Model 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.

S52624A

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

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

convert to improper (big × bottom + top)

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

find a common denominator (30)

$\frac{13}{5} \underset{\times 6}{\overset{\times 6}{=}} \frac{78}{30}$ $\frac{11}{6} \underset{\times 5}{\overset{\times 5}{=}} \frac{55}{30}$

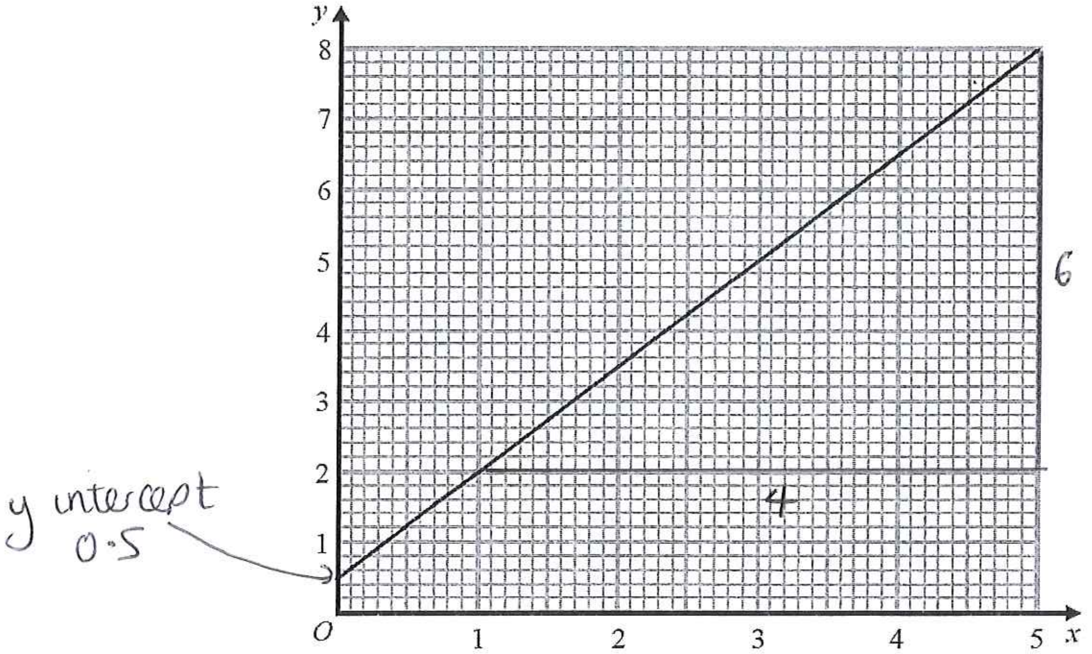
Subtract numerators

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

$\frac{23}{30}$

(Total for Question 1 is 3 marks)

2



Phone calls cost £ 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.

It shows the starting price for the phone call is 50p.

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

The gradient shows for each minute the price increases by £1.50

(2)

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

hint: Find gradient by drawing triangle on the graph

$\frac{\text{change in } y}{\text{change in } x} = \frac{6}{4} = 1.5$

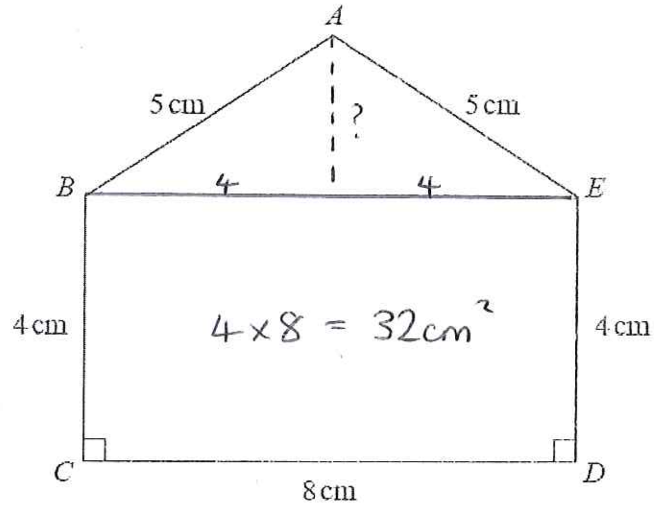
y intercept is 0·5

$y = 1.5x + 0.5$

(3)

(Total for Question 2 is 5 marks)

3 *ABCDE* is a pentagon.



Work out the area of *ABCDE*.

Height of triangle (use pythagoras $c^2 - b^2 = a^2$)

$\sqrt{5^2 - 4^2} = \sqrt{9} = 3\text{cm}$

Area of triangle $\left(\frac{b \times h}{2}\right) = \frac{8 \times 3}{2} = 12\text{cm}^2$

Area of rectangle $(l \times w) = 8 \times 4 = 32\text{cm}^2$

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

.... cm^2

(Total for Question 3 is 5 marks)

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

Tarek's train left Manchester at 08 35
It got to London at 11 05
The train travelled at an average speed of 110 miles per hour.

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

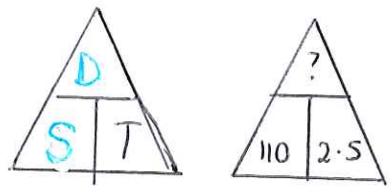
Gill's train also left at 08 35 but was diverted.
The train had to travel an extra 37 miles.
The train got to London at 11 35

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

Tarek

110mph

0835 2·5hours 1105



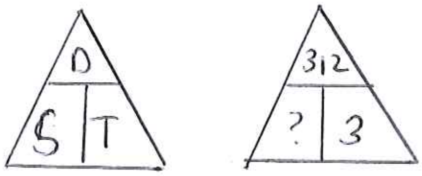
$110 \times 2 \cdot 5 = 275$

275 miles

Gill − $275 + 37 = 312$ miles

312miles

0835 3hours 1135



$312 \div 3 = 104$

104mph

Difference in speed

$110 - 104 = 6$mph

......6...... miles per hour

(Total for Question 4 is 4 marks)

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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.

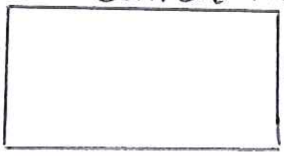
$\frac{3}{5}$ of the tiles will be white.

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 $\overset{G}{1} : \overset{B}{3}$

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

Convert m to cm.



Divide tiles into the wall dimensions.
180 cm ÷ 30 cm = 6 rows
600 cm ÷ 60 cm = 10 colums

total tiles 6 × 10 = 60 tiles

white : $\frac{3}{5}$ of 60 (60 ÷ 5 × 3 = 36)

remaining tiles ~~A~~ 60 − 36 = 24
Share 24 in ratio $\overset{G}{1} : \overset{B}{3}$
1 + 3 = 4
24 ÷ 4 = 6

$\times 6 \downarrow \quad \downarrow \times 6$

6 : 18

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?

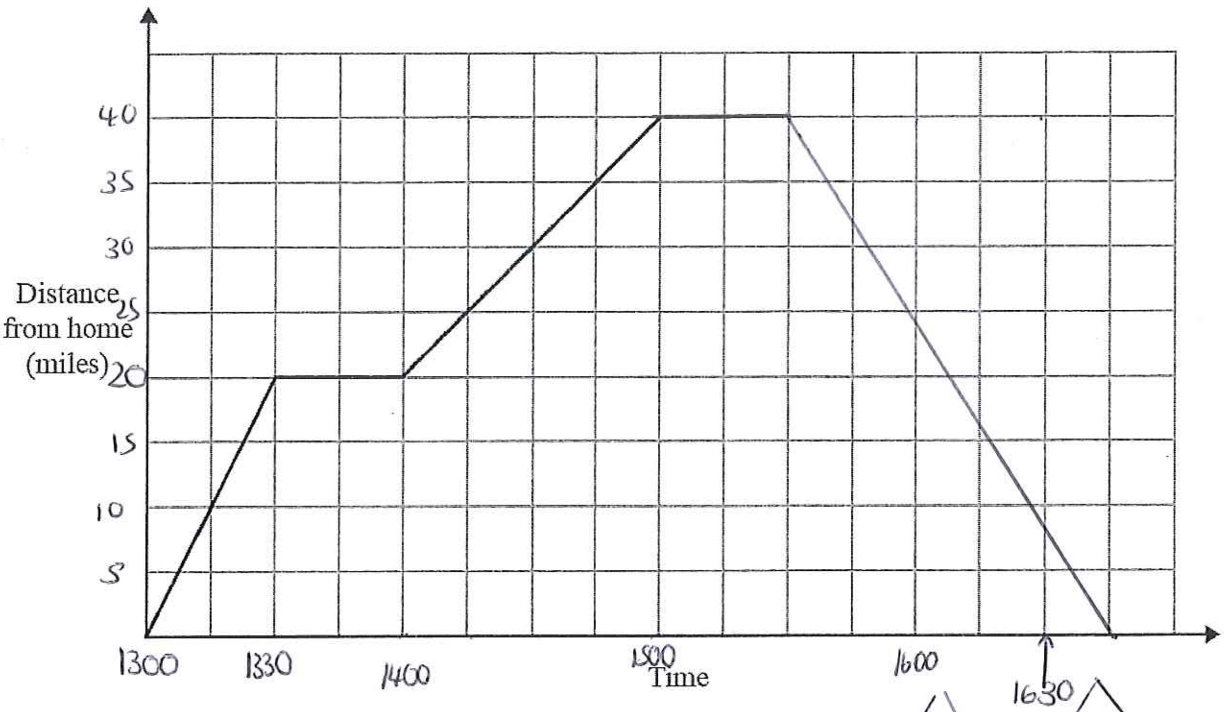
....He may need less tiles.....

....

(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 13 00
She drove for 30 minutes at a constant speed of 40 mph.
She then stopped for a break.

D
S T

?
40 0·5

40 × 0·5 = 20 miles
label on graph.

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 16 30

D
S | T

40
32 | ?

40 ÷ 32 = 1·25 hours

1530 ——— 1645
1·25h

She arrives home at 1645

(Total for Question 6 is 4 marks)

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

Round to 1sf

$$\frac{40 \times \sqrt{100}}{0.2} = \frac{40 \times 10}{0.2}$$

Dividing by 0.2 is the same as multiplying by 5.

$$\frac{400}{0.2} = 2000$$

..........2000..........

(Total for Question 7 is 3 marks)

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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**.

2 translations create a translation

$\begin{pmatrix} 4 \\ -7 \end{pmatrix}$ right down $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ left down

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

..........translation by vector $\begin{pmatrix} 1 \\ -9 \end{pmatrix}$..........

(Total for Question 8 is 2 marks)

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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.
All the machines work at the same rate.

For 2 days, only 4 machines are used to make the bottles.
From the 3rd day, all 8 machines are used to make the bottles.

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

$8 \times 5 = 40$ (how many days 1 machine would take)

$2 \times 4 = 8$

$40 - 8 = 32$

$32 \div 8$ machines $=$ 4 days.

2 days + 4 days = 6 days

from Question

6 days

(Total for Question 9 is 3 marks)

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

remember $x^{-a} = \frac{1}{x^a}$

so $64^{-\frac{2}{3}} = \frac{1}{64^{2/3}}$

remember $x^{a/b} = \sqrt[b]{x^a}$

$\frac{1}{64^{2/3}} = \frac{1}{\sqrt[3]{64}^{\,2}} = \frac{1}{4^2} = \frac{1}{16}$

$\frac{1}{16}$

(Total for Question 10 is 1 mark)

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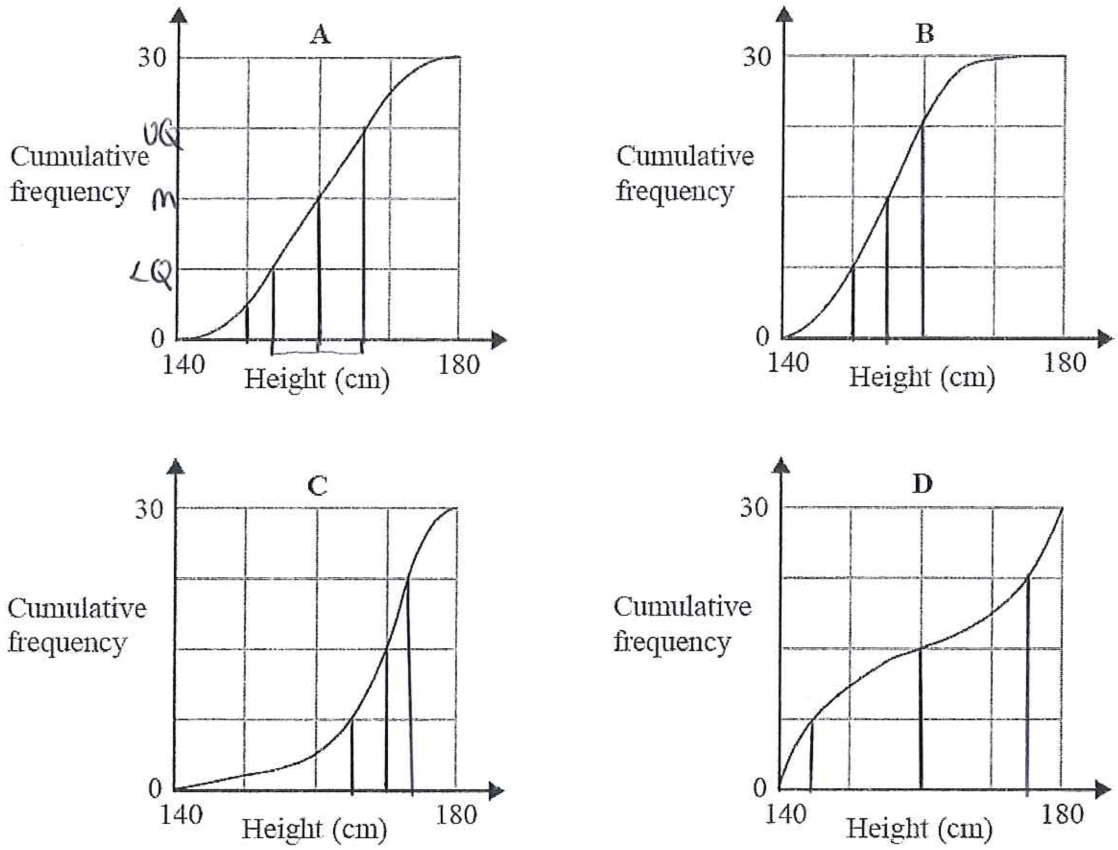
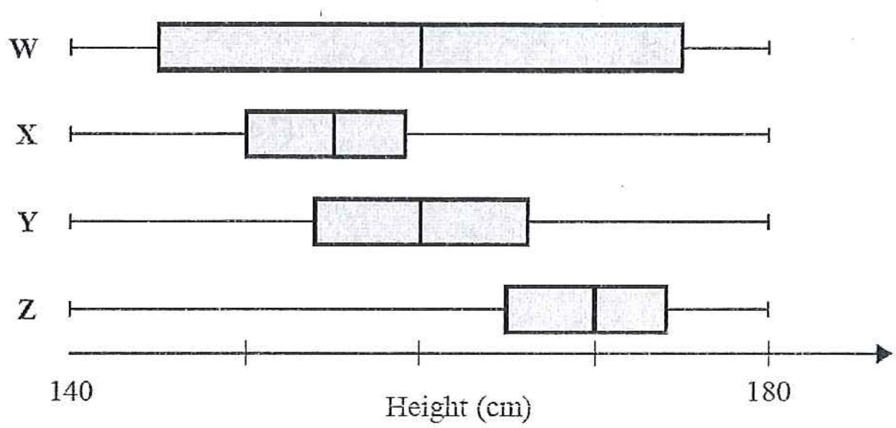
11 Joan measured the heights of students in four different classes.

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

Look at the LQ, median and UQ





Match each cumulative frequency graph to its box plot.

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

(Total for Question 11 is 2 marks)

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

The jacket has a normal price of £52. ← original price.
The jacket has a sale price of £41.60.

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

$$\text{percentage change} = \frac{\text{change in price}}{\text{original price}} \times 100$$

$$52 - 41.60 = £10.40 \text{ (change)}$$

$$\text{\% change} = \frac{£10.40}{£52} \times 100 = 20\%$$

.......20....... %

(Total for Question 12 is 3 marks)

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

An odd number can be represented by $2n+1$
(or any expression which, any substitution would give an odd answer).
A different odd number could be $2m+1$

Difference means subtract

$$2n+1-(2m+1)$$
$$= 2n+1-2m-1 \leftarrow \text{collect like terms}$$
$$= 2n-2m$$
$$= 2(n-m) \leftarrow \text{factorise}$$

Any number multiplied by 2 is positive

(Total for Question 13 is 3 marks)

14 Write $0.6\dot{2}\dot{4}$ as a fraction in its simplest form.

Say $x = 0.6\dot{2}\dot{4}$ ← multiply to get recurring numbers after the decimal point

$10x = 6.\dot{2}\dot{4}$ ← multiply again to get $.\dot{2}\dot{4}$ after the decimal
$1000x = 624.\dot{2}\dot{4}$

$1000x = 624.\dot{2}\dot{4}$ ← now subtract to eliminate recurring parts.
$10x = 6.\dot{2}\dot{4}$

$990x = 618$ ← divide by 990 to get x

$x = \frac{618}{990}$ ← simplify

$x = \frac{103}{165}$

$\frac{103}{165}$

(Total for Question 14 is 3 marks)

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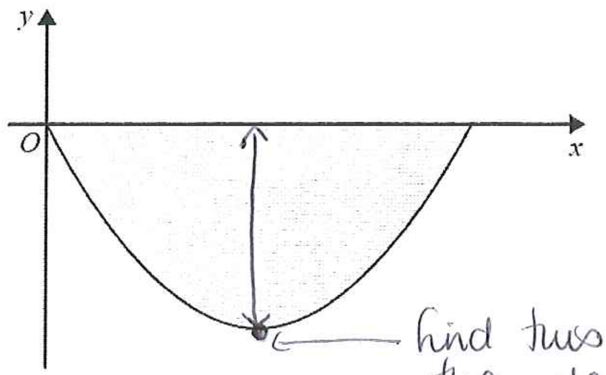
15 Here is a sketch of a vertical cross section through the centre of a bowl.



find this point to get the depth

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.

To find the minimum point of a quadratic, complete the square

Factorise $y = \frac{1}{10}(x^2 - 30x)$

Complete the square $y = \frac{1}{10}\{(x-15)^2 - 225\}$

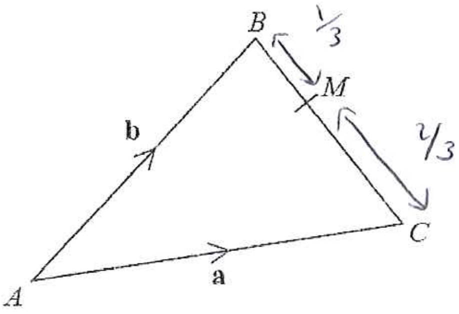
expand brackets $y = \frac{1}{10}(x-15)^2 - 22.5$

Minimum point is at $(15, -22.5)$

22.5 cm

(Total for Question 15 is 4 marks)

16



M is the point such that $BM : MC$ is 1 : 2 ← means $\frac{1}{3}$ and $\frac{2}{3}$

Here is Charlie's method to find $\overrightarrow{BM}$ in terms of **a** and **b**.

$$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AC}$$
$$= -\mathbf{b} + \mathbf{a}$$
$$= \mathbf{a} - \mathbf{b}$$
$$\overrightarrow{BM} = \frac{1}{2}\overrightarrow{BC}$$
$$= \frac{1}{2}(\mathbf{a} - \mathbf{b})$$

(*a*) Evaluate Charlie's method.

He should have used $\frac{1}{3}(a-b)$ instead of $\frac{1}{2}$

(1)

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

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

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

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

$12x^3 + 8x^2 - 12x^2 - 8x - 9x - 6$

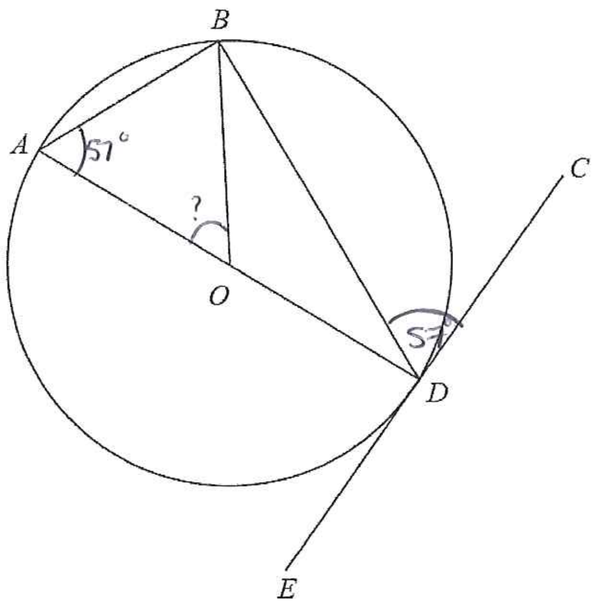
$= 12x^3 - 4x^2 - 17x - 6$

The constant term should be -6 not 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 $BDC = 57°$ ⇐ label this on diagram

Find the size of angle AOB.
You must give a reason for each stage of your working.

Angle OAB = 57° (alternate segment theorem)

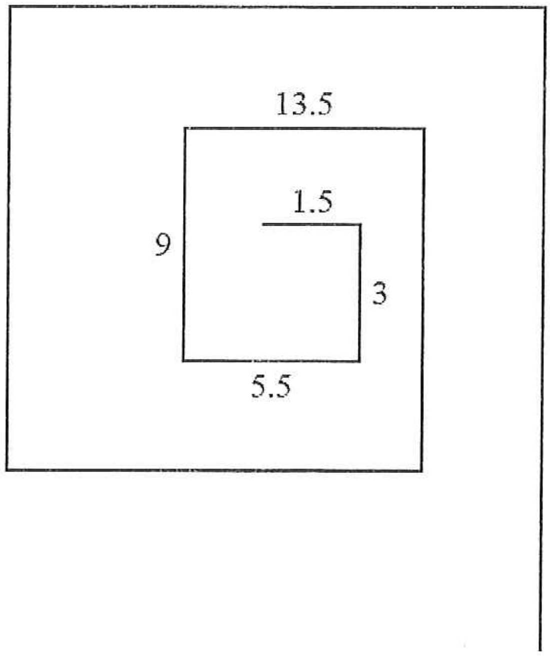
Angle ABO = 57° (triangle OAB is isosceles so base angles are equal)

$180 - 57 - 57 = 66°$

Angle AOB = 66° because angles in a triangle sum to 180°.

(Total for Question 17 is 4 marks)

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.

1.5, 3, 5.5, 9, 13.5

+1.5 +2.5 +3.5 +4.5

adding different number each time so not linear

+1 +1 +1

find second difference (Quadratic sequence) so use n^2

Halve second difference : $1 \div 2 = \frac{1}{2}$

$\frac{1}{2}n^2$

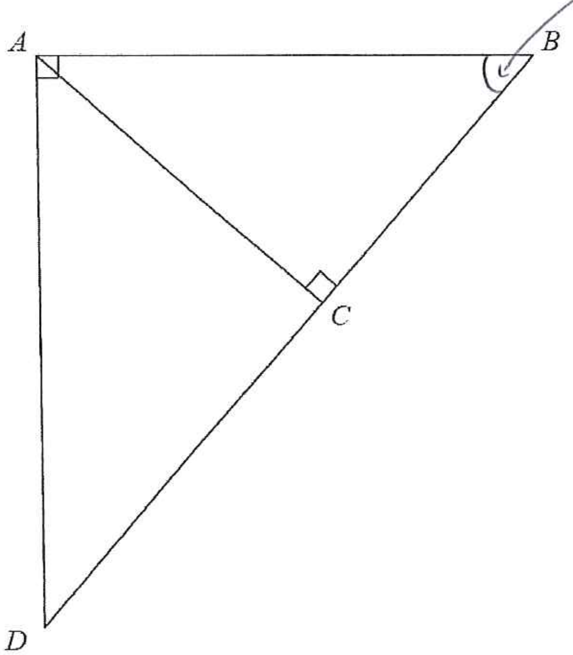
sequence	1.5	3	5.5	9
$\frac{1}{2}n^2$	0.5	2	4.5	8
difference	1	1	1	1

$\frac{1}{2}n^2 + 1$

(Total for Question 18 is 3 marks)

19 *ABD* is a right-angled triangle.

included in both Δs.



C is the point on *BD* such that angle $ACB = 90°$.

Prove that triangle *ABD* is similar to triangle *CBA*.

BAD = ACB = 90° (shown in question)

ABC = ABD (common to both triangles)

ADC = 180 − 90 − ABD

BAC = 180 − 90 − ABC

therefore ADC = BAC

So, triangle ABD is similar to CBA as all three angles are the same (AAA)

(Total for Question 19 is 3 marks)

20 Solve algebraically

$$x^2 + y^2 = 18$$

$$x - 2y = -3$$ & rearrange

$x = 2y - 3$ substitute

$(2y-3)^2 + y^2 = 18$ expand

$\underline{(2y-3)(2y-3)} + y^2 = 18$ expand

$\underline{4y^2 - 6y - 6y + 9} + y^2 = 18$ simplify

$5y^2 - 12y + 9 = 18$ make = to 0 by subtracting 18

$5y^2 - 12y - 9 = 0$ factorise

$(5y + 3)(y - 3) = 0$ put each bracket $= 0$ & solve

$5y + 3 = 0$ $y - 3 = 0$

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

substitute both values into $\underline{x = 2y - 3}$

$x = 2\left(\frac{-3}{5}\right) - 3$ $x = 2(3) - 3$

$x = -4.2$ $x = 3$

....

(Total for Question 20 is 5 marks)

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

$$\frac{3+\sqrt{2}}{5+\sqrt{8}} \times \frac{5-\sqrt{8}}{5-\sqrt{8}} = \frac{(3+\sqrt{2})(5-\sqrt{8})}{(5+\sqrt{8})(5-\sqrt{8})} = \frac{15-3\sqrt{8}+5\sqrt{2}-\sqrt{16}}{25-5\sqrt{8}+5\sqrt{8}-\sqrt{64}}$$

$$= \frac{15-3\sqrt{8}+5\sqrt{2}-4}{25-8} = \frac{11-3\sqrt{8}+5\sqrt{2}}{17}$$

now convert $\underbrace{3\sqrt{8}}$

$$= 3\times\underbrace{\sqrt{8}}$$

$$= 3\times\underbrace{\sqrt{4}\times\sqrt{2}}$$

$$= 3\times 2\times\sqrt{2}$$

$$= 6\times\sqrt{2}$$

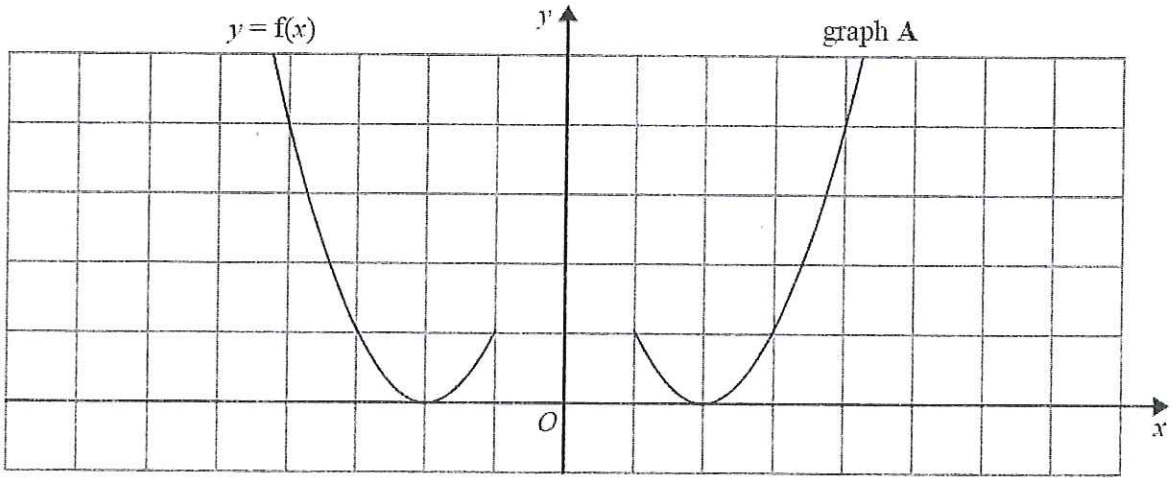
$$= 6\sqrt{2}$$

$$= \frac{11-6\sqrt{2}+5\sqrt{2}}{17}$$

$$= \frac{11 - \sqrt{2}}{17}$$

(Total for Question 21 is 3 marks)

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



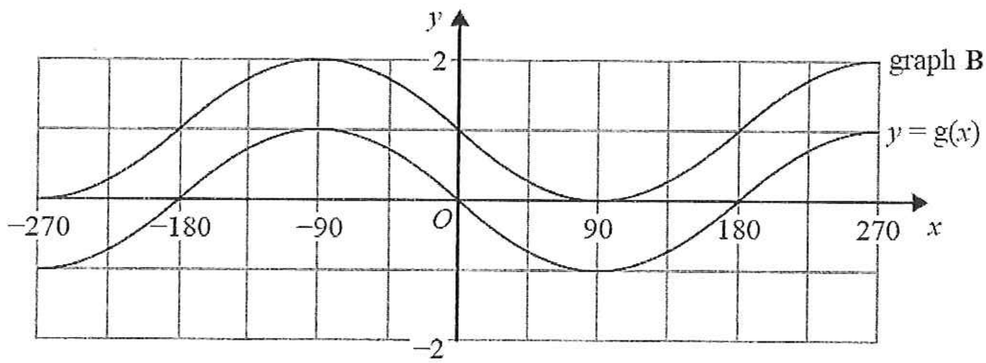
Graph **A** is a reflection of the graph of $y = f(x)$.

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

$y = f(-x)$

(1)

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



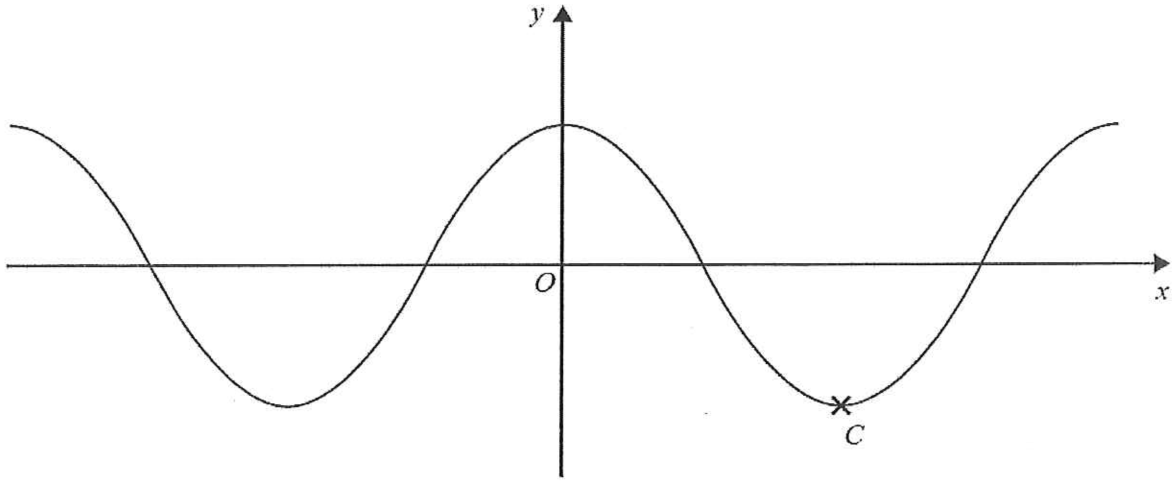
Graph **B** is a translation of $y = g(x)$.

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

$y = g(x) + 1$

(1)

The graph of $y = \cos x°$ is shown.



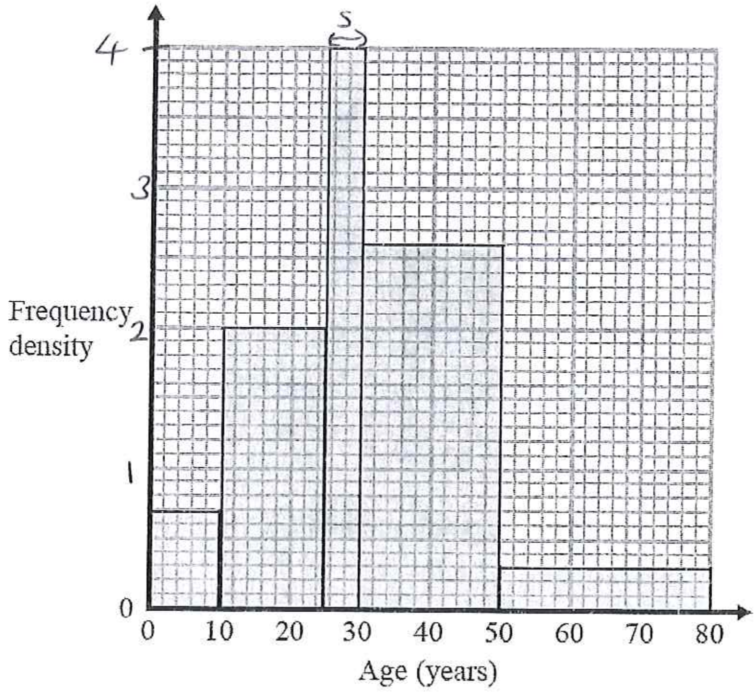
(*c*) Write down the coordinates of the point marked *C*.

(......180......, ...−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.

5

One member of the club is chosen at random.

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

FD = F ÷ CW

FD = 20 ÷ 5

FD = 4 ← new label on FD axis.

Use FD × CW to find frequency of each bar.

10 × 0·7 = 7

15 × 2 = 30

~~10~~ 5 × 4 = 20

20 × 2·6 = 52

30 × 0·3 = 9

over 30s 52 + 9 = 61

$\frac{61}{118}$

total: 7 + 30 + 20 + 52 + 9 = 118

(Total for Question 23 is 3 marks)

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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**.

Bag C has an even number of black & white so you only need to know the probability of picking a black from bag B.

either Black from A then Black from B

$$\frac{6}{10} \times \frac{8}{11} = \frac{48}{110}$$

OR White from A then Black from B

$$\frac{4}{10} \times \frac{7}{11} = \frac{28}{110}$$

means add so $\frac{48}{110} + \frac{28}{110} = \frac{76}{110}$

$\frac{76}{110}$

(Total for Question 24 is 3 marks)

TOTAL FOR PAPER: 80 MARKS