

Write your name here

Surname					Other names				
Centre Number					Candidate Number				
<b>Pearson Edexcel</b> <b>Level 1/Level 2 GCSE (9 - 1)</b>									

# Mathematics

## Paper 2 (Calculator)

**Higher Tier**

Specimen Papers Set 1	Paper Reference
<b>Time: 1 hour 30 minutes</b>	<b>1MA1/2H</b>

**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  $\pi$  button, take the value of  $\pi$  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  $w = 3t + 11$

$$w - 11 = 3t$$

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

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

(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.

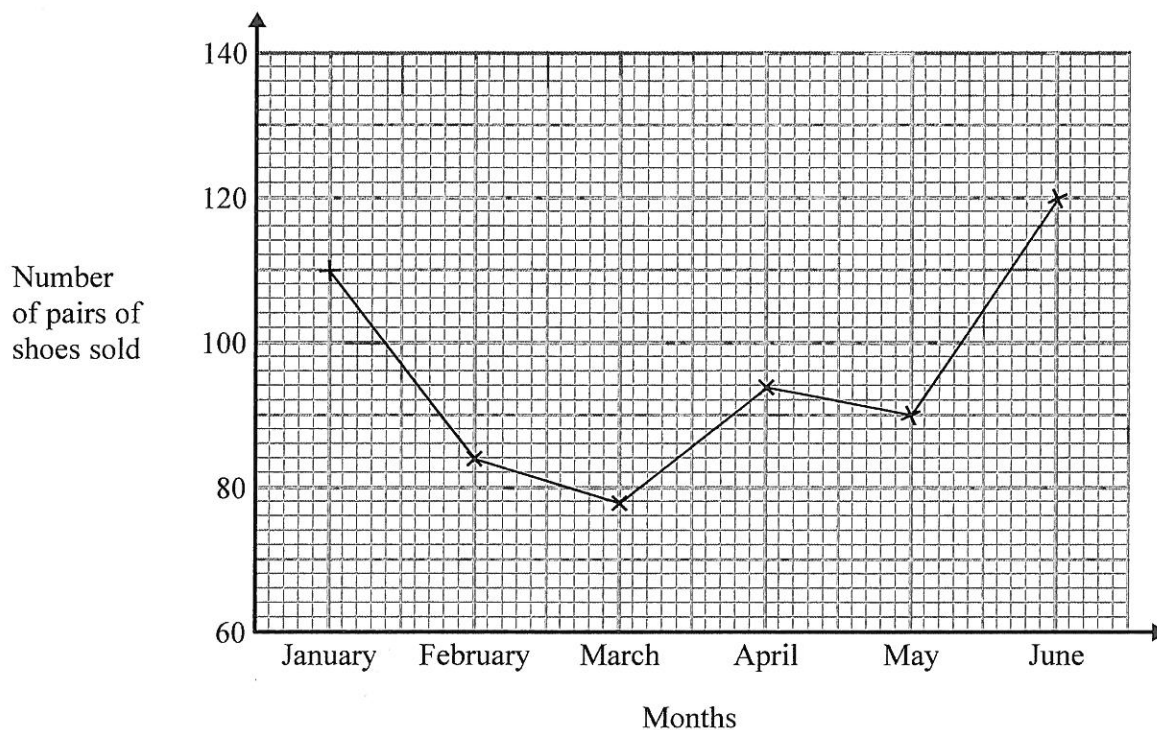
$$\text{PARIS: } \frac{1980}{1.34} = £1477.61$$

$$\text{N.Y. } \frac{2250}{1.52} = £1480.26$$

∴ 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.

$$110 + 84 + 78 + 94 + 90 + 120 = 576$$

$$576 \div 6 = 96$$

MEAN = 96  $\therefore$  SHOP MEETS ITS TARGET

(Total for Question 3 is 3 marks)

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

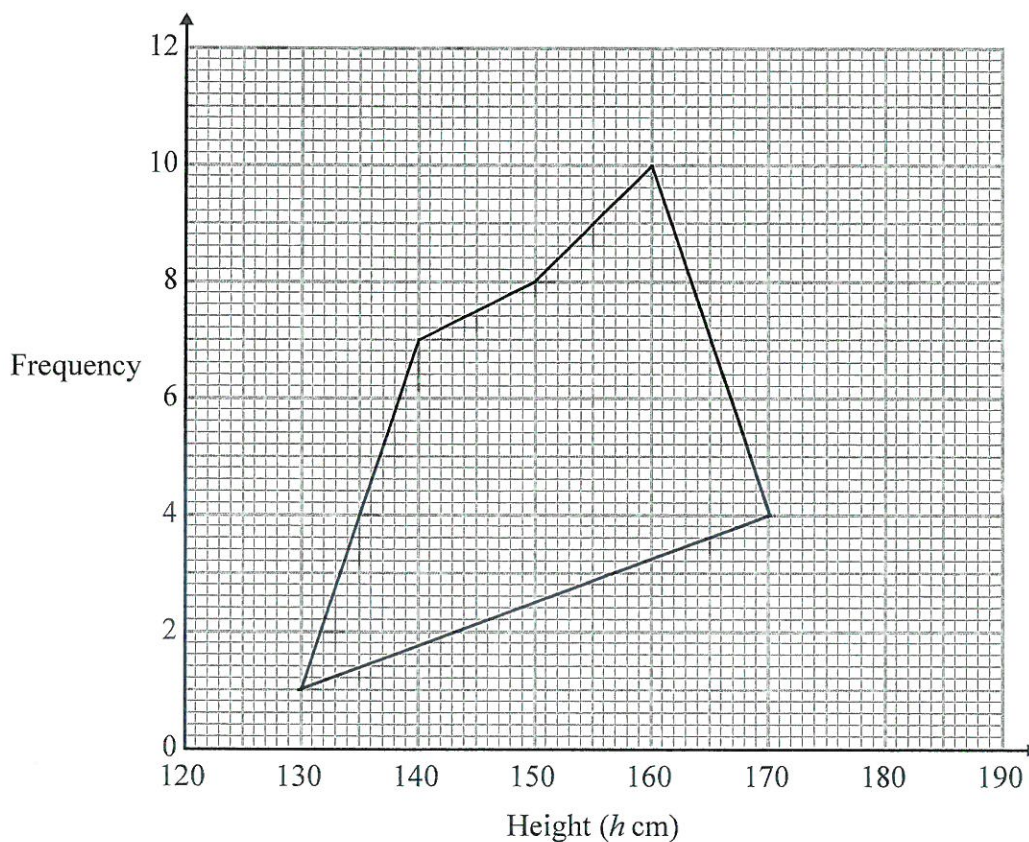
Height ( $h$ cm)	Frequency
$130 < h \leq 140$	1
$140 < h \leq 150$	7
$150 < h \leq 160$	8
$160 < h \leq 170$	10
$170 < h \leq 180$	4

(a) Write down the modal class interval.

$160 < h \leq 170$

(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 MIDDPOINTS OF HEIGHT INTERVAL SHOULD HAVE BEEN USED

2 FIRST AND LAST POINTS SHOULD NOT BE JOINED

(2)

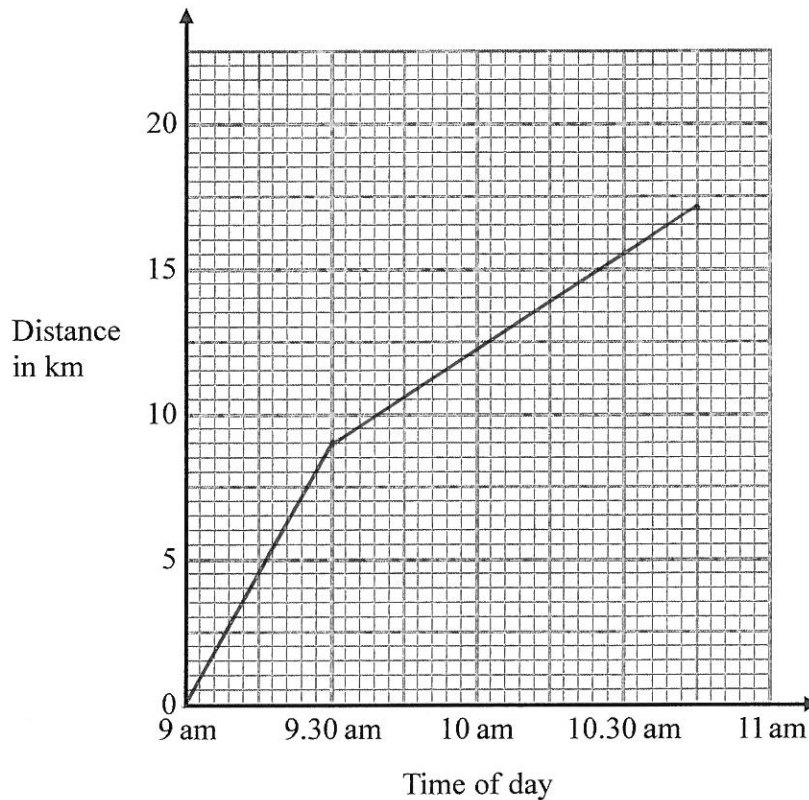
(Total for Question 4 is 3 marks)

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.

$$\text{DISTANCE} = \frac{36}{60} \times 15 = 9 \text{ km}$$

(a) Draw a travel graph to show Bradley's journey.



(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.

$$\frac{1}{4} \text{ HOUR AT } 18 \text{ km/hr}$$

$$\therefore \text{DISTANCE} = \frac{1}{4} \times 18 = 4.5 \text{ km}$$

$$\underline{\quad\quad\quad 4.5 \quad\quad\quad} \text{ km}$$

(2)

(Total for Question 5 is 5 marks)

- 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?

$$7500 \times 1.04^2$$

£ 8112

(Total for Question 6 is 2 marks)

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

They have a total of 57 marbles.

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.

$$x + 2x + 2x + 7 = 57$$

$$\therefore 5x + 7 = 57$$

$$\therefore 5x = 50$$

$$\therefore x = 10$$

BECKY : 10

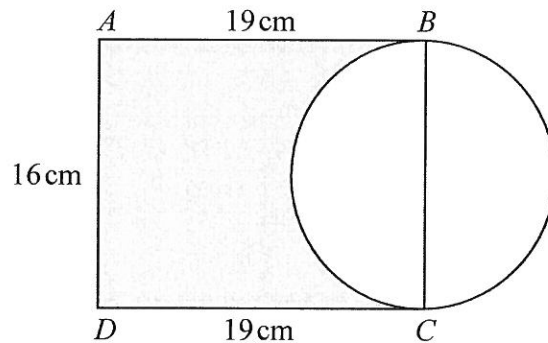
CHRIS : 20

DAN : 27

DAN IS WRONG, IF HE GIVES BECKY 10 MARBLES SO THAT SHE HAS THE SAME NUMBER AS CHRIS, THEN HE WILL HAVE ONLY 17.

(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.

Calculate the percentage of the area of the rectangle that is shaded.  
Give your answer correct to 1 decimal place.

$$\text{AREA OF RECTANGLE} = 16 \times 19 = 304 \text{ cm}^2$$

$$\text{AREA OF SEMI-CIRCLE} = \frac{1}{2} \pi \times 8^2 = 32\pi \text{ cm}^2$$

$$\therefore \text{SHADED AREA} = 304 - 32\pi$$

$$\begin{aligned} \therefore \% \text{ SHADED} &= \frac{304 - 32\pi}{304} \times 100 \\ &= 66.970 \end{aligned}$$

66.9 %

(Total for Question 8 is 4 marks)

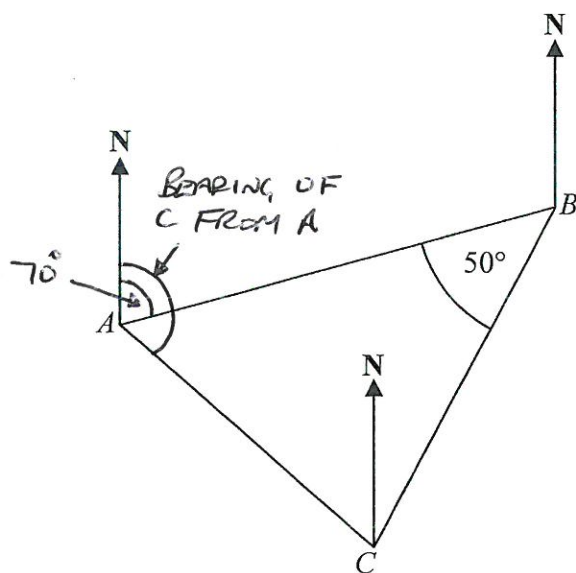


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9 The diagram shows the positions of three points,  $A$ ,  $B$  and  $C$ , on a map.



The bearing of  $B$  from  $A$  is  $070^\circ$

Angle  $ABC$  is  $50^\circ$

$AB = CB \longrightarrow \therefore$  TRIANGLE IS ISOSCELES AND

Work out the bearing of  $C$  from  $A$ .

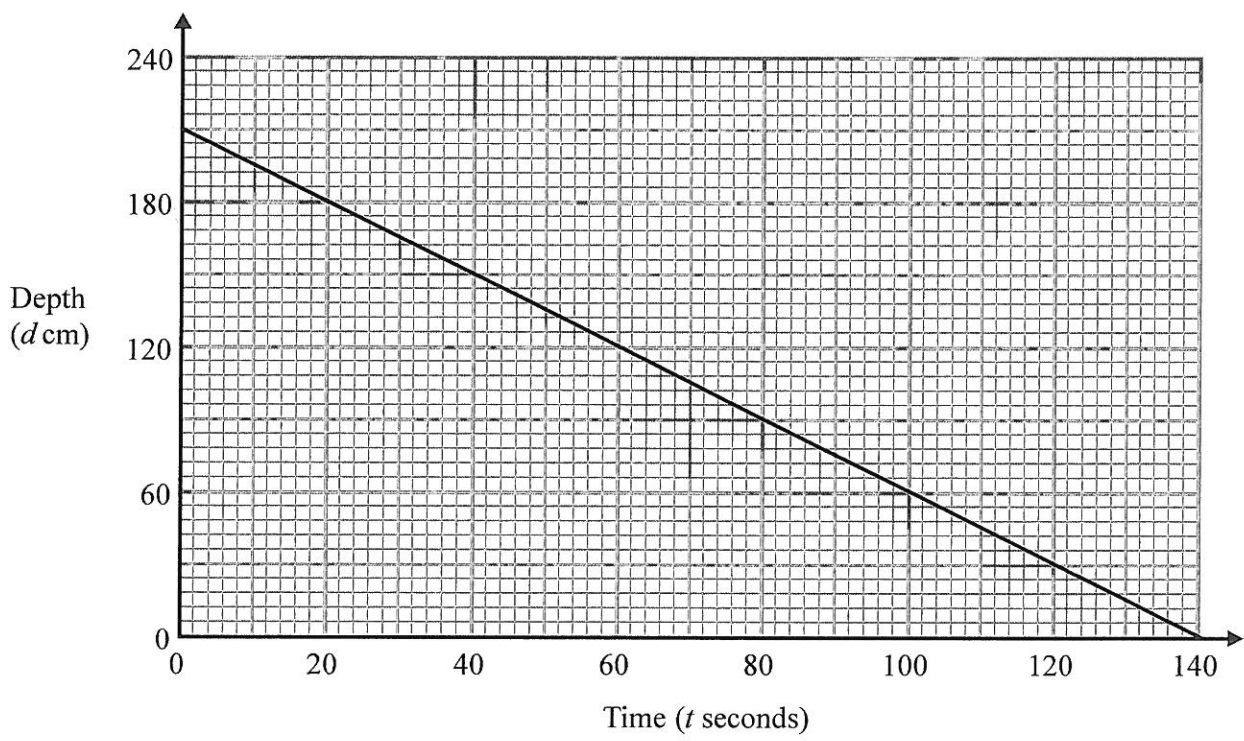
$$\hat{BAC} = \frac{1}{2} (180 - 50) = 65$$

$$65 + 70 = 135$$

..... 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.

$$\frac{210}{140} = \frac{21}{14} = \frac{3}{2}$$

$$\frac{210}{140} = -\frac{3}{2}$$

(b) Explain what this gradient represents.

DEPTH DECREASES BY ~~10~~<sup>3</sup> cm EVERY ~~14~~<sup>2</sup> SECONDS

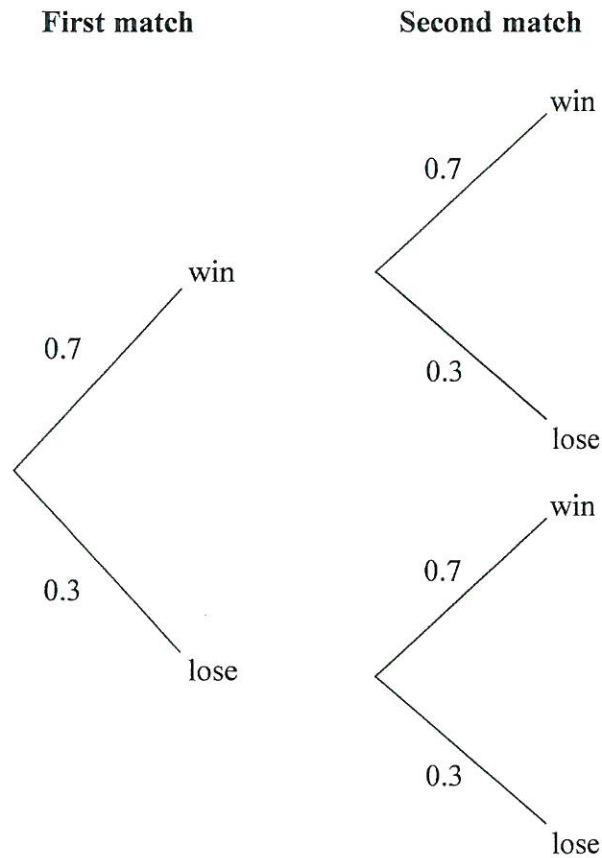
(OR RATE OF CHANGE OF DEPTH OF WATER IN TANK)

(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.

$$0.7 \times 0.7$$

0.49

(2)

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

$$\begin{aligned} & 0.7 \times 0.3 + 0.3 \times 0.7 + 0.3 \times 0.3 \\ = & 0.21 + 0.21 + 0.09 \\ = & 0.51 \end{aligned}$$

0.51

(2)

(Total for Question 11 is 4 marks)

12 (a) Find the reciprocal of 2.5 =  $\frac{2}{5}$

$\frac{2}{5}$  or 0.4  
(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.

0.585593423

0.586

(2)

(Total for Question 12 is 3 marks)

13 Show that

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

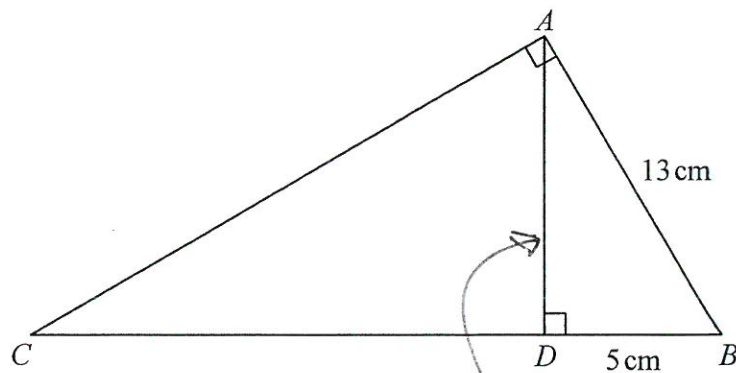
for all values of  $x$ .

$$\begin{aligned}(x + 5)(4x - 3) &= 4x^2 - 3x + 20x - 15 \\ &= 4x^2 + 17x - 15\end{aligned}$$

$$\begin{aligned}(3x - 1)(4x^2 + 17x - 15) &= 12x^3 + 51x^2 - 45x \\ &\quad - 4x^2 - 17x + 15 \\ &= 12x^3 + 47x^2 - 62x + 15\end{aligned}$$

(Total of Question 13 is 3 marks)

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  $CB$ .

$$\cos \hat{DBA} = \frac{5}{13}$$

$$\therefore \hat{DBA} = \cos^{-1} \frac{5}{13} = 67.4^\circ$$

$$\therefore \hat{ACD} = 180 - 90 - 67.4 = 22.6^\circ$$

$$\tan 22.6^\circ = \frac{12}{CD}$$

$$\therefore CD = \frac{12}{\tan 22.6} = 28.8 \text{ cm}$$

$$\therefore CB = 28.8 + 5 = 33.8 \text{ cm}$$

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%.

Work out the percentage increase in the time period.

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

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

BEFORE INCREASE  $T_1 = k\sqrt{L_1}$

AFTER INCREASE  $T_2 = k\sqrt{L_2} = k\sqrt{1.4L_1}$

$$\begin{aligned} \therefore \frac{T_2 - T_1}{T_1} \times 100\% &= \frac{k\sqrt{1.4L_1} - k\sqrt{L_1}}{k\sqrt{L_1}} \times 100 \\ &= (\sqrt{1.4} - 1) \times 100 \end{aligned}$$

18.3 %

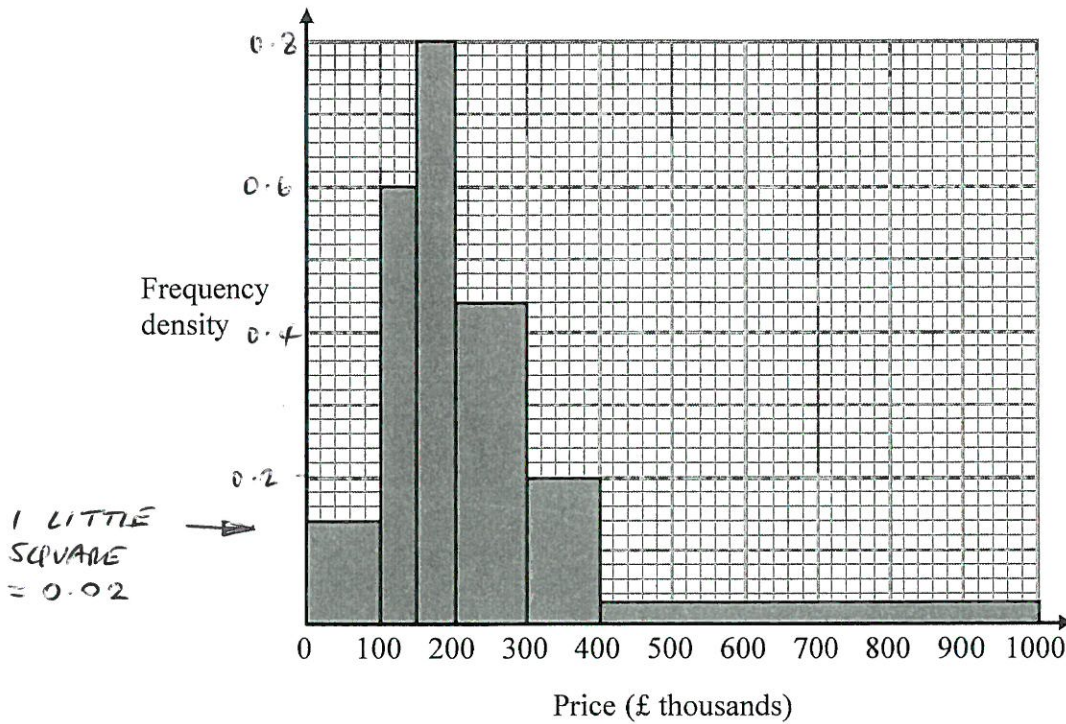
(Total for Question 15 is 3 marks)

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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 £300 000 and £400 000

Work out the number of houses in the village with a price under £200 000

$$\rightarrow \text{FREQUENCY DENSITY} = \frac{20}{100} = 0.2$$

$$\begin{aligned} & 0.14 \times 100 + 0.6 \times 50 + 0.8 \times 50 \\ &= 14 + 30 + 40 \\ &= 84 \end{aligned}$$

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.

+2            +4            +6            +8

+2            +2            +2

$$T_n = an^2 + bn + c \quad \text{WITH } a = \frac{1}{2} \times 2 = 1$$

$$\therefore T_n - n^2 = bn + c$$

$T_n$             1            3            7            13            21

$T_n - n^2$     0            -1            -2            -3            -4

-1            -1            -1            -1

$$\therefore bn + c = -n + 1$$

$$\underline{n^2 - n + 1}$$

(Total for Question 17 is 3 marks)

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

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

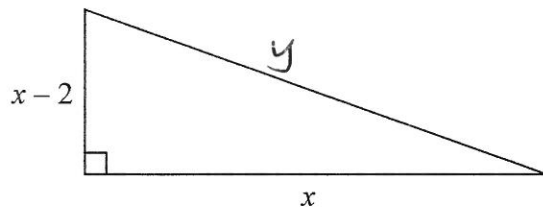
$$\begin{aligned} f(x+2) &= 3(x+2)^2 - 2(x+2) - 8 \\ &= 3(x+2)(x+2) - 2x - 4 - 8 \\ &= 3(x^2 + 4x + 4) - 2x - 12 \\ &= 3x^2 + 12x + 12 - 2x - 12 \\ &= 3x^2 + 10x \end{aligned}$$

$$\underline{3x^2 + 10x}$$

(Total for Question 18 is 3 marks)



19 Here is a right-angled triangle.



All measurements are in centimetres.

The area of the triangle is  $2.5 \text{ cm}^2$ .

Find the perimeter of the triangle.

Give your answer correct to 3 significant figures.

You must show all of your working.

$$\therefore \frac{1}{2} x(x-2) = 2.5$$

$$\therefore x(x-2) = 5$$

$$\therefore x^2 - 2x - 5 = 0$$

$$a=1 \quad b=-2 \quad c=-5$$

$$x = \frac{2 \pm \sqrt{4 + 4 \times 5}}{2}$$

$$= \frac{2 \pm \sqrt{24}}{2} = 3.449$$

Since  $x > 0$

SIDES SHOWN ARE

$$1.449 \times 3.449$$

$$\therefore y^2 = 1.449^2 + 3.449^2$$

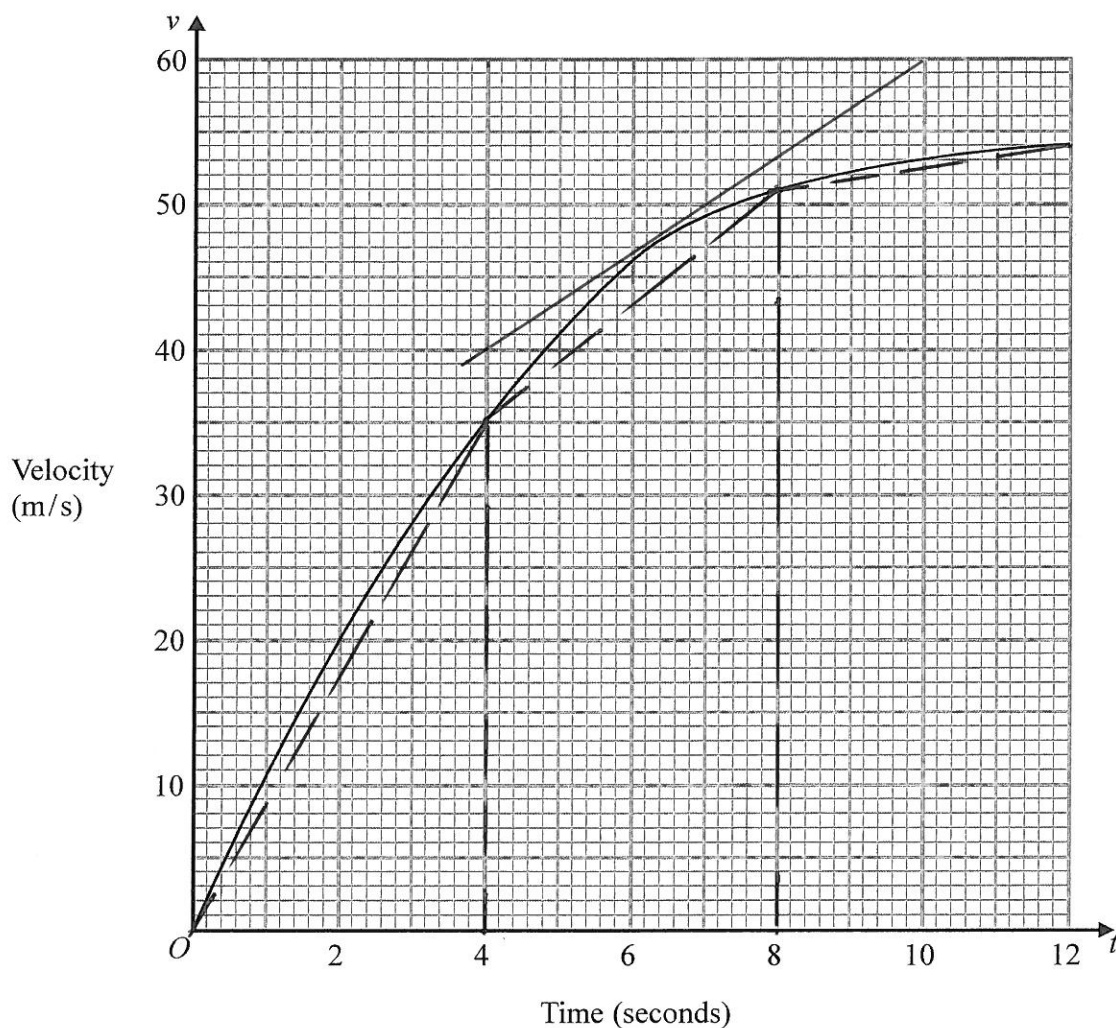
$$\therefore y^2 = 13.995$$

$$\therefore y = \sqrt{13.995} = 3.741$$

$$\begin{aligned} \therefore \text{PERIMETER} &= 1.449 + 3.449 + 3.741 \\ &= 8.639 \end{aligned}$$

8.64 cm  
(8.63 - 8.65)  
(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  $t = 6$

$$\frac{60-40}{10-4} = \frac{20}{6}$$

$$\frac{3.3}{(3-4)} \quad (2) \quad \text{m/s}^2$$

- (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.

$$\frac{1}{2} \times 4 \times 35 + \frac{4}{2} (35+51) + \frac{4}{2} (51+54)$$

$$= 70 + 172 + 210$$

$$\frac{452}{(3)} \quad \text{m}$$

(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?

2016  $P_1 = 1.05(P_0 - 250) = 1.05(9500 - 250) = 9712.5$

2017  $P_2 = 1.05(9712.5 - 250) = 9935.625$

2018  $P_3 = 1.05(9935.625 - 250) = 10169.90625$

10170  
(or 10169)

(Total for Question 21 is 3 marks)

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

$x = 99.7$  correct to 1 decimal place.  
 $y = 67$  correct to 2 significant figures.

99.75  
66.5

Work out an upper bound for  $D$ .

$$D_{\text{MAX}} = \frac{99.75}{66.5}$$

1.5

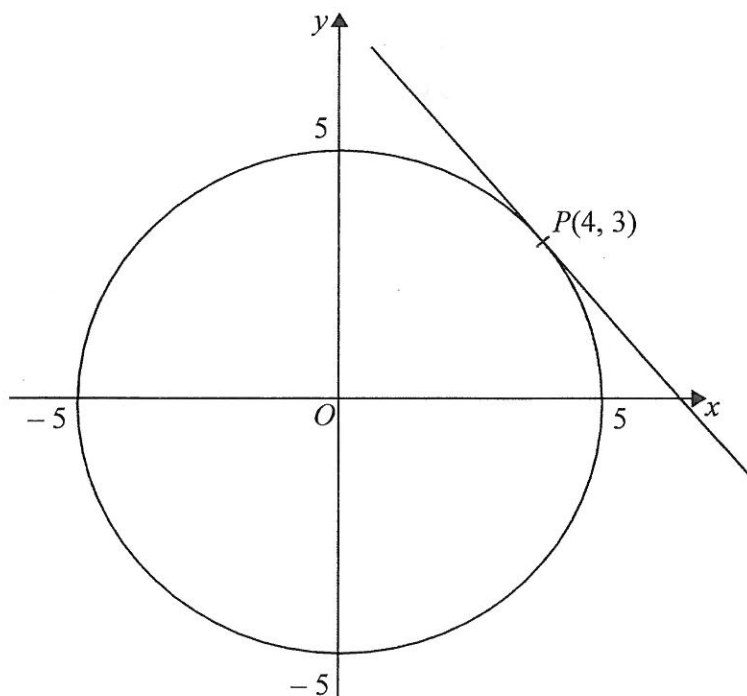
(Total for Question 22 is 3 marks)

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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  $P$ .

$$\text{GRADIENT OF } OP = \frac{3}{4}$$

$$\therefore \text{GRADIENT OF TANGENT} = -\frac{4}{3}$$

$$\therefore \text{EQUATION OF TANGENT IS } y = -\frac{4}{3}x + c$$

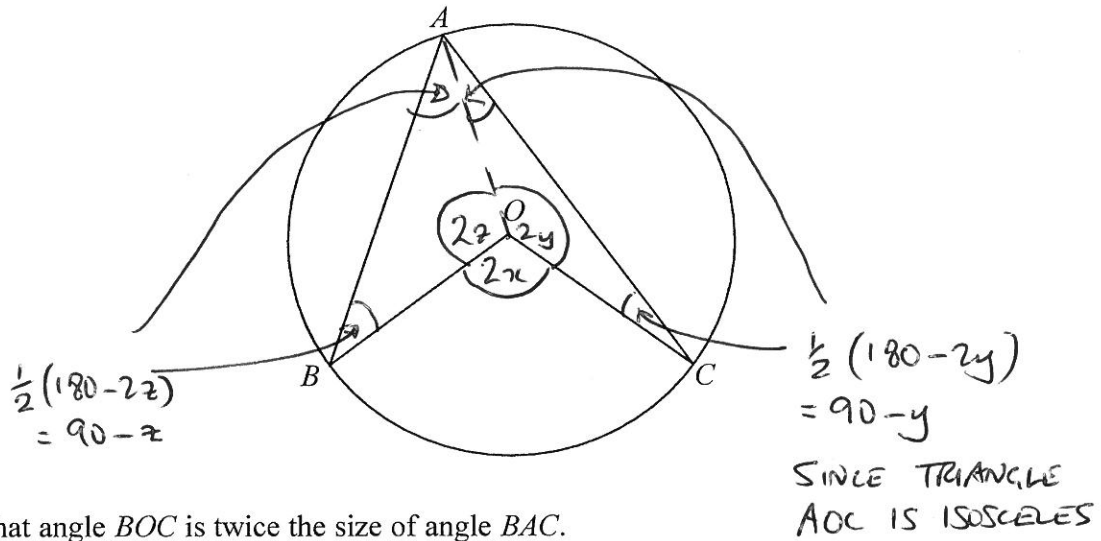
$$\text{AT } P \quad 3 = -\frac{4}{3} \times 4 + c$$

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

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

(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  $BAC$ .

$$2x + 2y + 2z = 360$$

$$\therefore x + y + z = 180$$

$$\therefore x = 180 - y - z$$

$$\begin{aligned} \hat{BAC} &= 90 - z + 90 - y = 180 - z - y \\ &= x \end{aligned}$$

SINCE  $\hat{BOC} = 2x$

$$\hat{BOC} = 2 \times \hat{BAC}$$

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS