1MA0/3H

Edexcel GCSE

Mathematics (Linear) – 1MA0

Practice Paper 3H (Non-Calculator)
Set B

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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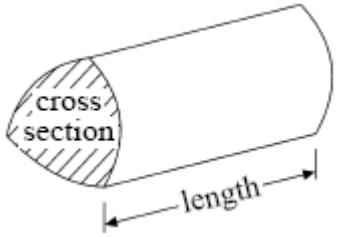
GCSE Mathematics (Linear) 1MA0

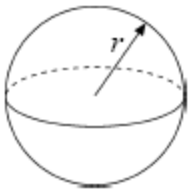
Formulae: Higher Tier

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

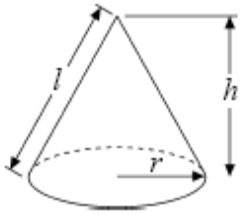
Volume of prism = area of cross section × length



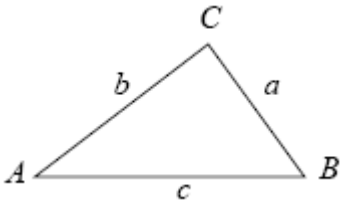
Volume of sphere $\frac{4}{3}\pi r^3$
Surface area of sphere $= 4\pi r^2$



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 TWO questions

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. Ken has a car hire business.
The cost, in pounds, of hiring a car from Ken can be worked out using this rule.

Add 6 to the number of day's hire
Multiply your answer by 12

Michelle wants to hire a car from Ken for 9 days.

(a) Work out how much Michelle will have to pay.

£ ……..

(2)

Angela a hired a car from Ken and paid £156

(b) Work out how many days Angela hired a car for.

……. days

(2)

The cost of hiring a car for n days is C pounds.

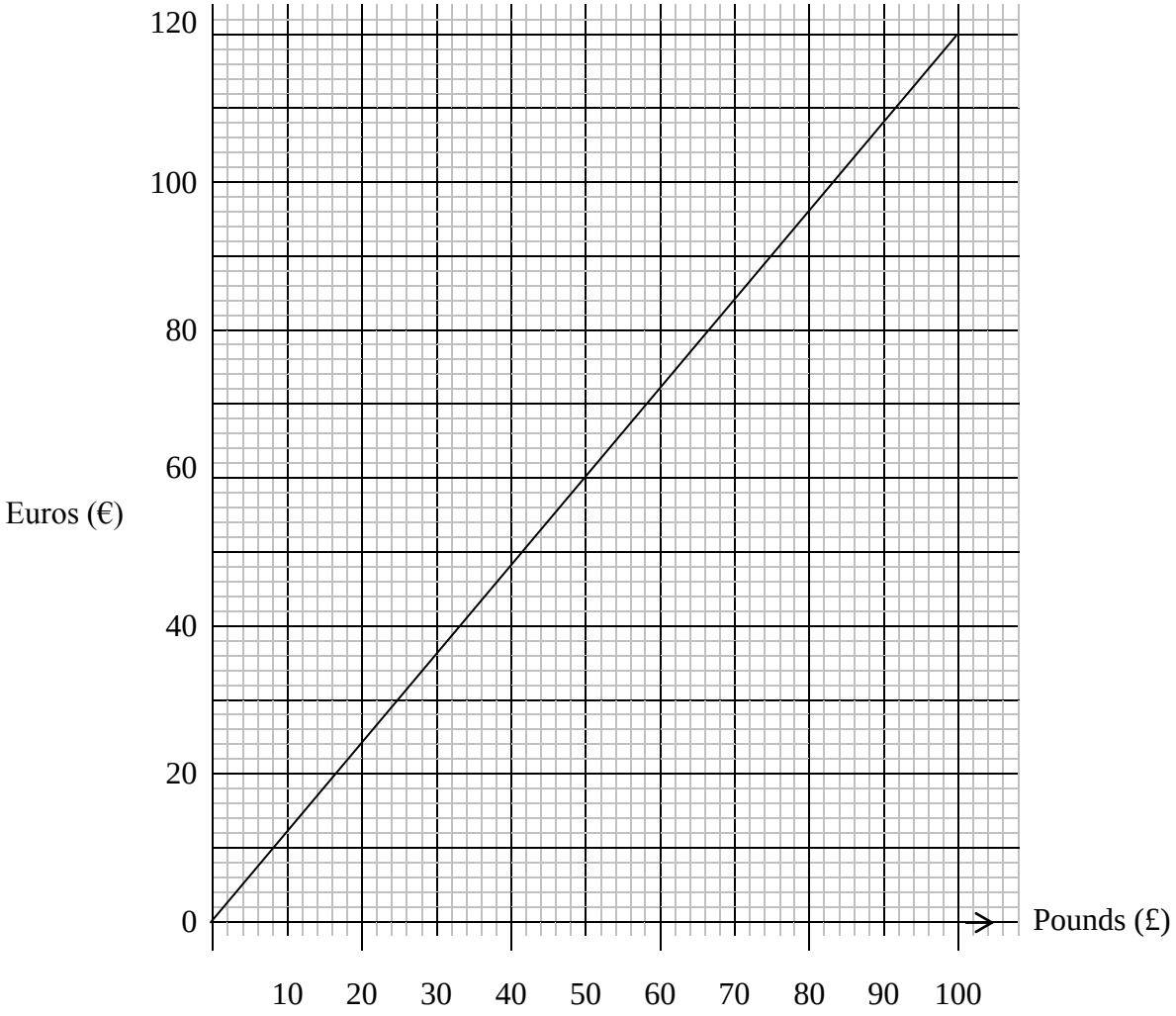
(c) Write down a formula for C in terms of n.

……..

(3)

(Total 7 marks)

***2.** On these two pages you will find conversion graphs from pounds (£) to Euros (€) and from pounds (£) to dollars ($).



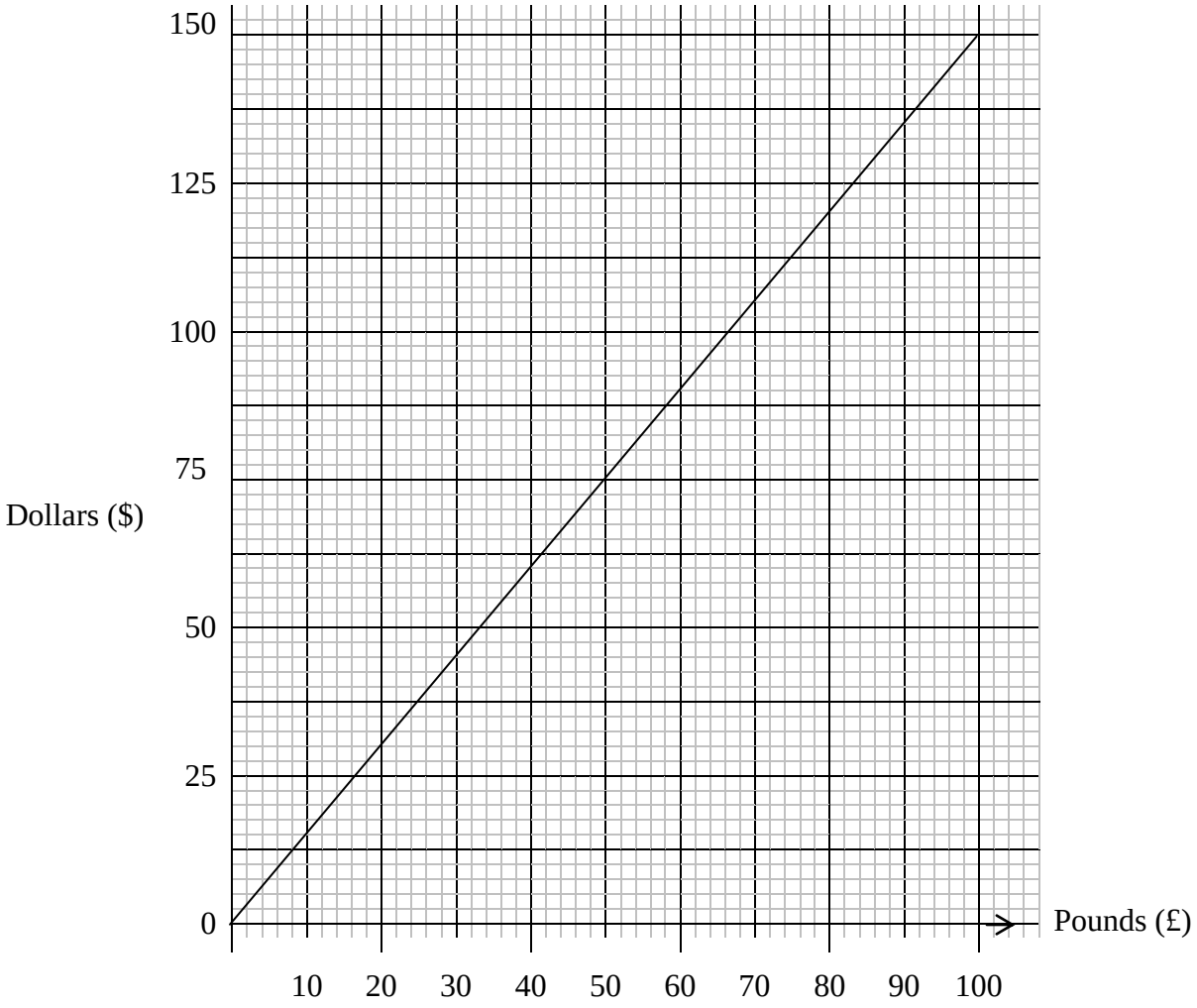
Jessica is shopping on the internet for a camera.
The same camera is on two websites.

On a Spanish website, the cost of the camera is €239.99
On an American website, the cost of the camera is $279.95

(a) From which website should Jessica buy the camera?
You must show clearly how you found your answer.

……..

(4)



(b) Estimate the exchange rate from the euro (€) to the dollar ($)

.....

(2)

(Total 4 marks)

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3. (a) Write 90 as a product of its prime factors

……

(3)

(b) Find the Lowest Common Multiple of 90 and 108

……

(2)

(Total 5 marks)

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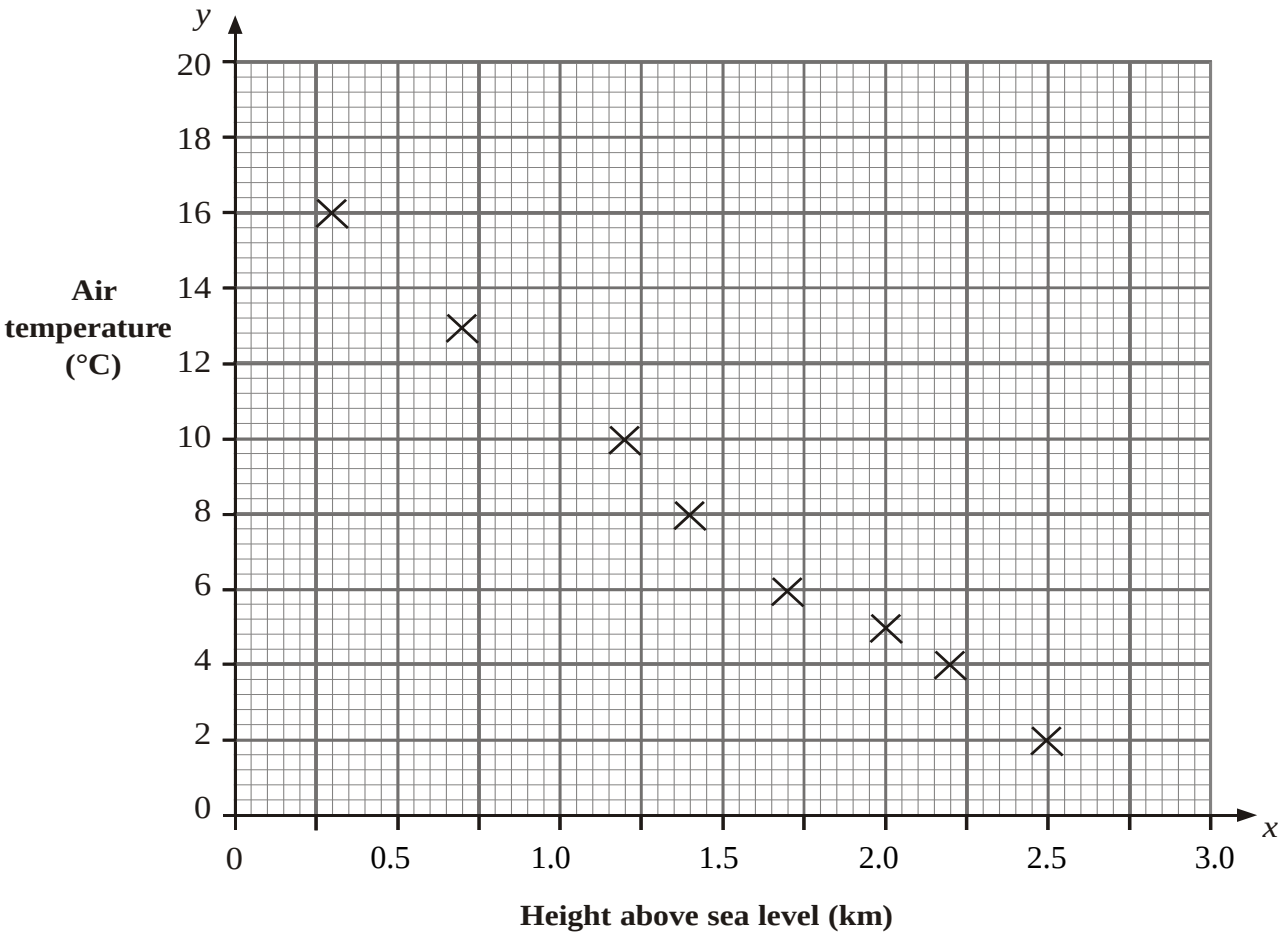
4. On a particular day, a scientist recorded the air temperature at 8 different heights above sea level. The scatter diagram shows the air temperature, y °C, at each of these heights, x km, above sea level.

Air temperature at different heights above sea level



(a) Using the scatter diagram, write down the air temperature recorded at a height of 2.5 km above sea level.

..... °C

(1)

(b) Describe the correlation between the air temperature and the height above sea level.

.....

(1)

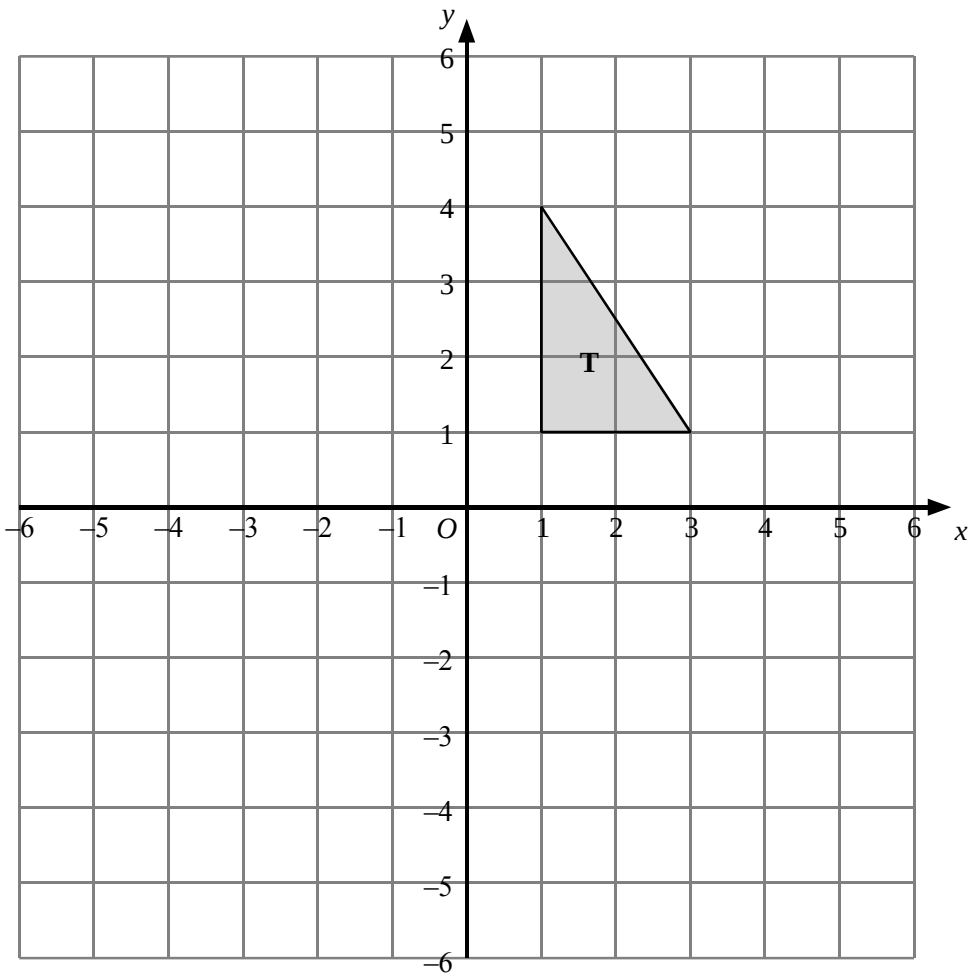
(c) Find an estimate of the height above sea level when the air temperature is 0 °C.

..... km

(2)

(Total 4 marks)

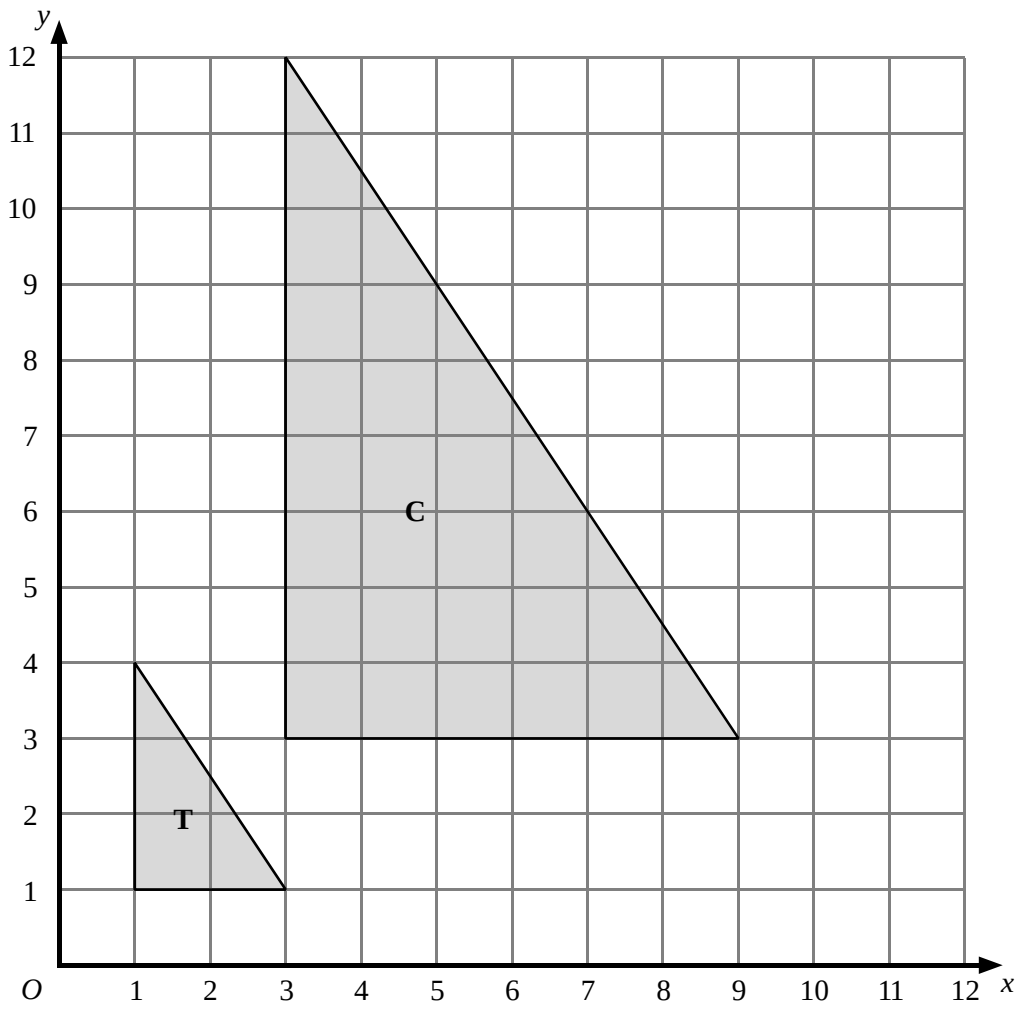
5.



Triangle **T** has been drawn on the grid.

(a) Rotate triangle **T** clockwise through 90^{o} about the point (–1, 0)
Label the new triangle **A**.

(2)



(b) Describe fully the single transformation which maps triangle **C** onto triangle **T**.

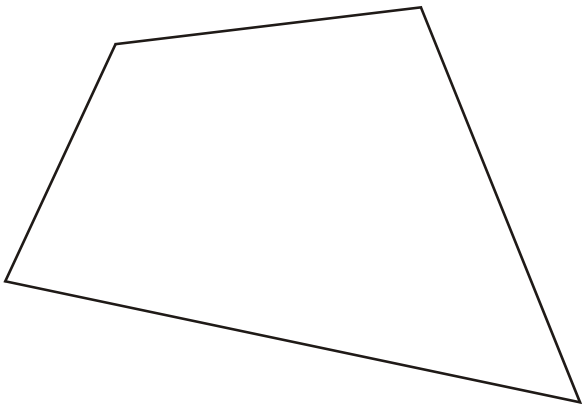
.....

.....

(3)

(Total 4 marks)

6. (a)



The sum of the angles of a triangle is 180°.

Prove that the sum of the angles of any quadrilateral is 360°.

(2)

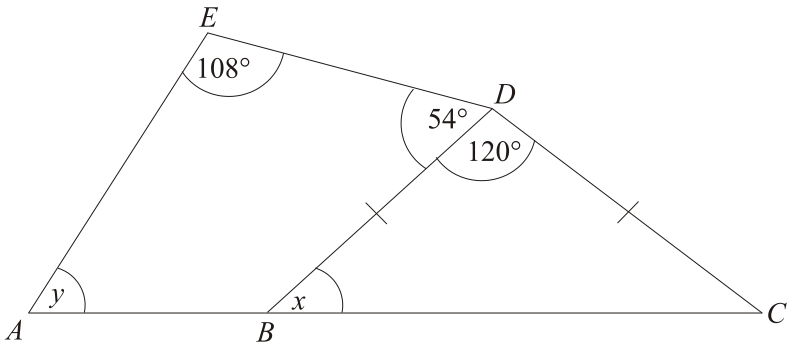


Diagram **NOT** accurately drawn

In the diagram, *ABC* is a straight line and *BD* = *CD*.

(a) Work out the size of angle *x*.

.....°

(2)

(b) Work out the size of angle *y*.

.....°

(2)

(Total 6 marks)

7. The local council is planning to build a new swimming pool.

The councillors want to get the views of the local people.

Councillor Smith suggests taking a sample from the people who attend the local sports centre.

(a) Explain why this would not be a good sample.

.....

.....

.....

(1)

Councillor Singh suggests taking a simple random sample of 100 people.

(b) Describe how the council could take a simple random sample.

.....

.....

.....

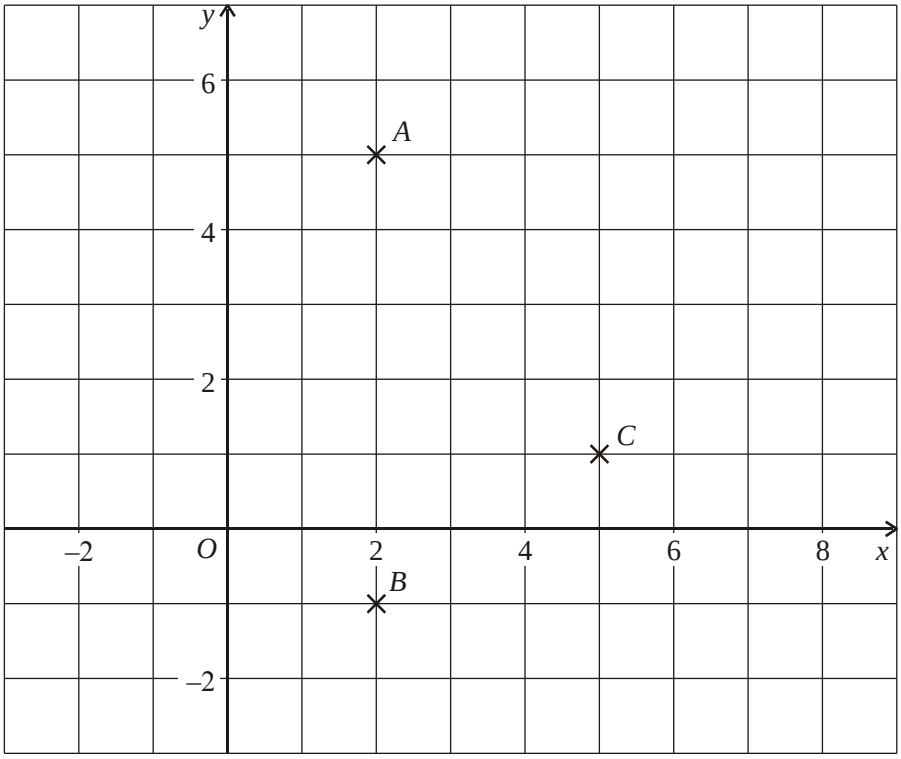
(1)

The council decided to use a questionnaire to find out how often people would use the swimming pool.

(c) Design a question the council could use on their questionnaire.

(1)
(Total 4 marks)

8. The diagram shows three points *A*, *B* and *C* on a centimetre grid.



On the grid, shade the region in which points are,

nearer to *A* than *B*,

and also less than 3 cm from *C*.

(Total 3 marks)

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9. Ann and Bob shared £240 in the ratio 3 : 5

Ann gave a **half** of her share to Colin.

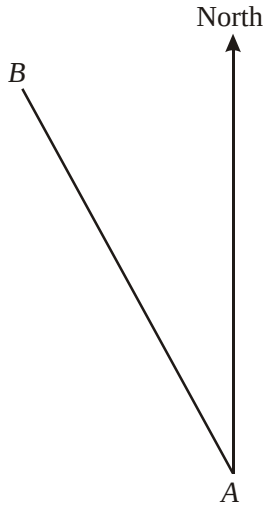
Bob gave a **tenth** of his share to Colin.

What fraction of the £240 did Colin receive?

.....

(Total 4 marks)

10.



(a) Measure and write down the bearing of *B* from *A*.

.....°

(1)

(b) On the diagram, draw a line on a bearing of 107° from *A*.

(1)

(Total 2 marks)

---

11. (a) Work out $1\frac{5}{8} + 3\frac{2}{3}$

.....

(2)

(b) Work out $3\frac{1}{2} \div 2\frac{4}{5}$

.....

(2)

(Total 4 marks)

---

12. n is an integer.

$-3 < n < 4$

(a) Write down all the possible values of n.

.....

(2)

(b) Solve $11 - x \leq 2(x + 3)$

.....

(2)

(Total 4 marks)

---

13. (a) Expand $6(2x + 3)$

.....

(1)

(b) Simplify $2y - 3z + y + 5z$

.....

(2)

(c) Expand and simplify $(p + 6)(p - 3)$

.....

(2)

(d) Factorise fully $8m^2 - 2$

.....

(2)

(Total 7 marks)

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14. 90 students took an examination.
The grouped frequency table shows information about their results.

Mark (x)	Frequency
$0 < x \leq 10$	3
$10 < x \leq 20$	10
$20 < x \leq 30$	17
$30 < x \leq 40$	30
$40 < x \leq 50$	21
$50 < x \leq 60$	7
$60 < x \leq 70$	2

(a) On the grid opposite, draw a cumulative frequency graph.

(3)

(b) Find an estimate for the median mark.

……..

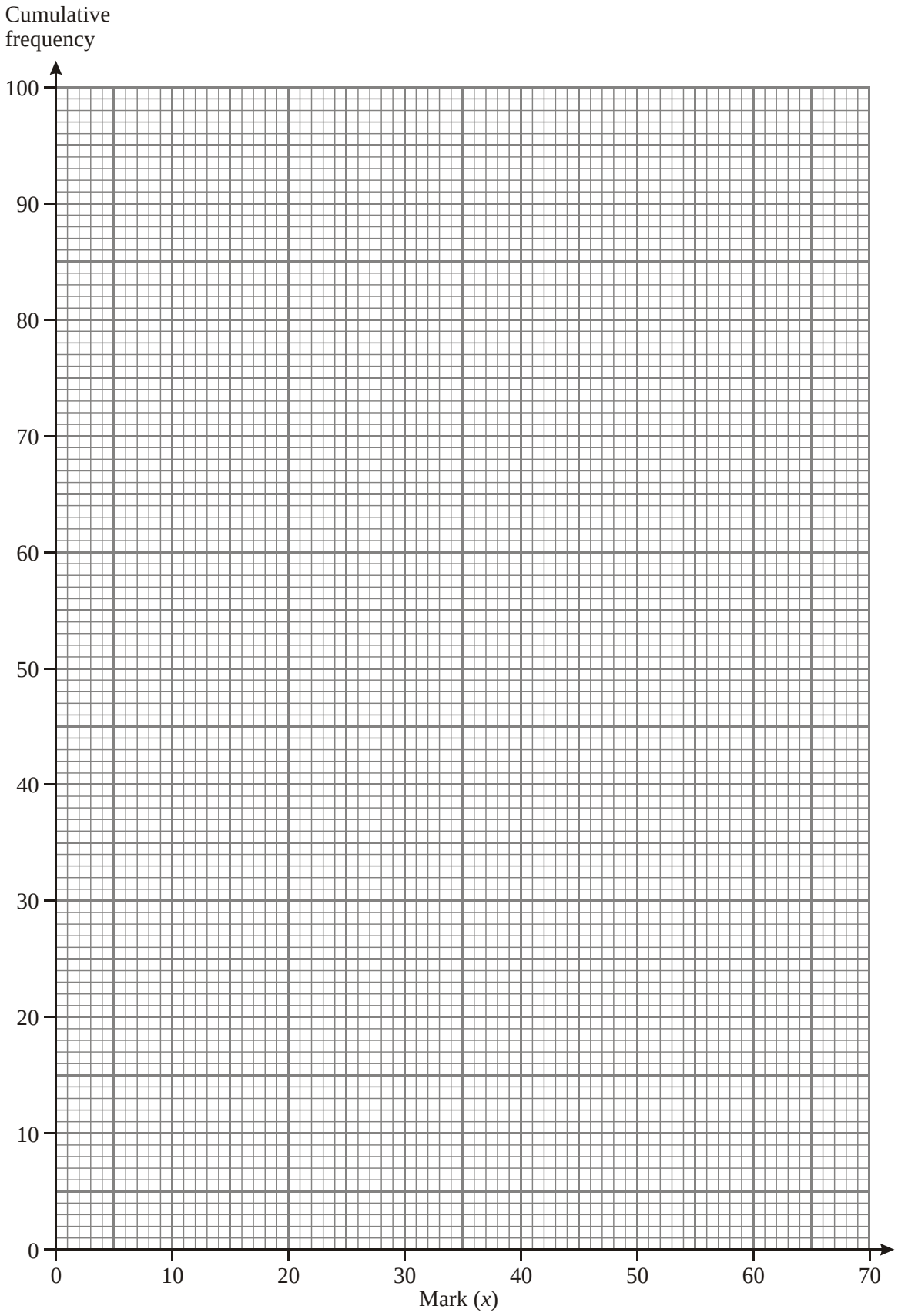
(1)

The pass mark for the examination was 28.

(c) Find an estimate for the number of students who passed the examination.

……..

(2)



(Total 6 marks)

15.

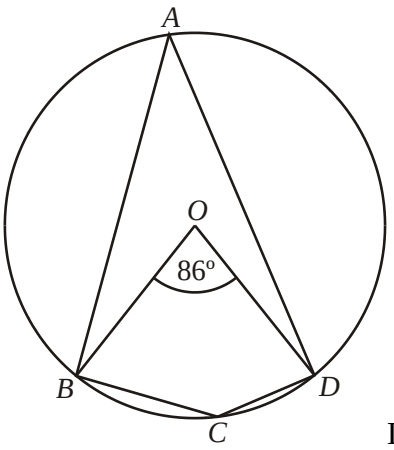


Diagram **NOT** accurately drawn

A, *B*, *C* and *D* are points on the circle, centre *O*.
Angle *BOD* = 86°

(a) (i) Work out the size of angle *BAD*.

.....°

(ii) Give a reason for your answer.

.....

.....

(2)

(b) (i) Work out the size of angle *BCD*.

.....°

(ii) Give a reason for your answer.

.....

.....

(2)

(Total 4 marks)

16. Solve the simultaneous equations

$$4x - 3y = 11$$
$$10x + 2y = -1$$

$x =$ ……

$y =$ ……

(Total 4 marks)

---

17. A field is in the shape of a rectangle.

The length of the field is 340 m, to the nearest metre.
The width of the field is 117 m, to the nearest metre.

Calculate the upper bound for the perimeter of the field.

..... m

(Total 2 marks)

---

18. (a) Express $0.\dot{2}\dot{9}$ as a fraction in its simplest form.

.....

(2)

x is an integer such that $1 \leq x \leq 9$

(b) Prove that $0.\dot{0}\dot{x} = \frac{x}{99}$

(2)
(Total 4 marks)

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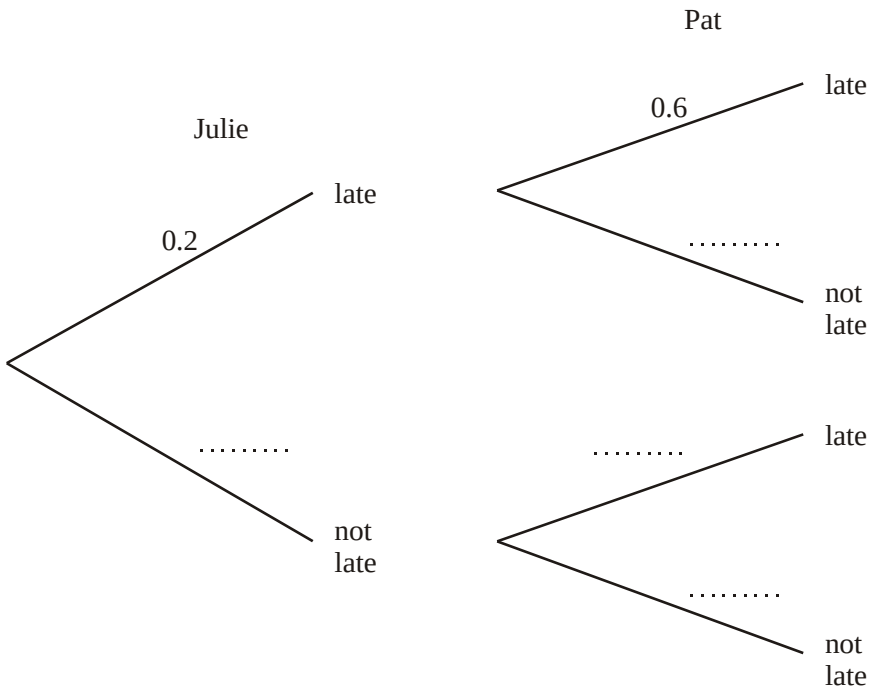
19. Julie and Pat are going to the cinema.

The probability that Julie will arrive late is 0.2
The probability that Pat will arrive late is 0.6
The two events are independent.

(a) Complete the diagram.



(2)

(b) Work out the probability that Julie and Pat will both arrive late.

.....

(2)
(Total 4 marks)

20. (a) Explain what is meant by a stratified sample.

.....

.....

(1)

The table shows some information about the members of a golf club.

Age range	Male	Female	Total
Under 18	29	10	39
18 to 30	82	21	103
31 to 50	147	45	192
Over 50	91	29	120
		Total number of members	454

The club secretary carries out a survey of the members.

He chooses a sample, stratified both by age range and by gender, of 90 of the 454 members.

(b) Work out an estimate of the number of male members, in the age range 31 to 50, he would have to sample.

.....

(2)

(Total 3 marks)

21.

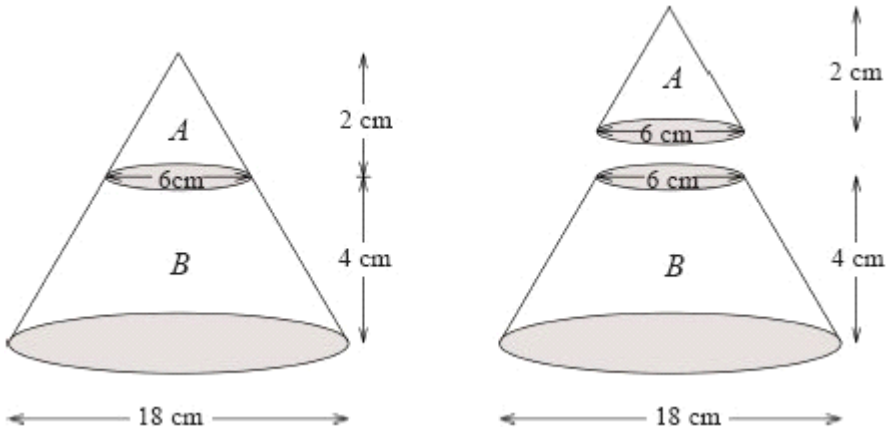


Diagram **NOT** accurately drawn

The diagram represents a large cone of height 6 cm and base diameter 18 cm.

The large cone is made by placing a small cone *A* of height 2 cm and base diameter 6 cm on top of a frustum *B*.

Calculate the volume of the frustum *B*.
Give your answer in terms of π.

.....

(Total 4 marks)

22.

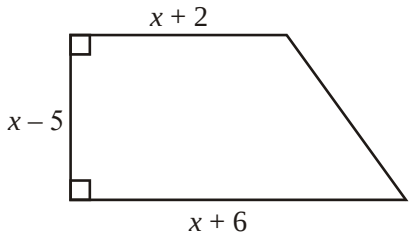


Diagram **NOT** accurately drawn

The diagram shows a trapezium.

The lengths of three of the sides of the trapezium are $x - 5$, $x + 2$ and $x + 6$.
All measurements are given in centimetres.

The area of the trapezium is 36 cm^2.

(a) Show that $x^2 - x - 56 = 0$

(4)

(b) (i) Solve the equation $x^2 - x - 56 = 0$

.....

(ii) Hence find the length of the shortest side of the trapezium.

..... cm

(4)

(Total 8 marks)

TOTAL FOR PAPER: 100 MARKS

END

Question		Working	Answer	Mark	Notes
1(a)		(9 + 6) x 12	180	2	M1 for (9 + 6) x 12 A1 cao
1(b)		(156 ÷ 12) – 6	7	2	M1 for (156 ÷ 12) – 6 A1 cao
1(c)			$C = 12(n + 6)$	3	B3 for a fully correct formula [B2 for $12(n + 6)$ or $C = 12(n + k)$ Or $C = p(n + 6)$ B1 for $12n$ or $(n + 6)$ seen]
2(a)		€239.99 ≈ €240 = £200 $279.95 ≈ $280 ≈ £185	American website since185 < 200	4	M1 for reading using either graph to convert any factor of either €240 or $280 into pounds or an attempt to find either conversion factor A1 for any correct conversion factor or £200 or £185 (±£4) A1 for both £200 and £185 (±£4) C1 for 'American website since185 < 200' oe
2(b)		£100 = €120 £100 = $150 150/120	1.25	2	M1 for 150/120 oe A1 for 1.25 (±0.04) [B1 for 0.8 if M0 scored]

Question		Working	Answer	Mark	Notes
3(a)		90 ÷ 2 45 ÷ 3 15 ÷ 3 5	2 x 3 x 3 x 5	3	M1 for a complete method of at least 2 correct divisions, condone one arithmetic error A1 for 2, 3, 3, 5 seen (maybe in a factor tree) A1 for 2 x 3 x 3 x 5 oe
3(b)		90 = 2 x 3 x 3 x 5 108 = 2 x 2 x 3 x 3 x 3 LCM = 2 x 2 x 3 x 3 x 3 x 5	540	2	M1 for 90 = 2 x 3 x 3 x 5 and 108 = 2 x 2 x 3 x 3 x 3 A1 cao
4(a)			2	1	B1 cao
4(b)			Negative	1	B1 cao
4(c)			2.6 to 2.9	2	B2 for answer in the range 2.6 to 2.9 [B1 for a line of best fit drawn if answer outside this range]
5(a)			Triangle at (0, -2), (3, -2), (0, -4)	2	B2 for a correct rotation [B1 for correct orientation or correct rotation 90^o anticlockwise
5(b)			Enlargement, scale factor 3 about (0, 0)	3	B1 for enlargement B1 for scale factor of 3 B1 for centre (0, 0) oe

Question		Working	Answer	Mark	Notes
6(a)		180 x 2 = 360	Proof	2	M1 for splitting the quad into two triangles C1 for stating 180 x 2 = 360
6(b)		(180 – 120)/2	30	2	M1 for (180 – 120)/2 A1 cao
6(c)		360 – 54 – 108 – (180 – 30)	48	2	M1 for 360 – 54 – 108 – (180 – '30') A1 cao
7(a)			Biased sample	1	B1 for 'biased sample" oe
7(b)			Eg: stopping the 1st 100 people in the town centre OR knock on 100 doors in the local area	1	B1 for an acceptable method
7(c)			How many times in a month would you use the swimming pool? 0 1-3 4-5 6+	2	B1 for including a time period in an appropriate question B1 for at least 3 non-everlapping response boxes.
8			Correct region shaded	3	B1 for $y = 2$ draw B1 for a circle, radius 3cm, centre C drawn B1 for correct region

Question		Working	Answer	Mark	Notes
9		240 ÷ 8 = 30 Ann = 30 x 3 = 90 Bob = 30 x 5 = 150 90 ÷ 2 + 150 ÷ 10 = 60 OR Ann = 3/8 Bob = 5/8 3/8 x ½ + 5/8 x 1/10 3/16 + 5/80 = 15/80 + 5/80	60/240 (= ¼)	4	M1 for 240 ÷ 8 = 30 M1 for 30 x 3 (= 90) or 30 x 5 (= 150) M1 for '90' ÷ 2 + '150' ÷ 10 A1 cao OR M1 for 3/8 or 5/8 M1 for 3/8 x ½ + 5/8 x 1/10 M1 for 3/16 + 5/80 A1 cao
10(a) 10(b)			330 Line drawn	1 1	B1 for 330 ±2° B1 for line drawn ±2°
11(a) 11(b)		4 + 15/24 + 16/24 = 4 + 31/24 7/2 ÷ 14/5 = 7/2 x 5/14	$5\frac{7}{24}$ $1\frac{1}{4}$	2 2	M1 for 4 + 15/24 + 16/24 oe A1 cao M1 for 7/2 or 14/5 seen A1 cao
12(a) 12(b)		 11 – x ≤ 2x + 6 5 ≤ 3x	-2, -1, 0, 1, 2, 3 $x \geq 1\frac{2}{3}$	2 2	B2 for all 6 correct integers and no extras [-1 for each error or omission] M1 for 11 – 6 ≤ 2x + x A1 cao

Question		Working	Answer	Mark	Notes
13(a)			$12x + 18$	1	B1 cao
13(b)			$3y + 2z$	2	B2 cao [B1 for $3y$ or $2z$
13(c)		$p^2 + 6p - 3p - 18$	$p^2 + 3p - 18$	2	M1 for 3 out of 4 correct terms or 4 terms correct ignoring signs
13(d)		$2(4m^2 - 1)$	$2(2m - 1)(2m + 1)$	2	M1 for $2(4m^2 - 1)$ or $(2m \pm 1)(2m \pm 1)$ A1 cao
14(a)			Cf graph	3	B3 for a cf graph drawn through (10,3), (20,13), (30,30), (40,60), (50,81), (60,88) and (70,90) [B2 for points plotted consistently within the intervals and joined, condone one plotting error. B1 for a correct cf table]
14(b)			35 to 38	1	B1 for an answer in the range 35 to 38 inc.
14(c)		90 - 26	64	2	M1 for a reading taken at $x = 28$ A1 for an answer in the range 61 to 67
15(a)(i)		86 ÷ 2	43	2	B1 cao
(ii)			Angle at centre = 2x angle at circumference		B1 for a correct reason
15(b)(i)		180 – 43	137	2	B1 cao
(ii)			Sum of the opposite angles of a cyclic quad = 180^o		B1 for a correct reason

Question		Working	Answer	Mark	Notes
16		$8x - 6y = 22$ $30x + 6y = -3$ $38x = 19$; $x = 0.5$ 4x 0.5 – 3y = 11 3y = -9	0.5. –3	4	M1 for a correct method of eliminating one unknown, condone one error. A1 for one correct unknown M1 for substituting found value into one of the equations A1 for 0.5 and -3
17		2 x 340.5 + 2 x 117.5 = 681 + 235	916	2	M1 for either 340.5 or 117.5 seen A1 cao
18(a)		x= 0.292929… $100x = 29.292929…$ $99x = 29$	29/99	2	M1 for 0.292929… A1 for 29/99 oe
18(b)		$y = 0.0x0x0x…$ $100y = x.0x0x0x…$ $99y = x$ so $y = x/9$	Proof	2	M1 for for sight of two recurring decimals whose difference is a rational number A1 for completion of proof
19(a)			0.8 on Julie branch 0.4, 0.6, 0.4 on Pat branch	2	B1 for 0.8 B1 for 0.4, 0.6, 0.4
19(b)		0.2 x 0.6	0.12	2	M1 for 0.2 x 0.6 A1 cao

Question		Working	Answer	Mark	Notes
20(a)			A sample selected taking into account the population of different groups (strata)	1	B1 for an acceptable reason
20(b)		147/454 ≈ 1/3 90 ÷ 3	30	2	M1 for 90 x 147/454 A1 for 30
21		$\frac{1}{3} \pi \times 9^2 \times 6 - \frac{1}{3} \pi \times 3^2 \times 2$ OR $(\frac{1}{3} \pi \times 9^2 \times 6) \times \frac{26}{27}$	156π	4	M1 for $\frac{1}{3} \pi \times 9^2 \times 6$ or $\frac{1}{3} \pi \times 3^2 \times 2$ A1 for 162π or 6π M1 for 162π − 6π A1 cao
22(a)		½ $(x + 2 + x + 6)(x – 5)$ $= (x + 4))(x – 5) = 36$ $x^2 + 4x – 5x$ -20 = 36	Proof	4	M1 for ½ $(x + 2 + x + 6)(x – 5)$ oe M1 for ½ $(x + 2 + x + 6)(x – 5) = 36$ M1 for $x^2 + 4x – 5x$ -20 = 36 A1 for completion of proof
22(b)(i)		$(x + 7))(x – 8) = 0$	$x = 8$, $x = -7$	4	M1 for $(x + 7))(x – 8)$ (= 0) A1 for $x = 8$
(ii)		8 + 2 = 10, 8 – 5 = 3, 8 + 6 = 14	3		A1 for $x = -7$ B1 ft for 3