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Write your name here					
Surname			Other names		
Pearson Edexcel		Centre Number		Candidate Number	
Level 1/Level 2 GCSE (9 - 1)		<input type="text"/>		<input type="text"/>	
<h1>Mathematics</h1> <h2>Paper 2 (Calculator)</h2>					
				Higher Tier	
Specimen Papers Set 1			Paper Reference		
Time: 1 hour 30 minutes			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 $w = 3t + 11$

$$\begin{aligned} w - 11 &= 3t \\ \frac{w - 11}{3} &= \frac{3t}{3} \\ t &= \frac{w - 11}{3} \end{aligned}$$

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

(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.

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

$$\text{New York: } \frac{2250}{1.52} = £1480.26$$

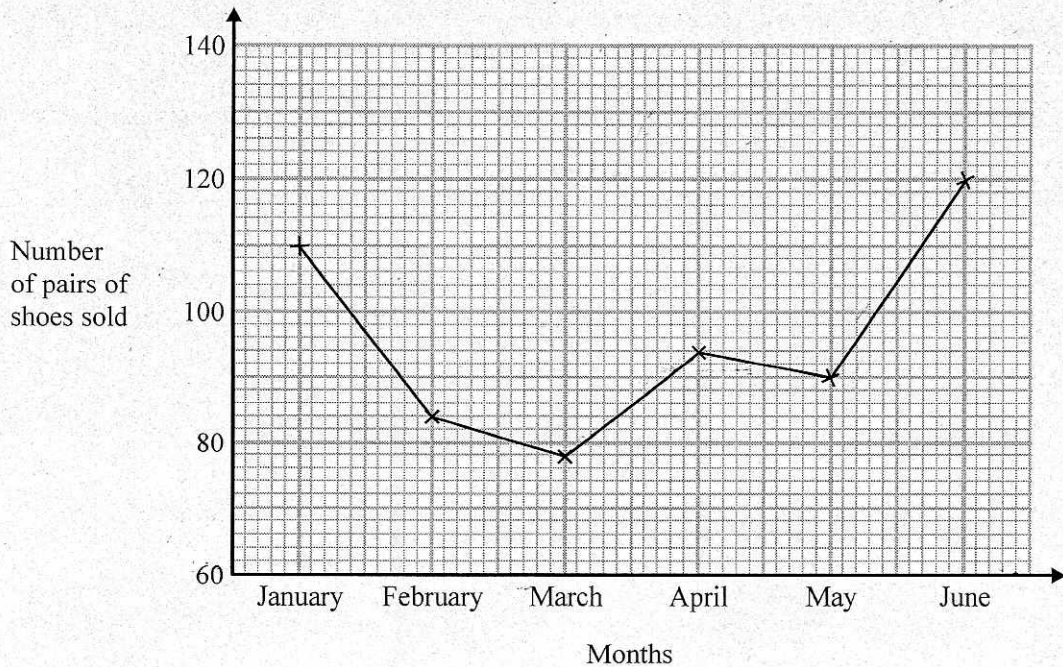
Jardins of Paris sells furniture
at the lowest price

(Total for Question 2 is 3 marks)



S 4 9 8 1 8 A 0 3 2 4

- 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.

$$\frac{110 + 84 + 78 + 94 + 90 + 120}{6} = 96$$

The shop met their sales target.

(Total for Question 3 is 3 marks)



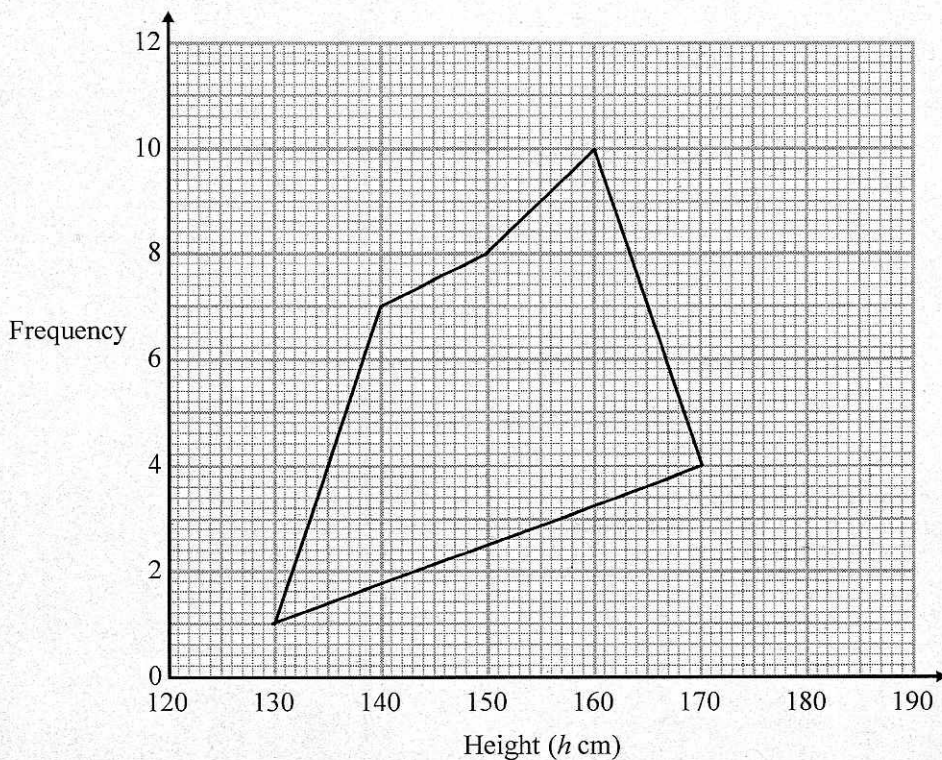
4 The grouped frequency table gives information about the heights of 30 students.

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.

$160 < h \leq 170$
(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 midpoint should be used
 - 2 the shape should not be joined up (enclosed)
- (2)

(Total for Question 4 is 3 marks)



S 4 9 8 1 8 A 0 5 2 4

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

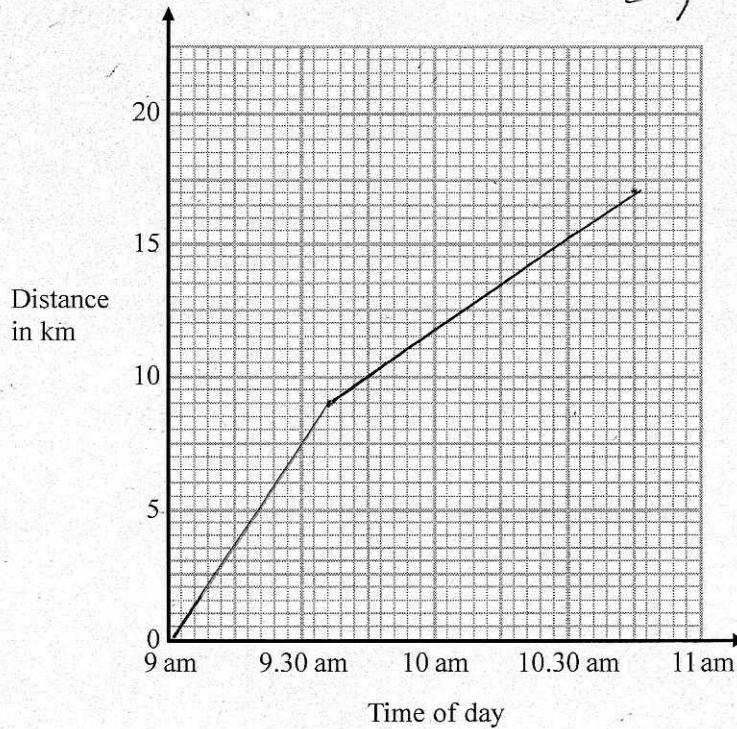


From 9 am to 9.36 am, he cycled at an average speed of 15 km/h.
From 9.36 am to 10.45 am, he cycled a further 8 km.

$$36 \text{ mins} = 0.6 \text{ hours}$$

$$D = S \times T \\ = 15 \times 0.6 \\ = 9$$

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



$$9 + 8 = 17$$

(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.

$$15 \text{ mins} = 0.25 \text{ hours}$$

$$\text{Distance} = \text{Speed} \times \text{Time} \\ = 18 \times 0.25$$

$$4.5 \text{ km} \\ (2)$$

(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.

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

$$5x + 7 = 57$$

$$5x = 50$$

$$x = 10$$

Becky : 10

Chris : 20

Dan : 27

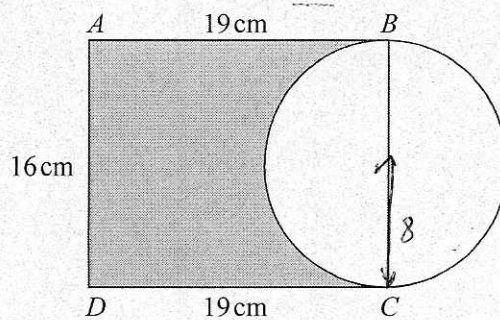
Dan and Becky cannot both have 20 marbles
If Dan gives 10 to Becky, he has 17.

(Total for Question 7 is 3 marks)



S 4 9 8 1 8 A 0 7 2 4

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.

$$\begin{aligned} \text{Area of Rectangle} &= 16 \times 19 \\ &= 304 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of Circle} &= \pi r^2 \\ &= \pi (8)^2 \\ &= 64\pi \end{aligned}$$

$$\text{Area of Semicircle} = 32\pi$$

$$\text{Shaded Area} = 304 - 32\pi$$

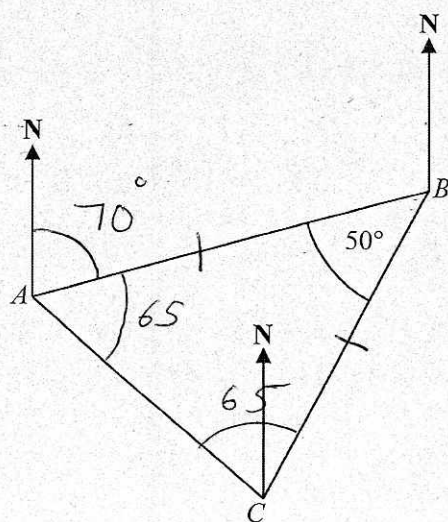
$$\frac{304 - 32\pi}{304} \times 100 = 66.9\%$$

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°

Angle ABC is 50°

$AB = CB$

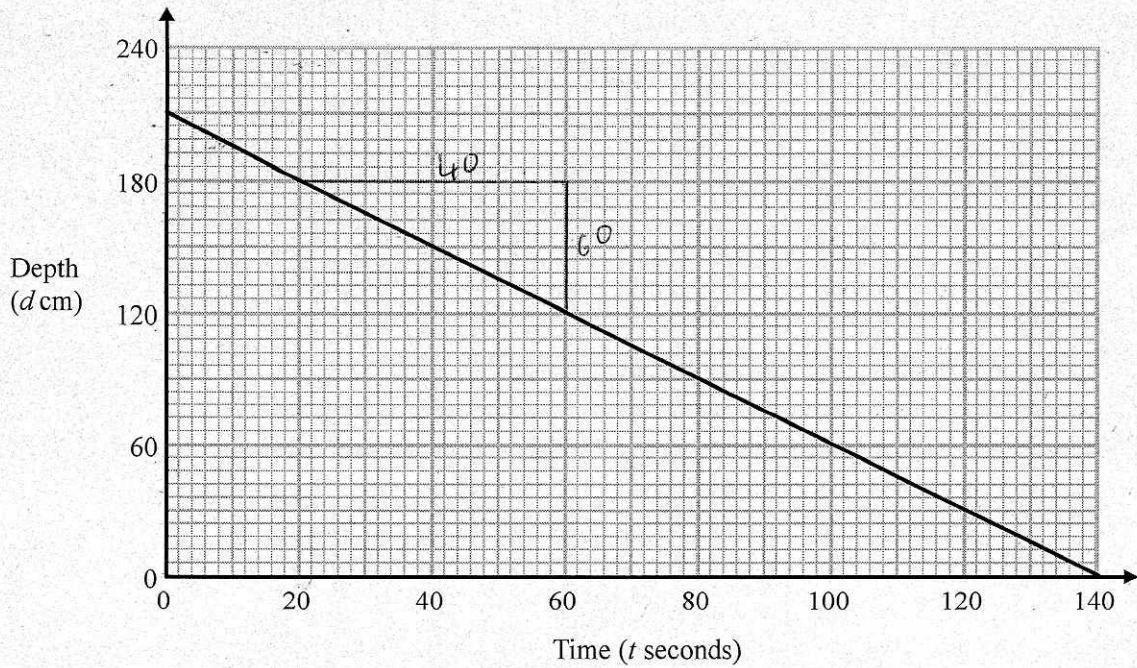
Work out the bearing of C from A .

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.

$$\frac{-60}{40} = -1.5$$

$$\underline{-1.5}$$

(2)

(b) Explain what this gradient represents.

the change in depth per second.

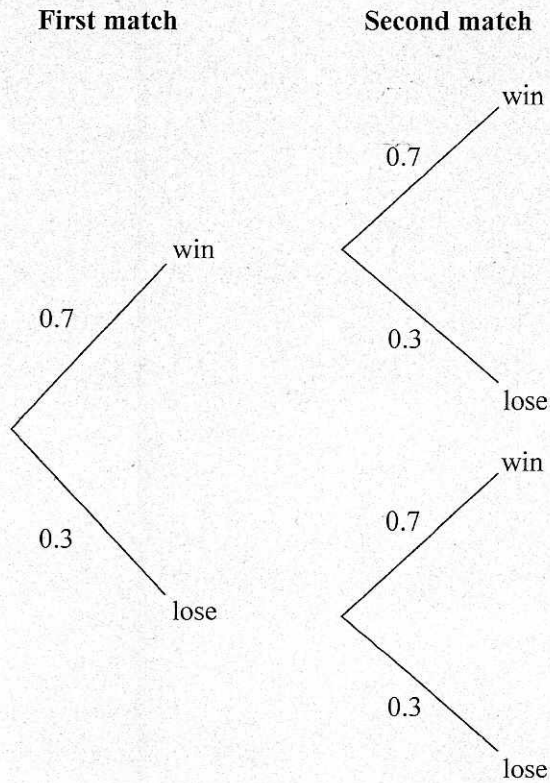
(1)

(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.

$$0.7 \times 0.7$$

$$\frac{0.49}{(2)}$$

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

$$1 - 0.49$$

$$\frac{0.51}{(2)}$$

(Total for Question 11 is 4 marks)



S 4 9 8 1 8 A 0 1 1 2 4

12 (a) Find the reciprocal of 2.5

$$\frac{1}{2.5}$$

$$\begin{array}{r} 0.4 \\ 2.5 \overline{) 1.00} \\ \underline{10} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

(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.

$$0.5855934233$$

$$\begin{array}{r} 0.586 \\ \hline \end{array}$$

(2)

(Total for Question 12 is 3 marks)

13 Show that

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

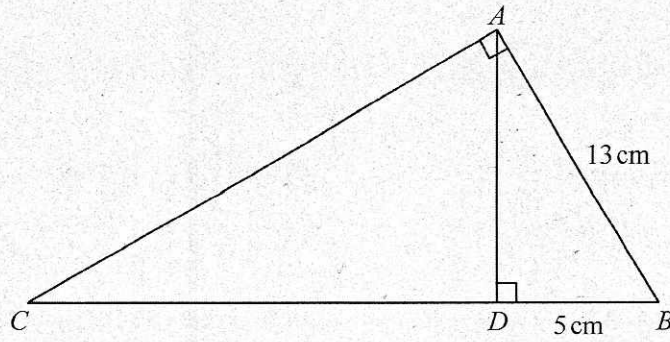
for all values of x .

$$\begin{aligned} & (3x - 1)(4x^2 - 3x + 20x - 15) \\ & (3x - 1)(4x^2 + 17x - 15) \\ & 12x^3 + 51x^2 - 45x - 4x^2 - 17x + 15 \\ & \underline{12x^3 + 47x^2 - 62x + 15} \end{aligned}$$

(Total of Question 13 is 3 marks)



14 ABC and ABD are two right-angled triangles.

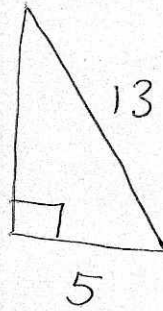


Angle $BAC = \text{angle } ADB = 90^\circ$

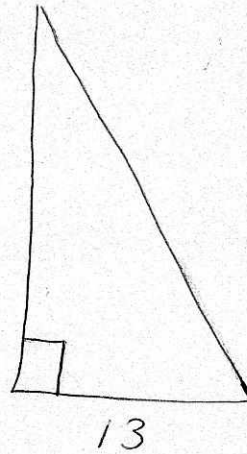
$AB = 13 \text{ cm}$

$DB = 5 \text{ cm}$

Work out the length of CB .



$$\begin{array}{r} \rightarrow \\ \times \frac{13}{5} \end{array}$$



$$13 \times \frac{13}{5}$$

33.8 cm

(Total for Question 14 is 3 marks)



S 4 9 8 1 8 A 0 1 3 2 4

- 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.

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

$$\sqrt{1.4} = 1.183215957$$

$$18.3\% \text{ (3sf)}$$

18.3 %

(Total for Question 15 is 3 marks)

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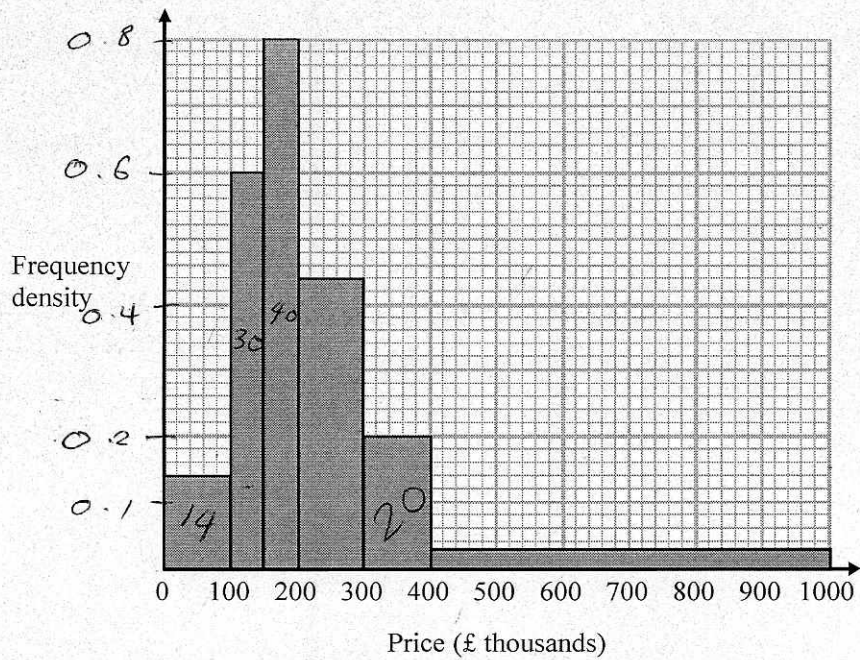
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16 The histogram gives information about house prices in a village in 2015



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

$$40 + 30 + 14 = \underline{\underline{84}}$$

(Total for Question 16 is 3 marks)



S 4 9 8 1 8 A 0 1 5 2 4

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

$$a + b + c \rightarrow 1 \quad 3 \quad 7 \quad 13 \quad 21$$

$$an^2 + bn + c$$

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

$$\begin{array}{cccccc} & & 2 & 4 & 6 & 8 \\ 3a+b & \rightarrow & & & & \\ & & 2 & 2 & 2 & \\ 2a & \rightarrow & & & & \end{array}$$

$$\begin{aligned} 2a &= 2 \\ a &= 1 \end{aligned}$$

$$3(1) + b = 2$$

$$b = -1$$

$$1 - 1 + c = 1$$

$$c = 1$$

$$n^2 - n + 1$$

(Total for Question 17 is 3 marks)

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

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

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

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

$$3(x^2 + 2x + 2x + 4) - 2x - 12$$

$$3(x^2 + 4x + 4) - 2x - 12$$

$$3x^2 + 12x + 12 - 2x - 12$$

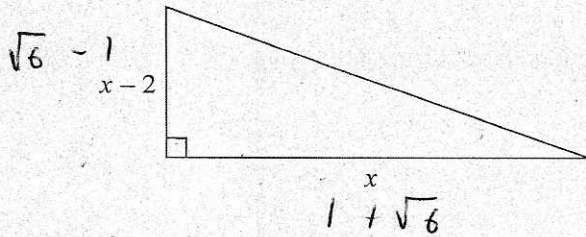
$$3x^2 + 10x$$

$$3x^2 + 10x$$

(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 cm^2 .

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

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

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

$$x^2 - 2x = 5$$

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

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

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-5)}}{2(1)}$$

$$= 3.449489743 \text{ or } -1.449489743$$

x cannot be negative.

$$\sqrt{(3.449489743)^2 + (1.449489743)^2} = 3.741657387$$

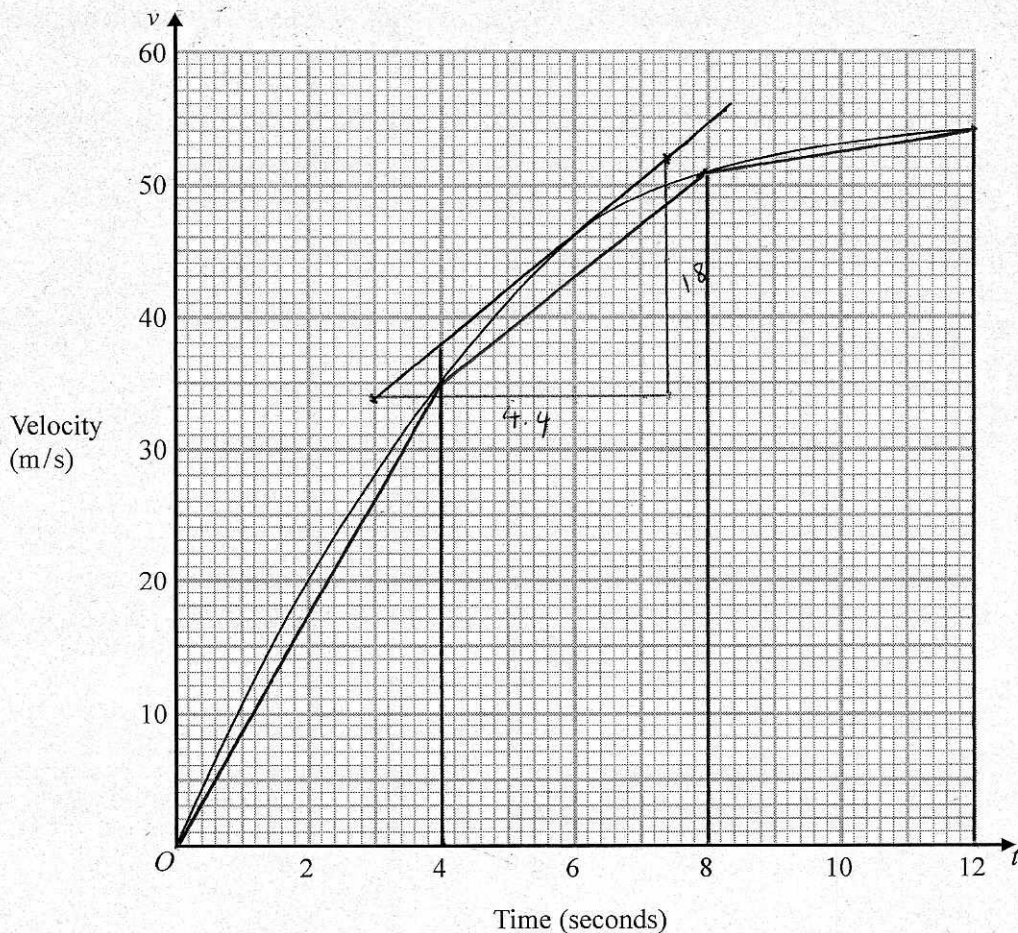
$$p = 3.449489743 + 1.449489743 + 3.741657387 = 8.64 \text{ cm}$$

(Total for Question 19 is 6 marks)



S 4 9 8 1 8 A 0 1 7 2 4

- 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 $t=6$

$$\frac{18}{4.4} = 4.1 \text{ (1dp)} \quad \underline{4.1} \text{ m/s}^2 \quad (2)$$

- (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.

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

$$70 + 172 + 210 \quad \underline{452} \text{ m} \quad (3)$$

(Total for Question 20 is 5 marks)



- 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?

$$2016: \quad 1.05(9500 - 250) = 9712.5$$

$$2017: \quad 1.05(\text{Ans} - 250) = 9935.625$$

$$2018: \quad 1.05(\text{Ans} - 250) = 10169.90625$$

10170

(Total for Question 21 is 3 marks)



S 4 9 8 1 8 A 0 1 9 2 4

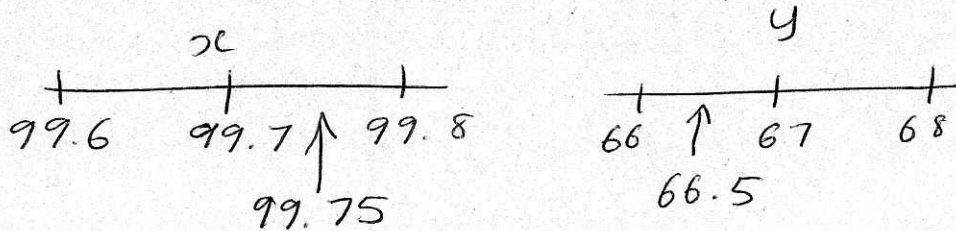
22 $D = \frac{x}{y}$

$x = 99.7$ correct to 1 decimal place.

$y = 67$ correct to 2 significant figures.

Work out an upper bound for D .

upper $D = \frac{\text{upper } x}{\text{lower } y}$



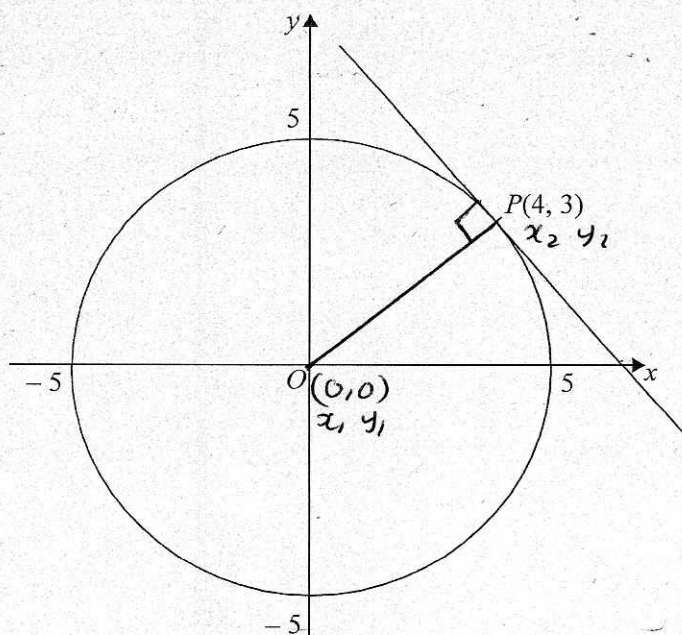
$$\frac{99.75}{66.5} = 1.5$$

1.5

(Total for Question 22 is 3 marks)



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 .

$$\begin{aligned} \text{Gradient of radius} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3 - 0}{4 - 0} = \frac{3}{4} \end{aligned}$$

$$\text{Gradient of tangent} = \frac{-4}{3} \quad (\text{perpendicular})$$

$$y = \frac{-4}{3}x + c \quad (4, 3)$$

$$3 = \frac{-4}{3}(4) + c$$

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

$$9 = -16 + 3c$$

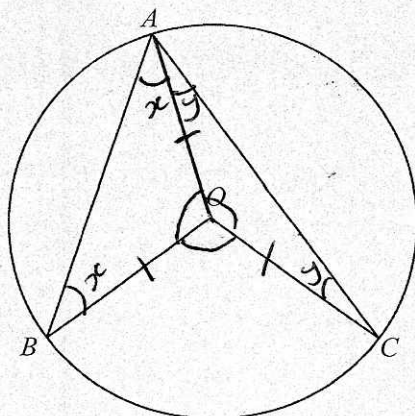
$$25 = 3c \quad c = \frac{25}{3} \quad (\text{Total for Question 23 is 3 marks})$$

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



S 4 9 8 1 8 A 0 2 1 2 4

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 .

$$\text{Let } \angle BAO \text{ and } \angle ABO = x$$

$$\text{Let } \angle CAO \text{ and } \angle ACO = y$$

$$\angle BAC = x + y$$

$$\angle AOB = 180 - 2x \quad \angle AOC = 180 - 2y$$

(Angles in a triangle add to 180)

$$\angle BOC = 360 - (180 - 2x) - (180 - 2y)$$

$$= 360 - 180 + 2x - 180 + 2y$$

$$= 2x + 2y$$

(Angles around a point add to 360)

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

