

Complete ✓

Please check the examination details below before entering your candidate information

Candidate surname

LH

Other names

WS

Centre Number

Candidate Number

Pearson Edexcel

Level 1/Level 2 GCSE (9–1)

Tuesday 11 June 2019

Morning (Time: 1 hour 30 minutes)

Paper Reference 1MA1/3H

Mathematics

Paper 3 (Calculator)

Higher Tier

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

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



### 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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6/7/1/1/1/1/1/



P 5 5 6 0 2 A 0 1 2 4

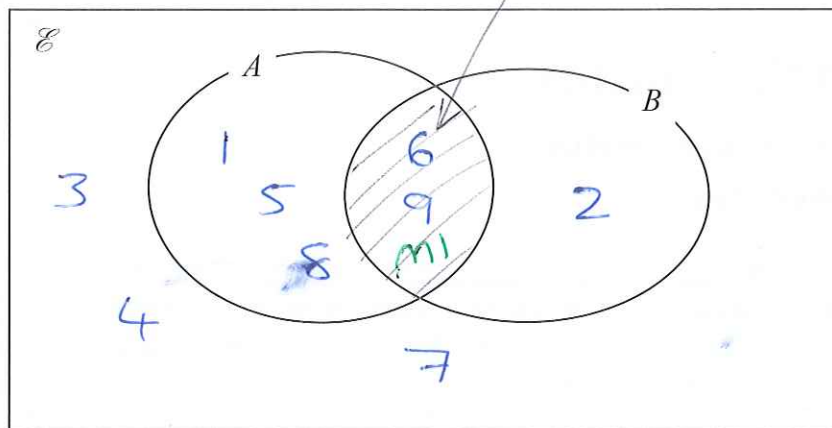
  
Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1  $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$   
 $A = \{1, 5, 6, 8, 9\}$   
 $B = \{2, 6, 9\}$



- (a) Complete the Venn diagram to represent this information.

(3)

A number is chosen at random from the universal set  $\mathcal{E}$ .

- (b) Find the probability that the number is in the set  $A \cap B$

$$\frac{n(A \cap B)}{n(\mathcal{E})} = \frac{2}{9}$$

(2)

(Total for Question 1 is 5 marks)



- 2 Katy invests £200 000 in a savings account for 4 years.  
The account pays compound interest at a rate of 1.5% per annum.

Calculate the total amount of interest Katy will get at the end of 4 years.

$$1.5\% = \frac{1.5}{100} = 0.015$$

$$100\% + 1.5\% = 101.5\% \\ = 1.015$$

$$£200\,000 \times (1.015)^4$$

m1 correct  
first step

$$= £212,272.7101$$

$$= £212,272.71 \text{ (to nearest penny)} \quad m1$$

Total interest

$$= £212,272.71 - £200\,000$$

$$= \underline{£12\,272.71 \text{ (to nearest penny)}}$$

accept

$$£12\,272.70$$

$$£12\,272.71$$

$$£12\,272.72$$

A1

$$£12\,272.71$$

(Total for Question 2 is 3 marks)





- 3 The table shows information about the heights of 80 plants.

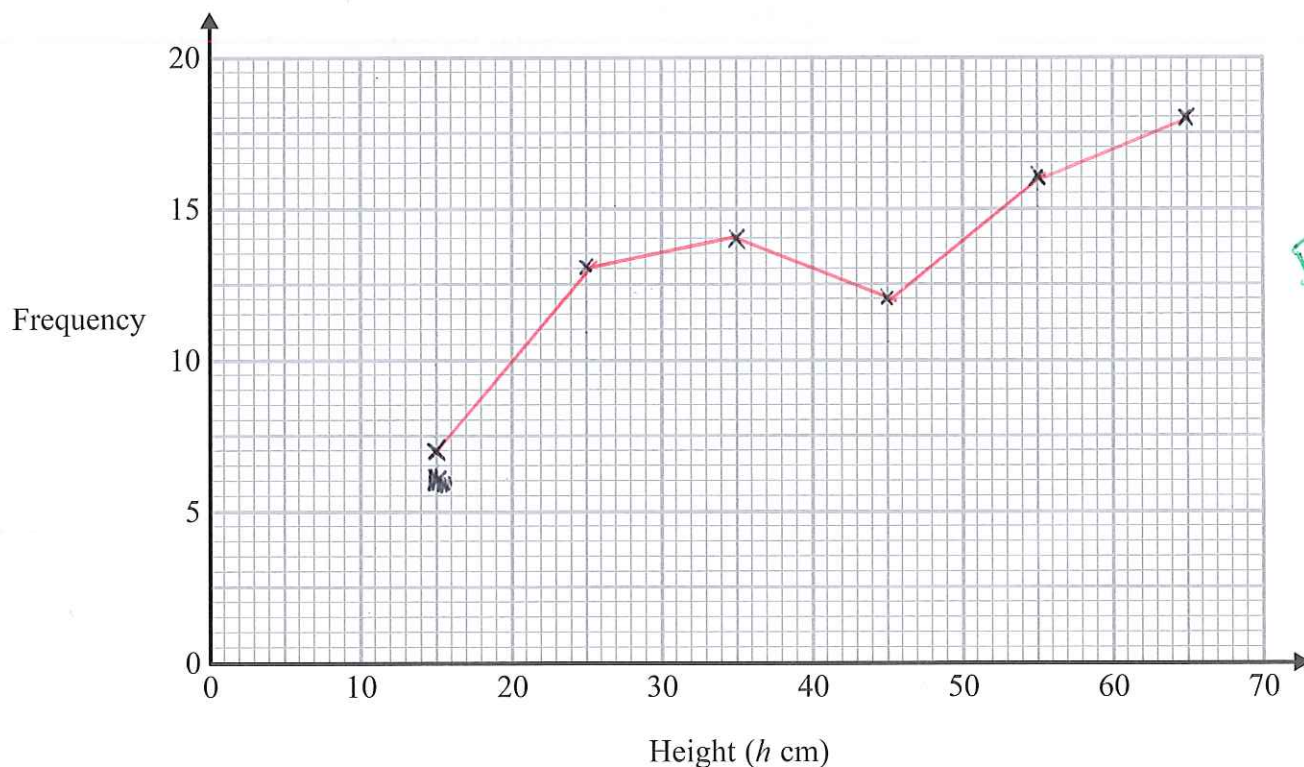
Height ( $h$ cm)	<sup>mid plant</sup> Frequency	CF
$10 < h \leq 20$	(15, 7)	7
$20 < h \leq 30$	(25, 13)	20
$30 < h \leq 40$	(35, 14)	34
→ $40 < h \leq 50$	(45, 12)	46
$50 < h \leq 60$	(55, 16)	62
$60 < h \leq 70$	(65, 18)	80

- (a) Find the class interval that contains the median.

B1  
 $40 < h \leq 50$

(1)

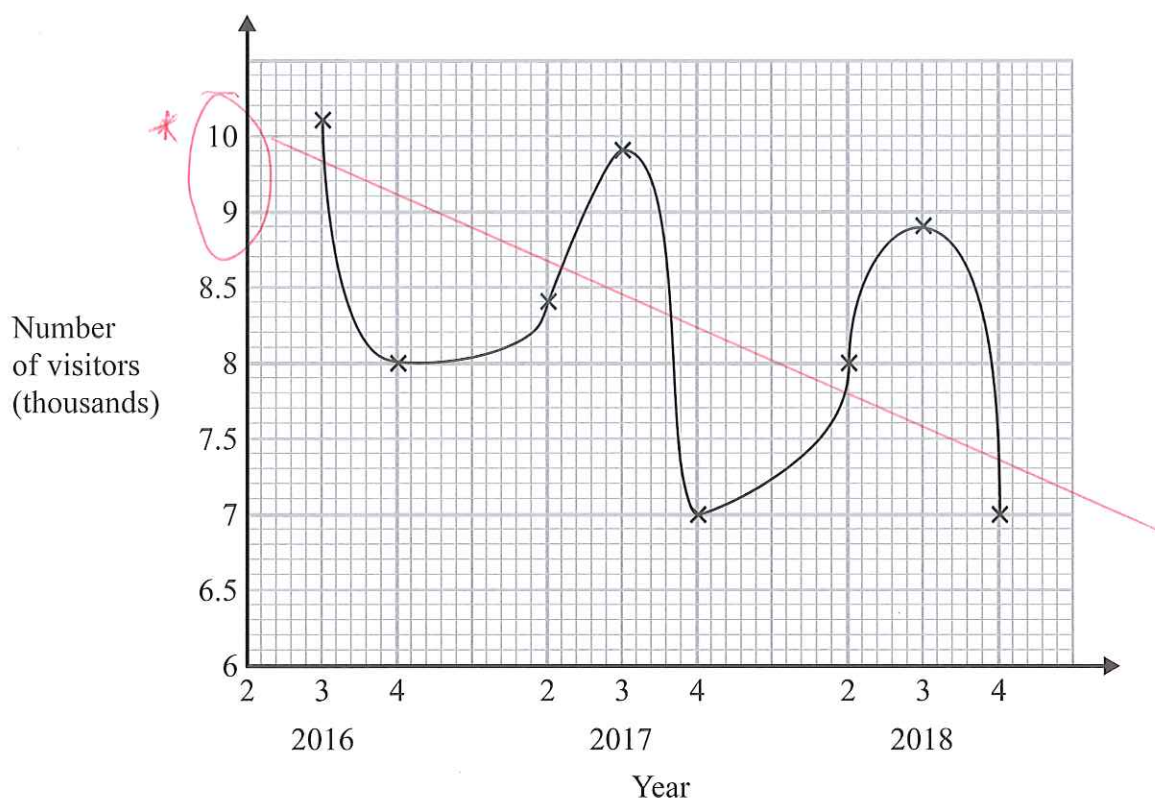
- (b) On the grid, draw a frequency polygon for the information in the table.



(2)

(Total for Question 3 is 3 marks)

- 4 Sean has drawn a time series graph to show the numbers, in thousands, of visitors to a fun park.



Write down two things that are wrong or could be misleading with this graph.

- 1 A time series graph should have a trend line rather than joining up all points — this would show a decreasing trend.
- 2 \* Scale must be consistent and should go 9, 9.5, 10 whereas 9.5 is missed out.

(Total for Question 4 is 2 marks)

- 3 Points could be joined with straight lines but not curves
- 4 horizontal not fully labelled (what does 2, 3, 4 represent?)

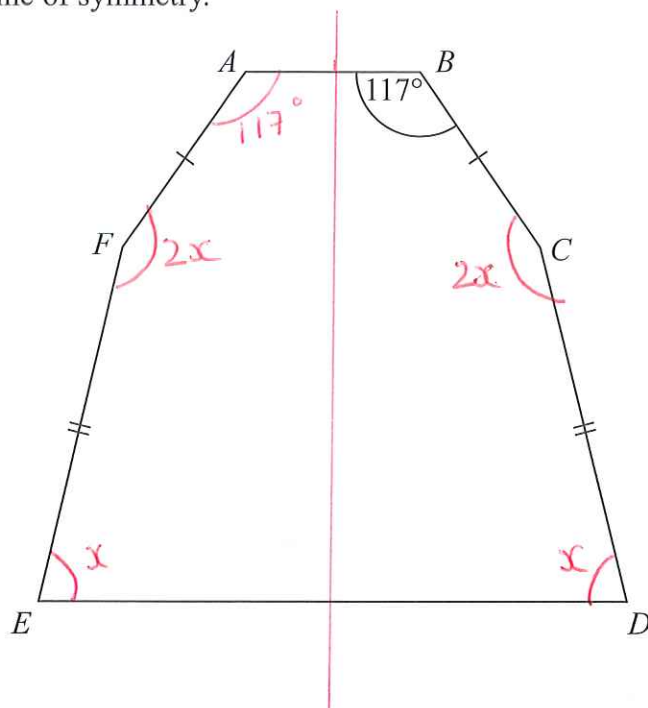
5



P 5 5 6 0 2 A 0 5 2 4



- 5 The diagram shows a hexagon.  
The hexagon has one line of symmetry.



$$FA = BC$$

$$EF = CD$$

$$\text{Angle } ABC = 117^\circ$$

$$\text{Angle } BCD = 2 \times \text{angle } CDE$$

Work out the size of angle  $AFE$ .

You must show all your working.

Let angle  $CDE = x$ , then  $BCD = 2x$  m1  
Since the hexagon is symmetrical,  $\hat{BAF} = \hat{ABC}$   
 $\hat{AFE} = \hat{BCD}$   
 $\hat{FED} = \hat{CDE}$

$$\begin{aligned} \text{Angle sum of hexagon} &= 6 \times 180^\circ \\ &= 720^\circ \quad \text{m1} \end{aligned}$$

$$\begin{aligned} \therefore 117 + 117 + 2x + 2x + x + x &= 720 \\ 234 + 6x &= 720 \end{aligned}$$

$$\begin{aligned} 6x &= 486 \quad \text{m1} \\ x &= 81 \end{aligned}$$

$$\begin{aligned} [-234] \\ [\div 6] \end{aligned}$$

$$\begin{aligned} \therefore \text{AFE} &= 2x \\ &= 2 \times 81 \\ &= 162^\circ \end{aligned}$$

c1

$$162^\circ \quad \checkmark$$

(Total for Question 5 is 4 marks)



6 Jeremy has to cover 3 tanks completely with paint.

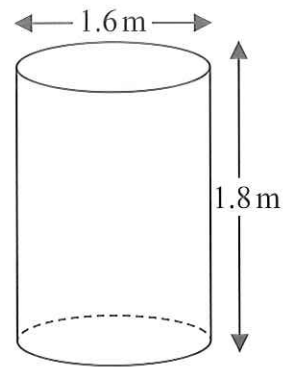
Each tank is in the shape of a cylinder with a top and a bottom.  
The tank has a diameter of 1.6 m and a height of 1.8 m.

Jeremy has 7 tins of paint.

Each tin of paint covers  $5 \text{ m}^2$

$$d = 1.6$$

$$r = 0.8$$



Has Jeremy got enough paint to cover completely the 3 tanks?  
You must show how you get your answer.

$$\begin{aligned} \text{Surface Area Cylinder} &= 2\pi r^2 + 2\pi r h \\ &= 2 \times \pi \times 0.8^2 + 2 \times \pi \times 0.8 \times 1.8 \\ &= 1.28\pi + 2.88\pi \\ &= 4.16\pi \\ &= \underline{13.06902544 \text{ m}^2} \end{aligned}$$

Jeremy has enough paint to cover  
 $7 \times 5 \text{ m}^2 = 35 \text{ m}^2$  PI

$$\begin{aligned} \text{He needs to cover } &3 \times 13.06902544 \text{ m}^2 \\ &= 39.20707632 \text{ m}^2 \\ &= 39.2 \text{ m}^2 \text{ (3sf)} \end{aligned}$$

He does not have enough - He will have  
 $4.2 \text{ m}^2$  not covered. CI

(Total for Question 6 is 5 marks)



7 Work out  $\sqrt{\frac{2.5 \times \sin 43^\circ}{8.2^2 - 50.5}}$

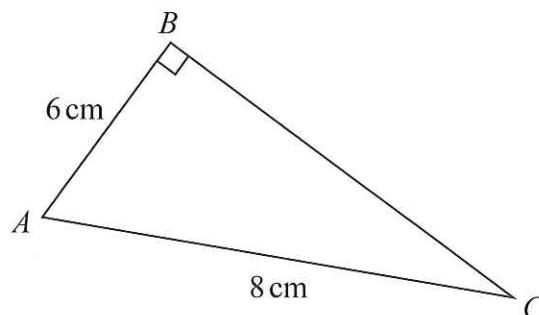
Give your answer correct to 3 significant figures.

$$= 0.3191419855 \text{ m}$$

$$0.319 \text{ A1}$$

(Total for Question 7 is 2 marks)

8  $ABC$  is a right-angled triangle.



Here is Sarah's method to find the length of  $BC$ .

$$\begin{aligned} BC^2 &= AB^2 + AC^2 \\ &= 6^2 + 8^2 \\ &= 100 \\ BC &= 10 \end{aligned}$$

(a) What mistake has Sarah made in her method?

She has taken  $BC$  to be the hypotenuse but it is not.

She should have done  $AC^2 = AB^2 + BC^2$

$$BC^2 = AC^2 - AB^2$$

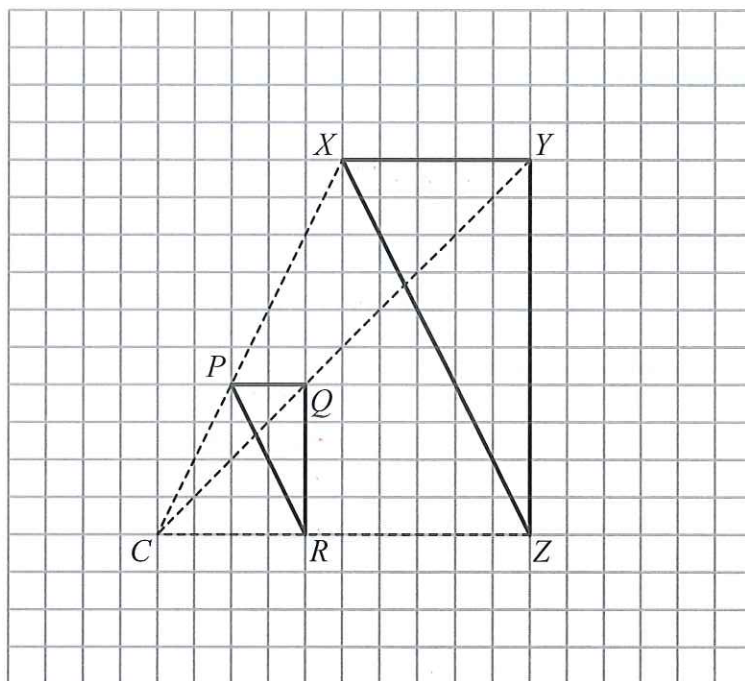
$$= 8^2 - 6^2 \quad (1)$$

$$= 28$$

$$BC = \sqrt{28}$$







Roy is going to enlarge triangle  $PQR$  with centre  $C$  and scale factor  $1\frac{1}{2}$

He draws triangle  $XYZ$ .

(b) Explain why Roy's diagram is **not** correct.

He has enlarged by scale factor  $2\frac{1}{2}$  not  $1\frac{1}{2}$

Side  $XY$  is 5 squares but should be 3

Side  $YZ$  is 10 squares but should be 6

(1)

(Total for Question 8 is 2 marks)



- 9 A company has to make a large number of boxes.

The company has 6 machines.

All the machines work at the same rate.

When all the machines are working, they can make all the boxes in 9 days.

The table gives the number of machines working each day.

	day 1	day 2	day 3	all other days
Number of machines working	3	4	5	6

Work out the total number of days taken to make all the boxes.

Day	1	2	3	4	5	6	7	8	9	10
Machines	3	4	5	6	6	6	6	6	6	6

*Handwritten notes: Circles around (Day 1, 2, 3) and (Day 4, 5) with '12' below them. A blue 'P1' is written below Day 1 and Day 10.*

12 machines for 3 days  
will do what 6 machines/day  
would take 2 days for.

∴ an extra day needed

*Handwritten: A 10*

(Total for Question 9 is 3 marks)

*OR*  
Day 1 3 machines (half as much as 6 machines)  
∴  $\frac{1}{2}$  days production short

Day 2 + Day 3 9 machines ( $1\frac{1}{2}$  days production in 2 days)  
∴  $\frac{1}{2}$  day production short

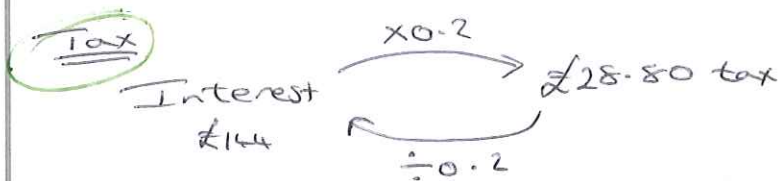
to catch up  $\frac{1}{2} + \frac{1}{2}$  day = 1 day extra



- 10 Marie invests £8000 in an account for one year.  
At the end of the year, interest is added to her account.

Marie pays tax on this interest at a rate of 20%  
She pays £28.80 tax.

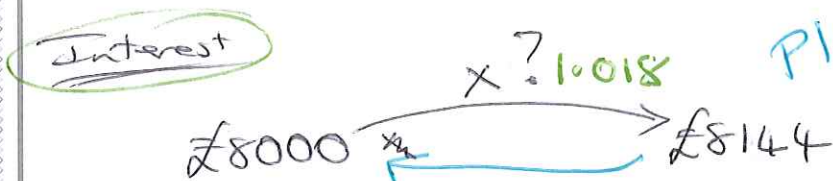
Work out the percentage interest rate for the account.



P1

Interest = £144

At the end of the year Marie has £8000 + £144  
= £8144  
Before Tax



P1

$$\frac{8144}{8000} = 1.018$$

∴ £8144 is 101.8% of £8000  
Interest rate = 1.8%

A1

1.8 %

(Total for Question 10 is 3 marks)

Alternative method

$$\begin{aligned} 20\% &= £28.80 \\ \times 5 & \\ 100\% &= £144 \end{aligned}$$

$$\begin{aligned} \text{Interest Rate} &= \frac{144}{8000} \times 100 \\ &= 0.018 \times 100 \\ &= 1.8\% \end{aligned}$$





Mw 83

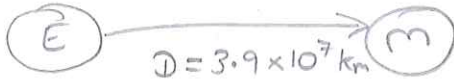


- 11 In May 2019, the distance between Earth and Mars was  $3.9 \times 10^7$  km.

In May 2019, a signal was sent from Earth to Mars.

Assuming that the signal sent from Earth to Mars travelled at a speed of  $3 \times 10^5$  km per second,

- (a) how long did the signal take to get to Mars?



$$S = 3 \times 10^5 \text{ km/s}$$

$$T = \frac{D}{S}$$

$$= \frac{3.9 \times 10^7}{3 \times 10^5}$$

P1

130 seconds

(2)

The speed of the signal sent from Earth to Mars in May 2019 was actually less than  $3 \times 10^5$  km per second.

- (b) How will this affect your answer to part (a)?

The signal would take longer to get to Mars since it is travelling more slowly.

C1

(1)

(Total for Question 11 is 3 marks)

- 12 Patrick has to work out the exact value of  $64^{\frac{1}{4}}$

Mw 188

Patrick says,

$$\text{"}\frac{1}{4}\text{ of } 64 \text{ is } 16 \text{ so } 64^{\frac{1}{4}} = 16\text{"}$$

Explain what is wrong with what Patrick says.

power of  $\frac{1}{4}$  means fourth root

$$\therefore 64^{\frac{1}{4}} = \sqrt[4]{64} \neq 16$$

C1

(Total for Question 12 is 1 mark)



- 13 The density of ethanol is  $1.09 \text{ g/cm}^3$   
The density of propylene is  $0.97 \text{ g/cm}^3$

$\textcircled{D} \quad \textcircled{M} \quad \textcircled{V}$

60 litres of ethanol are mixed with 128 litres of propylene to make 188 litres of antifreeze.

Work out the density of the antifreeze.  
Give your answer correct to 2 decimal places.

Ethanol

Propylene

Antifreeze

$$D = 1.09 \text{ g/cm}^3 \quad D = 0.97 \text{ g/cm}^3 \quad \text{total } D =$$

$$M = 65400 \text{ g} + M = 124160 \text{ g} = \text{total } M = 189560 \text{ g}$$

$$V = 60000 \text{ cm}^3 + V = 128000 \text{ cm}^3 = \text{total } V = 188000 \text{ cm}^3 \quad \text{PI}$$

$$\textcircled{D} = \frac{M}{V}$$

$$= \frac{189560}{188000}$$

$$= 1.008297872$$

$$1.00 \rightarrow 1.01 \quad \text{AI}$$

$$\underline{1.01} \text{ g/cm}^3 \quad (2dp)$$

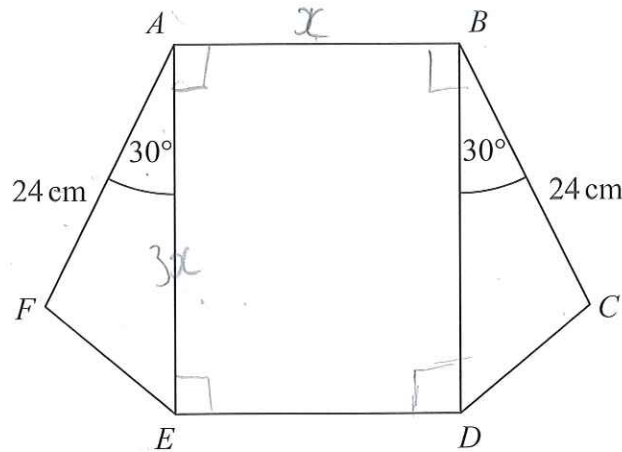
(Total for Question 13 is 4 marks)

$$\begin{aligned} \text{Mass} &= D \times V \\ &= 1.09 \times 60000 \\ &= 65400 \text{ g} \quad \text{PI} \end{aligned}$$

$$\begin{aligned} \text{Mass} &= D \times V \\ &= 0.97 \times 128000 \\ &= 124160 \text{ g} \quad \text{PI} \end{aligned}$$



- 14 The diagram shows a rectangle,  $ABDE$ , and two congruent triangles,  $AFE$  and  $BCD$ .



area of rectangle  $ABDE$  = area of triangle  $AFE$  + area of triangle  $BCD$

$$AB : AE = 1 : 3$$

Work out the length of  $AE$ .

$$x \times 3x = 3x^2$$

Area  $ABDE$

P1

$$\begin{aligned} \text{Area } BCD \\ = \text{Area } AFE \end{aligned}$$

$$\begin{aligned} \text{Area } AFE &= \frac{1}{2}(AE)(AF)\sin 30^\circ \\ &= \frac{1}{2} \times 3x \times 24 \times \sin 30^\circ \\ &= \frac{1}{2} \times 3x \times 24 \times \frac{1}{2} \\ &= 6 \times 3x \\ &= 18x \end{aligned}$$

P1

$$\text{Area } ABDE = \text{Area } BCD + \text{Area } AFE$$

$$3x^2 = 18x + 18x$$

$$3x^2 = 36x$$

$$x^2 = 12x$$

$$x^2 - 12x = 0$$

$$x(x - 12) = 0$$

$$x \neq 0 \text{ or } x = 12$$

$x$  cannot be 0 as we cannot have length zero

P1

$$\begin{aligned} AE &= 3x \\ &= 3 \times 12 \\ &= 36 \text{ cm} \end{aligned}$$

A1

36 cm

(Total for Question 14 is 4 marks)





MW 196

- 15 The graph of the curve C with equation  $y = f(x)$  is transformed to give the graph of the curve S with equation  $y = f(-x) - 3$

The point on C with coordinates (7, 2) is mapped to the point Q on S.

Find the coordinates of Q.

$$y = f(-x) - 3$$

↑ reflection in y-axis

↑ shift down 3

m1

$$(7, 2) \rightarrow (-7, 2) \rightarrow (-7, -1)$$

A1

$$(-7, -1)$$

(Total for Question 15 is 2 marks)

- 16 Here are the first six terms of a quadratic sequence.

MW 213

-1 5 15 29 47 69

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

$$\begin{array}{ccccccc} a+b+c & (-1) & 5 & 15 & 29 & 47 & 69 \\ & | & / & / & / & / & / \\ 3a+b & (6) & 10 & 14 & 18 & 22 & \\ & | & / & / & / & / & \\ 2a & (4) & 4 & 4 & 4 & 4 & \end{array}$$

m1

method 1

2nd diff 4  $\therefore 2n^2$

n	$2n^2$	sequence
1	2 $\xrightarrow{-3}$	-1
2	8 $\xrightarrow{-3}$	5
3	18 $\xrightarrow{-3}$	15
4	32 $\xrightarrow{-3}$	29
5	50 $\xrightarrow{-3}$	47
6	72 $\xrightarrow{-3}$	69

method 2

$an^2 + bn + c$

$$2a = 4$$

$$a = 2$$

$$3a + b = 6$$

$$3 \times 2 + b = 6$$

$$6 + b = 6$$

$$b = 0$$

$$a + b + c = -1$$

$$2 + 0 + c = -1$$

$$2 + c = -1$$

$$c = -3$$

$$2n^2 - 3$$

m1

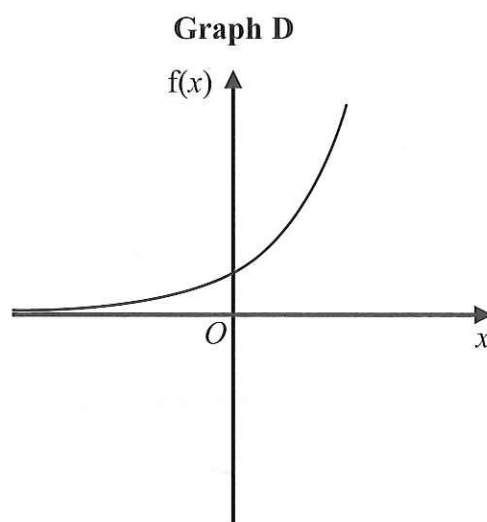
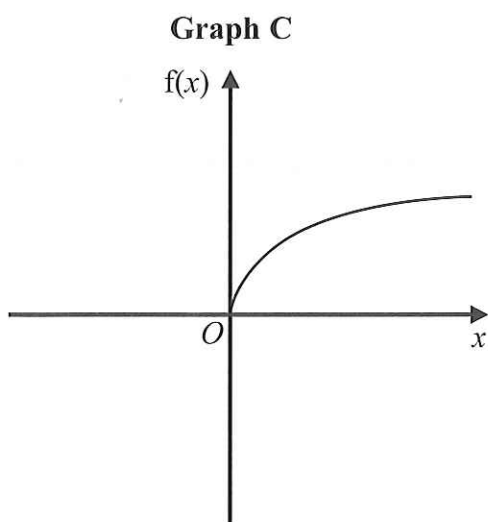
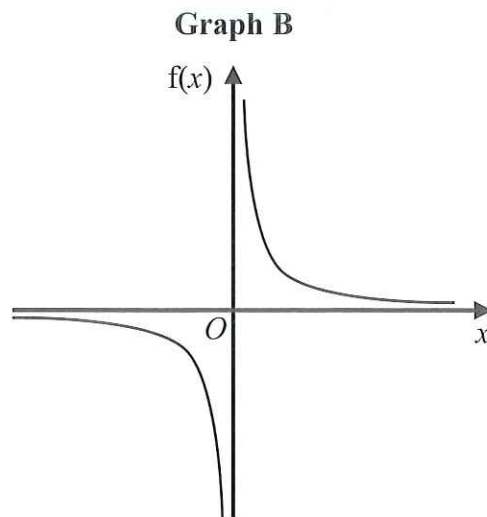
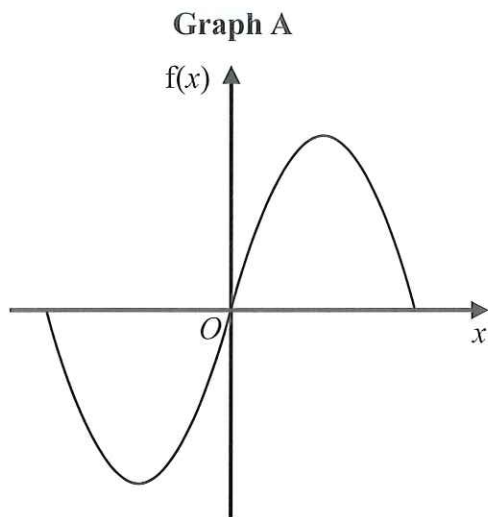
A1

(Total for Question 16 is 3 marks)



P 5 5 6 0 2 A 0 1 5 2 4

17 Here are four graphs.



The graphs represent four different types of function  $f$ .

Match each description of the function in the table to the letter of its graph.

Description of function	Graph
$f(x)$ is inversely proportional to $x$	B
$f(x)$ is a trigonometrical function	A
$f(x)$ is an exponential function	D
$f(x)$ is directly proportional to $\sqrt{x}$	C

B1 2 or 3 correct  
B1 all correct

(Total for Question 17 is 2 marks)

- 18 (a) Show that  $(2x+1)(x+3)(3x+7)$  can be written in the form  $ax^3 + bx^2 + cx + d$  where  $a, b, c$  and  $d$  are integers.

$$\begin{aligned} & (x+3)(3x+7) \\ &= 3x^2 + 7x + 9x + 21 \quad \text{ml} \\ &= 3x^2 + 16x + 21 \end{aligned}$$

$$\begin{aligned} & (2x+1)(3x^2 + 16x + 21) \\ &= 6x^3 + 32x^2 + 42x + 3x^2 + 16x + 21 \quad \text{ml} \\ &= 6x^3 + 35x^2 + 58x + 21 \end{aligned}$$

$a=6, b=35, c=58, d=21$  AI

(b) Solve

MW 210  
 $(1-x)^2 < \frac{9}{25}$

method 1

$$(1-x)^2 - \frac{9}{25} < 0$$

$$(1-x)(1-x) - \frac{9}{25} < 0 \quad \text{ml}$$

$$1-x-x+x^2 - \frac{9}{25} < 0$$

$$\frac{16}{25} - 2x + x^2 < 0 \quad [\times 25]$$

$$16 - 50x + 25x^2 < 0$$

$$25x^2 - 50x + 16 < 0$$

$$(5x-2)(5x-8) < 0$$

$x = \frac{2}{5}$  or  $x = \frac{8}{5}$  Key values ml

method 2

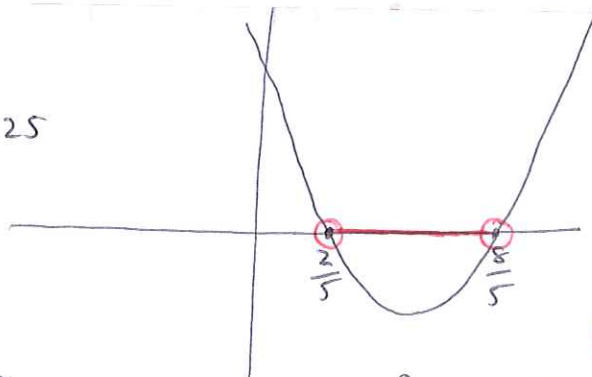
$$(1-x)^2 < \frac{9}{25}$$

$$1-x < \pm \frac{3}{5}$$

$$1 < \pm \frac{3}{5} + x$$

$$1 \pm \frac{3}{5} < x$$

critical values  $x = \frac{2}{5}, x = \frac{8}{5}$



$\frac{2}{5} < x < \frac{8}{5}$  AI

(3)

(Total for Question 18 is 6 marks)





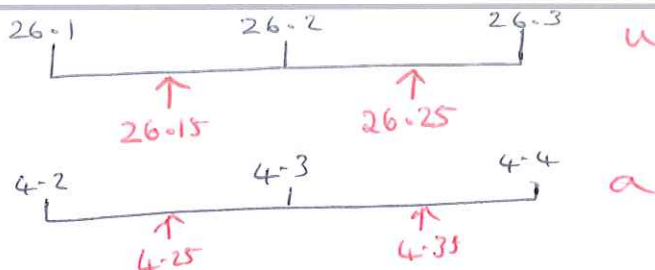
19  $D = \frac{u^2}{2a}$

$u = 26.2$  correct to 3 significant figures

$a = 4.3$  correct to 2 significant figures

- (a) Calculate the upper bound for the value of  $D$ .  
Give your answer correct to 6 significant figures.  
You must show all your working.

M1  
any correct  
bound



$\text{Big} = \frac{\text{Big}}{\text{small}}$

upper bound  $D = \frac{(\text{upper bound } u)^2}{2 \times \text{lower bound } a}$  P1

$= \frac{(26.25)^2}{2 \times 4.25}$

$= 81.06617647$

A1

$81.0661 \rightarrow 81.0662 \quad 81.0662 \text{ (6sf)}$   
(3)

The lower bound for the value of  $D$  is 78.6003 correct to 6 significant figures.

- (b) By considering bounds, write down the value of  $D$  to a suitable degree of accuracy.  
You must give a reason for your answer.

lower bound  $D = 80 \text{ (2sf)}$   
upper bound  $D = 80 \text{ (2sf)}$

both values are equal to 2sf C1

$\therefore D = 80 \text{ (2sf)}$  B1

(2)

(Total for Question 19 is 5 marks)



20 Solve algebraically the simultaneous equations

$$x^2 - 4y^2 = 9$$

$$3x + 4y = 7$$

$$3x = 7 - 4y$$

$$x = \frac{7}{3} - \frac{4}{3}y$$

$$\left(\frac{7}{3} - \frac{4}{3}y\right)^2 - 4y^2 = 9 \quad m1$$

$$\left(\frac{7}{3} - \frac{4}{3}y\right)\left(\frac{7}{3} - \frac{4}{3}y\right) - 4y^2 = 9$$

$$\frac{49}{9} - \frac{28}{9}y - \frac{28}{9}y + \frac{16}{9}y^2 - 4y^2 = 9 \quad m1$$

$$\frac{49}{9} - \frac{56}{9}y - \frac{20}{9}y^2 = 9 \quad [ \times 9$$

$$49 - 56y - 20y^2 = 81 \quad [-81$$

$$-32 - 56y - 20y^2 = 0 \quad [ \times -1$$

$$32 + 56y + 20y^2 = 0$$

$$20y^2 + 56y + 32 = 0 \quad [ \div 4$$

$$5y^2 + 14y + 8 = 0 \quad A1$$

$$(5y + 4)(y + 2) = 0 \quad m1$$

$$5y + 4 = 0$$

$$y = -\frac{4}{5}$$

$$\text{or } y + 2 = 0$$

$$y = -2$$

$$y = -\frac{4}{5}, \quad x = \frac{7}{3} - \frac{4}{3}\left(-\frac{4}{5}\right) = \frac{17}{5}$$

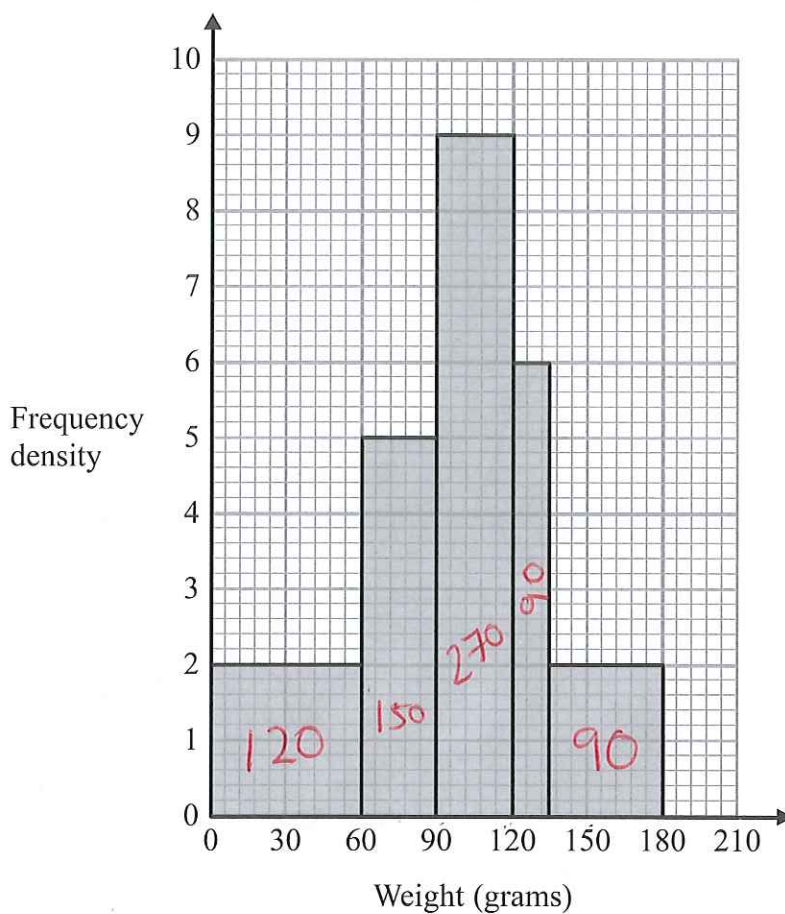
$$y = -2, \quad x = \frac{7}{3} - \frac{4}{3}(-2) = 5$$

$$\left(\frac{17}{5}, -\frac{4}{5}\right) \quad A1 \quad (5, -2)$$

(Total for Question 20 is 5 marks)



- 21 The histogram gives information about the distribution of the weights of some onions grown by a farmer.



Onions less than 60 grams in weight are used for pickling.  
Onions greater than 120 grams in weight are sold at the market.  
The rest of the onions are sent to a food processing factory.

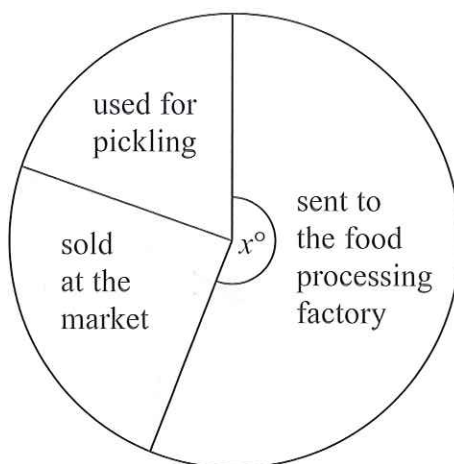
Frequency = area bar

0 → 60	Frequency = 60 × 2 = 120	
60 → 90	Frequency = 30 × 5 = 150	*
90 → 120	Frequency = 30 × 9 = 270	*
120 → 135	Frequency = 15 × 6 = 90	
135 → 180	Frequency = 45 × 2 = 90	+
<div style="border-top: 1px solid black; border-bottom: 3px double black; padding: 5px 0;"> 720 </div>		onions

M1



A pie chart is drawn using the information opposite to show what the farmer does with the onions he grows.



The angle of the sector for the onions sent to the food processing factory is  $x^\circ$ .

Work out the value of  $x$ .

onions between weigh 60 and 120  $\rightarrow$  food proc. fact.  
 $\star 150 + 270 = 420$  onions M1

$$\frac{420}{720} = \frac{7}{12} \quad \text{M1}$$

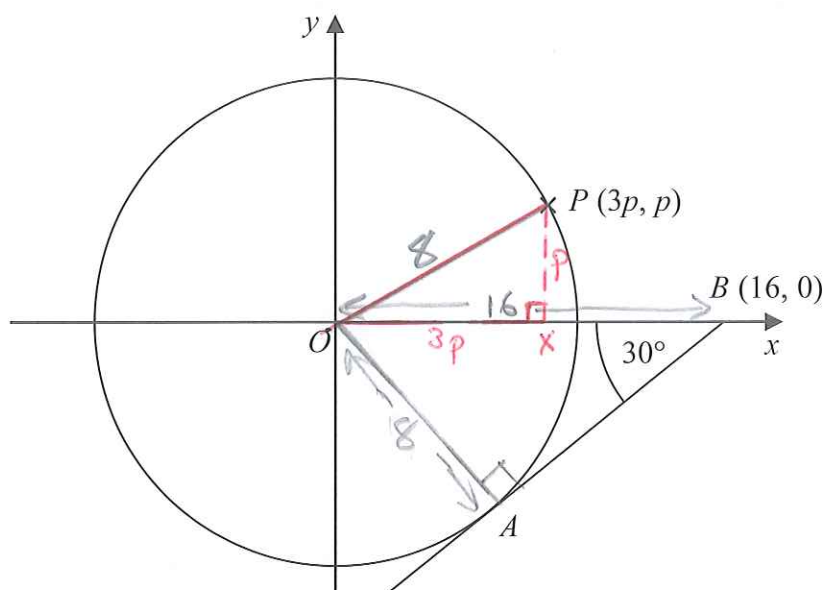
$$\text{Angle } x = \frac{7}{12} \times 360^\circ$$

$$x = 210^\circ \quad \text{A1}$$

(Total for Question 21 is 4 marks)



22 The diagram shows a circle, centre  $O$ .



$AB$  is the tangent to the circle at the point  $A$ .  
Angle  $OBA = 30^\circ$

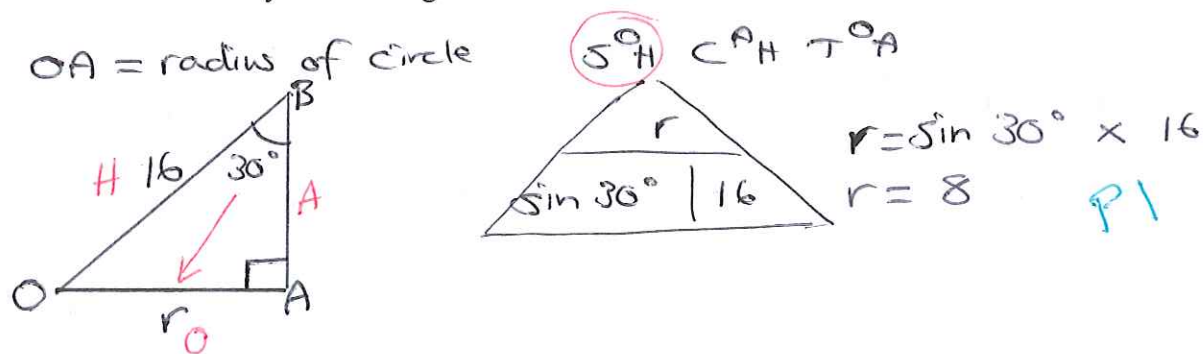
Point  $B$  has coordinates  $(16, 0)$

Point  $P$  has coordinates  $(3p, p)$

Find the value of  $p$ .

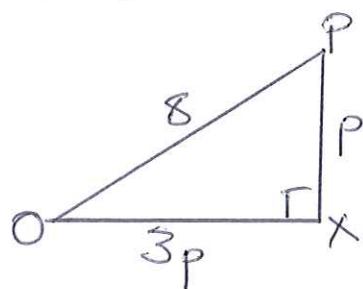
Give your answer correct to 1 decimal place.

You must show all your working.



$OP = \text{radius of circle} = 8$

$\therefore$  Distance between origin and point  $P$  is 8



Pythagoras' Theorem

$$(OX)^2 + (PX)^2 = (OP)^2$$

$$(3p)^2 + p^2 = 8^2$$

$$9p^2 + p^2 = 64$$

$$10p^2 = 64$$

$$p^2 = 6.4$$

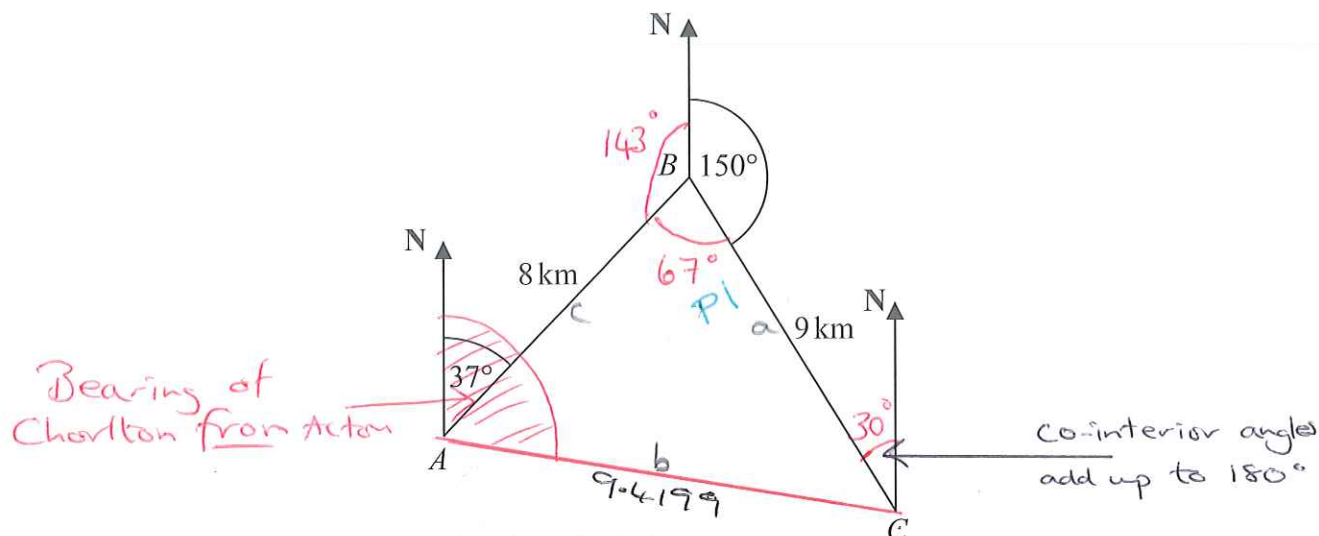
$$p = \sqrt{6.4} = 2.529822$$

$$p = 2.5 \text{ (1dp)}$$

(Total for Question 22 is 4 marks)



23 The diagram shows the positions of three towns, Acton (A), Barston (B) and Chorlton (C).



Barston is 8 km from Acton on a bearing of  $037^\circ$   
 Chorlton is 9 km from Barston on a bearing of  $150^\circ$

Find the bearing of Chorlton from Acton.  
 Give your answer correct to 1 decimal place.  
 You must show all your working.

Step 1 Use Cosine Rule to find AC

$$\begin{aligned} b^2 &= a^2 + c^2 - 2ac \cos B \\ &= 9^2 + 8^2 - 2 \times 9 \times 8 \times \cos 67^\circ \\ &= 88.7347175 \\ b &= 9.419910695 \end{aligned}$$

Step 2 Use Sine Rule to find angle  $\hat{BAC}$

$$\begin{aligned} \frac{\sin A}{a} &= \frac{\sin B}{b} \\ \frac{\sin A}{9} &= \frac{\sin 67^\circ}{9.419910695} \\ \sin A &= \frac{\sin 67^\circ}{9.419910695} \times 9 \\ A &= \sin^{-1} \left( \frac{\sin 67^\circ}{9.419910695} \times 9 \right) \\ \hat{BAC} &= 61.57868521^\circ \end{aligned}$$

Step 3 Bearing of Chorlton from Acton  
 $= 37^\circ + 61.57868521^\circ$   
 $= 98.57868521^\circ$   
 $= 98.6^\circ$  (1dp)

098.6°

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS





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