

Write your name here

Surname

Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9 - 1)

Centre Number

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Candidate Number

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Mathematics

Paper 2 (Calculator)

Higher Tier

Specimen Papers Set 1

Time: 1 hour 30 minutes

Paper Reference

1MA1/2H

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

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.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

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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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 Make t the subject of the formula $w = 3t + 11$ ← isolate t

$$w = 3t + 11$$

$$-11$$

$$w - 11 = 3t$$

$$\div 3$$

$$\frac{w - 11}{3} = t$$

$$t = \frac{w - 11}{3}$$

(Total for Question 1 is 2 marks)

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2 Three companies sell the same type of furniture.

The price of the furniture from Pooles of London is £1480

The price of the furniture from Jardins of Paris is €1980

The price of the furniture from Outways of New York is \$2250

The exchange rates are

$$£1 = €1.34$$

$$£1 = \$1.52$$

Which company sells this furniture at the lowest price?

You must show how you get your answer.

$$\text{London : } £1480$$

$$\text{Paris : } 1 : €1.34$$

$$€1980 \div 1.34 = £1477.61$$

$$\text{New York : } 1 : \$1.52$$

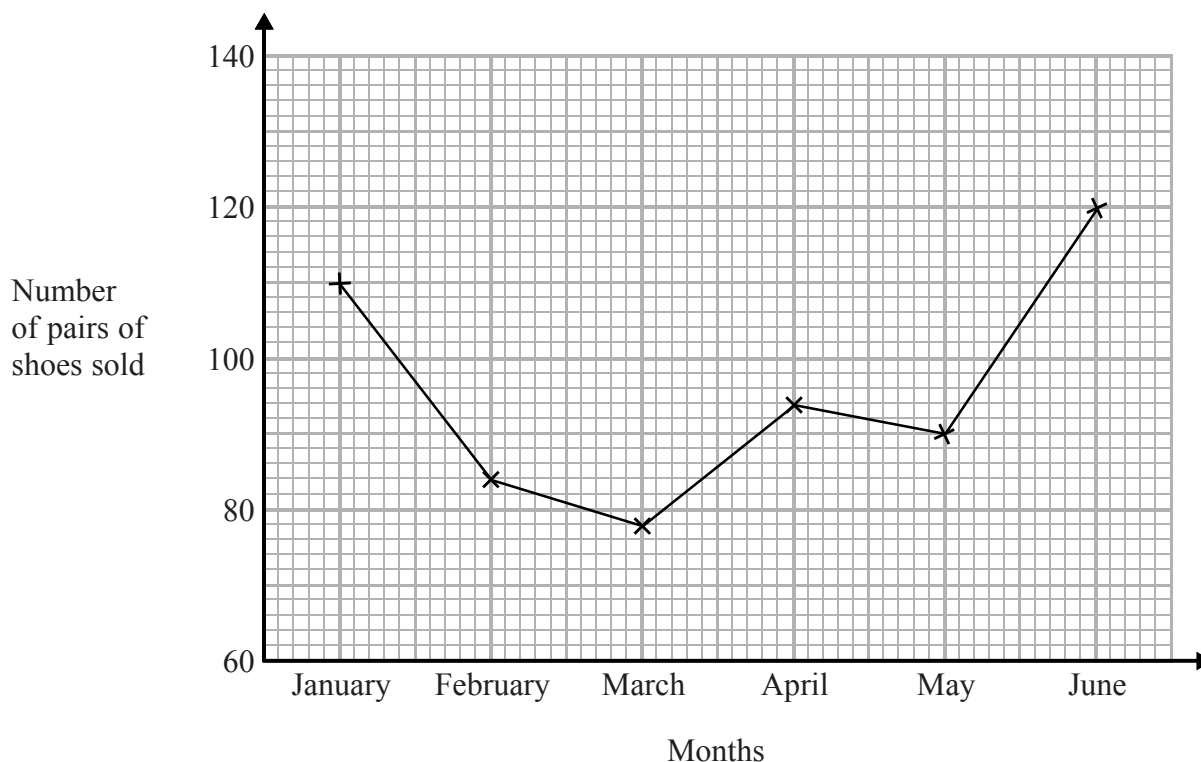
$$\$2250 \div 1.52 = £1480.26$$

£1477.61 is the lowest

\therefore Jardins of Paris is the cheapest

(Total for Question 2 is 3 marks)

- 3 The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

Did the shoe shop meet this sales target?
You must show how you get your answer.

$$\text{Mean} = \frac{\text{Total}}{\text{Freq}} = \frac{110 + 84 + 78 + 94 + 90 + 120}{6}$$

$$= \frac{576}{6} = 96$$

$$96 = 96$$

Yes, the target was met

(Total for Question 3 is 3 marks)

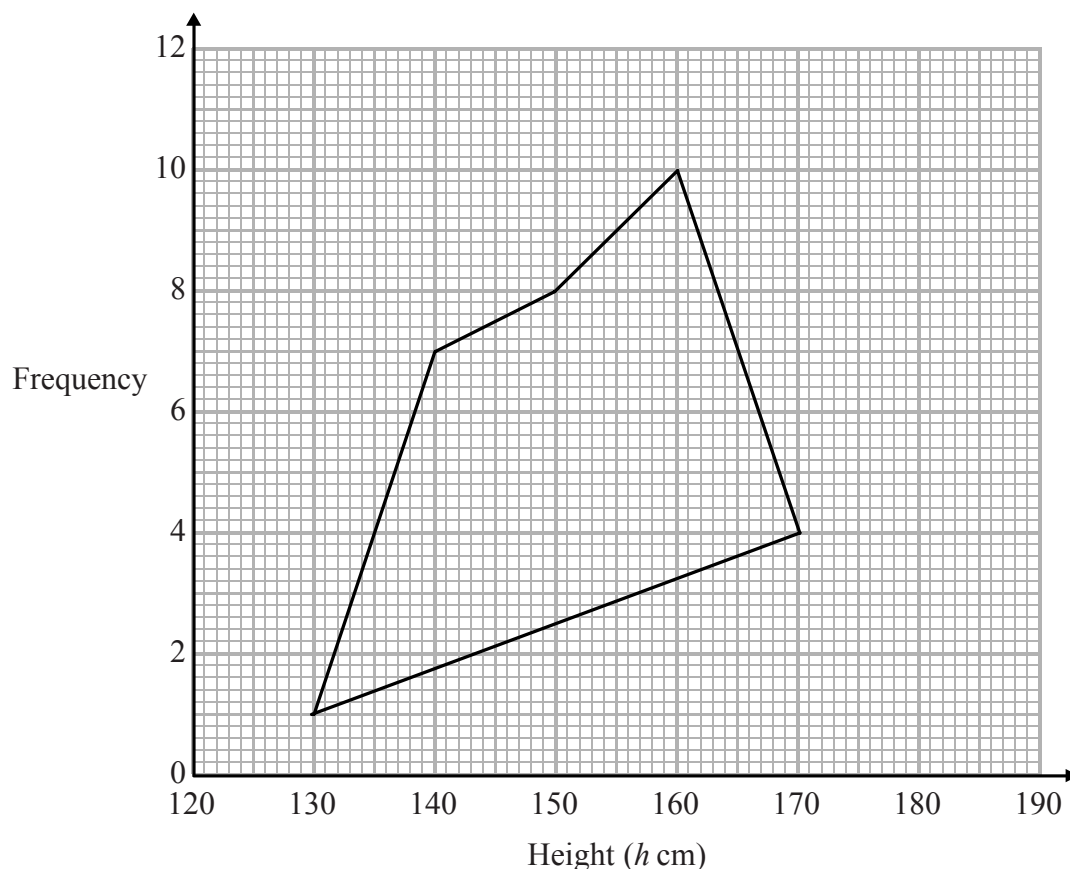
- 4 The grouped frequency table gives information about the heights of 30 students.

Height (h cm)	Frequency
$130 < h \leq 140$	1
$140 < h \leq 150$	7
$150 < h \leq 160$	8
$160 < h \leq 170$	10
$170 < h \leq 180$	4

- (a) Write down the modal class interval.

10 is the highest $160 < h \leq 170$ (1)

This incorrect frequency polygon has been drawn for the information in the table.



- (b) Write down two things wrong with this incorrect frequency polygon.

- 1 The points should be plotted at mid intervals
- 2 The 1st and last points shouldn't be joined

(2)

(Total for Question 4 is 3 marks)

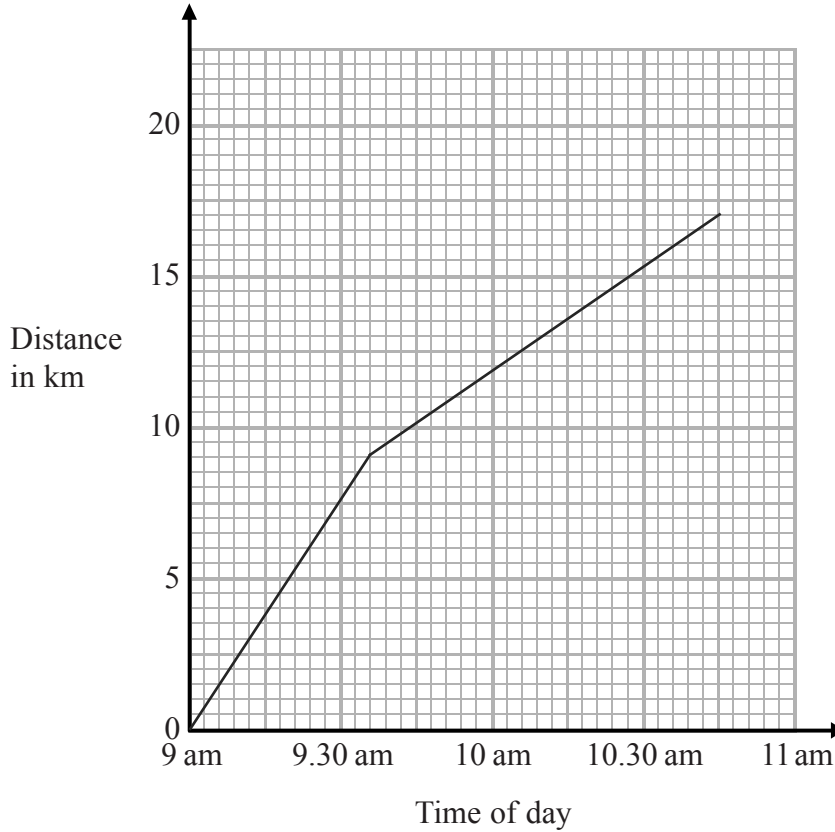
5 At 9 am, Bradley began a journey on his bicycle.

From 9 am to 9.36 am, he cycled at an average speed of 15 km/h.
 From 9.36 am to 10.45 am, he cycled a further 8 km.

$$\text{speed} = \frac{\text{dist}}{\text{time}}$$

$$\begin{aligned} \text{dist} &= \text{speed} \times \text{time} \\ &= 15 \times 0.6 \\ &= 9 \end{aligned}$$

(a) Draw a travel graph to show Bradley's journey. $9 + 8 = 17 \text{ km}$



(3)

From 10.45 am to 11 am, Bradley cycled at an average speed of 18 km/h.

(b) Work out the distance Bradley cycled from 10.45 am to 11 am. $15 \text{ min} = \frac{1}{4} \text{ h}$

$$\begin{aligned} \text{Dist} &= \text{speed} \times \text{time} \\ &= 18 \times \frac{1}{4} = 4.5 \text{ km} \end{aligned}$$

4.5 km
(2)

(Total for Question 5 is 5 marks)

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- 6 Toby invested £7500 for 2 years in a savings account.
He was paid 4% per annum compound interest.

How much money did Toby have in his savings account at the end of 2 years?

$$100\% + 4\% = 104\% = 1.04 \text{ multiplier}$$

$$7500 \times 1.04^2 = 8112$$

\swarrow
 Starting money

£ 8112

(Total for Question 6 is 2 marks)

- 7 Becky has some marbles.
Chris has two times as many marbles as Becky. 1
Dan has seven more marbles than Chris. 2

They have a total of 57 marbles. 3

Dan says,

"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?

You must show how you get your answer.

$$\textcircled{1} \frac{c}{2} = b$$

$$\textcircled{2} d = c + 7$$

$$\textcircled{3} b + c + d = 57$$

$$\frac{c}{2} + c + c + 7 = 57$$

$$\frac{5}{2}c + 7 = 57$$

$$\frac{5}{2}c = 50$$

$$c = 20$$

Becky has $\frac{20}{2} = 10$ marbles

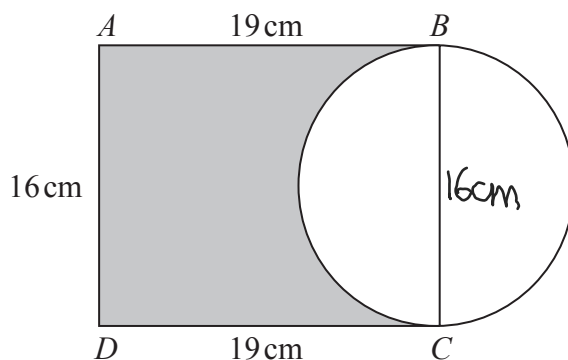
Chris has 20 marbles

Dan has $20 + 7 = 27$ marbles

As Chris has 20 marbles, 60 in total are required to share equally

(Total for Question 7 is 3 marks)

- 8 Here is a diagram showing a rectangle, $ABCD$, and a circle.



BC is a diameter of the circle.

$$r = 8$$

Calculate the percentage of the area of the rectangle that is shaded.

Give your answer correct to 1 decimal place.

$$\text{Area of rect} = 16 \times 19 = 304 \text{ cm}^2$$

$$\begin{aligned} \text{Area of shaded} &= \text{Area of rect} - \text{Area of } \frac{1}{2} \text{ semi circle} \\ &= 304 - \frac{1}{2} \times 8^2 \times \pi \\ &= 304 - 32\pi \end{aligned}$$

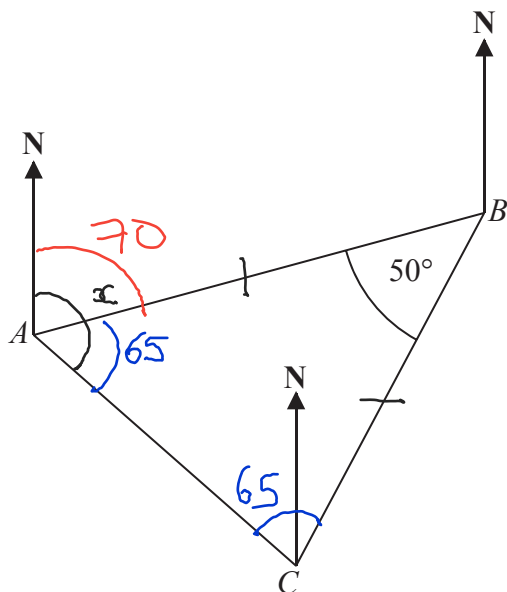
$$\begin{aligned} \text{Percentage} &= \frac{304 - 32\pi}{304} \times 100 \\ &= 66.93\% \end{aligned}$$

3 > 5 round down

$$\underline{66.9} \%$$

(Total for Question 8 is 4 marks)

9 The diagram shows the positions of three points, A , B and C , on a map.



The bearing of B from A is 070° ①

Angle ABC is 50°
 $AB = CB$

Work out the bearing of C from A .

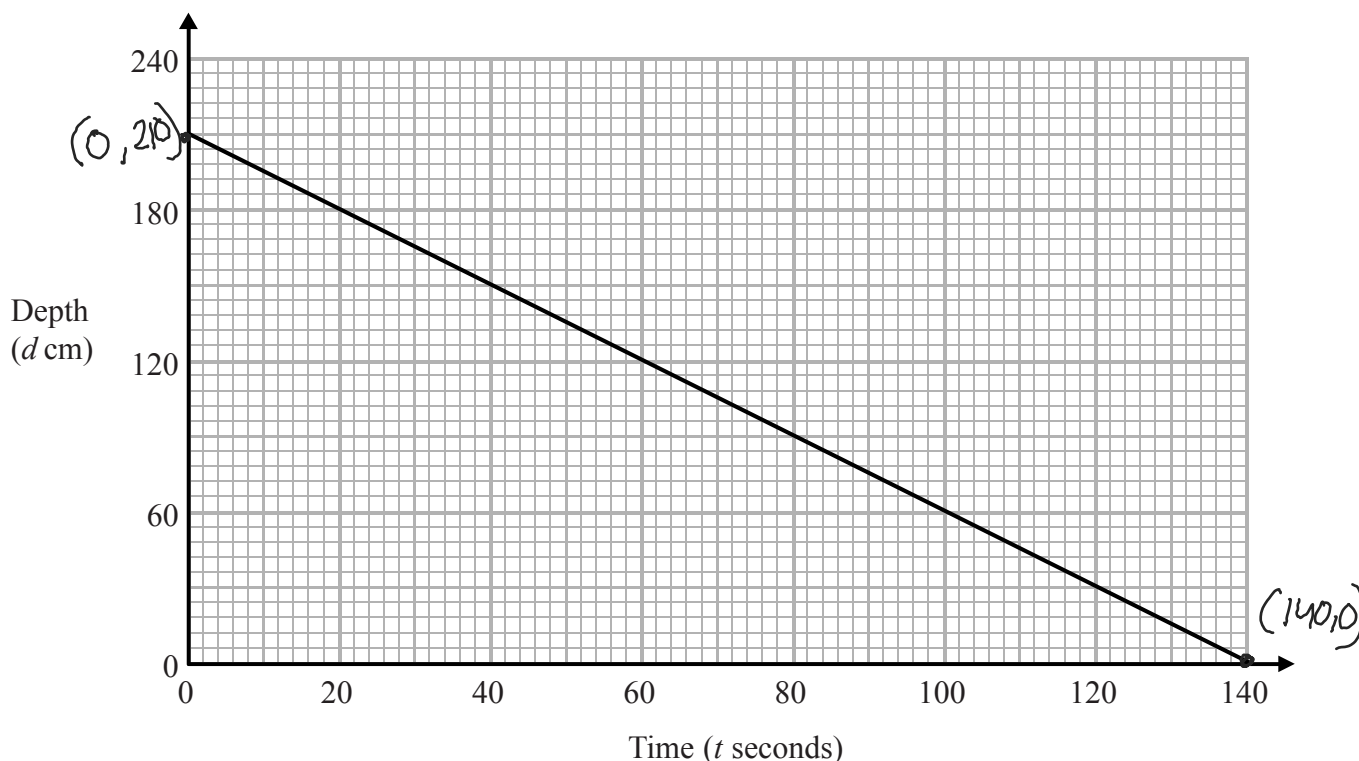
$$\frac{180 - 50}{2} = 65^\circ \quad \text{Isosceles Triangle}$$

$$70 + 65 = 135$$

..... 135°

(Total for Question 9 is 3 marks)

10 The graph shows the depth, d cm, of water in a tank after t seconds.



(a) Find the gradient of this graph.

$$\begin{aligned} \text{gradient} &= \frac{y_1 - y_2}{x_1 - x_2} = \frac{210 - 0}{0 - 140} \\ &= \frac{210}{-140} = -1.5 \end{aligned}$$

(2)

(b) Explain what this gradient represents.

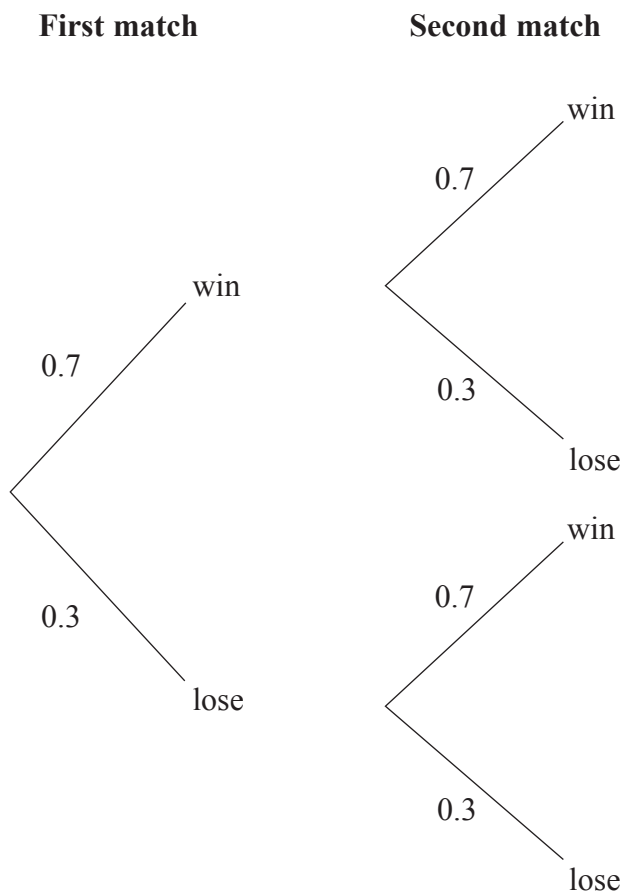
The rate at which water flows out of the tank

(1)

(Total for Question 10 is 3 marks)

11 Finlay plays two tennis matches.

The probability that he will win a match and the probability that he will lose a match are shown in the probability tree diagram.



(a) Work out the probability that Finlay wins both matches.

win x win

$$0.7 \times 0.7 = 0.49$$

0.49
(2)

(b) Work out the probability that Finlay loses at least one match.

$$1 - P(\text{Wins both})$$

$$1 - 0.49 = 0.51$$

0.51
(2)

(Total for Question 11 is 4 marks)

12 (a) Find the reciprocal of 2.5 \leftarrow 1 over 2.5

$$\frac{1}{2.5} \stackrel{\times 2}{=} \frac{2}{5}$$

$$\frac{2}{5} \quad (1)$$

(b) Work out $\sqrt[3]{\frac{4.3 \times \tan 39^\circ}{23.4 - 6.06}}$

Give your answer correct to 3 significant figures.

$$\sqrt[3]{\frac{4.3 \times 0.8097540382}{23.4 - 6.06}}$$

$$= 0.586 \quad (3 \text{ sf})$$

$$0.586 \quad (2)$$

(Total for Question 12 is 3 marks)

13 Show that

$$(3x-1)(x+5)(4x-3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of x.

$$1 \times 2 = 3x^2 + 5x - x - 5$$

$$1 \times 2 \times 3 = (3x^2 + 14x - 5)(4x - 3)$$

$$12x^2 - 9x^2 + 56x^2 - 42x - 20x + 15$$

$$= 12x^2 + 47x^2 - 62x + 15$$

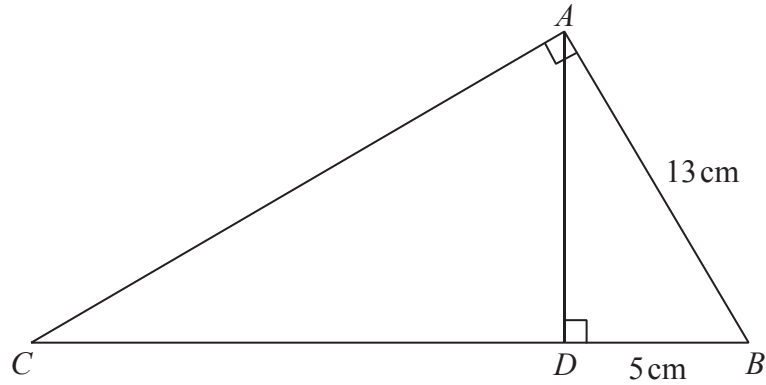
(Total of Question 13 is 3 marks)

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14 ABC and ABD are two right-angled triangles.



Angle $BAC = \text{angle } ADB = 90^\circ$

$AB = 13 \text{ cm}$

$DB = 5 \text{ cm}$

Work out the length of CB .

$\triangle ABC$ and $\triangle ADB$ are similar by RHS

$$\text{sf : } \frac{5}{13} = \frac{13}{CB}$$

$$CB = \frac{13}{\frac{5}{13}} = \frac{169}{5} = 33.8 \text{ cm}$$

33.8 cm

(Total for Question 14 is 3 marks)

- 15 A pendulum of length L cm has time period T seconds.
 T is directly proportional to the square root of L .

The length of the pendulum is increased by 40%. $\rightarrow \times 1.4$

Work out the percentage increase in the time period.

$$T \propto \sqrt{L}$$

$$T = k\sqrt{L}$$

$$T_1 = k\sqrt{1.4L}$$

$$T_1 = \sqrt{1.4} \times k \times \sqrt{L}$$

$$T_1 = 1.183... k\sqrt{L}$$

$$\text{Percentage increase} = (1.183 - 1) \times 100$$

$$= 18.3\%$$

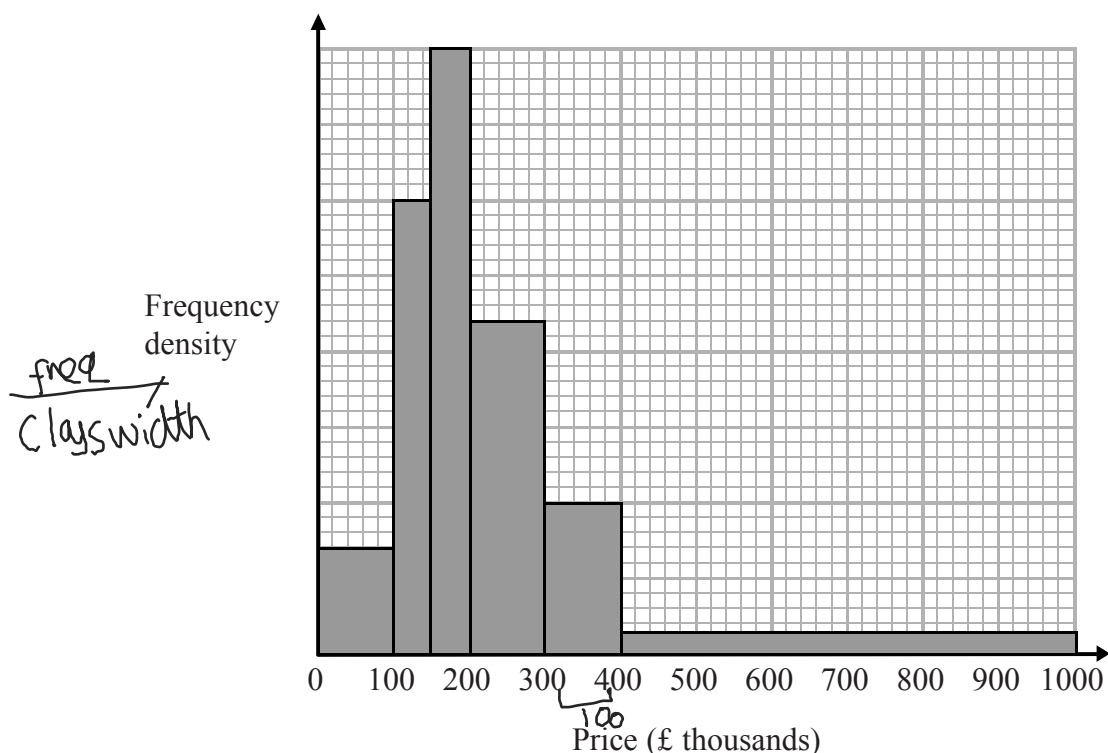
(Total for Question 15 is 3 marks)

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16 The histogram gives information about house prices in a village in 2015



20 houses in the village have a price between £300000 and £400000

Work out the number of houses in the village with a price under £200000

$$\text{freq} = \text{freq dens} \times \text{class width}$$

$$20 = fd \times 100$$

$$fd = 0.2$$

$$1 \text{ division} = 0.2 \div 10 = 0.02$$

$$7 \times 0.02 \times 100 + 30 \times 0.02 \times 50 + 40 \times 0.02 \times 50$$

$$= 84$$

84

(Total for Question 16 is 3 marks)

17 Here are the first 5 terms of a quadratic sequence.

1 3 7 13 21

Find an expression, in terms of n , for the n th term of this quadratic sequence.

$$1, 3, 7, 13, 21$$

$$\underbrace{\quad} +2 \quad \underbrace{\quad} +4 \quad \underbrace{\quad} +6 \quad \underbrace{\quad} +8$$

$$\underbrace{\quad} +2 \quad \underbrace{\quad} +2$$

$$- 2 \times \frac{1}{2} n^2 = n^2$$

seq	1	3	7	13
n^2	1	4	9	16

$$0, -1, -2, -3$$

$$\underbrace{\quad} -1 \quad \underbrace{\quad} -1$$

$$-n+1$$

$$n^2 - n + 1$$

(Total for Question 17 is 3 marks)

18 $f(x) = 3x^2 - 2x - 8$

Express $f(x + 2)$ in the form $ax^2 + bx$

$$3(x+2)^2 - 2(x+2) - 8$$

$$= 3(x^2 + 4x + 4) - 2x - 4 - 8$$

$$= 3x^2 + 12x + 12 - 2x - 4 - 8$$

$$= 3x^2 + 10x$$

$$3x^2 + 10x$$

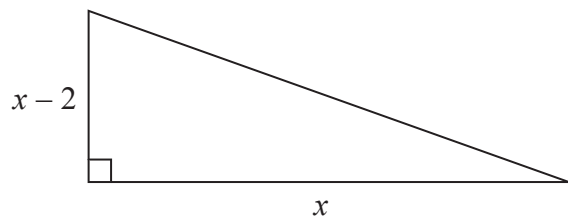
(Total for Question 18 is 3 marks)

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19 Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm^2 .

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

$$\begin{aligned} \text{Area} &= \frac{1}{2} \times b \times h \\ &= \frac{x(x-2)}{2} = \frac{x^2 - 2x}{2} \\ \frac{x^2 - 2x}{2} &= \frac{5}{2} \end{aligned}$$

$$\frac{1}{a}x^2 - \frac{2}{b}x - \frac{5}{c} = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{+2 \pm \sqrt{4 + 20}}{2}$$

$$x = 1 \pm \sqrt{6} \quad x = 1 + \sqrt{6} \quad \leftarrow \text{can't be negative}$$

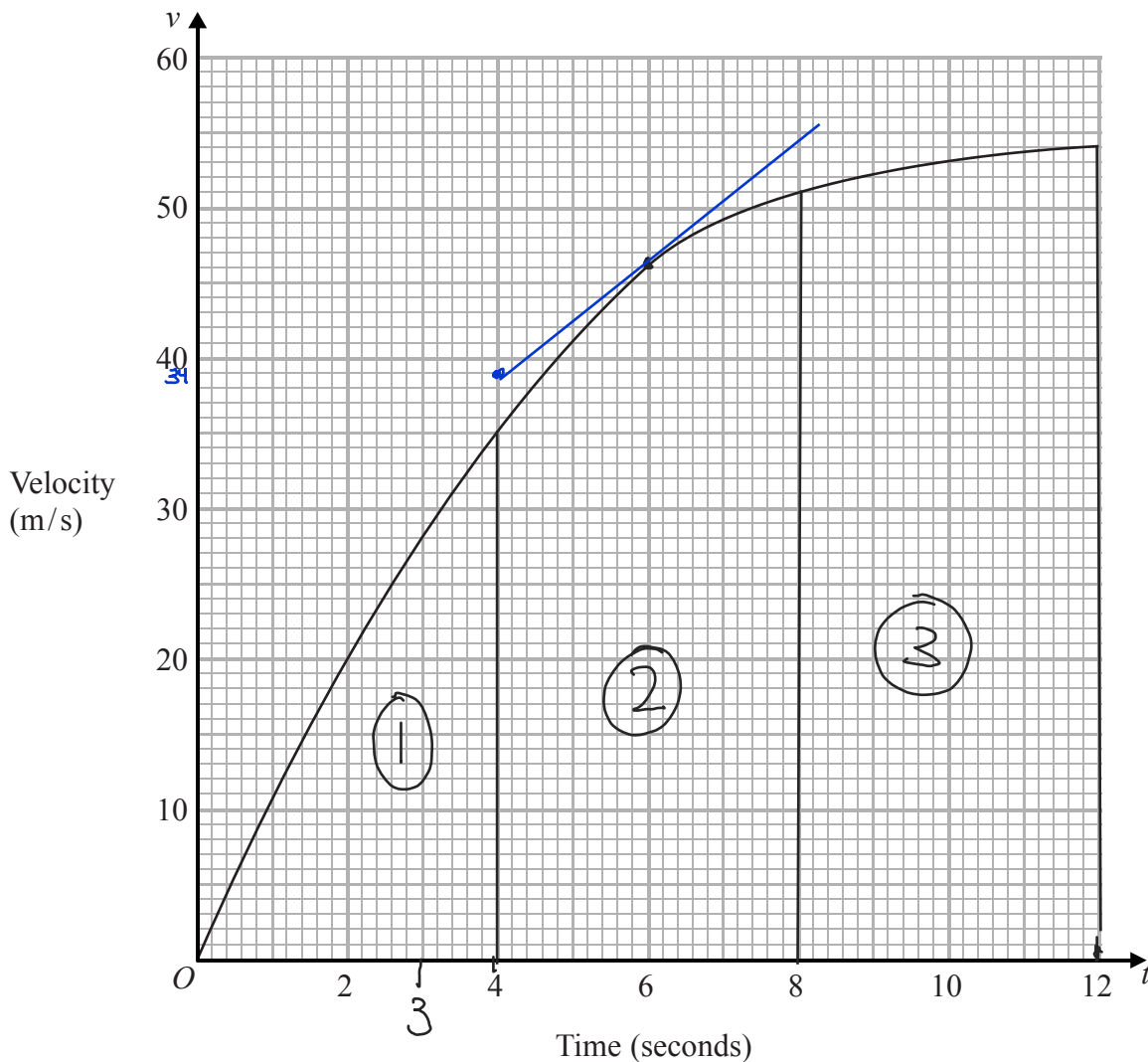
$$a^2 + b^2 = c^2$$

$$\begin{aligned} \text{hypotenuse} &= \sqrt{x^2 + (x-2)^2} = \sqrt{(1+\sqrt{6})^2 + (\sqrt{6}-1)^2} \\ &= \sqrt{14} \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &= \sqrt{14} + 1 + \sqrt{6} + \sqrt{6} - 1 \\ &= \sqrt{14} + 2\sqrt{6} = 8.64 \text{ cm} \end{aligned}$$

(Total for Question 19 is 6 marks)

20 The graph shows information about the velocity, v m/s, of a parachutist t seconds after leaving a plane.



(a) Work out an estimate for the acceleration of the parachutist at $t = 6$

$\frac{y_1 - y_2}{x_1 - x_2}$ gradient = $\frac{46 - 39}{6 - 4} = \frac{7}{2} = 3.5$ 3.5 m/s²
(2)

Draw tangent at $t=6$

(b) Work out an estimate for the distance fallen by the parachutist in the first 12 seconds after leaving the plane. Use 3 strips of equal width. split in trapezium + triangle

$\frac{12}{3} = 4$ sec width

① $\frac{1}{2} \times 4 \times 35 = 70$

② $\frac{1}{2} \times 4 \times (35 + 51) = 172$

③ $\frac{1}{2} \times 4 \times (51 + 54) = 210$

$70 + 172 + 210 = 452$ m
(3)

(Total for Question 20 is 5 marks)

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- 21 The number of bees in a beehive at the start of year n is P_n .
The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$

At the start of 2015 there were 9500 bees in the beehive.

How many bees will there be in the beehive at the start of 2018?

$$\begin{aligned} P_{2016} &= 1.05(9500 - 250) \\ &= 9712.5 \end{aligned}$$

$$P_{2017} = 9935.625$$

$$P_{2018} = 10169.90625$$

↑
nearest
whole
number

10170

(Total for Question 21 is 3 marks)

$$22 \quad D = \frac{x}{y}$$

$x = 99.7$ correct to 1 decimal place.

$y = 67$ correct to 2 significant figures.

Work out an upper bound for D .

$$\text{Bounds:} \quad 99.65 \leq x < 99.75$$
$$66.5 \leq y < 67.5$$

$$\text{UB for } D = \frac{\text{UB}}{\text{LB}} = \frac{99.75}{66.5} = \frac{3}{2}$$

1.5

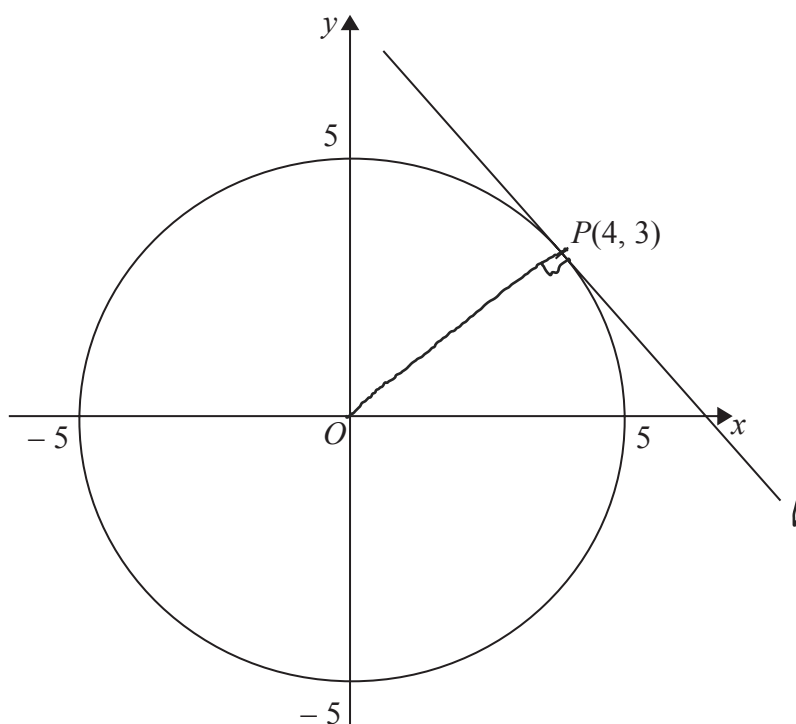
(Total for Question 22 is 3 marks)

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23 Here is a circle, centre O , and the tangent to the circle at the point $P(4, 3)$ on the circle.



Find an equation of the tangent at the point P .

$$\text{gradient of } OP = \frac{3-0}{4-0} = \frac{3}{4}$$

tangent meets at 90° , so gradient of l is negative reciprocal of $\frac{3}{4} = -\frac{4}{3}$

$$y = \frac{-4}{3}x + c$$

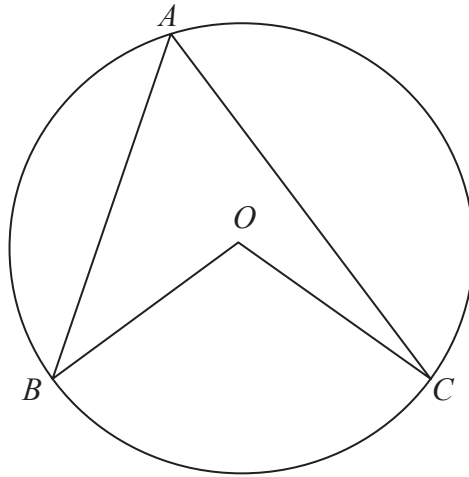
$$3 = \frac{-4}{3} \times 4 + c$$

$$3 + \frac{16}{3} = c = \frac{25}{3}$$

$$y = \frac{-4}{3}x + \frac{25}{3}$$

(Total for Question 23 is 3 marks)

24 A , B and C are points on the circumference of a circle centre O .



Prove that angle BOC is twice the size of angle BAC .

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

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