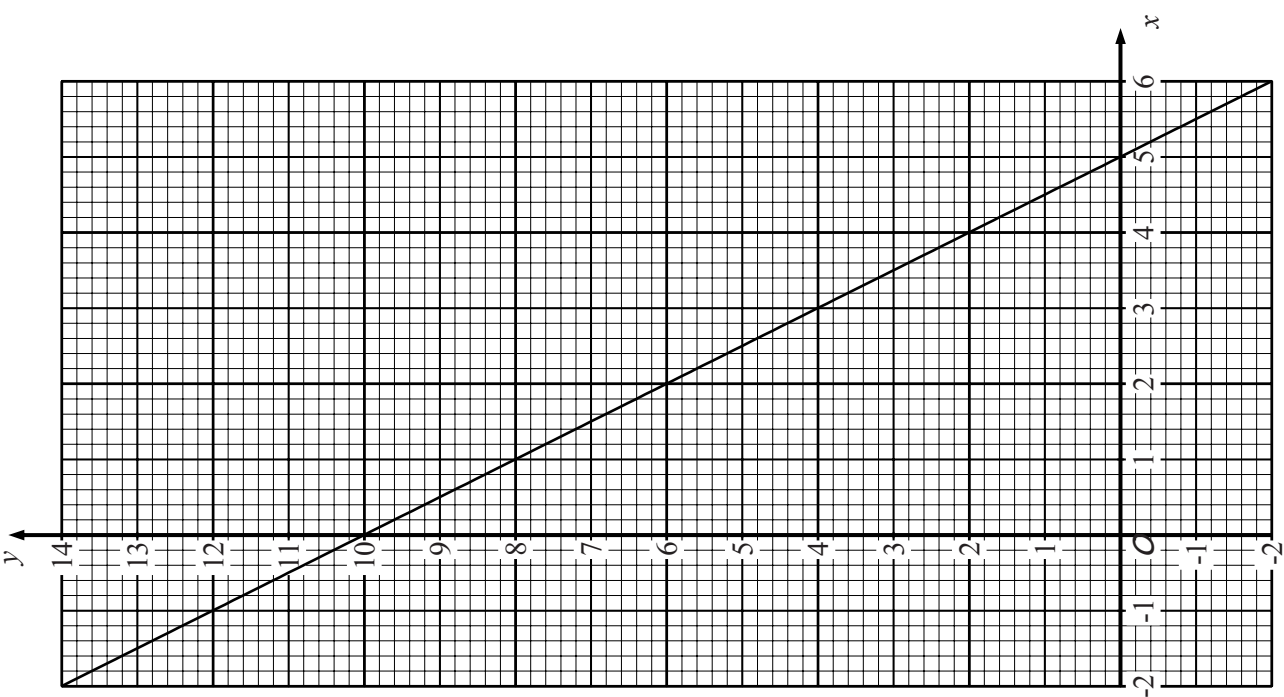
5MM1F				
Question	Working	Answer	Mark	Additional Guidance
10.	(a)	Correct graph	3	B3 for a fully correct graph M1 for an attempt to rearrange the equation to $y =$ or to substitute a value of x (in the range -1 to 5) into the equation M1 for then substituting x in the range -1 to 5 into the equation $y = 10 - 2x$ or into the original equation and attempting to find y A1 correct line drawn from -1 to 5
	(b)	$x = 0.7$ $y = 5.4$	2	B1 $x = 0.7$ (allow in the range ± 0.05) B1 $x = 5.4$ (allow in the range ± 0.05)
Total for Question: 5 marks				
11.	(a)	$3c$	1	B1 cao
	(b)	$4a$	1	B2 cao B1 for $2a$ or $7b$ correct
	(c)	$-xy$	1	
	(d)	$2a + 7b + 8$	2	
Total for Question: 5 marks				
12.	(a)	Pat with reason	1	C1 for Pat and explanation that you do 5×3 first, then do $20 - "15"$
	(b)	7	1	B1 cao
	(c)	$5 + 8 \times (3 - 4 + 2) = 13$	1	B1 cao
Total for Question: 3 marks				

5MM1F				
Question	Working	Answer	Mark	Additional Guidance
13.	15 and 16 parts shaded OR $\frac{3}{4} = 0.75, \frac{4}{5} = 0.8$ OR $\frac{3}{4} = \frac{15}{20}, \frac{4}{5} = \frac{16}{20}$	$\frac{4}{5}$ with reason	3	M1 for correctly shading 15 out of 20 for $\frac{3}{4}$ M1 for correctly shading 16 out of 20 for $\frac{4}{5}$ A1 (dependent on M1, M1) for selection of $\frac{4}{5}$ OR M1 for $\frac{3}{4} = 0.75$ M1 for $\frac{4}{5} = 0.8$ A1 (dependent on M1, M1) for selection of 0.8 oe OR M1 for $\frac{3}{4} = \frac{15}{20}$ M1 for $\frac{4}{5} = \frac{16}{20}$ A1 (dependent on M1, M1) for selection of $\frac{16}{20}$ oe
				Total for Question: 3 marks
14.	Let g be the probability that the bead will be green Probability blue = $2g$, probability yellow = $g + 0.1$ $g + 2g + g + 0.1 = 1$ $g = \frac{1 - 0.1}{4} = 0.225$	40	3	M1 for sight of $g + 2g + g + 0.1 = 1$ M1 for solution A1 for 40
				Total for Question: 3 marks

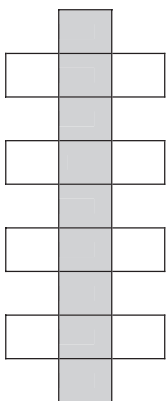
5MM1F					
Question	Working	Answer	Mark	Additional Guidance	
15.	(a)	Correct enlargement	2	B2 cao (B1 correct scale factor but in the wrong position)	
	(b)	Reflection in the line $x = -2$	2	M1 for reflection with the equation of a line given or shown on the diagram A1 for $x = -2$	
	(c)	Correct rotation and translation	2	M1 for a rotation of 180° about a stated point and a translation consistent with the centre of rotation. The translation may be poorly described A1 for a fully correct description, such as rotation of 180° about O followed by a translation of $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$	
Total for Question: 6 marks					
16.	(a)	Yes, as the difference between the relative frequencies is so large	2	M1 attempts to calculate at least two relative frequencies A1 conclusion	
	(b)	175	2	M1 250×0.7 A1 cao	
Total for Question: 4 marks					
17.	Area of rectangle = 60 Area of trapezium = 63 $\left(\frac{6+12}{2}\right) \times 7 = 63$	123 cm ²	4	M1 area of rectangle = 5×12 M1 area of trapezium = $\left(\frac{6+12}{2}\right) \times h$ B1 $h = 7$ A1 cao	
Total for Question: 4 marks					
18.	(a)	4t = 19 - 1 4t = -18	2	M1 for correctly moving the number term eg $4t = 19 - 1$ A1 4.5 oe	
	(b)	4w - 2w = 7 - 8 2w = -1	2	M1 for moving terms correctly eg $4w - 2w = 7 - 8$ A1 -0.5 oe	
	(c)	x + 2x + 2x + 5 = 7x x = 2.50	2	M1 for $x + 2x + 2x + 5 = 7x$ A1 cao	
Total for Question: 6 marks					

5MM1F																																																						
Question	Working	Answer	Mark	Additional Guidance																																																		
19.	(i) $15.8 \times 6.8 = 107.44$ 0.158×6.8	1.0744	1	B1 cao																																																		
	(ii) $1074.4 \div 0.158$	6800	1	B1 cao																																																		
Total for Question: 2 marks																																																						
20.	(a) Sample space is (1, 1) to (6, 6) Event consists of the 6 pairs. (1, 1) to (6, 6)	$\frac{6}{36}$	3	M1 for identifying sample space and attempting to list all pairs M1 for identifying the doubles A1 $\frac{6}{36}$ oe																																																		
	(b)	$\frac{32}{36}$	3	M1 identifies either the outcomes with a 1 or with a blue M1 (dep) identifies the outcomes which are neither (or their complement) A1 $\frac{32}{36}$																																																		
	<table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>1</td><td>1B</td><td>1</td><td>1B</td><td>1</td><td>1B</td></tr><tr><td>2</td><td>1B</td><td>B</td><td>B</td><td>B</td><td>B</td><td>B</td></tr><tr><td>3</td><td>1</td><td>B</td><td></td><td>B</td><td></td><td>B</td></tr><tr><td>4</td><td>1B</td><td>B</td><td>B</td><td>B</td><td>B</td><td>B</td></tr><tr><td>5</td><td>1</td><td>B</td><td></td><td>B</td><td></td><td>B</td></tr><tr><td>6</td><td>1B</td><td>B</td><td>B</td><td>B</td><td>B</td><td>B</td></tr></table>		1	2	3	4	5	6	1	1	1B	1	1B	1	1B	2	1B	B	B	B	B	B	3	1	B		B		B	4	1B	B	B	B	B	B	5	1	B		B		B	6	1B	B	B	B	B	B				
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5	1	B		B		B																																																
6	1B	B	B	B	B	B																																																
Total for Question: 6 marks																																																						
21.	$\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12}$	$x = \frac{1}{12}$	3	M1 for $\frac{3}{4} - \frac{2}{3}$ M1 for writing the fractions with a correct denominator and at least 1 numerator correct A1 cao																																																		
Total for Question: 3 marks																																																						

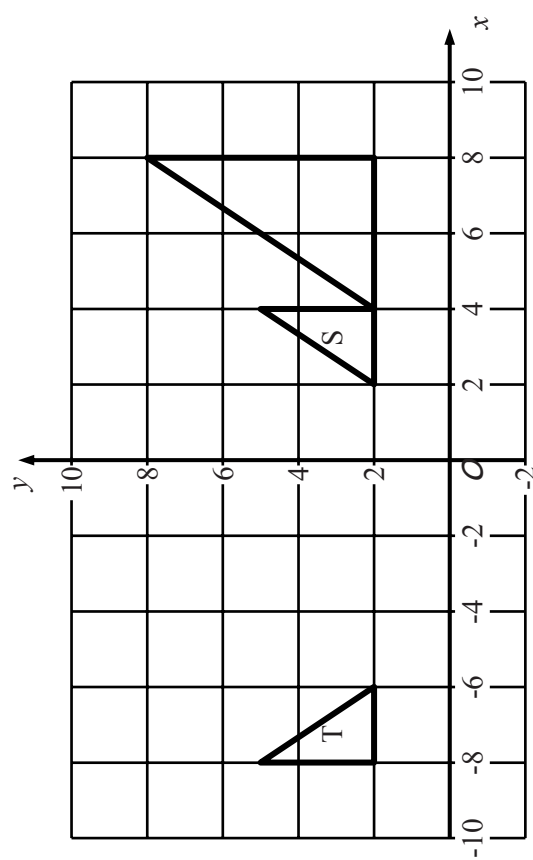
5MM1F																																			
Question	Working	Answer	Mark	Additional Guidance																															
22.	5, 13, 29, 53, 85, 125	eg 85	2	M1 for correct evaluation of at least 3 odd cases OR sequence of 5 (8), 13, (20), 29 seen OR the expression with $n = 9$ or 11 or 19 or 21... substituted but not evaluated A1 for 85 or 125 or 365 or 445... identified																															
(a)	An even number times an even number is a multiple of 4 A multiple of 4 added to 4 is still a multiple of 4	An even number times an even number is a multiple of 4. A multiple of 4 added to 4 is still a multiple of 4	2	C1 An even number times an even number is a multiple of 4 C1 A multiple of 4 added to 4 is still a multiple of 4																															
Total for Question: 4 marks																																			
23.	QWC (ii, iii)  OR <table><tr><td>X</td><td>X</td><td>//</td><td>*</td></tr><tr><td>X</td><td>X</td><td>//</td><td>*</td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td></tr></table> Key: one sq per student X History only, / / for Geography only, * for History and Geography and blank for neither	X	X	//	*	X	X	//	*	X	//	//	*	X	//	//	*	X	//	//	*	X	//	//	*	X	//	//	*	X	//	//	*	5	M1 two overlapping ovals with correct labels QWC: Diagram is clear and correct and correct M1 with 8 in the intersection A1 9 and 12 in the correct places A1 6 in the correct place B1 $\frac{6}{35}$ cao OR M1 for drawing grid 7×5 oe QWC: Diagram is clear and correct M1 for $17 - 8 = 9$, $20 - 8 = 12$ A1 for 9 History/12 Geography A1 for 6 neither B1 for $\frac{6}{35}$ cao QWC: Diagram is clear and correct and all calculations are attributable
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Total for Question: 5 marks																																			



10



9



Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Sample Assessment Material

Time: 1 hour 45 minutes

Paper Reference

5MM1H/01

You must have:

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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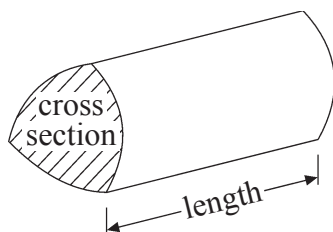
S 3 8 3 7 1 A 0 1 2 1

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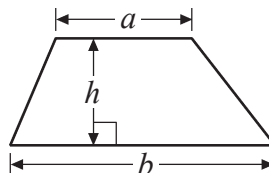
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section $\times$ length

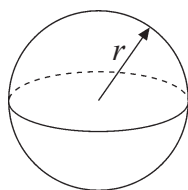


Area of trapezium = $\frac{1}{2}(a + b)h$



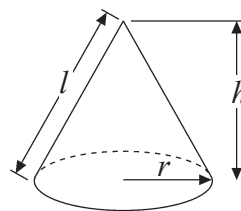
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

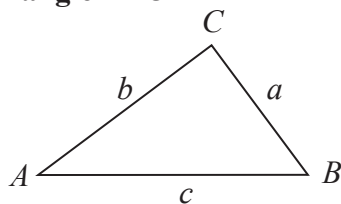


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 Work out $\frac{19}{20} \times 340$

.....

(Total for Question 1 = 2 marks)

2 (a) Write 120 as a product of its prime factors.

(2)

.....

(b) Find the Highest Common Factor (HCF) of 120 and 96

(2)

.....

(Total for Question 2 = 4 marks)

3 Here are the first four terms in an arithmetic sequence.

7 11 15 19

Is the number 203 a term in this arithmetic sequence?
You must give a reason for your answer.

(Total for Question 3 = 3 marks)

4 (a) Expand and simplify $2(x + 2y) + 3(x - y)$

(2)

(b) Solve $6 = -4(x - 1)$

(3)

$x =$

(c) Solve $3(y + 2) + 2y = y + 9$

(4)

$y = \dots\dots\dots$

(Total for Question 4 = 9 marks)

5 Simplify

(i) $2^6 \times 2^7$

(1)

(ii) $4^8 \div 4^2$

(1)

(iii) $\frac{3^8 \times 3}{3^6}$

(2)

(Total for Question 5 = 4 marks)

- 6 Jim has two ordinary dice. On both dice the even numbers are coloured blue and the odd numbers are coloured red.

Each dice is thrown once.

- (a) Work out the probability that the numbers on the two dice are the same.

(3)

- (b) Work out the probability of getting a blue number or the number 1

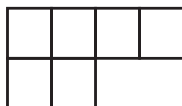
(3)

(Total for Question 6 = 6 marks)

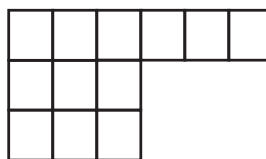
7 Here is a sequence of patterns made from centimetre squares



Pattern Number 1



Pattern Number 2



Pattern Number 3

(a) Write down the number of centimetre squares in Pattern Number 4

(1)

.....

(b) Find an expression, in terms of n , for the number of centimetre squares in Pattern Number n .

(2)

.....

(c) Can the number of centimetre squares in a pattern ever be a square number?
Explain your answer.

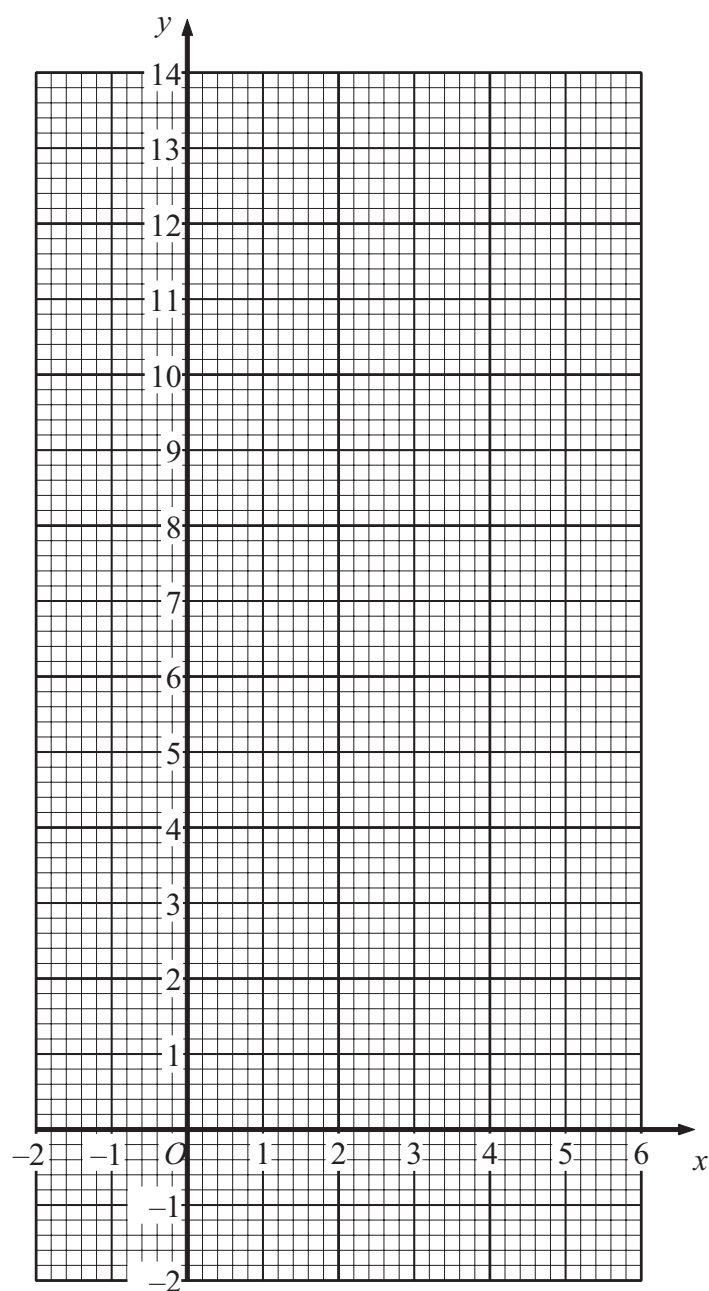
(1)

.....

(Total for Question 7 = 4 marks)

8 (a) On the grid, plot the graph of $y + 2x = 10$ for values of x from -1 to 5

(3)



(b) Work out the equation of the graph that is perpendicular to $y + 2x = 10$ and passes through the point $(1, 8)$.

(2)

.....
(Total for Question 8 = 5 marks)

- 9 This is some information about a class.
There are 35 students in the class.
17 of the students study History. 20 of the students study Geography.
8 of the students study both History and Geography.

(a) Draw a suitable diagram that shows all this information.

(4)

A student is chosen at random from the class.

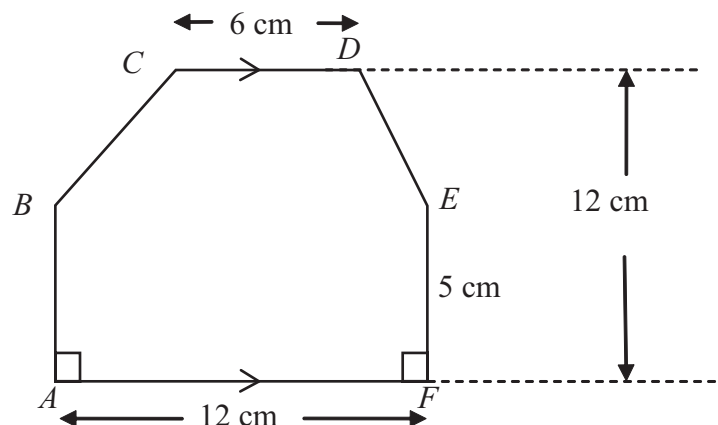
(b) Find the probability that this student studies neither History nor Geography.

(1)

.....

(Total for Question 9 = 5 marks)

10



$ABCDEF$ is a hexagon with one line of symmetry.

CD is parallel to AF .

The distance between CD and AF is 12 cm.

The interior angles at A and F are right angles.

$EF = 5$ cm

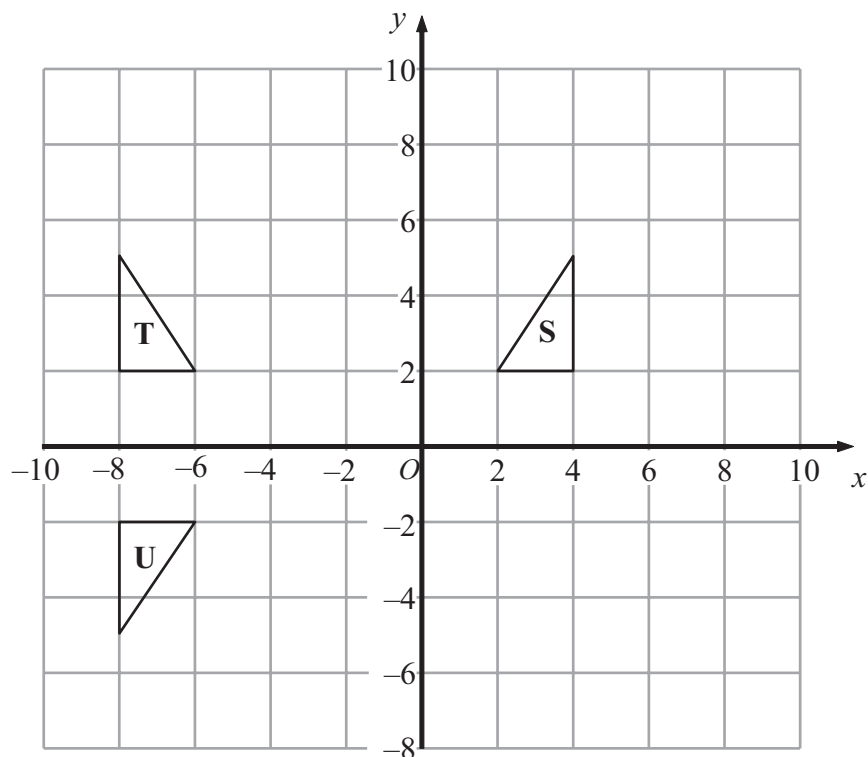
$AF = 12$ cm

Calculate the area of the hexagon.

.....cm²

(Total for Question 10 = 4 marks)

11



(a) Enlarge shape S, scale factor 2, centre (0, 2).

(2)

(b) Describe fully the single transformation that maps shape S onto shape T.

(2)

Shape S can be transformed to shape U by a rotation followed by a translation.

(c) Describe the rotation and the translation fully.

(2)

(Total for Question 11 = 6 marks)

12 Hiroshi has two boxes, A and B.

In box A are 6 green and 4 red counters.

In box B are 3 green and 7 red counters.

Hiroshi takes a counter at random from box A and a counter at random from box B.

(a) Work out the probability that Hiroshi takes 2 red counters.

(3)

.....
(b) Work out the probability that Hiroshi takes 1 red counter and 1 green counter.

(3)

.....
(Total for Question 12 = 6 marks)

- 13** Put the following numbers in order.
Start with the smallest number.

$$6.0 \times 10^8 \quad 3.2 \times 10^{-2} \quad 46 \times 10^7 \quad 0.43 \times 10^{-3}$$

(Total for Question 13 = 2 marks)

- 14** Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number.

(Total for Question 14 = 3 marks)

15

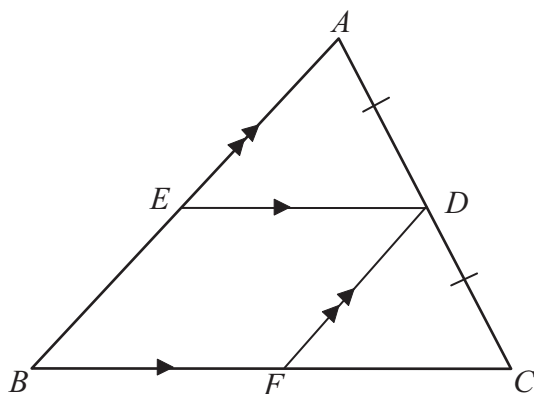


Diagram **NOT**
accurately drawn

ABC is a triangle.

D is the midpoint of AC .

E is the point on AB such that DE is parallel CB .

F is the point on BC such that DF is parallel to AB .

*(a) Prove that triangles AED and DFC are congruent.

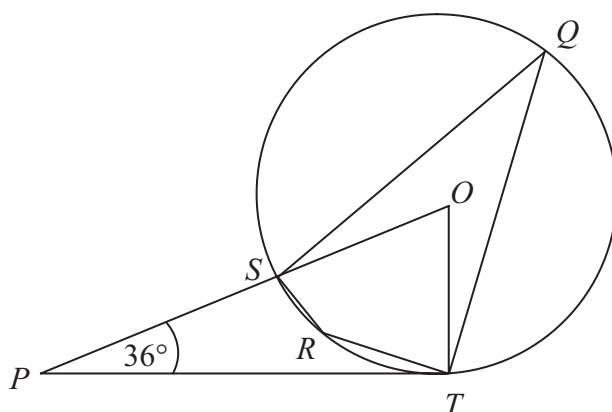
(3)

(b) Show that the area of the parallelogram $EDFB$ is one half of the area of the triangle ABC .

(2)

(Total for Question 15 = 5 marks)

Diagram **NOT**
accurately drawn



PT is a tangent to the circle, centre O at T .

R , S and Q are points on the circle.

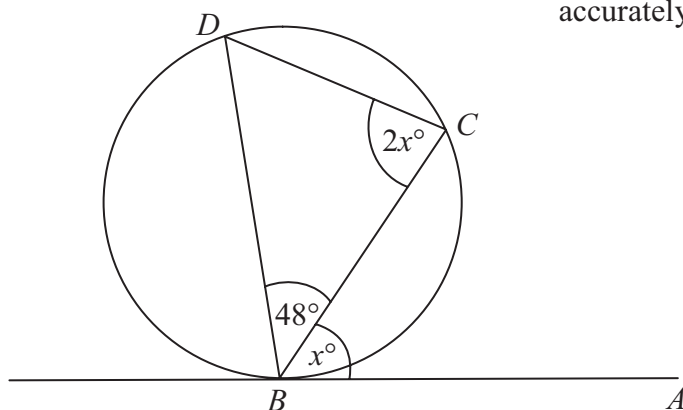
PSO is a straight line.

- *(a) Work out the size of angle SRT .
Give reasons for your answer.

(4)

o

Diagram **NOT**
accurately drawn



B , C and D are three points on a circle.

AB is the tangent to the circle at B .

Angle $ABC = x^\circ$

Angle $CBD = 48^\circ$

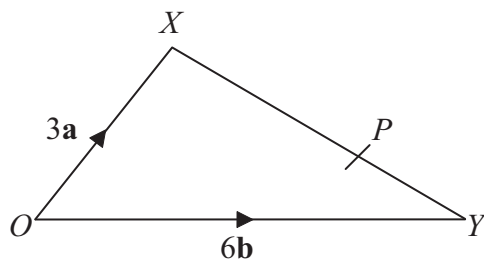
Angle $BCD = 2x^\circ$

(b) Find the value of x

(3)

.....
(Total for Question 16 = 7 marks)

Diagram **NOT**
accurately drawn



$$\vec{OX} = 3\mathbf{a} \text{ and } \vec{OY} = 6\mathbf{b}.$$

P lies on XY such that $XP:PY = 2:1$

(a) Find $\vec{OP}$, the position vector of P . Give your answer in terms of $\mathbf{a}$ and $\mathbf{b}$.

(3)

G is the point such that YG is parallel to OP and the length of $YG = \text{length of } OP$.

(b) Find $\vec{OG}$, the position vector of the point G .
Give your answer in terms of $\mathbf{a}$ and $\mathbf{b}$ in its simplest form.

(3)

(Total for Question 17 = 6 marks)

18 (a) Rationalise the denominator of $\frac{3}{\sqrt{7}}$ (2)

.....

(b) Expand $(2 + \sqrt{6})(\sqrt{3} + \sqrt{12})$

Give your answer in the form $p\sqrt{2} + q\sqrt{3}$ where p and q are integers. (4)

.....

(Total for Question 18 = 6 marks)

***19** Prove that the answer to every line of the pattern below is 8.

$$3 \times 5 - 1 \times 7$$

$$4 \times 6 - 2 \times 8$$

$$5 \times 7 - 3 \times 9$$

(4)

(Total for Question 19 = 4 marks)

20 (a) Simplify

$$\frac{2x^2 - 5x + 2}{4x^2 - 16}$$

(3)

(b) Complete the square for the expression

$$12x^2 - 12x$$

(3)

(c) Find the n th term of the quadratic sequence

$$1, 7, 17, 31, \dots$$

(3)

(Total for Question 20 = 9 marks)

TOTAL FOR PAPER = 100 MARKS

5MM1H					Additional Guidance	
Question	Working	Answer	Mark			
1.	$\frac{19}{20} \times 340 = 19 \times 17$	323	2	M1 complete method A1 cao		
Total for Question: 2 marks						
2.	(a) $120 = 2 \times 60$ $= 2 \times 2 \times 30$ $= 2 \times 2 \times 2 \times 3 \times 5$	$2 \times 2 \times 2 \times 3 \times 5$	2	M1 for repeated division or a tree with at least the first 2 steps correct A1 $2 \times 2 \times 2 \times 3 \times 5$ or $2^3 \times 3 \times 5$		
	(b) $48 = 2^4 \times 3$ HCF = $2^3 \times 3$	24	2	M1 use of Venn diagram in prime factor decomposition of both numbers A1 cao OR M1 list 3 factors of 48 and 3 factors of 120 A1 cao (If M1 not earned then B1 for any common factor > 3)		
Total for Question: 4 marks						
3.	Expression for n th term is $4n + 3$ Solve $4n + 3 = 203$ $n = 50$	Yes with reason	3	B1 for $4n + 3$ M1 $4n + 3 = 203$ A1 yes with support e.g. sight of 50		
Total for Question: 3 marks						
4.	(a)	$5x + y$	2	B2 cao (B1 for $5x$ or $+3y$)		
	(b) $6 = -4x + 4$ $4x = 4 - 6$	$-\frac{1}{2}$	3	M1 correct signs multiplying out M1 correctly isolate $4x$ or $-4x$ A1 cao		
	(c) $3y + 6 + 2y = y + 9$ $3y + 2y - y = 9 - 6$	0.75	4	B1 $3y + 6$ M1 isolate terms in x A1 $4y = 3$ A1 $\frac{3}{4}$ oe		
Total for Question: 9 marks						

5MM1H					Additional Guidance																																								
Question	Working	Answer	Mark																																										
8.	(a)		3	B3 for a fully correct graph M1 for an attempt to rearrange the equation to $y =$ or to substitute a value of x (in the range -1 to 5) into the equation . M1 for then substituting x in the range -1 to 5 into the equation $y = 10 - 2x$ or into the original equation and attempting to find y A1 correct line drawn from -1 to 5																																									
	(b)	$m = \frac{1}{2}$ $8 = \frac{1}{2}(1) + c$	2	B2 cao B1 for either $m = \frac{1}{2}$ or $c = 7\frac{1}{2}$																																									
Total for Question: 5 marks																																													
9.	H G 6 9 8 12 OR <table><tr><td>X</td><td>X</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>X</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td><td></td></tr><tr><td>X</td><td>//</td><td>//</td><td>*</td><td>*</td></tr></table> Key: one sq per student X History only, // for geography only, * for History and Geography and blank for neither	X	X	//	*		X	X	//	*		X	//	//	*		X	//	//	*		X	//	//	*		X	//	//	*		X	//	//	*		X	//	//	*	*	$\frac{6}{35}$	5	M1 two overlapping ovals with correct labels M1 with 8 in the intersection A1 9 and 12 in the correct places A1 6 in the correct place B1 $\frac{6}{35}$ cao OR M1 for drawing grid 7×5 oe M1 for $17 - 8 = 9$, $20 - 8 = 12$ A1 for 9 History/12 Geography A1 for 6 neither B1 for $\frac{6}{35}$ cao	
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Total for Question: 5 marks																																													

5MM1H				
Question	Working	Answer	Mark	Additional Guidance
10.	Area of rectangle = 60 Area of trapezium = 63 $\left(\frac{6+12}{2}\right) \times 7 = 63$	123 cm ²	4	M1 Area of rectangle = 5×12 M1 area of trapezium = $\left(\frac{6+12}{2}\right) \times h$ B1 $h = 7$ A1 cao
Total for Question: 4 marks				
11.	(a)	Correct enlargement	2	B2 cao (B1 correct scale factor but in the wrong position)
	(b)	Reflection in the line $x = -2$	2	M1 for reflection with the equation of a line given or shown on the diagram A1 for $x = -2$
	(c)	Correct rotation and translation	2	M1 for a rotation of 180° about a stated point and a translation consistent with the centre of rotation. The translation may be poorly described A1 for a fully correct description, such as rotation of 180° about O followed by a translation of $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$
Total for Question: 6 marks				

5MM1H				
Question	Working	Answer	Mark	Additional Guidance
12.	(a)	$\frac{4}{10} \times \frac{7}{10}$	3	B1 sight of two of $\frac{4}{10}, \frac{3}{10}, \frac{6}{10}, \frac{7}{10}$ M1 $\frac{4}{10} \times \frac{7}{10}$ A1 for $\frac{28}{100}$ oe
	(b)	$\frac{6}{10} \times \frac{7}{10} + \frac{4}{10} \times \frac{3}{10}$	3	M1 $\frac{6}{10} \times \frac{7}{10}$ or $\frac{4}{10} \times \frac{3}{10}$ M1 adds together probabilities for GR and RG A1 oe
Total for Question: 6 marks				
13.		$0.43 \times 10^{-3},$ $3.2 \times 10^{-2},$ $46 \times 10^7,$ 6×10^8	2	M1 (numbers put in common form at least in pairs according to sign of index) A1 correct order
Total for Question: 2 marks				
14.		Proof	3	M1 attempt to arrive at n and $n + 1$ (oe) M1 sight of $2n + 1$ (oe) A1 explanation of $2n + 1$
Total for Question: 3 marks				

5MM1H				
Question	Working	Answer	Mark	Additional Guidance
15.				
(a) QWC ii	$AD = DC$ (given) $\angle ADE = \angle FCD$ (corresponding angles for ED and FC) $\angle EAD = \angle FDC$ (corresponding angles for BA and FD) Hence $\triangle AED \cong \triangle DFC$ (2 angles and the corresponding side)	Proof	3	M1 any 3 correct statements which would lead to a congruence proof M1 all three statements justified M1 correct reason for congruence QWC: Statement supported by correct previous working and justification
(b)	Area of $\triangle DFC = \text{area } \triangle AED$ (congruent) $FC = ED = BF$ (congruency and opposite sides of a parallelogram are equal) So area of parallelogram $EDFB = 2 \times \text{area } \triangle DFC = 2 \times \text{area } \triangle AED$ But $\text{area } \triangle AED = \frac{1}{4} \times \text{area } \triangle ABC$ Hence shown	Proof	2	M1 area of $\triangle DFC = \text{area } \triangle AED$ (congruent) $FC = ED = BF$ (congruency and opposite sides of a parallelogram are equal) so area of parallelogram $EDFB = 2 \times \text{area } \triangle DFC = 2 \times \text{area } \triangle AED$ A1 but $\text{area } \triangle AED = \frac{1}{4} \times \text{area } \triangle ABC$ and conclusion
Total for Question: 5 marks				

5MM1H				
Question	Working	Answer	Mark	Additional Guidance
16.	(a) QWC	153°	4	M1 SOT = 90° – 36° with angle between tangent and radius = 90° C1 SQT = SOT ÷ 2 with angle at centre 2 × angle at circumference. QWC: Correct attributable working shown with reason stated C1 SRT = 180 – SQT with opposite angles of a cyclic quadrilateral are supplementary QWC: Correct attributable working shown with reason stated A1 for 153°cao
	(b)	44°	3	B1 BDC = x M1 x + 2x + 48 = 180 A1 cao
Total for Question: 7 marks				
17.	(a)	4b + a	3	M1 $\vec{XY} = 6b - 3a$ M1 $\vec{XP} = \frac{2}{3}(6b - 3a)$ A1 cao
	(b)	a + 10b	3	M1 $\vec{OP} = \vec{YG}$ (parallelogram) M1 $\vec{OG} = 6b + 'a + 4b'$ A1 ft on (a)
Total for Question: 6 marks				

5MM1H				
Question	Working	Answer	Mark	Additional Guidance
18.	(a) $\frac{3}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$	$\frac{3\sqrt{7}}{7}$	2	M1 $\frac{3}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$ A1 cao
	(b) $2\sqrt{3} + 2\sqrt{12} + \sqrt{18} + \sqrt{72}$ $2\sqrt{3} + 4\sqrt{3} + 3\sqrt{2} + 6\sqrt{2}$	$6\sqrt{3} + 9\sqrt{2}$	4	M1 correct exp or 3 out of 4 terms correct M1 $\sqrt{72} = \sqrt{36 \times 2}$ B1 $\sqrt{72} = 6\sqrt{2}$ or $\sqrt{12} = 2\sqrt{3}$ A1 cao
Total for Question: 6 marks				
19. QWC (iii)	The n th line of the pattern is: $(n+2)(n+4) - n(n+6)$	Proof supported by attributable working.	4	M1 for $(n+2)(n+4)$ M1 for $-n(n+6)$ A1 for correct simplification B1 conclusion QWC: Appropriate conclusion supported by attributable working.
Total for Question: 4 marks				

5MM1H/X				
Question	Working	Answer	Mark	Additional Guidance
20. (a)	$2x^2 - 5x + 2 = (2x - 1)(x - 2)$ $4x^2 - 16 = 4(x^2 - 4) = 4(x - 2)(x + 2)$	$\frac{2x - 1}{4(x + 2)}$	3	B1 $(2x - 1)(x - 2)$ B1 $4(x - 2)(x + 2)$ or $(2x - 4)(2x + 4)$ B1 cao
(b)	$12x^2 - 12x = 2(x^2 - 6x)$ $= 2[(x - 3)^2 - (3)^2]$ $= 2(x - 3)^2 - 9$	$2(x - 3)^2 - 9$	3	M1 for $12x^2 - 12x = 2(x^2 - 6x)$ M1 for $= 2[(x - 3)^2 - (3)^2]$ A1 for $= 2(x - 3)^2 - 9$
(c)	$ \begin{array}{ccccccc} 1 & 7 & 17 & 31 \\ & 6 & 10 & 14 \\ & & 4 & 4 \end{array} $ 2nd difference is 4, so use $2n^2$ $n = 1 \quad 2$ $n = 2 \quad 8$ $n = 3 \quad 18$ $n = 4 \quad 32$ n th term is $2n^2 - 1$	$2n^2 - 1$	3	M1 for using method of differences (oe) A1 for sight of $2n^2$ A1 correct generalisation
				Total for Question: 9 marks

Unit 2: Methods 2

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Methods in Mathematics

Unit 2: Method 2

For Approved Pilot Centres ONLY

Foundation Tier

Sample Assessment Material

Time: 1 hour 45 minutes

Paper Reference

5MM2F/01

You must have:

Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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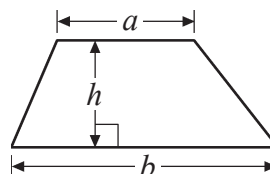
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GCSE Mathematics 2MM01

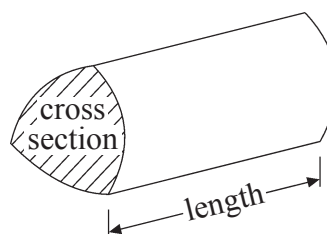
Formulae: Foundation Tier

**You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.**

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section $\times$ length

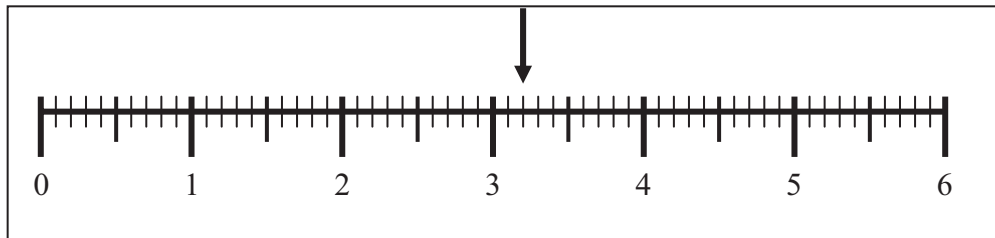


Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1



The arrow points to a number.

(a) What has to be added to the number to make 6?

(2)

(b) Write down the number that is 1000 times the number the arrow points to.

(1)

(Total for Question 1 = 3 marks)

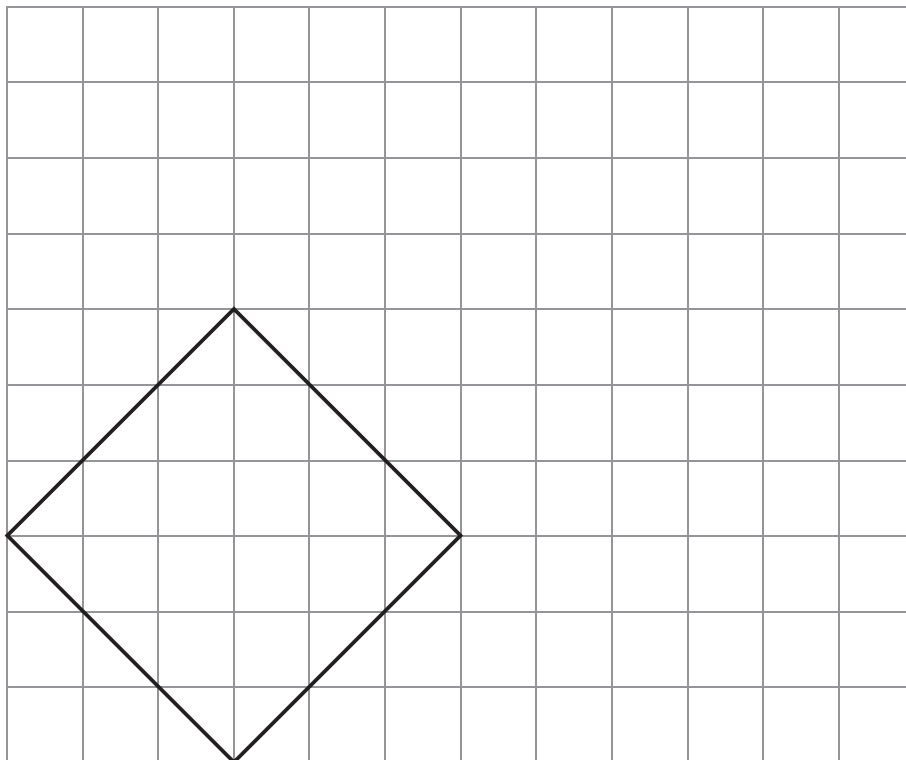
2 Find the number that should be written in the empty boxes.

(i) $\boxed{38} + \boxed{64} - \boxed{} = \boxed{77}$

(ii) $\boxed{2.3} \times \boxed{} \div \boxed{5.75} = \boxed{0.76}$

(Total for Question 2 = 4 marks)

3



This shape has been drawn on a grid of centimetre squares.

(a) Find the area of this shape.

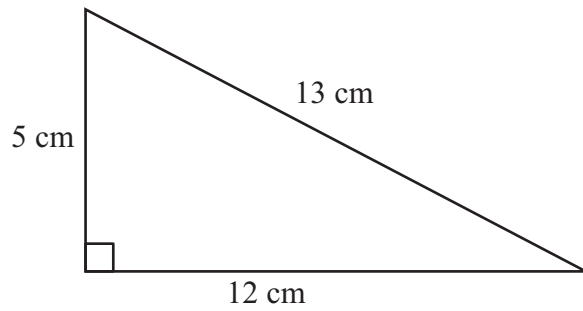
(2)

.....

(b) On the grid, draw a rectangle that has the same area as this shape.

(2)

Diagram **NOT**
accurately drawn



(c) Work out the area of this triangle.

(2)

.....
(Total for Question 3 = 6 marks)

- 4 Anisha has four cards, with a number written on each card.

4	9	1	5
---	---	---	---

Anisha puts all four cards on the table to make a number.

- (a) (i) Write the numbers on the cards to show the **smallest** number Anisha can make with the four cards.

--	--	--	--

- (ii) Write the numbers on the cards to show the **largest** number Anisha can make with the four cards.

--	--	--	--

(2)

Anisha uses the cards to make a true statement.

- (b) Write the number on the cards to make this true.
Use each of Anisha's cards once.

(1)

	+		=		
--	---	--	---	--	--

A fifth card is needed to show the result of the multiplication 4915×10
She needs a fifth card.

- (c) Write the number that should be on the fifth card.

(1)

--

(Total for Question 4 = 4 marks)

5 Crystal wrote down the temperature at different times on 1st January 2009.

Time	Temperature
4 am	-10°C
8 am	-4°C
noon	7°C
3 pm	6°C
7 pm	-2°C
midnight	-6°C

(a) Write down

(2)

(i) the highest temperature

..... $^{\circ}\text{C}$

(ii) the lowest temperature.

..... $^{\circ}\text{C}$

(b) Work out the difference in the temperature between

(2)

(i) 4 am and 8 am

..... $^{\circ}\text{C}$

(ii) 3 pm and 7 pm.

..... $^{\circ}\text{C}$

(Total for Question 5 = 4 marks)

- 6 Imran thinks of a number.
He multiplies the number by 3
He then adds 19
His answer is 61

What number did Imran first think of?

.....
(Total for Question 6 = 2 marks)

- 7 Find the reciprocal of:

(i) 0.2

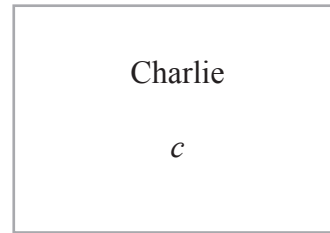
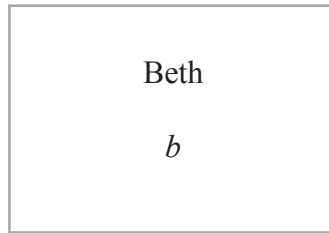
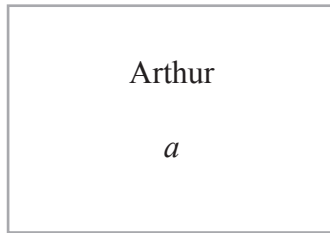
(1)

(ii) $0.2 \times \frac{1}{5}$

.....
(2)
.....

(Total for Question 7 = 3 marks)

8



Arthur, Beth and Charlie each have some marbles.
They keep their marbles in boxes each with their own name on.

Arthur has a marbles, Beth has b marbles and Charlie has c marbles.

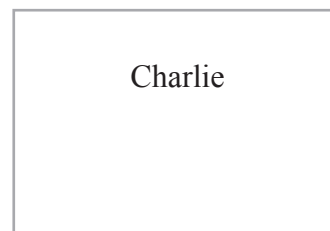
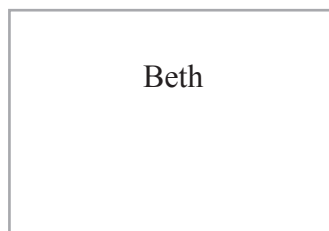
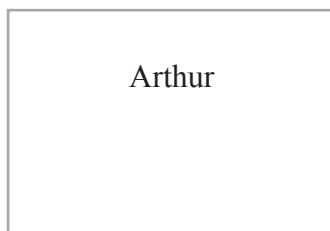
- (a) Write down an expression, in terms of a , b and c , for the total number of marbles that they have altogether.

(1)

Beth puts 4 of her marbles and Charlie puts 2 of her marbles into Arthur's box.
Charlie also puts 1 of her marbles into Beth's box.

- *(b) Complete the diagram to show expressions for the number of marbles in each box.
Give your answers in their simplest forms.

(4)



After this has been done the number of marbles in Arthur's box is the same as the number of marbles in Beth's box and is the same as the number of marbles in Charlie's box.

- (c) Find an expression, in terms of a , for the total number of marbles that they have.

(3)

(Total for Question 8 = 8 marks)

9 (a) Find two square numbers which have a sum which is also a square number.

(2)

.....

(b) Find two cube numbers which have a difference which is a prime number.

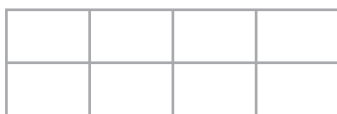
(2)

.....

(Total for Question 9 = 4 marks)

10 (a) Shade $\frac{1}{4}$ of this shape.

(1)



(b) Work out the number that is half way between

(3)

(i) 20 60

(ii) 6.5 6.6

(iii) $\frac{1}{4}$ $\frac{1}{2}$

(c) Find the point on the line AB that is $\frac{1}{3}$ of the way along the line from A .

Mark this point with a cross ($\times$).

(1)

A ————— B

(Total for Question 10 = 5 marks)

11

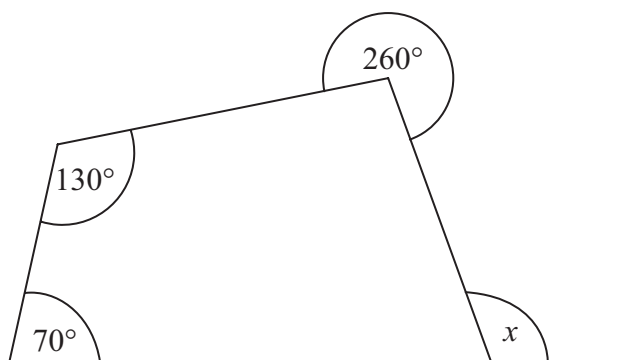


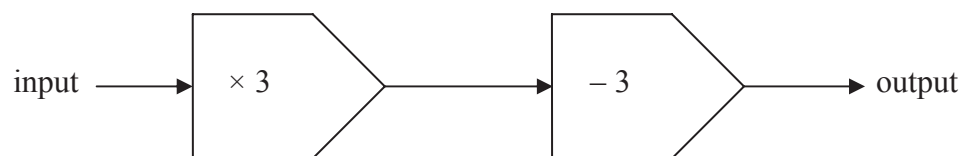
Diagram **NOT**
accurately drawn

Work out the size of the angle marked x .
You must show clearly how you obtained your answer.

.....°

(Total for Question 11 = 4 marks)

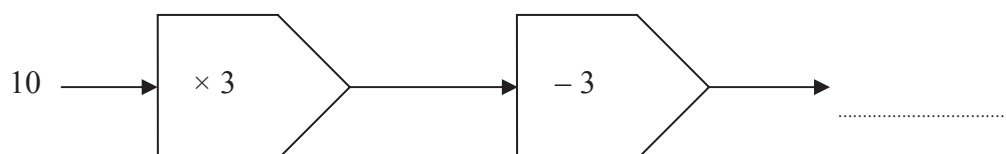
12 The diagram shows a mathematical rule.



It multiplies the input by 3 and then subtracts 3 to get the output.

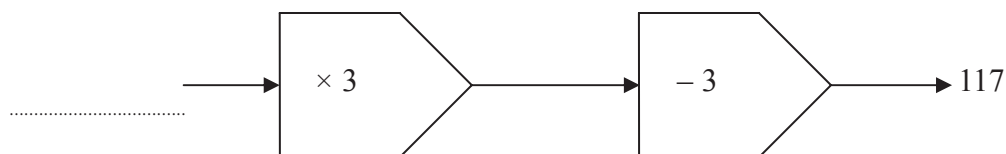
(a) Complete the diagram.

(1)

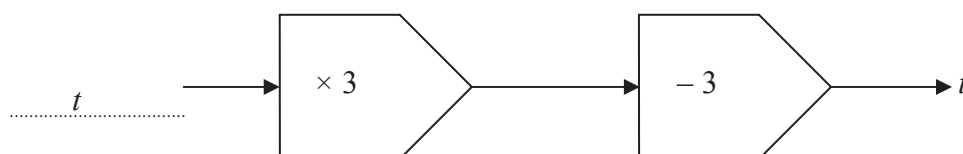


(b) Complete the diagram.

(1)



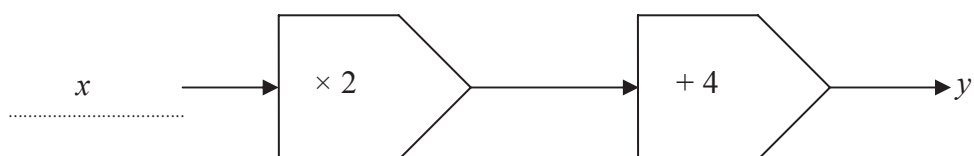
In this diagram the input and the output have the same value, t



(c) Work out the value of t .

(2)

$t = \dots\dots\dots$



In this diagram the input is x and the output is y

(d) Write x in terms of y

(2)

(Total for Question 12 = 6 marks)

13 (a) Write $\frac{1}{20}$ as a decimal.

(1)

(b) Find $\frac{7}{25}$ as a percentage.

(1)

Danny shares a bag of sweets with his friends.

He gives Mary $\frac{3}{5}$ of the sweets.

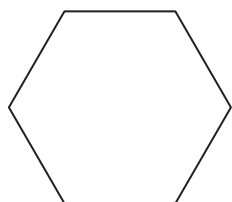
He gives Ann $\frac{1}{10}$ of the sweets.

He has 12 sweets left.

(c) How many sweets does Danny give to Mary?

(4)

(Total for Question 13 = 6 marks)



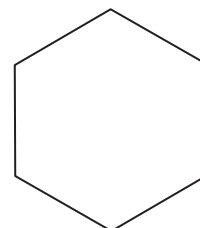
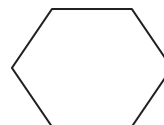
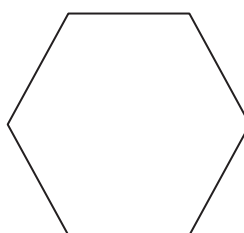
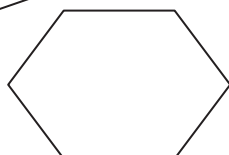
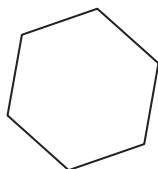
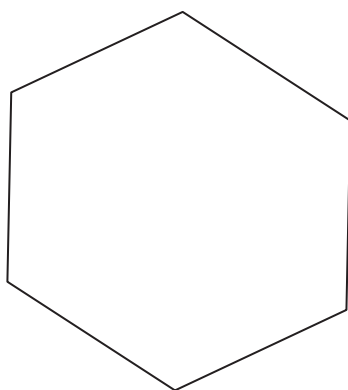
(a) What special name is given to this polygon?

(1)

One of the polygons below is congruent to the polygon shown in part (a).

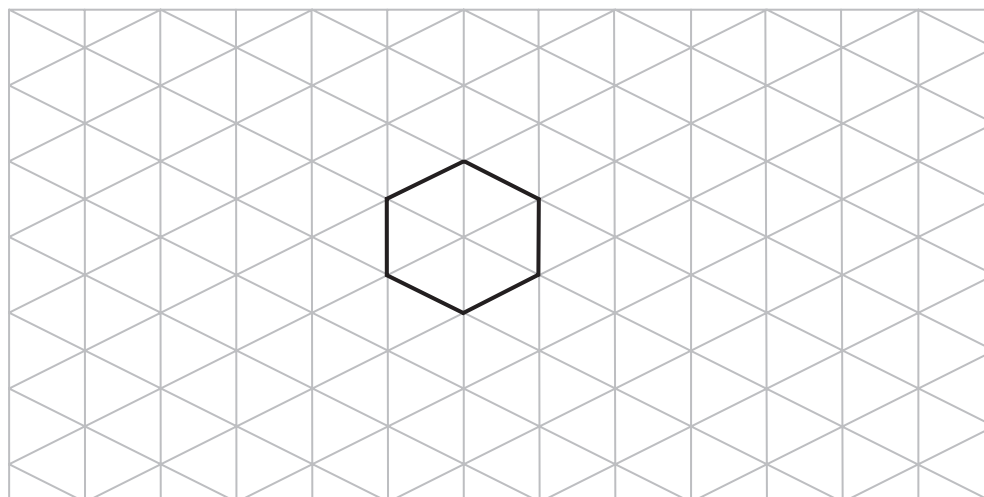
(b) Draw a circle around this polygon.

(1)



(c) On the grid, show how the shape below will tessellate.
You should draw at least 8 shapes.

(2)



(Total for Question 14 = 4 marks)

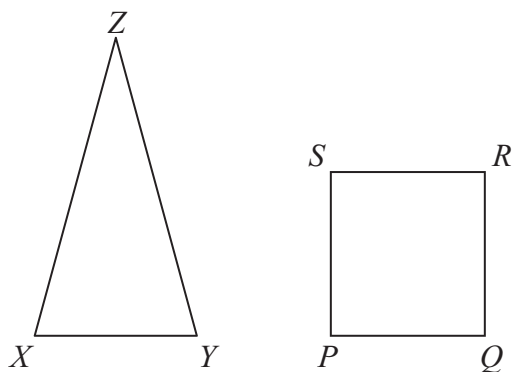


Diagram **NOT**
accurately drawn

XYZ is an isosceles triangle. $PQRS$ is a square.

$$PQ = XY$$

$$XZ = YZ$$

XZ is 14 cm longer than PQ .

The perimeter of both shapes is the same.

Find the length of XZ .

..... cm

(Total for Question 15 = 3 marks)

16 Here is a triangular prism.

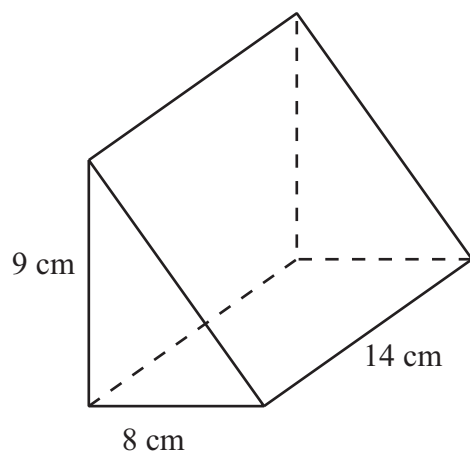


Diagram **NOT**
accurately drawn

(a) Calculate the volume of the triangular prism.

(2)

..... cm^3

A cube has the same volume as this triangular prism.

(b) Calculate the surface area of the cube.

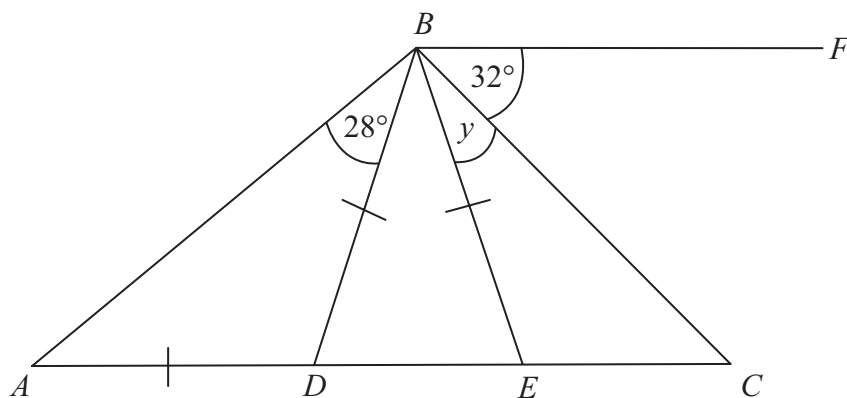
Give your answer correct to the nearest whole number.

(3)

..... cm^2

(Total for Question 16 = 5 marks)

Diagram **NOT**
accurately drawn



In the diagram, $AD = BD = BE$.

$ADEC$ is a straight line.

Angle $DBA = 28^\circ$

Angle $CBF = 32^\circ$

BF is parallel to AC .

Find the size of the angle marked y

You must show clearly how you obtained your answer.

(Total for Question 17 = 4 marks)

18

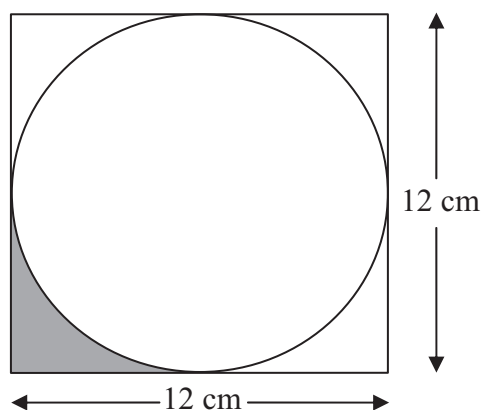


Diagram **NOT**
accurately drawn

The diagram shows a circle enclosed by a square.
Work out the area of the region shaded in the diagram.
Give your answer correct to one decimal place.

..... cm^2

(Total for Question 18 = 4 marks)

19 (a) Solve

$$3y + 4 = 2 - 2y$$

(2)

$$y = \dots\dots\dots$$

(b) Solve

$$3(2x - 4) + x = 2x - 25$$

(4)

$$x = \dots\dots\dots$$

(Total for Question 19 = 6 marks)

20 There were 800 students at Prestwick School at the start of the year.

48% of these 800 students were girls.

(a) What is the number of girls attending the school?

(2)

.....

There are 176 students in Year 10.

(b) What percentage of the students at the school are Year 10 students?

(2)

..... %

By the end of the year $\frac{1}{6}$ of the girls had left and $12\frac{1}{2}\%$ of the boys had left.

(c) Work out the number of students at Prestwick School at the end of the year.

(4)

.....

(Total for Question 20 = 8 marks)

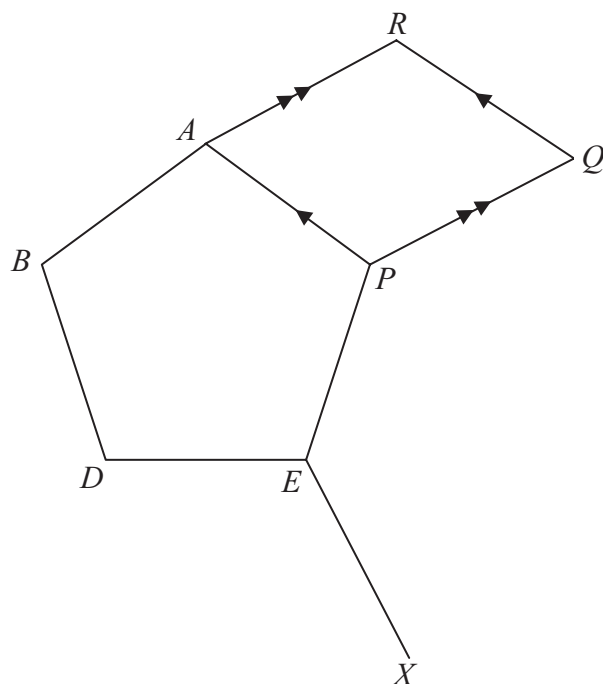


Diagram **NOT**
accurately drawn

$ABCDP$ is a regular pentagon.
 $QPEX$ is part of a regular octagon.
 $PARQ$ is a parallelogram.

Calculate the size of angle PAR .

(Total for Question 21 = 7 marks)

TOTAL FOR PAPER = 100 MARKS

Unit 2 Foundation: Methods 2

5MM2F					Additional Guidance	
Question	Working	Answer	Mark			
1.	(a)		2.8	2	M1 $6 - 3.2$ or $6 - 3.4$ A1 cao	
	(b)		3200	1	B1cao	
					Total for Question: 3 marks	
2.	(i)	$38 + 64 = 102$ $102 - 77 = 25$	25	2	M1 $38 + 64$ and '102' – 77 A1 cao	
	(ii)	$2.3 \div 5.75 = 0.4$ $0.76 \div 0.4 = 1.9$	1.9	2	M1 $2.3 \div 5.75$ and $0.76 \div '0.4'$ A1 cao	
					Total for Question: 4 marks	
3.	(a)		18 cm ²	2	M1 shows clearly that is counting squares or splits into triangles and attempts $b \times h \div 2$ A1 cao	
	(b)		rectangle 2 by 9 or 3 by 6	2	M1 rectangle drawn A1 9 by 2 or 6 by 3	
	(c)	$\frac{12 \times 5}{2}$	30 cm ²	2	M1 $\frac{12 \times 5}{2}$ A1 cao	
					Total for Question: 6 marks	
4.	(a) (i)		1459	2	B1 cao	
	(ii)		9541		B1 cao transposed answers award one mark	
	(b)		$9 + 5 = 14$	1	B1 for $9 + 5 = 14$ or $5 + 9 = 14$	
	(c)		0	1	B1 cao	
					Total for Question: 4 marks	

5MM2F					
Question	Working	Answer	Mark	Additional Guidance	
5.	(a)(i) (ii)	7 -10	2	B1 cao B1 cao	
	(b)(i) (ii)	6 8	2	B1 accept - 6 B1 accept - 8	
Total for Question: 4 marks					
6.	$61 - 19 = 42$ $42 \div 3 = 14$	14	2	M1 for -19 and $\div 3$ or 42 seen A1 cao	
Total for Question: 2 marks					
7.	(i) (ii)	5 25	3	A1 cao M1 0.04 oe A1 cao	
Total for Question: 3 marks					
8.	(a)	$a + b + c$	1	B1 cao	
QWC (ii)	(b)	$a + 6$ $b - 3$ $c - 3$	4	B4 all correct QWC: correct notation and simplified expressions (B3 all correct but unsimplified) (B2 any 2 correct) (B1 any 1 correct)	
	(c)	$3a + 18$	3	M1 for $b = a + 9$ or $c = a + 9$ for a statement that Arthur had 9 less than Beth (or Charlie) A1 for a correct algebraic expression for b or c in terms of a A1 any expression that would simplify to $3a + 18$	
Total for Question: 8 marks					
9.	(a)	Lists square numbers 1, 4, 9, 16, 25	2	M1 lists square numbers (at least 4) A1 9 and 16	
	(b)	Lists cube numbers 1 8	2	M1 for 1 and 8 A1 1 and 8 and comment that 7 is prime	
Total for Question: 4 marks					

5MM2F				
Question	Working	Answer	Mark	Additional Guidance
10.				
(a)		2 squares shaded	1	B1 2 squares shaded
(b)(i)		40	3	B1 cao
(ii)		6.55		B1 cao
(iii)		$3\frac{3}{8}$		B1 0.375, $\frac{3}{8}$ oe
(c)		Mark 2.1-2.5 cm from A	1	B1 for mark 2.1-2.5 cm from A
Total for Question: 5 marks				
11	$360 - 260 = 100$ $100 + 70 + 130 = 300$ $360 - 300 = 60$ $180 - 60 = 120$	120°	4	B1 for 100 clearly shown in the correct place M1 for $360 - (100 + 70 + 130)$ M1 for $180 - '60'$ A1 cao
Total for Question: 4 marks				
12.				
(a)		27	1	B1 cao
(b)		40	1	B1 cao
(c)	$3t - 3 = t$	1.5	2	M1 $3t - 3 = t$ A1 cao
(d)	$2x + 4 = y$ $2x = y - 4$	$x = \frac{y-4}{2}$	2	M1 for a clear attempt to work backwards through the number machines eg by arrows on the diagram or from $x = y - 4 \div 2$ A1 cao
Total for Question: 6 marks				

5MM2F					
Question	Working	Answer	Mark	Additional Guidance	
13.					
(a)		0.05	1	B1 cao	
(b)	$\frac{7}{25} \times \frac{4}{4} = \frac{28}{100}$	28%	1	B1 cao	
(c)	$\frac{3}{5} + \frac{1}{10} = \frac{7}{10}$ $1 - \frac{7}{10} = \frac{3}{10}$ $\frac{3}{10}$ of the total = 12 $12 \div 3 \times 10 = 40$	24	4	B1 $\frac{7}{10}$ M1 $1 - \frac{7}{10}$ of the total is 12 sweets M1 $12 \div 3 \times 10$ A1 24	
Total for Question: 6 marks					
14.					
(a)		Hexagon	1	B1 cao	
(b)		The one on the far right	1	B1 cao	
(c)		Tessellation	2	B2 for at least 7 additional shapes drawn (B1 for at least 5 additional shapes drawn, or shapes only on one line, or incomplete tessellation)	
Total for Question: 4 marks					

5MM2F					
Question	Working	Answer	Mark	Additional Guidance	
15.	Let $XY = x$ $x + x + 14 + x + 14 = 4x$ $x = 28$	42	3	B1 $x + x + 14 + x + 14$ or $4x$ M1 $x + x + 14 + x + 14 = 4x$ A1 cao	
Total for Question: 3 marks					
16.	(a) $\frac{8 \times 9}{2} = 36$ $36 \times 14 = 504$	504	2	M1 $\frac{8 \times 9}{2} = 36$, 36×14 or $8 \times 9 \times 14 \div 2$ A1 cao	
	(b) $x^3 = 504$ $x = 7.958(1..)$ Surface area = $6 \times 7.958(1..)^2$	380	3	M1 $x = \sqrt[3]{504}$ M1 $6 \times 7.958(1..)^2$, A1 cao	
Total for Question: 5 marks					
17.	(a) $BAD = 28^\circ$ $BDE = 56^\circ$ $BED = 56^\circ$ $EBF = 56^\circ$ $y = 56^\circ - 32^\circ$ OR $BAD = 28^\circ$ $BDE = 56^\circ$ $DBE = 68^\circ$ $ECB = 32^\circ$ $y = 180^\circ - 28^\circ - 28^\circ - 68^\circ - 32^\circ$	24°	4	B1 $BAD = 28^\circ$ M1 $BDE = 56^\circ$ M1 $EBF = 56^\circ$ A1 cao OR B1 $BAD = 28^\circ$ M1 $BDE = 56^\circ$ M1 $ECB = 32^\circ$ A1 cao	
Total for Question: 4 marks					

5MM2F				
Question	Working	Answer	Mark	Additional Guidance
18.	Circle: $\pi \times 6 \times 6 = 113.097...$ $144 - 113.097... = 30.903$ $30.903 \div 4$	7.73	4	M1 for $\pi \times 6 \times 6$ B1 for 144 M1 $144 - '113.097' ...$ A1 answers in range 7.7 - 7.8
Total for Question: 4 marks				
19.	(a) $5y = -2$	$y = -\frac{2}{5}$	2	M1 correct process of isolating the terms in y A1 $-\frac{2}{5}$ oe
	(b) $6x - 12 + x = 2x - 25$ $6x + x - 2x = -25 + 12$ $x = -\frac{13}{5}$	$x = -\frac{13}{5}$	4	B1 $6x - 12 = x - 25$ M1 correct process of isolating the terms in x from a 4 or 5 term equation M1 collect terms in x on one side A1 $x = -\frac{13}{5}$ oe
Total for Question: 6 marks				
20.	(a) $\frac{48}{100} \times 800 = 384$	384	2	M1 $\frac{48}{100} \times 800$ A1 cao
	(b) $\frac{176}{800} \times 100$	22	2	M1 $\frac{176}{800} \times 100$ A1 cao
	(c) $384 \div 6 = 64$ $(800 - 384) \times \frac{12.5}{100} = 52$ $800 - 64 - 52 = 684$	684	4	M1 $384 \div 6$ M1 $(800 - '384') \times \frac{12.5}{100}$ M1 $800 - '64' - '52'$ A1 cao
Total for Question: 8 marks				

5MM2F				
Question	Working	Answer	Mark	Additional Guidance
21.	Ext angle of a pentagon is 72° Ext angle of octagon is 45° $APQ = 72 + 45 = 117^\circ$ $PAR = 180 - 117 = 63$ OR $APE = 108^\circ$ $QPE = 135^\circ$ $APQ = 360 - 108 - 135 = 117^\circ$ $PAR = 180 - 117 = 63$	63°	7	M1 for $\frac{360}{5}$ or $\frac{360}{8}$ A1, A1 for 72 and 45 M1 for '72' + '45' A1 for 117 M1 for $180 - '117'$ A1 cao OR M1 $\frac{10 - 4}{5} \times 90$ or $\frac{16 - 4}{8} \times 90$ A1, A1 for 108 and 135 M1 for $360 - 108 - 135$ A1 for 117 M1 for $180 - '117'$ A1 cao
				Total for Question: 7 marks

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Sample Assessment Material

Time: 1 hour 45 minutes

Paper Reference

5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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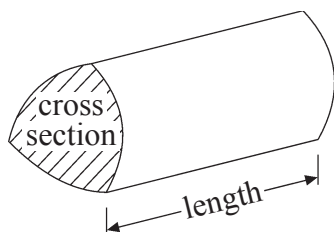
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GCSE Mathematics 2MM01

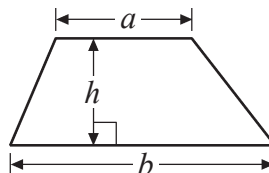
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section $\times$ length

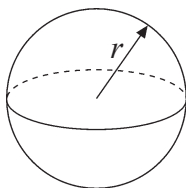


Area of trapezium = $\frac{1}{2}(a + b)h$



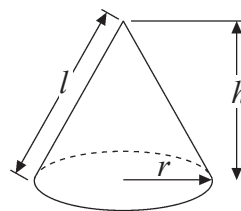
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

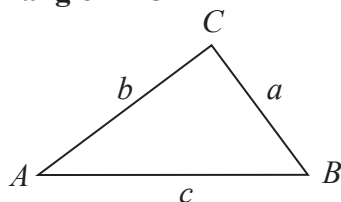


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

- 1** Divide £60 in the ratio 2:3

.....
(Total for Question 1 = 3 marks)

- 2** The diameter of a circle is 15 cm.

Find its circumference. Give the units of your answer.
Give your answer correct to 1 decimal place.

.....
(Total for Question 2 = 3 marks)

3 Here is a triangular prism

(a) Calculate the volume of the triangular prism.

(2)

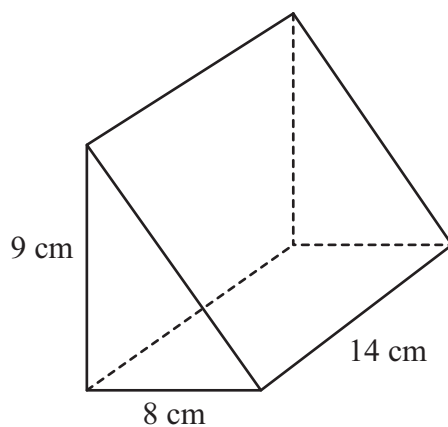


Diagram **NOT**
accurately drawn

..... cm^3

A cube has the same volume as this triangular prism.

(b) Calculate the surface area of the cube.

Give your answer correct to the nearest whole number.

(3)

..... cm^2

(Total for Question 3 = 5 marks)

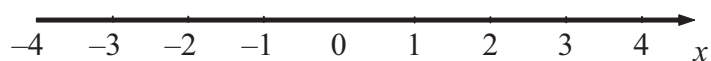
- 4 (a) n is an integer and $-3 < n \leq 2$

Write down all the possible values of n

(2)

.....

Here is a number line.

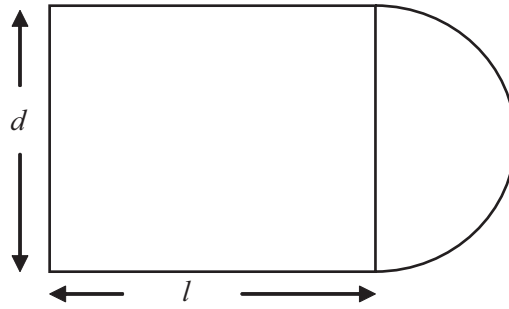


- (b) Display the inequality $-3 < x \leq 2$ on the number line.

(2)

(Total for Question 4 = 4 marks)

5



The diagram is a shape made up of a rectangle of width d and length l together with a semicircle of diameter d .

The perimeter P of the shape is given by $P = d + 2l + \frac{\pi d}{2}$

- (a) Work out the perimeter of the shape when the width is 8.4 cm and the length is 11.7 cm.

(2)

..... cm

- (b) Rearrange the formula to make d the subject.

(3)

.....

(Total for Question 5 = 5 marks)

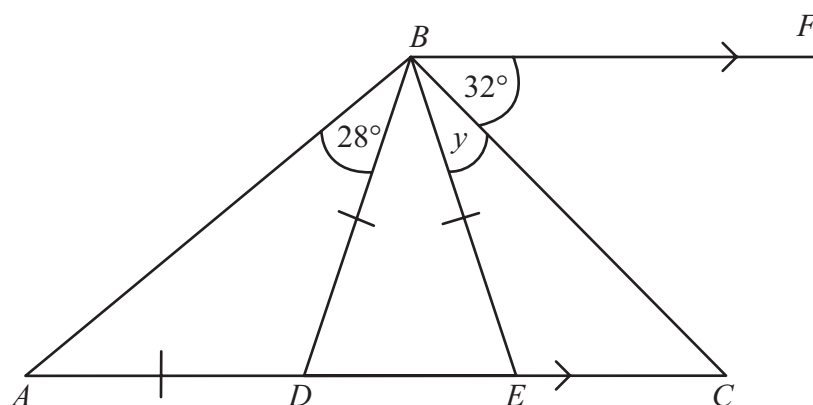


Diagram **NOT**
accurately drawn

In the diagram, $AD = BD = BE$

$ADEC$ is a straight line.

Angle $DBA = 28^\circ$

Angle $CBF = 32^\circ$

BF is parallel to AC .

Find the size of the angle marked y .

You must show clearly how you obtained your answer.

(Total for Question 6 = 4 marks)

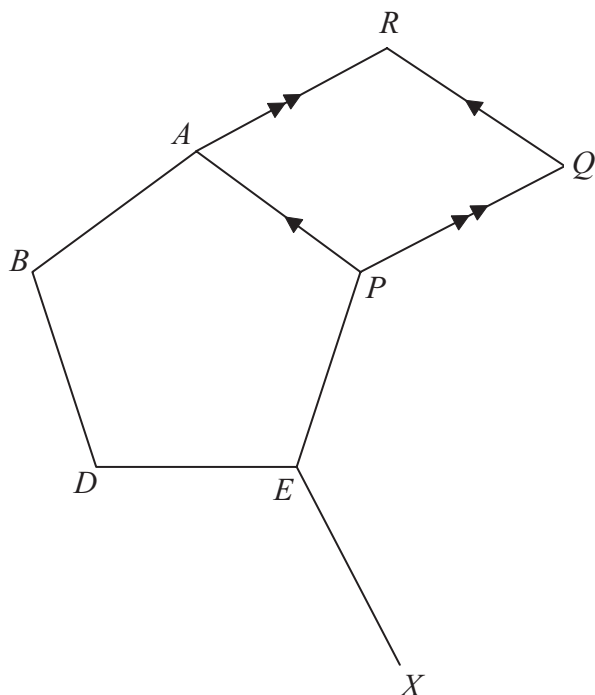


Diagram **NOT**
accurately drawn

$ABDEP$ is a regular pentagon.
 $QPEX$ is part of a regular octagon.
 $PARQ$ is a parallelogram.

Calculate the size of angle PAR .

(Total for Question 7 = 7 marks)

- 8 The quadratic curve with equation $y = x^2 + bx + c$ passes through the points $(2, -4)$ and $(-1, 2)$

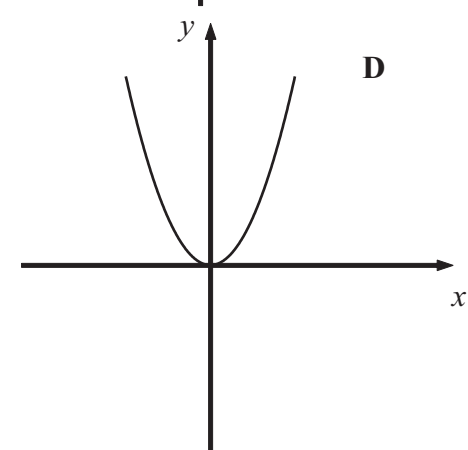
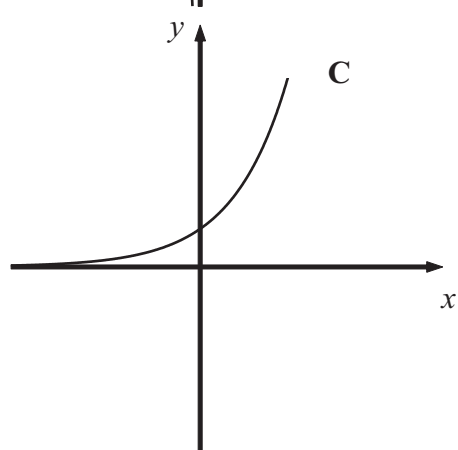
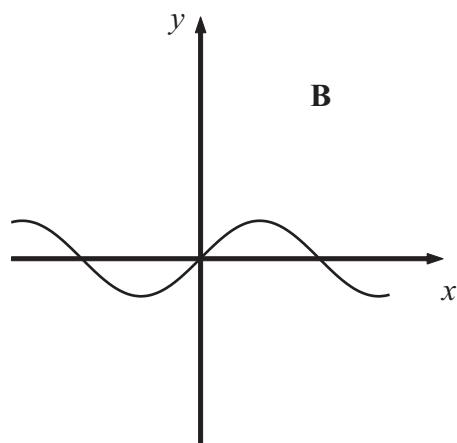
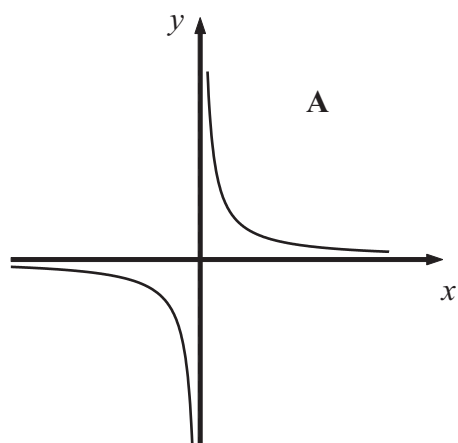
Find the values of b and c

$b = \dots\dots\dots$

$c = \dots\dots\dots$

(Total for Question 8 = 5 marks)

9 Here are four graphs.



Here are five equations of graphs.

P $y = \sin x$

Q $y = \cos x$

R $y = 2^x$

S $y = \frac{1}{x}$

T $y = x^2$

Match each graph with an equation.

A with equation

B with equation

C with equation

D with equation

(Total for Question 9 = 3 marks)

10 y is directly proportional to the square root of x and $y = 8$ when $x = 25$

(a) Find a formula for y in terms of x

(3)

$y = 36$

(b) Find the value of x

(2)

(Total for Question 10 = 5 marks)

11

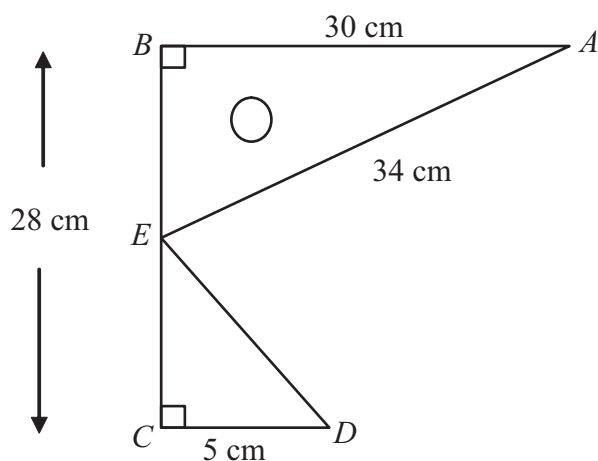


Diagram **NOT**
accurately drawn

Here is the design for a logo, $ABCD$.
The design is made from two right-angled triangles.

(a) Work out the perimeter of the logo.

(4)

..... cm

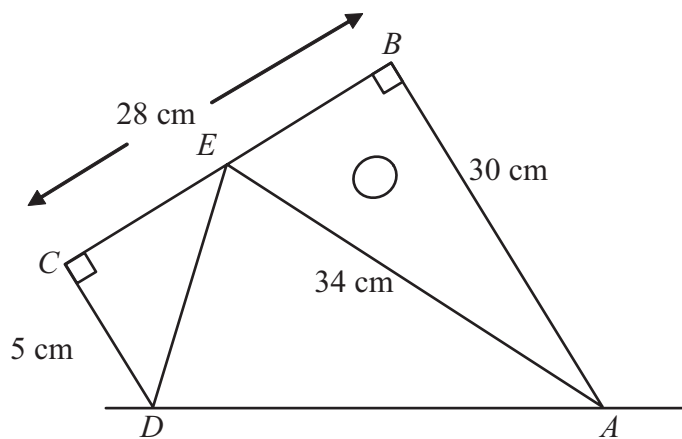


Diagram **NOT**
accurately drawn

The logo is turned to rest on the ground at the corners A and D .

(b) Calculate the size of angle BAD .

(4)

(Total for Question 11 = 8 marks)

12 On a farm, $\frac{3}{8}$ of the land area is used to keep sheep.

Half of the rest of the land area on the farm is used to grow crops.

The land area of the farm used to grow crops is 600 000 m².

Work out the land area of the farm used to keep sheep.

..... m²

(Total for Question 12 = 3 marks)

13 (a) Prove that the recurring decimal $0.1\dot{2}\dot{4} = \frac{41}{330}$

(3)

(b) Hence or otherwise, express as a fraction, the recurring decimal $0.06\dot{2}\dot{1}$

(1)

.....
(Total for Question 13 = 4 marks)

14

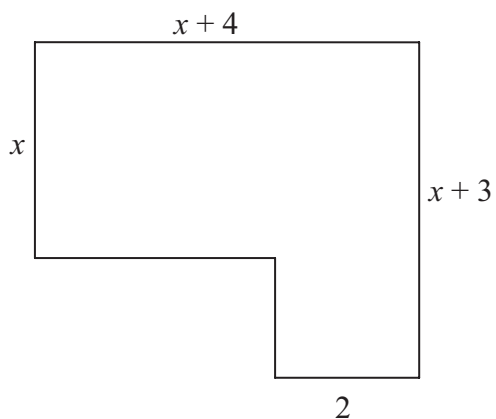


Diagram **NOT**
accurately drawn

The diagram shows a hexagon. All the angles are right angles. All the measurements are in centimetres.

The area of the hexagon is 50 cm^2 .

(a) Show that $x^2 + 4x - 44 = 0$ (3)

(b) (i) Solve the equation $x^2 + 4x - 44 = 0$ (3)

(ii) Write down the length of the longest side. (1)

.....cm

(Total for Question 14 = 7 marks)

15 (a) Find the set of values of x for which $3x - 5 < x + 8$

(2)

.....

(b) Hence or otherwise, find the set of values of x for which

$$3x - 5 < x + 8 \text{ and } 5x > x - 8$$

(3)

.....

(Total for Question 15 = 5 marks)

16 Find two numbers which have a difference of 3 and have a product of 88

(5)

.....

.....

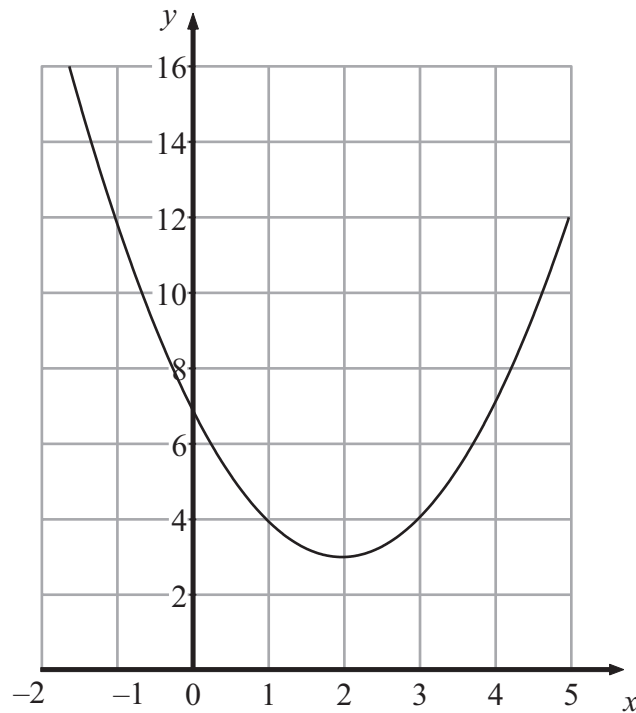
(Total for Question 16 = 5 marks)

17 Solve $x^2 + y^2 = 34$

$$y - x = 8$$

(5)

.....
.....
(Total for Question 17 = 5 marks)



Here is the graph of $y = f(x) = x^2 - 4x + 7$ for values of x from -2 to 4

(a) On the grid draw the graph of $y = f(x+1)$ for values of x from -2 to 3

(2)

The algebraic equation of another graph is $y = g(x) = x^2 - 3$

$y = f(x)$ can be mapped onto $y = g(x)$ by a transformation.

* (b) Describe fully this transformation.

You must show clearly how you obtained your answer.

(4)

(Total for Question 18 = 6 marks)

***19** (a) Show that $(mn - 1)^2 + (m + n)^2 = (m^2 + 1)(n^2 + 1)$

(3)

The two shorter sides of a right-angled triangle are $2m$ and $m^2 - 1$ where m is a positive integer.

(b) Show that the hypotenuse is always a positive integer.

(2)

(c) Find two square numbers which have a sum equal to 50005

(2)

(Total for Question 19 = 7 marks)

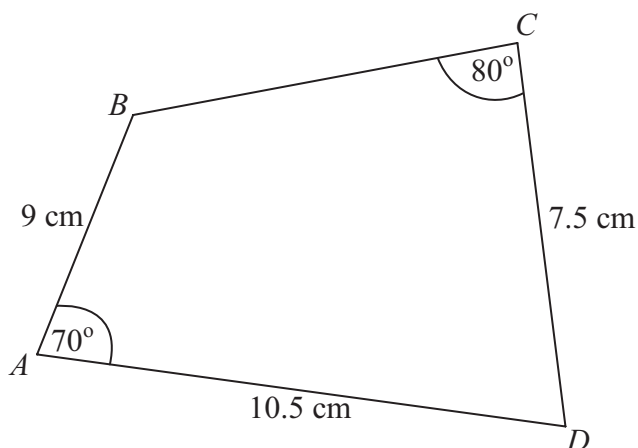


Diagram **NOT**
accurately drawn

In the quadrilateral $ABCD$,

$AD = 10.5$ cm

$AB = 9$ cm

$CD = 7.5$ cm

Angle $BAD = 70^\circ$

Angle $BCD = 80^\circ$

Calculate the size of angle DBC .

(Total for Question 20 = 6 marks)

TOTAL FOR PAPER = 100 MARKS

END

Unit 2 Higher: Methods 2

5MM2H					
Question	Working	Answer	Mark	Additional Guidance	
1.	$60 \div (2 + 3) = 12$ 12×3 12×4	24, 36	3	M1 $60 \div (2 + 3)$ A1 cao A1 cao	
Total for Question: 3 marks					
2.	$\pi \times 15 = 47.1(2\dots)$	47.1 cm	3	M1 $\pi \times 15 = 47.1(2\dots)$ A1 cao B1 (indep) cm	
Total for Question: 3 marks					
3.	(a) $\frac{8 \times 9}{2} = 36$ $36 \times 14 = 504$	504	2	M1 $\frac{8 \times 9}{2} = 36$, '36' $\times 14$ or $8 \times 9 \times 14 \div 2$ A1 cao	
	(b) $x^3 = 504$ $x = 7.958(1\dots)$ Surface area = $6 \times 7.958(1\dots)^2$	380	3	M1 $x = \sqrt[3]{504}$ M1 $6 \times '7.958(1\dots)'$ A1 cao	
Total for Question: 5 marks					
4.	(a)	-2, -1, 0, 1, 2	2	B2 cao (B1 -1, 0, 1, 2 or -2, -1, 0, 1)	
	(b)	Correct number line	2	M1 line from (-3 to +2) A1 with open circle at -3 and closed circle at 2	
Total for Question: 4 marks					

5MM2H				
Question	Working	Answer	Mark	Additional Guidance
5.				
(a)	$P = 8.4 + 2 \times 11.7 + \pi \times 8.4 \div 2$	45.0	2	M1 for $8.4 + 2 \times 11.7 + \pi \times 8.4 \div 2$ A1 44.9 – 45.0
(b)	$P - 2l = d + \frac{\pi d}{2}$ $P - 2l = d(1 + \frac{\pi}{2})$	$d = \frac{P - 2l}{1 + \frac{\pi}{2}}$	3	M1 for $P - 2l = d + \frac{\pi d}{2}$ M1 for $P - 2l = d(1 + \frac{\pi}{2})$ A1 $d = \frac{P - 2l}{1 + \frac{\pi}{2}}$ oe SC If π is taken to be 3.14 then allow 1 mark for $d = \frac{P - 2l}{2.57}$
Total for Question: 5 marks				
6.	$BAD = 28^\circ$ $BDE = 56^\circ$ $BED = 56^\circ$ $EBF = 56^\circ$ $y = 56^\circ - 32^\circ$ OR $BAD = 28^\circ$ $BDE = 56^\circ$ $DBE = 68^\circ$ $ECB = 32^\circ$ $y = 180^\circ - 28^\circ - 28^\circ - 68^\circ - 32^\circ$	24°	4	B1 $BAD = 28^\circ$ M1 $BDE = 56^\circ$ M1 $EBF = 56^\circ$ A1 cao OR B1 $BAD = 28^\circ$ M1 $BDE = 56^\circ$ M1 $ECB = 32^\circ$ A1 cao
Total for Question: 4 marks				

5MM2H				
Question	Working	Answer	Mark	Additional Guidance
7.	Ext angle of a pentagon is 72° Ext angle of octagon is 45° $APQ = 72 + 45 = 117^\circ$ $PAR = 180 - 117 = 63$ OR $APE = 108^\circ$ $QPE = 135^\circ$ $APQ = 360 - 108 - 135 = 117^\circ$ $PAR = 180 - 117 = 63$	63°	7	M1 for $\frac{360}{5}$ or $\frac{360}{8}$ A1, A1 for 72 and 45 M1 for '72'+',45', A1 for 117 M1 for 180 – '117' A1 cao OR M1 $\frac{10 - 4}{5} \times 90$ or $\frac{16 - 4}{8} \times 90$ A1, A1 for 108 and 135 M1 for 360 – 108 – 135 A1 for 117 M1 for 180 – '117' A1 cao
				Total for Question: 7 marks
8.	$2^2 + 2b + c = -4$ $2b + c = -8$ $(-1)^2 + b(-1) + c = 2$ $-b + c = 3$	$b = -3$ $c = -2$	5	C1 $2^2 + 2b + c = -4$ M1 $-b + c = 3$ M1 correct method to eliminate b or c A1 $b = -3$ A1 $c = -2$
				Total for Question: 5 marks
9.		A S B P C R D T	3	B3 all correct (B2 3 correct) (B1 2 correct)
				Total for Question: 3 marks

5MM2H				
Question	Working	Answer	Mark	Additional Guidance
10 a	$y = k\sqrt{x}$ $8 = k \times \sqrt{25}$ $k = \frac{8}{5}$	$y = 1.6\sqrt{x}$	3	M1 $y = k\sqrt{x}$ M1 $8 = k \times \sqrt{25}$ A1 $k = \frac{8}{5}$
b	$36 = 1.6 \times \sqrt{x}$ $x = \left(\frac{36}{1.6}\right)^2$	506.25	2	M1 $36 = 1.6 \times \sqrt{x}$ A1 cao
				Total for Question: 5 marks

5MM2H				
Question	Working	Answer	Mark	Additional Guidance
11. (a)	$34^2 - 30^2 = 1156 - 900 = 256$ $\sqrt{256} = 16$ $EC = 28 - 16 = 12$ $5^2 + 12^2 = 25 + 144 = 169$ $\sqrt{169} = 13$ $30 + 28 + 5 + 13 + 34$	110	4	M1 $34^2 - 30^2$ M1 (dep) $EC = 28 - '16'$ M1 $5^2 + 12^2 = 25 + 144 = 169$ A1 110 OR M1 for $\sin A = \frac{BE}{34}$, $BE = 34 \times \sin 28.07$ A1 for $BE = 16$, $CE = 26 - BE = 12$, $DE = \sqrt{(5^2 + 12^2)} = 13$ M1 for $5^2 + 12^2 = 169$ A1 110
(b)	$\tan BAD = \frac{30 - 5}{28}$ $BAD = \tan^{-1} 1.12$	48.2°	4	M1 recognition of a right-angled triangle with sides 30 – 5 and 28 M1 $\tan BAD = \frac{30 - 5}{28}$ M1 $BAD = \tan^{-1} 1.12$ A1 48.2 or better OR Angle CED = $\tan^{-1} \frac{5}{12} = 22.62^\circ$ Angle BEA = $\tan^{-1} \frac{30}{16} = 61.93^\circ$ Angle DEA = $180^\circ - 22.62^\circ - 61.93^\circ$ $AD = \sqrt{34^2 + 13^2} - 2.13.34 \cos 95.45 = 37.54$ Angle DAE = 20.17° Angle BAE = 28.07° Angle BAD = 48.2°
				Total for Question: 8 marks

5MM2H				
Question	Working	Answer	Mark	Additional Guidance
12.	$1 - \frac{3}{8} = \frac{5}{8}$ $\frac{5}{16}$ of the land area = 600000 Land area = $600000 \times \frac{16}{5}$ = 1920000 Sheep area = $1920000 \times \frac{3}{8}$	720000	3	M1 $\frac{5}{16}$ of the land area = 600000 M1 land area = $600000 \times \frac{16}{5}$ A1 cao
Total for Question: 3 marks				
13.	(a) $x = 0.1242424...$ $10x = 1.2424...$ $1000x = 124.2424...$ $990x = 123$ (oe)	$x = \frac{123}{990} = \frac{41}{330}$ (oe)	3	M1 $x = 0.1242424...$ M1 $10x$ and $1000x$ with subtract (or x and $100x$ with subtract) A1 correct $\frac{123}{990} = \frac{41}{330}$
	(b) $\frac{41}{330} \div 2$	$\frac{41}{660}$	1	B1 cao
Total for Question: 4 marks				

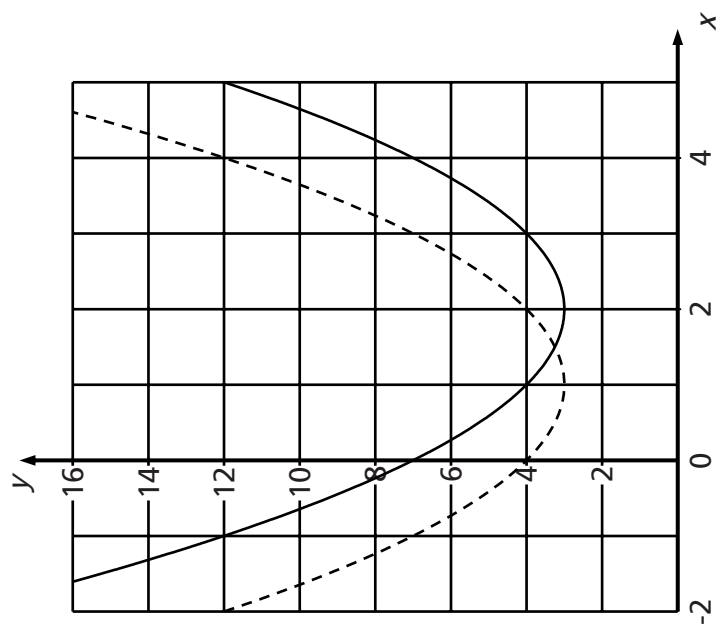
5MM2H					Additional Guidance	
Question	Working	Answer	Marks			
14.	(a)	$x(x+4) + 3 \times 2 = 50$ $x^2 + 4x + 6 = 50$ OR $2(x+3) + x(x+2) = 50$ $2x+6+x^2+2x=50$	3	AG	M1 split area into rectangles with correct expressions for areas A1 expand correctly A1 set = 50 and conclude	
	(b)(i)	$x = \frac{-4 \pm \sqrt{4^2 - 4 \times 1 \times (-44)}}{2}$ $x = \frac{-4 \pm \sqrt{192}}{2}$ OR $(x+2)^2 - 2^2 - 44$ $(x+2) = \pm \sqrt{48}$	4	4.93 or -8.93	M1 $(x+a)(x+b)$ with $ab = -45$ A1 $(x+9)(x-5)$ A1 cao OR M1 $x = \frac{-4 \pm \sqrt{4^2 - 4 \times 1 \times (-44)}}{2}$ allow sign errors in b and c M1 $x = \frac{-4 \pm \sqrt{192}}{2}$ A1 OR M1 $(x+2)^2 - 2^2 - 44$ M1 $(x+2) = \pm \sqrt{48}$ A1 $x = 4.93$ or -8.93 (both 'or better')	
	(ii)			8.93	B1 cao	
					Total for Question: 7 marks	
15.	(a)	$3x - x < 8 + 5$ $2x < 5$ $x < \frac{13}{2}$ or 6.5	2	$x < 6.5$	M1 A1	
	(b)	$5x > x - 8$ $4x > 8$ $x > 2$ Correct inequality diagram $-2 < x < 6.5$	3	$-2 < x < 6.5$	B1 for correct solution of inequality M1 for correct inequality diagram A1 cao	
					Total for Question: 5 marks	

5MM2H/X				
Question	Working	Answer	Mark	Additional Guidance
16.	$x(x-3) = 88$ $x^2 - 3x - 88 = 0$ $(x+8)(x-11) = 0$ $x = -8, x = 11$ OR $x(x-3) = 88$ $x^2 - 3x - 88 = 0$ $x = \frac{3 \pm \sqrt{9 - 4(1)(-88)}}{2}$ $x = \frac{3 \pm 19}{2}$	-8, 11	5	M1 for setting up equation A1 for correct simplification M1 for correct factorisation A1 cao A1 cao OR M1 for setting up equation A1 for correct simplification M1 for correct substitution into formula A1 cao A1 cao
Total for Question: 5 marks				
17.	$y = 8 + x$ $x^2 + y = 34$ $x^2 + (8+x)^2 - 34 + 0$ $2x^2 + 16x + 30 = 0$ $(x+3)(x+5) = 0$	$x = -3, y = 5$ $x = -5, y = 3$	5	M1 for rearranging $y - x = 8$ and for substituting into $x^2 + y^2 = 34$ A1 for correct simplification M1 for correct factorisation A2 cao for two correct pairs of values A1 cao for either both x values correct or both y values correct
Total for Question: 5 marks				

5MM2H/X					
Question	Working	Answer	Mark	Additional Guidance	
18.	(a)	Correct graph	2	M1 translation parallel to the x-axis A1 by -1 units	
QWC ii, iii	(b) $(x + a)^2 - 4(x + a) + 7$ $x^2 + 2ax + a^2 - 4x - 4a + a = 2$	Translation by $\begin{pmatrix} -2 \\ -6 \end{pmatrix}$	4	M1 replace x by $x + a$ in $f(x + a)$ M1 expand correctly A1 $a = 2$ A1 cao QWC: All calculations are attributable, with working clearly laid out in a clear progression of process	
Total for Question: 6 marks					
19. QWC ii, iii	(a) $(mn - 1)^2 = m^2n^2 - 2mn + 1$ $(m + n)^2 = m^2 + n^2 + 2mn$ Adding $m^2n^2 + 1 + m^2 + n^2$ $m^2n^2 + m^2 + n^2 + 1$ $m^2(n^2 + 1) + 1(n^2 + 1)$	Proof	3	B1 $(mn - 1)^2 = m^2n^2 - 2mn + 1$ and $(m + n)^2 = m^2 + n^2 + 2mn$ B1 $m^2n^2 + 1 + m^2 + n^2$ B1 convincing factorisation to give $(m^2 + 1)(n^2 + 1)$ QWC: All calculations are attributable, with working clearly laid out in a clear progression of process	
	(b) Set $m = n$ in the above and get $(m^2 - 1)^2 + (2m)^2 = (m^2 + 1)^2$ $(m^2 + 1)^2$ From Pythagoras, the third side is $(m^2 + 1)$	Proof	2	M1 Set $m = n$ in the above and get: $(m^2 - 1)^2 + (2m)^2 = (m^2 + 1)^2$ C1 From Pythagoras, the third side is $(m^2 + 1)$	
	(c) 5×10001 $m = 2, n = 100$	199^2 and 102^2	2	M1 set $m = 2, n = 100$ in (a) A1 99^2 and 102^2	
Total for Question: 7 marks					

5MM2H				
Question	Working	Answer	Mark	Additional Guidance
20.	$9^2 + 10.5^2 - 2 \times 9 \times 10.5 \cos 70 =$ (BD^2) $191.25 - 64.64 = 126.6$ $\frac{\sin DBC}{7.5} = \frac{\sin 80}{11.25}$ $DBC = \sin^{-1} \left(\frac{7.5 \times \sin 80}{11.25} \right)$ $= 41.0(3\dots)$	41.0	6	M1 $9^2 + 10.5^2 - 2 \times 9 \times 10.5 \cos 70$ M1 correct order of evaluation to get (BD^2) A1 11.3 or better (11.252...) M1 $\frac{\sin DBC}{7.5} = \frac{\sin 80}{11.25}$ M1 $DBC = \sin^{-1} \left(\frac{7.5 \times \sin 80}{11.25} \right)$ A1 41.0 or better
				Total for Question: 6 marks

20.



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