

ANSWERS

Write your name here		
Surname	Other names	
Pearson Edexcel Level 1/Level 2 GCSE (9 - 1)	Centre Number	Candidate Number
Mathematics		
Paper 1 (Non-Calculator)		
		Higher Tier
Mock Set 1 – Autumn 2016	Time: 1 hour 30 minutes	Paper Reference 1MA1/1H
You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. 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.*
- **Calculators may not be used.**
- 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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PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Work out $2\frac{3}{5} - 1\frac{5}{6}$

$$\frac{13}{5} - \frac{11}{6}$$

$$\frac{78}{30} - \frac{55}{30} = \frac{23}{30}$$

$$\frac{23}{30}$$

(Total for Question 1 is 3 marks)

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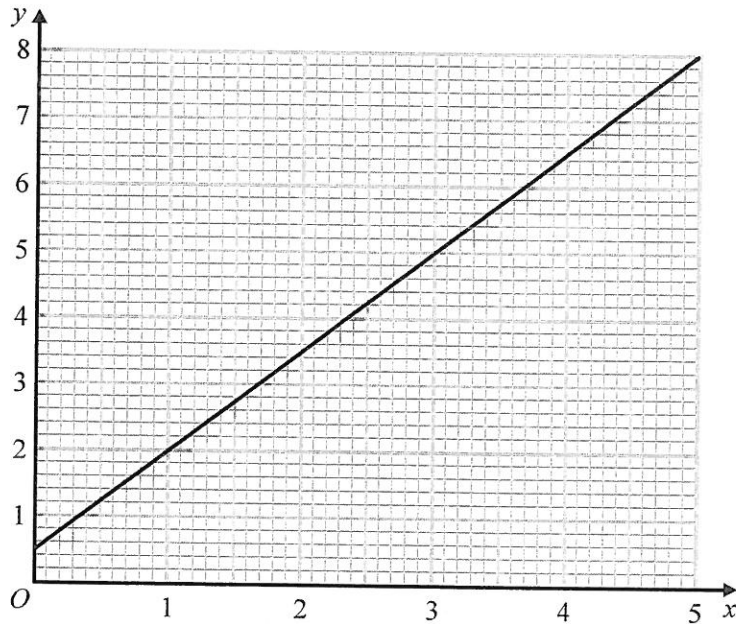
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2



Phone calls cost $\pounds y$ for x minutes.

The graph gives the values of y for values of x from 0 to 5

- (a) (i) Give an interpretation of the intercept of the graph on the y -axis.

FIXED CHARGE

- (ii) Give an interpretation of the gradient of the graph.

INCREASE IN COST PER INCREASE IN TIME

(2)

- (b) Find the equation of the straight line in the form $y = mx + c$

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

$$m = \frac{5-2}{3-1} = \frac{3}{2}$$

$$y = \frac{3x}{2} + \frac{1}{2}$$

(3)

(Total for Question 2 is 5 marks)

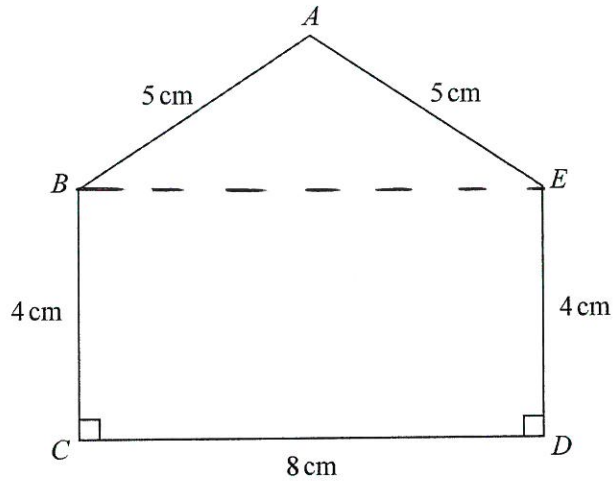


S 5 2 6 2 4 A 0 3 2 4

3

Turn over ▶

3 $ABCDE$ is a pentagon.



Work out the area of $ABCDE$.

$$\text{AREA OF RECTANGLE} = 4 \times 8 = 32 \text{ cm}^2$$

$$\text{PERPENDICULAR HEIGHT OF TRIANGLE} = \sqrt{5^2 - 4^2} = 3$$

$$\therefore \text{AREA OF TRIANGLE} = \frac{1}{2} \times 8 \times 3 = 12 \text{ cm}^2$$

$$\therefore \text{TOTAL AREA} = 32 + 12 = 44 \text{ cm}^2$$

44 cm²

(Total for Question 3 is 5 marks)



4 On Monday, Tarek travelled by train from Manchester to London.

Tarek's train left Manchester at 0835

It got to London at 1105

The train travelled at an average speed of 110 miles per hour.

On Wednesday, Gill travelled by train from Manchester to London.

Gill's train also left at 0835 but was diverted.

The train had to travel an extra 37 miles.

The train got to London at 1135

Work out the difference between the average speed of Tarek's train and the average speed of Gill's train.

TAREK'S TRAIN TOOK $2\frac{1}{2}$ HRS.

$$\therefore \text{DISTANCE} = 110 \times 2\frac{1}{2} = 220 + 55 = 275 \text{ MILES.}$$

GILL'S TRAIN TRAVELLED $275 + 37 = 312$ MILES
AND TOOK 3 HRS

$$\therefore \text{AVERAGE SPEED OF GILL'S TRAIN} = \frac{312}{3} = 104 \text{ mph.}$$

$$\therefore \text{DIFFERENCE IN SPEED} = 110 - 104 = 6 \text{ mph.}$$

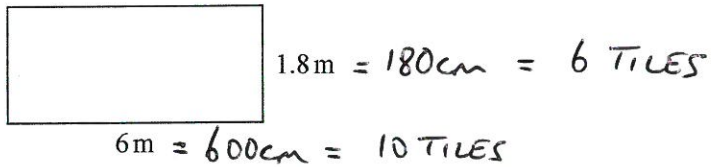
..... 6 miles per hour

(Total for Question 4 is 4 marks)



S 5 2 6 2 4 A 0 5 2 4

- 5 The diagram shows a rectangular wall.



Frank is going to cover the wall with rectangular tiles.
Each tile is 60 cm by 30 cm.

$\therefore 10 \times 6 = 60$ TILES

$\frac{3}{5}$ of the tiles will be white.

Some of the tiles will be green.
The rest of the tiles will be blue.

The ratio of the number of green tiles to the number of blue tiles will be 1:3

- (a) Assuming there are no gaps between the tiles, how many tiles of each colour will Frank need?

$\frac{3}{5} \times 60 = 36$ WHITE TILES \therefore 24 GREEN + BLUE TILES

GREEN	BLUE	TOTAL
1	3	4
6	18	24 $\downarrow \times 6$

white tiles 36
green tiles 6
blue tiles 18
(5)

Frank is told that he should leave gaps between the tiles.

- (b) If Frank leaves gaps between the tiles, how could this affect the number of tiles he needs?

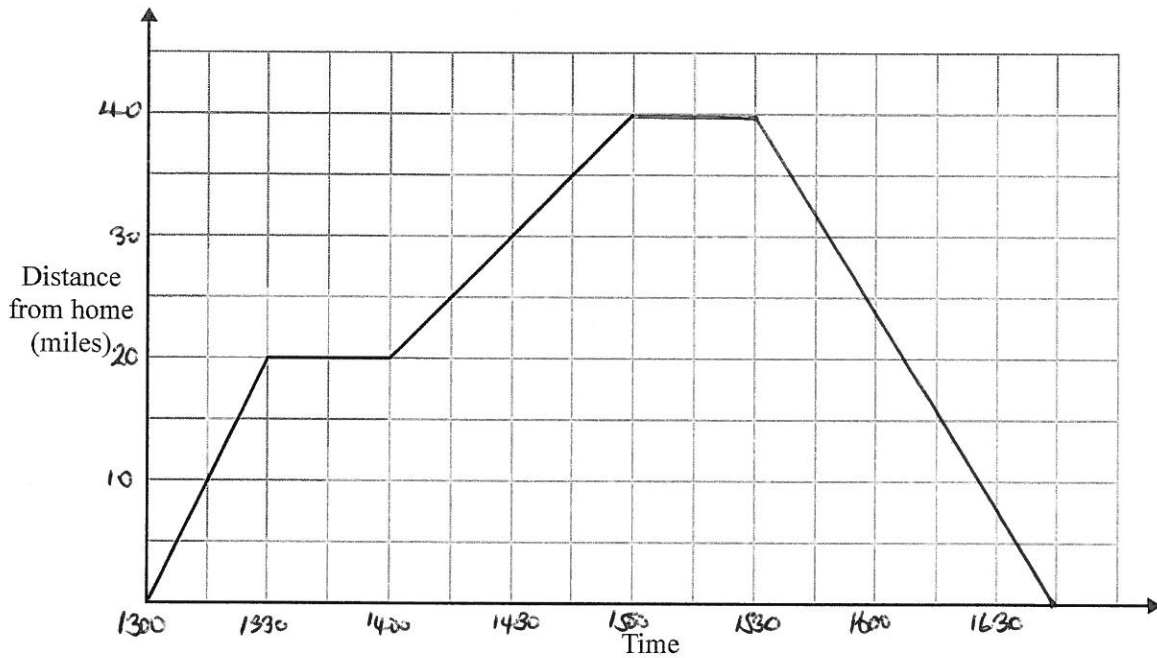
NUMBER OF TILES COULD BE REDUCED

(1)

(Total for Question 5 is 6 marks)



- 6 On Monday Ria delivered a parcel to a hospital.
The travel graph represents Ria's journey to the hospital.



Ria left home at 1300
She drove for 30 minutes at a constant speed of 40 mph.
She then stopped for a break.

Ria then drove to the hospital at a constant speed.
She was at the hospital for 30 minutes.
She then drove home at a constant speed of 32 mph.

Show that she does not arrive home before 1630

$$40 \text{ MILES TO HOME } \therefore \text{ TIME} = \frac{40}{32} \text{ HRS} = \frac{5}{4} \text{ HRS}$$

$$= 1 \frac{1}{4} \text{ HRS}$$

$$= 1 \text{ HR } 15 \text{ MINS}$$

LEAVES AT 1530
 \therefore ARRIVES HOME AT 1645.

(Total for Question 6 is 4 marks)



S 5 2 6 2 4 A 0 7 2 4

7 Work out an estimate for the value of $\frac{43.2 \times \sqrt{99.05}}{0.193}$

$$\approx \frac{40 \times \sqrt{100}}{0.2}$$

$$= \frac{40 \times 10}{0.2}$$

$$= 400 \times 5$$

$$= 2000$$

2000

(Total for Question 7 is 3 marks)

8 Shape A is translated by the vector $\begin{pmatrix} 4 \\ -7 \end{pmatrix}$ to make Shape B.

Shape B is then translated by the vector $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ to make Shape C.

Describe the single transformation that maps Shape A onto Shape C.

$$\begin{pmatrix} 4 \\ -7 \end{pmatrix} + \begin{pmatrix} -3 \\ -2 \end{pmatrix} = \begin{pmatrix} 1 \\ -9 \end{pmatrix}$$

TRANSLATION $\begin{pmatrix} 1 \\ -9 \end{pmatrix}$

(Total for Question 8 is 2 marks)



9 A company orders a number of bottles from a factory.

The 8 machines in the factory could make all the bottles in 5 days. \therefore TAKES 8×5
All the machines work at the same rate. $= 40$ MACHINE DAYS

For 2 days, only 4 machines are used to make the bottles. $= 8$ MACHINE DAYS
From the 3rd day, all 8 machines are used to make the bottles. $\therefore 32$ MACHINE DAYS
NEEDED IN ADDITION
TO THE INITIAL TWO

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

\therefore USING 8 MACHINES
WILL NEED 4 DAYS.

\therefore TOTAL OF $2 + 4 = 6$ DAYS.

..... 6 days

(Total for Question 9 is 3 marks)

10 Find the value of $64^{-\frac{2}{3}}$

$$64^{\frac{1}{3}} = 4$$

$$\therefore 64^{\frac{2}{3}} = 4^2 = 16$$

$$\therefore 64^{-\frac{2}{3}} = \frac{1}{16}$$

..... $\frac{1}{16}$

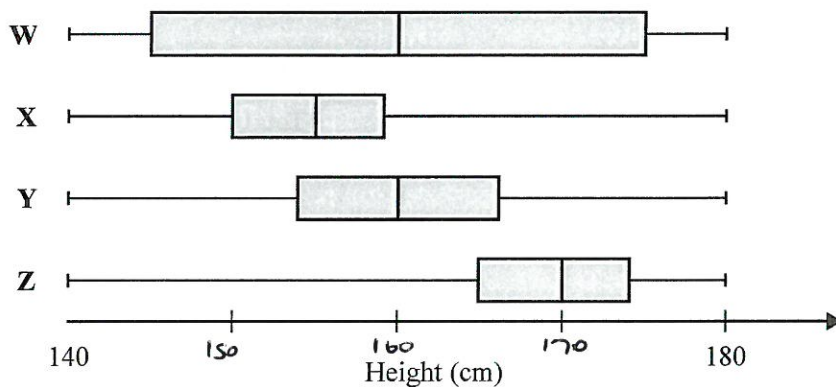
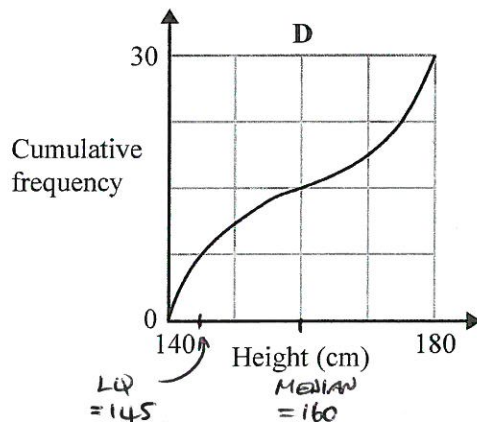
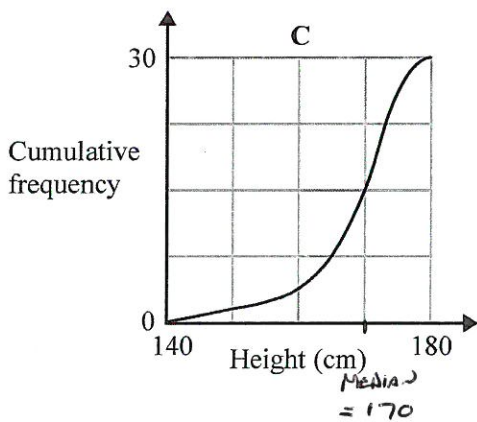
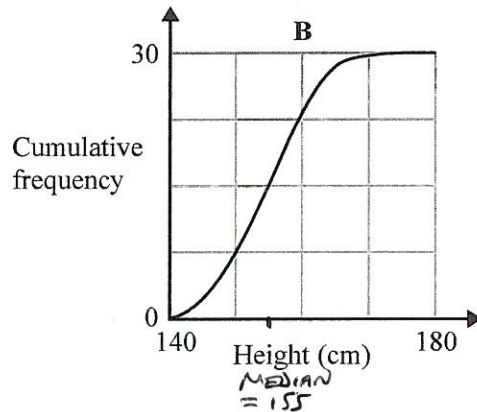
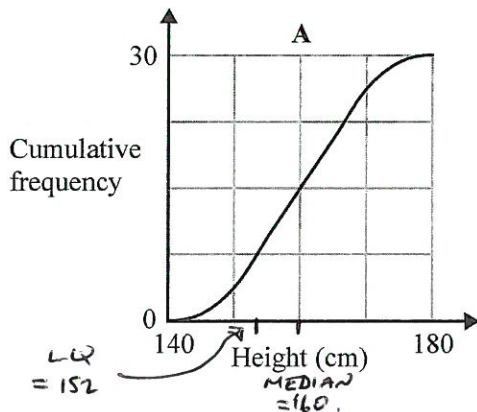
(Total for Question 10 is 1 mark)



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11 Joan measured the heights of students in four different classes.

She drew a cumulative frequency graph and a box plot for each class.



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Match each cumulative frequency graph to its box plot.

Cumulative frequency graph	Box plot
A	Y Y
B	X
C	Z
D	W

(Total for Question 11 is 2 marks)

12 In a sale, the price of a jacket is reduced.

The jacket has a normal price of £52

The jacket has a sale price of £41.60

Work out the percentage reduction in the price of the jacket.

$$\text{REDUCTION} = 52 - 41.60 = \pounds 10.40$$

$$\therefore \% \text{ REDUCTION} = \frac{10.4}{52} \times 100$$

$$= \frac{104}{520} \times 100$$

$$= \frac{1}{5} \times 100$$

$$= 20$$

20 %

(Total for Question 12 is 3 marks)



S 5 2 6 2 4 A 0 1 1 2 4

13 Prove algebraically that the difference between any two different odd numbers is an even number.

LET THE TWO ODD NUMBERS BE $2m+1$ AND $2n+1$

$$\text{DIFFERENCE} = (2m+1) - (2n+1)$$

$$= 2m - 2n$$

$$= 2(m-n)$$

$$= \text{A MULTIPLE OF 2 } \therefore \text{ EVEN}$$

QED.

(Total for Question 13 is 3 marks)

14 Write $0.6\overline{24}$ as a fraction in its simplest form.

$$\text{LET } x = 0.6\overline{24}$$

$$\therefore 10x = 6.\overline{24}$$

$$1000x = 624.\overline{24}$$

$$\therefore 990x = 618$$

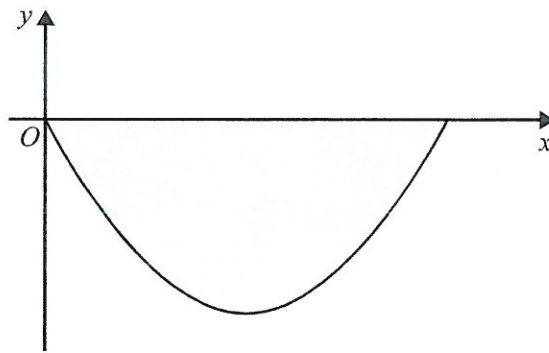
$$\therefore x = \frac{618}{990} = \frac{206}{330} = \frac{103}{165}$$

$$\frac{103}{165}$$

(Total for Question 14 is 3 marks)



15 Here is a sketch of a vertical cross section through the centre of a bowl.



The cross section is the shaded region between the curve and the x-axis.

The curve has equation $y = \frac{x^2}{10} - 3x$ where x and y are both measured in centimetres.

Find the depth of the bowl. *ie FIND y COORDINATE OF MINIMUM POINT*

$$y = x \left(\frac{x}{10} - 3 \right)$$

$$\therefore y = 0 \text{ AT } x = 0 \text{ AND } \frac{x}{10} - 3 = 0 \therefore x = 30$$

$$\therefore x \text{ COORDINATE OF MINIMUM POINT} = 15$$

$$y = 15 \left(\frac{15}{10} - 3 \right) = 15 (1.5 - 3) = 15 \times -1.5 \\ = -22.5$$

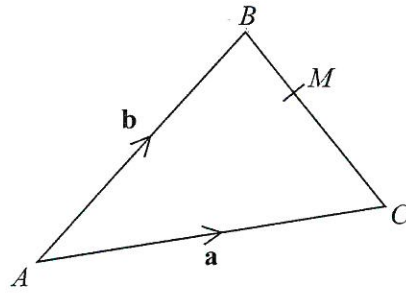
..... 22.5 cm

(Total for Question 15 is 4 marks)



S 5 2 6 2 4 A 0 1 3 2 4

16



M is the point such that $BM:MC$ is $1:2$

Here is Charlie's method to find \vec{BM} in terms of \mathbf{a} and \mathbf{b} .

$$\begin{aligned}\vec{BC} &= \vec{BA} + \vec{AC} \\ &= -\mathbf{b} + \mathbf{a} \\ &= \mathbf{a} - \mathbf{b} \\ \vec{BM} &= \frac{1}{2}\vec{BC} \\ &= \frac{1}{2}(\mathbf{a} - \mathbf{b})\end{aligned}$$

(a) Evaluate Charlie's method.

\vec{BC} IS CORRECT BUT $\vec{BM} = \frac{1}{2}\vec{BC} = \frac{1}{2}(\mathbf{a} - \mathbf{b})$

(1)

Martin expands $(2x + 1)(2x - 3)(3x + 2)$

He gets $12x^3 - 4x^2 - 17x + 6$

(b) Explain why Martin's solution cannot be correct.

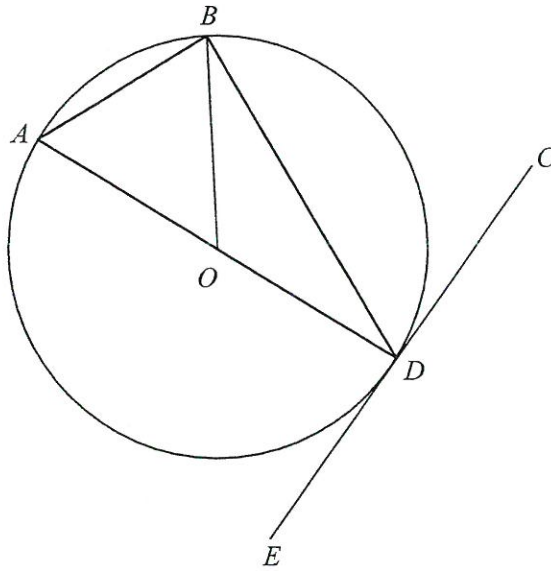
$1x - 3 \times 2 = -6$ AND MARTIN HAS $+6$

(1)

(Total for Question 16 is 2 marks)



17



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

EDC is a tangent to the circle.

Angle $BDC = 57^\circ$

Find the size of angle AOB .

You must give a reason for each stage of your working.

RADIUS OD MEETS TANGENT EDC AT 90° $\therefore \hat{ODC} = 90^\circ$
 \therefore SINCE $\hat{BDC} = 57^\circ$ $\hat{ODB} = 90 - 57 = 33^\circ$

TRIANGLE ODB IS ISOSCELES $\therefore \hat{ODB} = \hat{OBD} = 33^\circ$

~~$\hat{ABD} = 90^\circ$ SINCE IT IS SUBTENDED BY A DIAMETER~~

$\hat{BOD} = 180 - 2 \times 33 = 180 - 66 = 114^\circ$ SINCE ANGLES IN A TRIANGLE ADD UP TO 180°

$\therefore \hat{AOB} = 180 - 114 = 66^\circ$ SINCE ANGLES ON A STRAIGHT LINE ADD UP TO 180°

$$\hat{AOB} = 66^\circ$$

(Total for Question 17 is 4 marks)

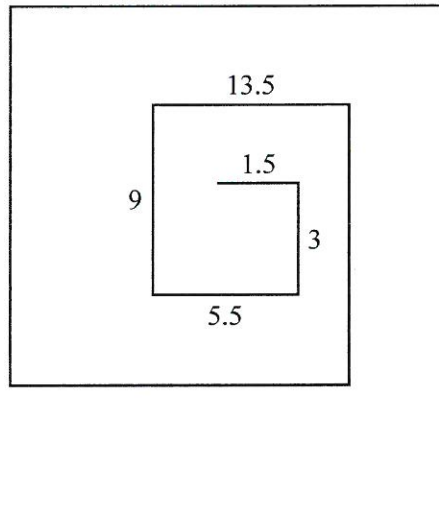


S 5 2 6 2 4 A 0 1 5 2 4

15

Turn over ►

- 18 The diagram shows the first 10 sides of a spiral pattern.
It also gives the lengths, in cm, of the first 5 sides.



The lengths, in cm, of the sides of the spiral form a sequence.

Find an expression in terms of n for the length, in cm, of the n th side.

SEQUENCE IS 1.5, 3, 5.5, 9, 13.5, ...

1ST DIFFERENCE 1.5 2.5 3.5 4.5

2ND DIFFERENCE 1 1 1

∴ SEQUENCE IS QUADRATIC $\sim \frac{1}{2}n^2$

SUBTRACT $\frac{1}{2}n^2$ FROM SEQUENCE $\Rightarrow 1, 1, 1, 1, 1$

∴ n^{th} TERM IS $\frac{1}{2}n^2 + 1$

(Total for Question 18 is 3 marks)

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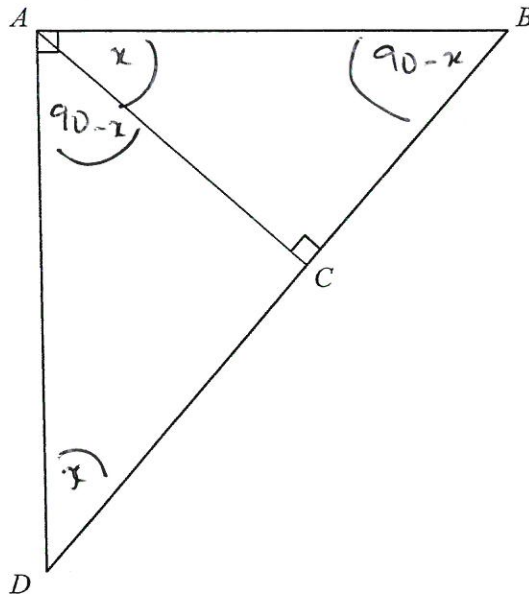
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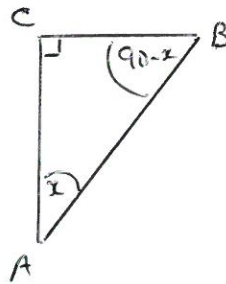
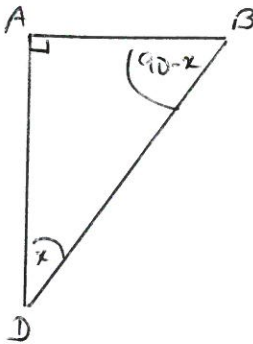


19 ABD is a right-angled triangle.



C is the point on BD such that angle $ACB = 90^\circ$.

Prove that triangle ABD is similar to triangle CBA .



SIMILAR IF RESPECTIVE
ANGLES ARE SAME

$$\hat{DAB} = \hat{ACB} = 90^\circ$$

$$\hat{ABD} = \hat{CBA} = x^\circ$$

$$\hat{ABD} = \hat{CBA} = 90 - x^\circ$$

QED.

(Total for Question 19 is 3 marks)



S 5 2 6 2 4 A 0 1 7 2 4

20 Solve algebraically

$$x^2 + y^2 = 18 \quad (1)$$

$$x - 2y = -3 \quad (2)$$

FROM (2) $x = 2y - 3$

SUBS IN (1) $(2y - 3)^2 + y^2 = 18$

$$\therefore 4y^2 - 12y + 9 + y^2 = 18$$

$$\therefore 5y^2 - 12y - 9 = 0$$

$$\therefore (5y + 3)(y - 3) = 0$$

$$\therefore y = -\frac{3}{5}, 3$$

$$x = 2y - 3$$

$$y = -\frac{3}{5} \quad x = 2 \times -\frac{3}{5} - 3 = -\frac{6}{5} - \frac{15}{5} = -\frac{21}{5}$$

$$y = 3 \quad x = 2 \times 3 - 3 = 6 - 3 = 3$$

$$\therefore \left(-\frac{21}{5}, -\frac{3}{5}\right) \text{ AND } (3, 3)$$

(Total for Question 20 is 5 marks)



21 Show that $\frac{3+\sqrt{2}}{5+\sqrt{8}}$ can be written as $\frac{11-\sqrt{2}}{17}$

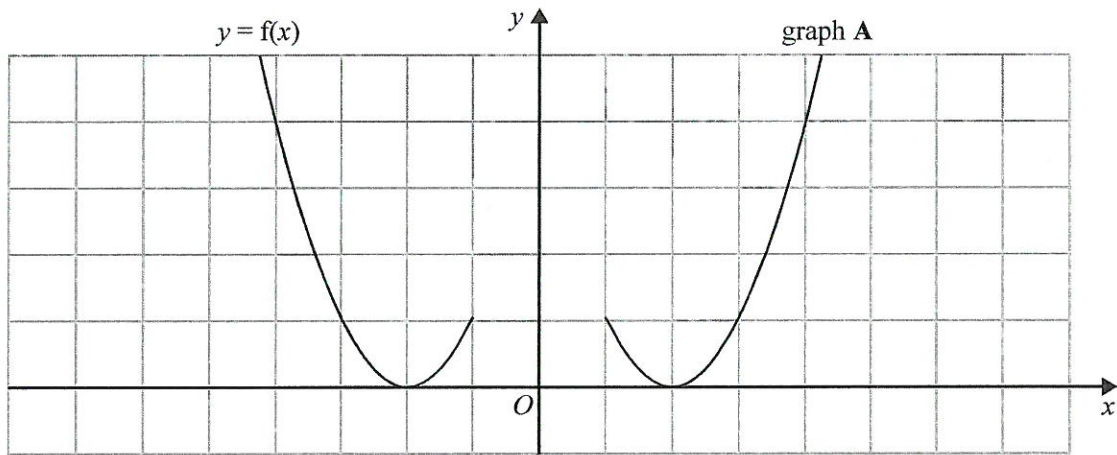
$$\begin{aligned}\frac{3+\sqrt{2}}{5+\sqrt{8}} \cdot \frac{5-\sqrt{8}}{5-\sqrt{8}} &= \frac{15 - \sqrt{16} + 5\sqrt{2} - 3\sqrt{8}}{25 - \sqrt{64}} \\ &= \frac{15 - 4 + 5\sqrt{2} - 6\sqrt{2}}{25 - 8} \\ &= \frac{11 - \sqrt{2}}{17}\end{aligned}$$

(Total for Question 21 is 3 marks)



S 5 2 6 2 4 A 0 1 9 2 4

22 The graph of $y = f(x)$ is shown on the grid.



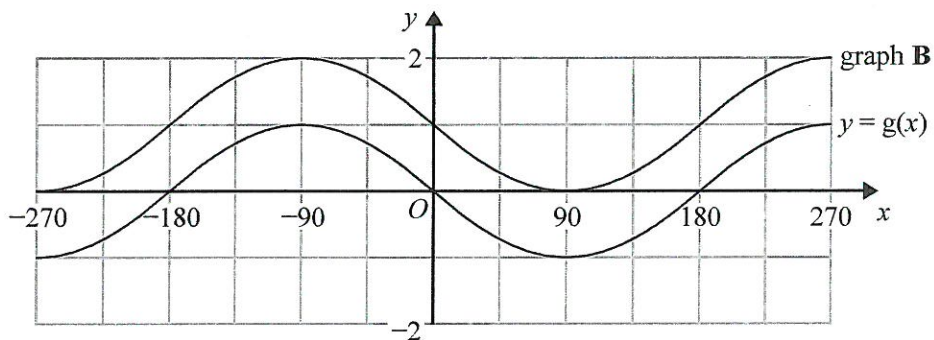
Graph **A** is a reflection of the graph of $y = f(x)$.

(a) Write down the equation of graph **A**.

$$y = f(-x)$$

(1)

The graph of $y = g(x)$ is shown on the grid.



Graph **B** is a translation of $y = g(x)$.

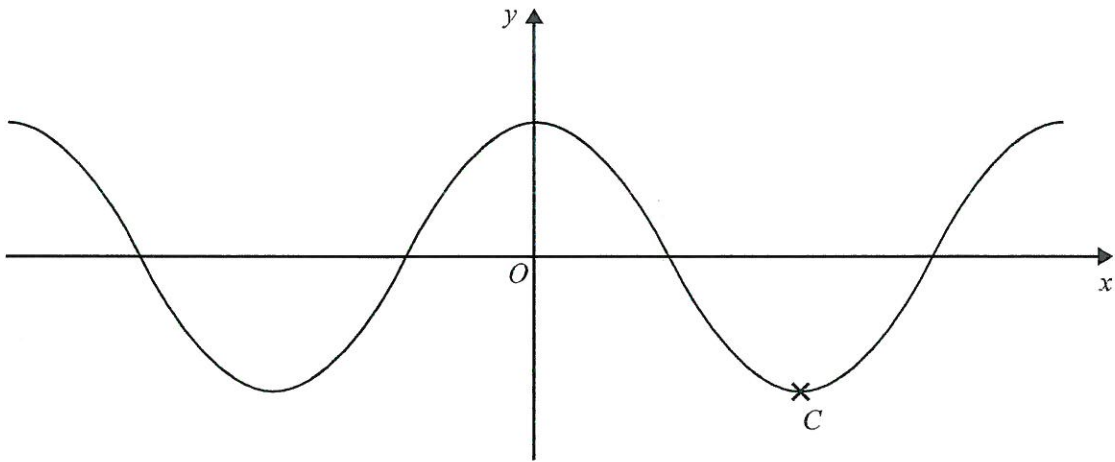
(b) Write down the equation of graph **B**.

$$y = g(x) + 1$$

(1)



The graph of $y = \cos x^\circ$ is shown.



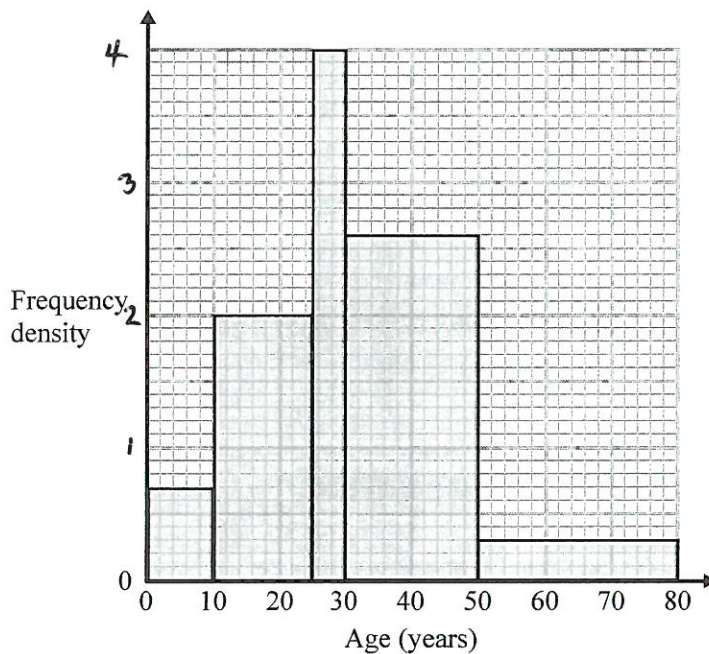
(c) Write down the coordinates of the point marked C.

(120, -1)
(1)

(Total for Question 22 is 3 marks)



23 The histogram shows information about the ages of the members of a football supporters club.



There are 20 members aged between 25 and 30. \therefore FREQUENCY DENSITY = $20 \div 5 = 4$

One member of the club is chosen at random.

What is the probability that this member is more than 30 years old?

INTERVAL	F. D.	FREQUENCY
0 - 10	0.7	7
10 - 25	2.0	30
25 - 30	4.0	20
30 - 50	2.6	52
50 - 80	0.3	9
		<hr/> 118

} 61

$$\frac{61}{118}$$

(Total for Question 23 is 3 marks)

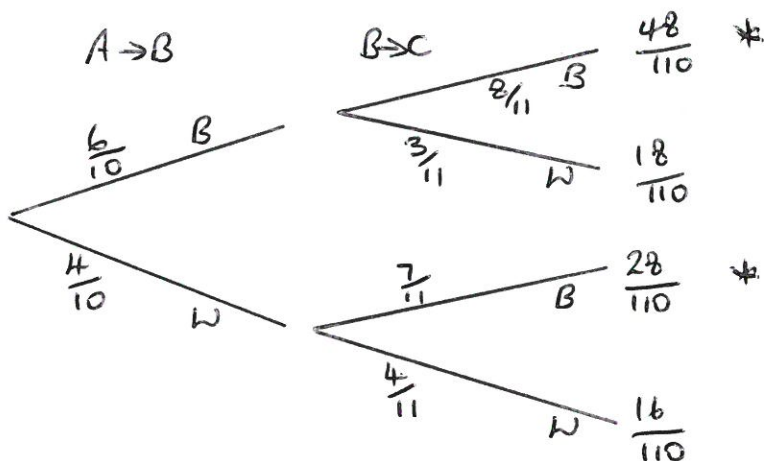


24 There are

- 6 black counters and 4 white counters in bag A
- 7 black counters and 3 white counters in bag B
- 5 black counters and 5 white counters in bag C

Bernie takes at random a counter from bag A and puts the counter in bag B.
He then takes at random a counter from bag B and puts the counter in bag C.

Find the probability that there are now more black counters than white counters in bag C.



TO HAVE MORE BLACK THAN WHITE IN C, BERNIE MUST TAKE A BLACK FROM B \therefore THE TWO MARKED * ARE RELEVANT

$$\frac{48}{110} + \frac{28}{110} = \frac{76}{110}$$

$$\frac{76}{110}$$

(Total for Question 24 is 3 marks)

TOTAL FOR PAPER IS 80 MARKS



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