1MA0/3H

Edexcel GCSE

Mathematics (Linear) – 1MA0

Practice Paper 3H (Non-Calculator)

Set C

Higher Tier

Time: 1 hour 45 minutes

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

Items included with question papers
Nil

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.

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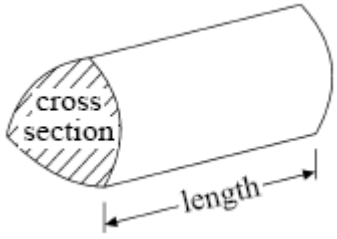
GCSE Mathematics (Linear) 1MA0

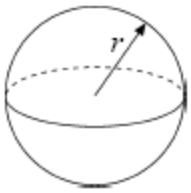
Formulae: Higher Tier

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

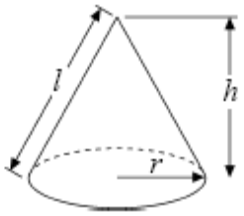
Volume of prism = area of cross section × length



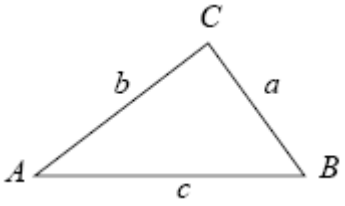
Volume of sphere $\frac{4}{3}\pi r^3$
Surface area of sphere $= 4\pi r^2$



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 $ax2+ bx + c = 0$
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 TWENTY ONE questions

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. A postman delivers mail on Bolton Road.

Each house number on one side of the road is an even number.

The postman delivers to houses from house number 308 to house number 400

Work out the greatest number of houses between house number 308 and house number 400

……

(2)

On the opposite side of the road each house number is an odd number.

The postman delivers mail to n houses on this side of the road.

He delivers mail to is house number 321, house number 323, and so on.

Write down an expression, in terms of n, for the least number of the final house.

……

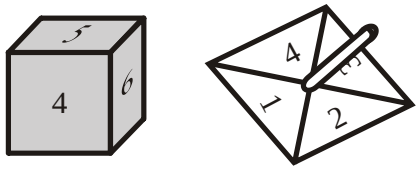
(2)

(Total 4 marks)

2. A village fair has stalls to raise money for charity.

On one stall there is a game where you roll a 6-sided dice and spin a 4-sided spinner.

The dice is labelled 1, 2, 3, 4, 5, 6
The spinner is labelled 1, 2, 3, 4



The score on the dice and the score on the spinner are added to get the total score.
The table shows some of the possible total scores.

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3					
3	4					
4	5					

(a) Complete the table of possible total scores.

(2)

People pay 50p to play the game.

The prizes are:

£1 for a total score of 7 or 8

£2 for a total score of 9 or 10

During one day of the fair, exactly 360 people played the game.

*(b) Did the stall make a profit or a loss on this day?
You must fully explain your answer.

(5)
(Total 7 marks)

3. (a) Solve $3x^2 = 48$

$x =$ .....

(2)

(b) Solve $2x + 4 = 6(x - 1)$

$x =$ .....

(3)

(Total 5 marks)

4.

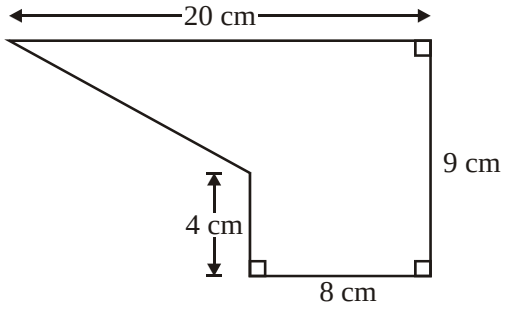


Diagram **NOT** accurately drawn

The diagram shows a shape.
Work out the area of the shape.

..... cm^2

(Total 4 marks)

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5. Gordon is going to open a restaurant.
He wants to know how often people eat out at a restaurant.
He designs a questionnaire.
He uses this question on a questionnaire.

"How often do you go to a restaurant?"

Never	Sometimes	Often

(a) Write down two things that are wrong about this question.

1.....

.....

2.....

.....

(2)

(b) Design a more suitable question Gordon could use to find out how often people eat out at a restaurant.

(2)

Gordon asks his family "Do you agree that pizza is better than pasta?"

This is not a good way to find out what people who might use his restaurant like to eat.

(c) Write down two reasons why this is not a good way to find out what people who might use his restaurant like to eat.

1st reason .....

.....

2nd reason .....

.....

(2)

(Total 6 marks)

6. Mr Green buys a garden spade.
The spade costs £19.50 plus 20% VAT.

Garden spade
£19.50 + 20% VAT

(a) Calculate the total cost of the spade.

£ .....
(3)

Mr Green makes some compost.

He mixes soil, manure and leaf mould in the ratio 3:1:2

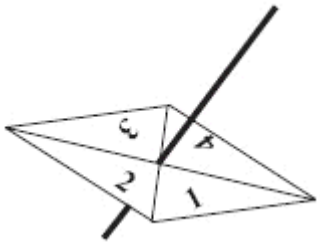
Mr Green makes 72 litres of compost.

(b) How many litres of leaf mould does he use?

..... litres
(3)

(Total 6 marks)

7. Here is a 4-sided spinner.



The sides of the spinner are labelled 1, 2, 3 and 4.
The spinner is biased.

The probability that the spinner will land on each of the numbers 2 and 3 is given in the table.

The probability that the spinner will land on 1 is equal to the probability that it will land on 4

Number	1	2	3	4
Probability	x	0.3	0.2	x

Sarah is going to spin the spinner 200 times.

Work out an estimate for the number of times it will land on 4

.....

(Total 4 marks)

8.

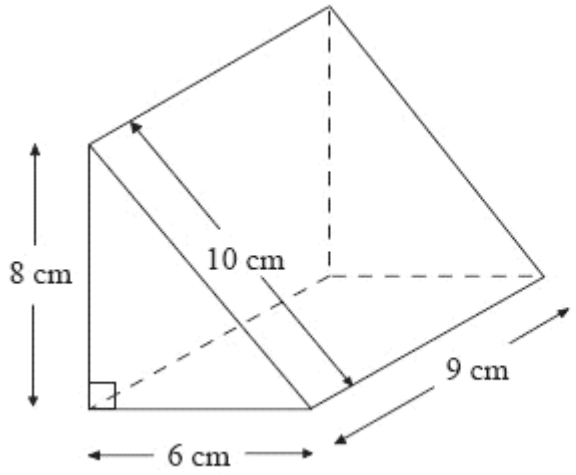


Diagram **NOT** accurately drawn

Work out the surface area of the triangular prism.

.....

(Total 4 marks)

9. (a) Complete the table of values for $y = x^2 - 3x - 1$.

x	–2	–1	0	1	2	3	4
y		3	–1	–3			3

(2)

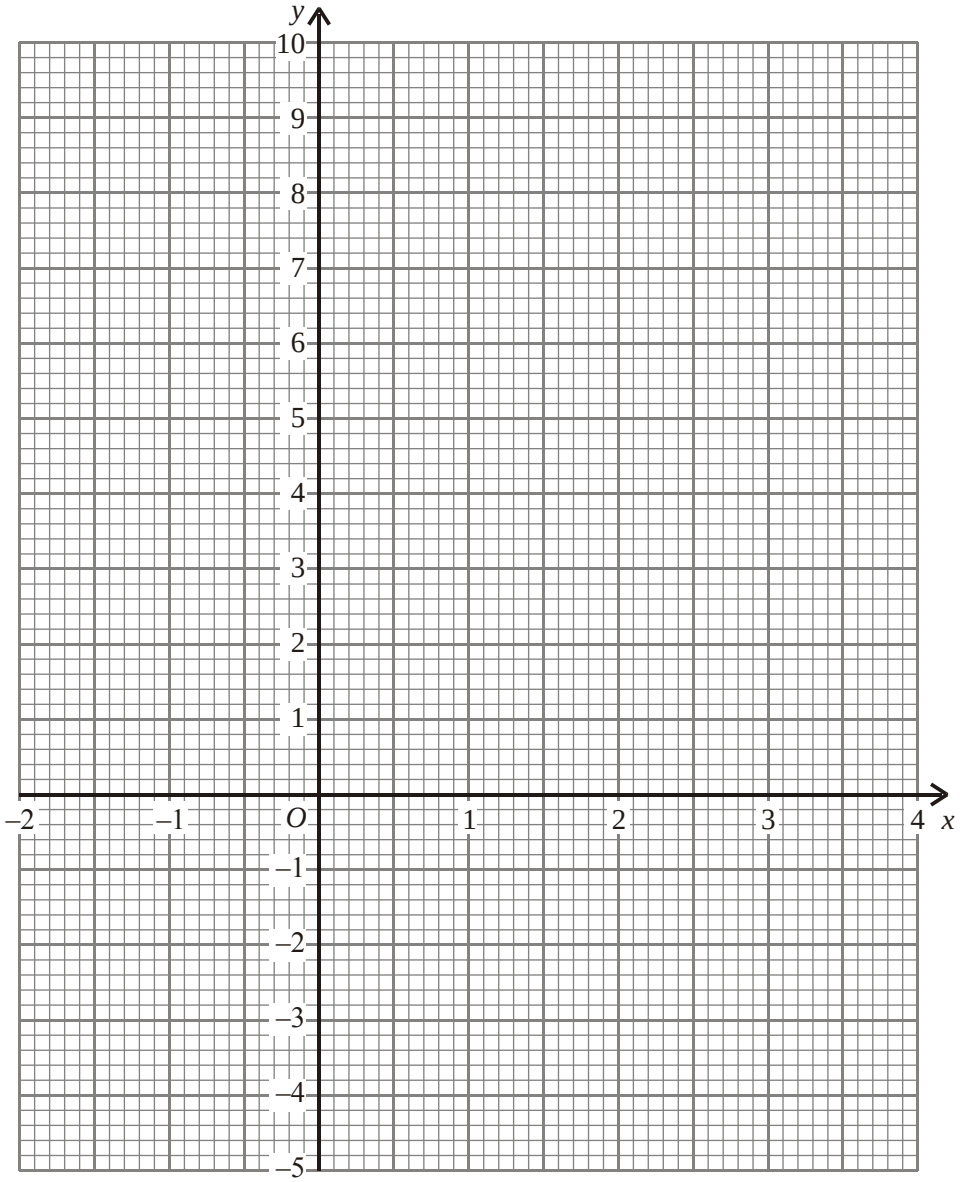
(b) On the grid below, draw the graph of $y = x^2 - 3x - 1$.

(2)

(c) Use your graph to find an estimate for the minimum value of y.

.....

(1)



(Total 5 marks)

10. (a) Work out the value of $\frac{2}{3} \times \frac{3}{4}$

Give your answer as a fraction in its simplest form.

.....

(2)

(b) Work out the value of $1\frac{2}{3} + 2\frac{3}{4}$

Give your answer as a fraction in its simplest form.

.....

(3)

(Total 5 marks)

---

11. The mass of 5 m^3 of copper is 44 800 kg.

(a) Work out the density of copper.

..... kg/m^3

(2)

The density of zinc is 7130 kg/m^3.

(b) Work out the mass of 5 m^3 of zinc.

..... kg

(2)

(Total 4 marks)

---

12. (a) Solve the inequality $3x + 12 > 2$

.....

(2)

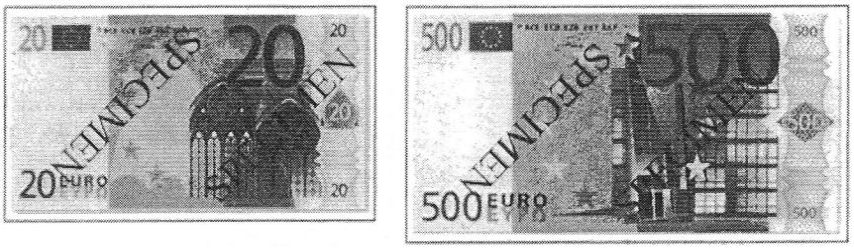
(b) Expand and simplify $(x - 7)(x + 3)$

.....

(2)

(Total 4 marks)

***13.**



Pictures **NOT** accurately drawn

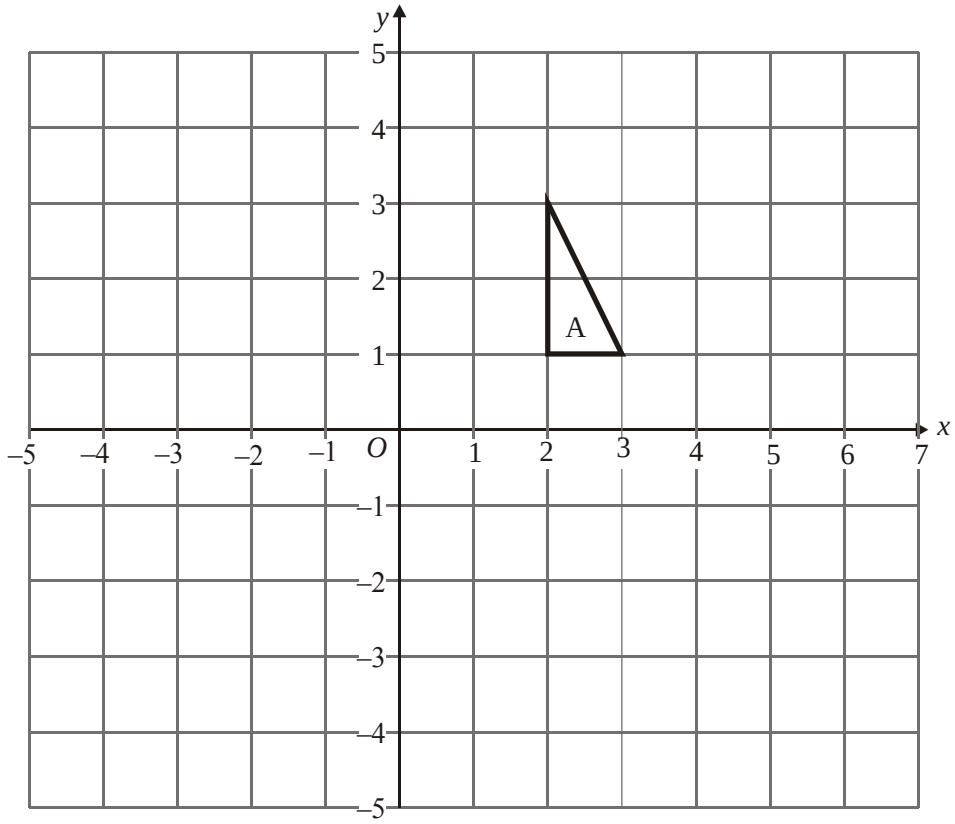
A 20 Euro note is a rectangle 133 mm long and 72 mm wide.

A 500 Euro Note is a rectangle 165 mm long and 82 mm wide.

Show that the two rectangles are not mathematically similar.

(Total 3 marks)

14.



Enlarge triangle **A** by scale factor $-1\frac{1}{2}$, centre *O*.

(Total 3 marks)

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15. (a) Solve $\frac{x}{3} - 5 = 3(x - 2)$

$x =$ .....

(4)

(b) Solve $x^2 - 3x - 18 = 0$

.....

(3)

(Total 7 marks)

---

16. Work out the value of

(a) $(2^2)^3$

.....

(1)

(b) $(\sqrt{3})^2$

.....

(1)

(c) $\sqrt{2^4 \times 9}$

.....

(2)

(d) 4^{-2}

.....

(1)

(Total 5 marks)

---

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

.....

(4)

(b) Calculate x when $F = 64$.

.....

(2)

(Total 6 marks)

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18. Jenni has a box of chocolates.

The box contains 6 plain, 4 milk and 5 white chocolates.

Jenni takes two chocolates at random from the box.

Work out the probability that at least one of these chocolates will be a milk chocolate.

.....

(Total 4 marks)

19.

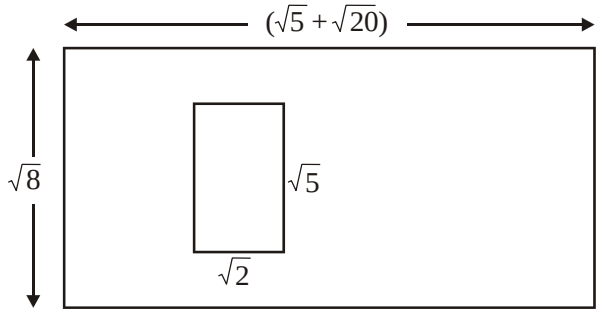


Diagram **NOT** accurately drawn

A large rectangular piece of card is $(\sqrt{5} + \sqrt{20})$ cm long and $\sqrt{8}$ cm wide.

A small rectangle $\sqrt{2}$ cm long and $\sqrt{5}$ cm wide is cut out of the piece of card.

Express the area of the card that is left as a percentage of the area of the large rectangle.

.....%

(Total 4 marks)

20.

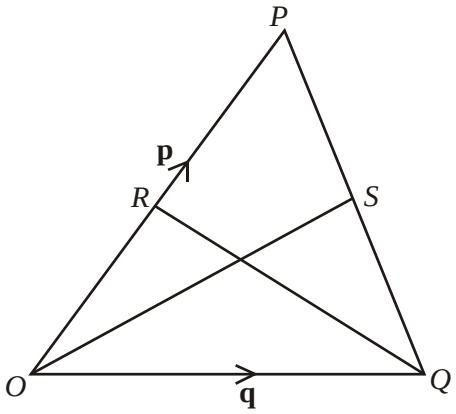


Diagram **NOT** accurately drawn

OPQ is a triangle.

R is the midpoint of *OP*.

S is the midpoint of *PQ*.

$\overrightarrow{OP} = p$ and $\overrightarrow{OQ} = q$

(i) Find $\overrightarrow{OS}$ in terms of *p* and *q*.

$\overrightarrow{OS}$ = ...

(ii) Show that *RS* is parallel to *OQ*.

(Total 5 marks)

21. The diagram shows a sector of a circle with a radius of x cm and centre O.

PQ is an arc of the circle.

Angle $POQ = 120°$

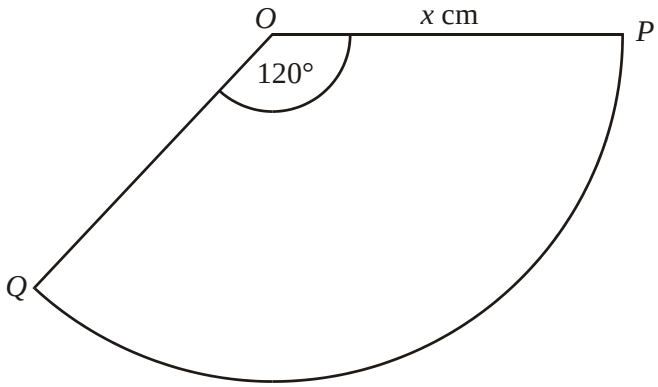


Diagram **NOT** accurately drawn

(a) Write down an expression in terms of π and x for

(i) the area of this sector,

.....

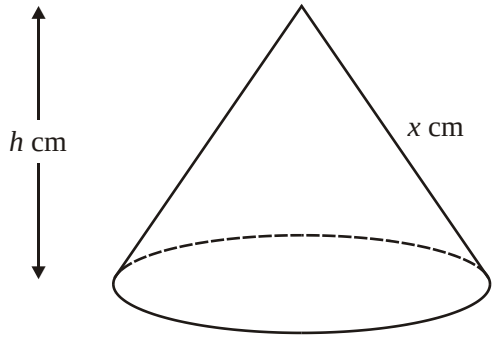
(ii) the arc length of this sector.

.....

(2)

The sector is the net of the curved surface of this cone.

Arc PQ forms the circumference of the circle that makes the base of the cone.



The curved surface area of the cone is A cm^2.

The volume of the cone is V cm^3.

The height of the cone is h cm.

Given that $V = 3A$,

(b) find the value of h.

.....

(3)

(Total 5 marks)

TOTAL FOR PAPER: 100 MARKS

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Question		Working	Answer	Mark	Notes
1(a)		(400 – 308)/2 + 1	47	2	M1 for (400 – 308)/2 or 46 seen A1 cao
1(c)			$2n - 1$	2	B2 cao [B1 for $2n \pm k$ where $k \neq -1$]
2(a)			4 5 6 7 8 5 6 7 8 9 6 7 8 9 10	2	B2 for a fully correct table [B1 at least 5 correct entries]
2(b)		P(7 or 8) = 7/24 P(9 or 10) = 3/24 7/24 x 360 x 1 = 105 3/24 x 360 x 2 = 90 Takings = 360 x 0.5 = 180	A loss of £15	5	M1 for P(7 or 8) {= 7/24}or P(9 or 10) {= 3/24} oe M1 for '7/24' x 360 x 1(= 105) or'3/24' x 360 x 2 (= 90) M1 for 360 x 0.5 (= 180) A1 for 180 and 195 seen C1 for 'a loss of £15' oe
3(a)		√(48/3)	±4	2	M1 for √(48/3) A1 for 4 or -4 or ±4
3(b)		$2x + 4 = 6(x - 1)$ $2x + 4 = 6x - 6$ $10 = 4x$	2.5	3	M1 for $2x + 4 = 6(x - 1)$ M1 for $4 + 6 = 6x - 2x$ A1 cao
4		9 x 8 + ½ x 5 x 12	102	4	M1 for splitting M1 for either 9 x 8 or ½ x 5 x 12 oe M1 for 9 x 8 + ½ x 5 x 12 A1 cao

Question		Working	Answer	Mark	Notes
5(a)			Vague response boxes Question does not include a time period	2	B1 for a correct criticism of the question B1 for a correct criticism of the response boxes
5(b)			How many times a month do you go to a restaurant? 0 1 – 3 4 – 5 6+	2	B1 for a relevant question inc. time period B1 for at least 3 non-overlapping response boxes
5(c)			A leading question Restricted/biased sample	2	B1 for a 'leading/biased' question oe B1 for 'small/biased'sample oe
6(a)		19.5 + 19.5/5	23.40	3	M1 for 19.5/5 M1 for 19.5 + 19.5/5 oe A1 cao
6(b)		72 ÷ 6 = 12 12 x 2	24	3	M1 for 72 ÷ 6 M1 for '12' x 2 A1 cao
7		(1 – 0.3 – 0.2)/2 x 200	50	4	M1 for 1 – 0.3 – 0.2 M1 for (1 – 0.3 – 0.2)/2 or 0.25 seen M1 for '0.25' x 200 A1 cao
8		½ x 6 x 8 x 2 + (8+6+10) x 9	264 cm^2	4	M1 for ½ x 6 x 8 or 8x9 or 6x9 or 10x9 M1 for ½ x 6 x 8 x 2 + (8+6+10) x 9 oe A1 for 264 B1 ft for cm^2

Question		Working	Answer	Mark	Notes
9(a)			**9**, 3, -1, -3, **-3, -1**, 3	2	B2 for fully correct table [B1 for 1 or 2 correct entries]
9(b)			Graph	2	B2 ft for a fully 'correct' graph through their points [B1 at least 6 of their correctly plotted points]
9(c)			-3.25	1	B1 for an answer in the range –3.1 to -3.5
10(a)		6/12	½	2	M1 for 6/12 oe A1 cao
10(b)		$3+\frac{8}{12}+\frac{9}{12}=3\frac{17}{12}$	$4\frac{5}{12}$	3	M1 for $\frac{8}{12}+\frac{9}{12}$ oe M1 for $3+\frac{17}{12}$ A1 cao
11(a)		44800 ÷ 5	8960	2	M1 for 44800 ÷ 5 A1 cao
11(b)		7130 x 5	35650	2	M1 for 7130 x 5 A1 cao
12(a)		$3x > 2 – 12$	$x > -10/3$ oe	2	M1 for $3x > 2 – 12$ A1 for $x > -10/3$ or better
12(b)		$x^2 – 7x + 3x – 21$	$x^2 – 4x – 21$	2	M1 for 3 correct out of 4 terms or 4 correct terms ignoring signs A1 for $x^2 – 4x – 21$ oe

Question		Working	Answer	Mark	Notes
13		165 ÷ 82 > 2 133 ÷ 82 < 2	Since 165 ÷ 82 > 2 and 133 ÷ 82 < 2, the scale factors are different; so not similar	3	M1 for considering 165 ÷ 82 or 133 ÷ 82 oe A1 for correct estimated answers C1 for a correct conclusion based upon their answers
14			Triangle with coordinates (-3,-1.5), (-4.5,-1.5) and (-3,-4.5)	3	B3 for a correct triangle [B2 for an enlargement of 1.5 about (0,0) or for an enlargement of -1 about (0,0) B1 for an enlargement of 1.5 about any point]
15(a)		$\frac{x}{3} - 5 = 3x - 6$	3/8	4	M1 for $3x - 6$ M1 for $x - 15 = 9x - 18$ M1 for rearranging so that numbers and x-terms or on opposite sides of the equation A1 for 3/8 oe
15(b)		$(x - 6)(x + 3)$	$x = 6$ and $x = -3$	3	M1 for $(x \pm 6)(x \pm 3)$ A1 for $x = 6$ and A1 for $x = -3$
16(a)		2^6	64	1	B1 cao
16(b)			3	1	B1 cao
16(c)		$\sqrt{(2^4 x 3^2)} = 2^2 \times 3$	12	2	M1 for $2^2 \times 3$ oe A1 cao
16(d)		$1/4^2$	1/16	1	B1 cao

Question		Working	Answer	Mark	Notes
17(a)		$4 = k/3^2$ $F = 36/x^2$ $36/2^2$	9	4	M1 for $F = k/x^2$ M1 for $4 = k/3^2$ M1 for '36'/2^2 A1 cao
17(b)		$64 = 36/x^2$ $\sqrt{(36/64)}$	3/4	2	M1 for $64 = 36/x^2$ A1 cao
18		$\frac{6}{15}\times\frac{4}{14}+\frac{4}{15}\times\frac{6}{14}+\frac{4}{15}\times\frac{3}{14}$ $+\frac{4}{15}\times\frac{5}{14}+\frac{5}{15}\times\frac{4}{14}$	10/21		M1 for $\frac{4}{14}$ or $\frac{6}{14}$ or $\frac{3}{14}$ or $\frac{4}{14}$ M1 for $\frac{6}{15}\times\frac{4}{14}$ or $\frac{4}{15}\times\frac{6}{14}$ or $\frac{4}{15}\times\frac{3}{14}$ or $\frac{4}{15}\times\frac{5}{14}$ or $\frac{5}{15}\times\frac{4}{14}$ M1 for $\frac{6}{15}\times\frac{4}{14}+\frac{4}{15}\times\frac{6}{14}+\frac{4}{15}\times\frac{3}{14}+\frac{4}{15}\times\frac{5}{14}+\frac{5}{15}\times\frac{4}{14}$ A1 for 10/21 oe
19		$\sqrt{8}(\sqrt{5}+\sqrt{20})-\sqrt{5}\times\sqrt{2}$ $=2\sqrt{2}(\sqrt{5}+2\sqrt{5})-\sqrt{5}\times\sqrt{2}$ $=2\sqrt{2}\times3\sqrt{5}-\sqrt{5}\times\sqrt{2}$ $=6\sqrt{10}-\sqrt{10}=5\sqrt{10}$ $5\sqrt{10}$ / $6\sqrt{10}$ x 100 500/6	83.33…	4	M1 for $\sqrt{8}(\sqrt{5}+\sqrt{20})-\sqrt{5}\times\sqrt{2}$ oe M1 for $2\sqrt{2}(\sqrt{5}+2\sqrt{5})-\sqrt{10}$ M1 for $5\sqrt{10}$ / $6\sqrt{10}$ x 100 A1 for 83.33…
20(i) (ii)		q + ½ (p – q) RS = ½ (p+q) – ½ p = ½ q RS = ½ OQ parallel	½ (p+q) Proof	5	M1 for QP = q – p M1 for OS = q + ½ QP A1 for ½ (p+q) M1 for RS = ½ (p+q) – ½ p C1 for conclusion of proof; ie RS = ½ q and relating this to OQ = q

Question		Working	Answer	Mark	Notes
21(a)			$\pi x^2/3$ $2\pi x/3$	2	B1 for $\pi x^2/3$ oe B1 for $2\pi x/3$ oe
21(b)		A = $2\pi x/3 = 2\pi r$ r = $x/3$ V = $1/3 \times \pi \times (x/3)^2 \times h = 3 \times \pi x^2/3$ $1/3\ (1/3)^2 \times h = 1$	27	3	M1 for $2\pi x/3 = 2\pi r$ M1 for $1/3 \times \pi \times (x/3)^2 \times h = 3 \times \pi x^2/3$ A1 cao