

- Check your answers if you have time at the end.
 - Try to answer every question.
 - Read each question carefully before you start to answer it.
- Advice**

- 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.
- Information**

- Calculators may not be used.
 - Diagrams are NOT accurately drawn, unless otherwise indicated.
 - You must show all your working.
 - there may be more space than you need.
 - Answer the questions in the spaces provided.
 - Answer all questions.
 - and candidate number.
 - Fill in the boxes at the top of this page with your name, centre number
 - Use black ink or ball-point pen.
- Instructions**



Mathematics
Paper 1 (Non-Calculator)
Higher Tier

Time: 1 hour 30 minutes
Paper Reference 1MA1/1H

LPGS Autumn Mock Exam 2020

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)

Centre Number

Candidate Number

Candidate surname

Other names

Please check the examination details below before entering your candidate information

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Tracing paper may be used.

Total Marks

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1

Expand and simplify

$$2(m-3) + 3(m+4)$$

$$= 2m - 6 + 3m + 12$$

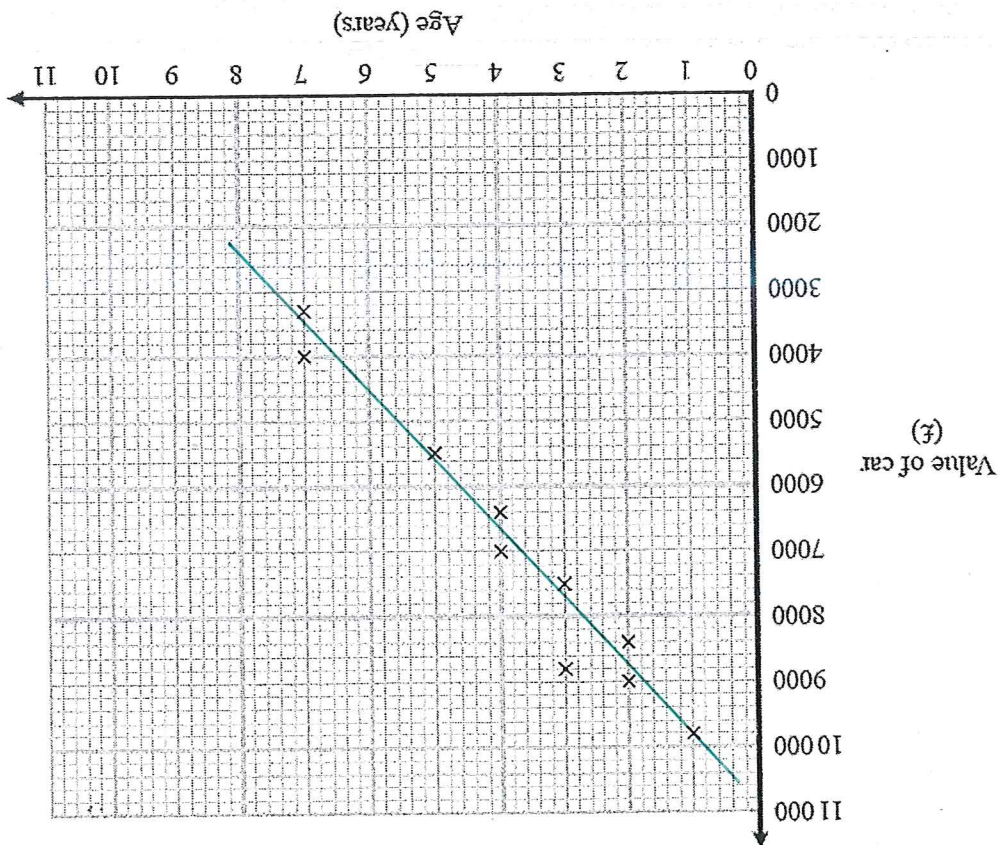
$$= 5m + 6$$

Al Cao

$$5m + 6$$

(Total for Question 1 is 2 marks)

The scatter graph shows the age and the value of each of ten cars of the same make and model.



(a) Describe the relationship between the value of a car and the age of the car.

The older a car, the lower its value.
or negative correlation

(1)

(b) Draw a line of best fit on the scatter graph.

C1

(1)

It may not be reliable to use the line of best fit to predict the value of a car that is 10 years old.

(c) Give a reason why.

A car that is 10 years old would be outside the range of the data. You would have to extrapolate which may not be reliable.

(1)

(Total for Question 2 is 3 marks)

3

There are 270 students in Year 7

Each student studies one of French or German or Spanish.

Of these 270 students

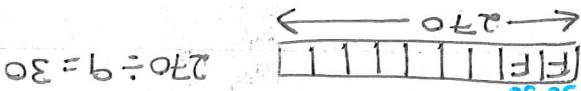
$\frac{2}{9}$ study French

the number who study French : the number who study Spanish = 3 : 7
42 boys study German

Of the students who study German, what percentage are boys?
You must show your working.

	French	Spanish	German	Total
Boys			42	
Girls				
Total	60	140	70	270

Bar model method (LTH)



60 students study French



140 students study Spanish

$$\begin{array}{r} \text{French } 60 \\ + \text{Spanish } 140 \\ \hline 200 \end{array}$$

270 - 200 = 70 students study German

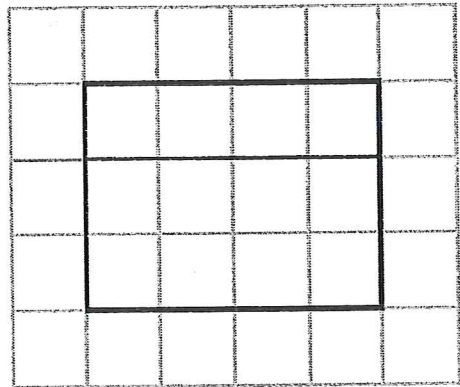
$$\frac{42}{70} = \frac{6}{10} = 60\%$$

(Total for Question 3 is 5 marks)

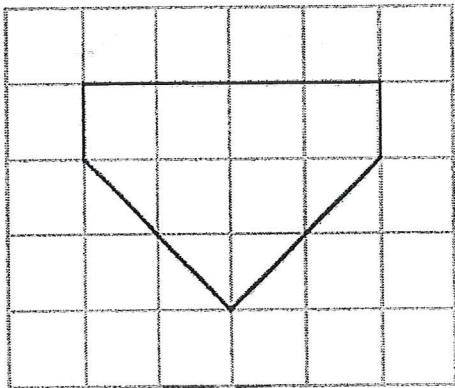
$$\begin{aligned} \text{French: } \frac{2}{9} \text{ of } 270 &= 60 \\ \text{Spanish: } F : S &= 3 : 7 \\ &\quad \times 20 \quad \uparrow \times 20 \\ &\quad 60 : 140 \\ \text{German: } 270 - 140 - 60 &= 70 \\ \frac{42}{70} \times 100 &= \frac{6}{10} \times 100 \\ &= 60\% \end{aligned}$$

Here are the front elevation and the side elevation of a solid prism.

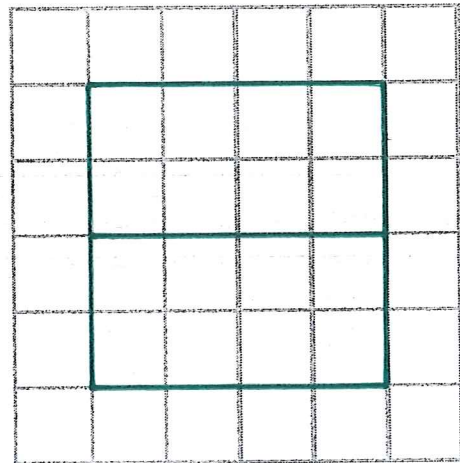
Front elevation



Side elevation



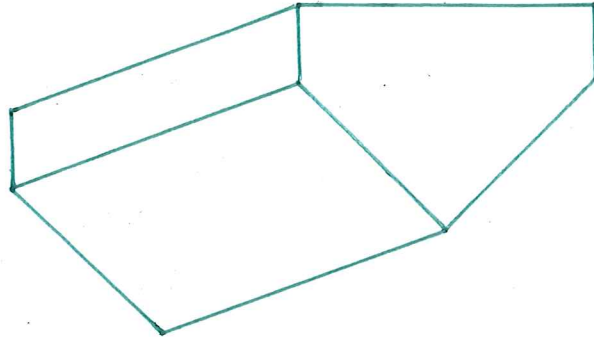
(a) On the grid below, draw a plan of the solid prism.



81 4 by 4 square
81 horizontal line
any orientation

(2)

(b) In the space below, draw a sketch of the solid prism.

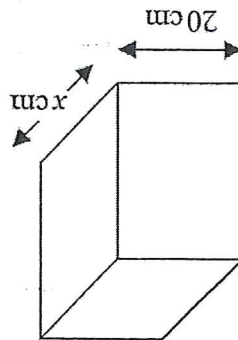


M1 3D sketch with
pentagonal face
A1 fully correct sketch

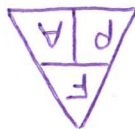
(2)

(Total for Question 4 is 4 marks)

The diagram shows a block of metal on horizontal ground.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$



The base of the block of metal is a rectangle 20 cm by x cm.
The block exerts a force of 1500 newtons on the ground.
The pressure on the ground is 3 newtons/cm²

Work out the value of x .

$$\text{Area} = \frac{\text{force}}{\text{pressure}}$$

$$20x = \frac{1500}{3}$$

$$20x = 500$$

$$x = 25$$

$$x = 25$$

$$x = 25$$

(Total for Question 5 is 3 marks)

25

(a) Write 247000 in standard form.

(1) 2.47×10^5 B1

(b) Write 6.5×10^{-4} as an ordinary number.

0.00065

(1)

0.00065 B1

(c) Work out $(3 \times 10^{-7}) \times (8 \times 10^{-6})$.
Give your answer in standard form.

$= 3 \times 8 \times 10^{-7} \times 10^{-6}$

$= 24 \times 10^{-13}$ M1

$= 2.4 \times 10^{-12}$

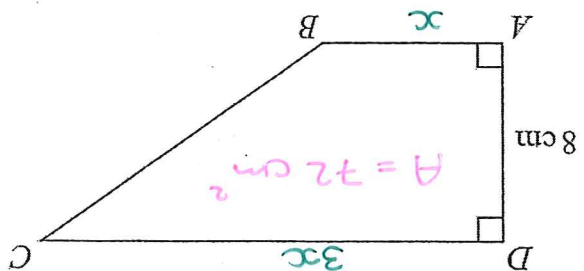
2.4×10^{-12} where $n \neq -12$ scores M1

(2)

2.4×10^{-12} A1

(Total for Question 6 is 4 marks)

The diagram shows a trapezium $ABCD$ and a square $PQRS$.



$$AD = 8 \text{ cm}$$

$$DC = 3AB$$

The perimeter of the square is 24 cm.

The area of the square is half the area of the trapezium.

Work out the length of AB .

$$24 \div 4 = 6$$

$$\text{Area of square} = 6 \times 6 = 36 \text{ cm}^2 \quad P1$$

$$\text{Area of trapezium} = 2 \times 36 = 72 \text{ cm}^2$$

$$\frac{1}{2} \times 8(x + 3x) = 72 \quad P1$$

$$4 \times 4x = 72$$

$$16x = 72 \quad P1$$

$$x = \frac{72}{16} = \frac{9}{2} \quad \div 16]$$

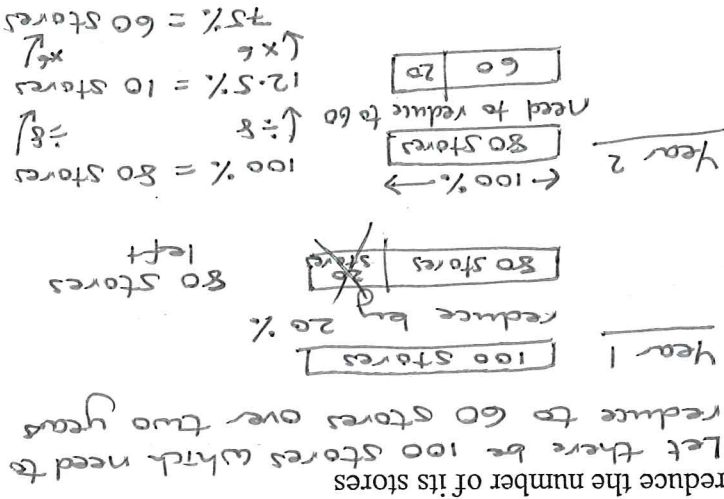
(Total for Question 7 is 4 marks)

..... cm

$$4.5 \quad P1$$

(Total for Question 9 is 3 marks)

At 25%
.....



Find the value of P .

It has reduced to 80% $P1$
 Needs to reduce to 60% $P1$
 $\frac{60}{80} \times 100 = \frac{3}{4} \times 100 = 75\%$

A company has a target to reduce the number of its stores by 40% over the next two years.

At the end of the first year it has reduced the number of its stores by 20%

If the company is going to reach its target, it must reduce the number of its stores by another $P\%$ in the second year

Find the value of P .

9

(Total for Question 8 is 3 marks)

(1)

overestimate. I rounded the 58.7 up and the 1612 down.
 C1

(b) Is your answer to part (a) an underestimate or an overestimate?
 Give a reason for your answer.

(2)

90 A1

$$\frac{60^2}{1600} \approx \frac{3600}{40} = 90$$

mi any rounded value

8 (a) Work out an estimate for the value of

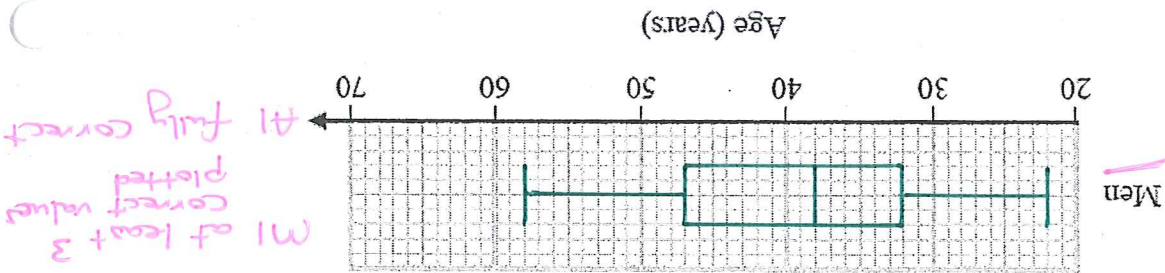
$$\frac{58.7^2}{\sqrt{1612}}$$

Here are the ages, in years, of the 19 men in a badminton club.

22 27 30 31 32 34 35 35 36 38

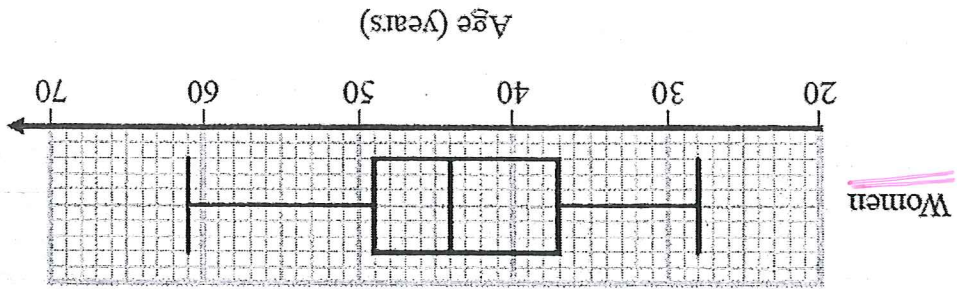
40 40 42 46 47 49 51 57 58

(a) On the grid, draw a box plot for this information.



(3)

The box plot below shows information about the distribution of the ages of the women in the badminton club.



(b) Compare the distribution of the ages of the men with the distribution of the ages of the women.

(2)

(Total for Question 10 is 5 marks)

C1 comparison of medians
C1 comparison of IQR's or ranges.
at least one comparison must be in context.

In general the women are older (median age 44 compared to 38 for men). The men's ages are more spread (IQR 15 for men and 12 for women)

Nadia sells small boxes of chocolates and large boxes of chocolates.

The total number of chocolates in 3 small boxes and 1 large box is 66
The total number of chocolates in 1 small box and 2 large boxes is 72

Work out the number of chocolates in each small box and the number of chocolates in each large box.

$$\begin{aligned} 3s + l &= 66 & \textcircled{1} \\ s + 2l &= 72 & \textcircled{2} \end{aligned}$$

P1 form two equations

$$\begin{aligned} \textcircled{1} \times 2: & \quad 6s + 2l = 132 \\ - & \quad 6s + 2l = 72 \\ \hline & \quad \quad \quad 60 \end{aligned}$$

M1 correct process to eliminate one variable

$$s = 12$$

$$\text{sub. into } \textcircled{1}: 36 + l = 66$$

$$l = 30$$

M1 (dep) subs to find other value

(Total for Question 11 is 4 marks)

large box 30

small box 12

✓ 1 both

(Total for Question 13 is 1 mark)

In this equation, $b = -5$ so $-b = 5$.

The formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

C1

What mistake has she made?

The first line of Julie's working is wrong.

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

Here is the first line of her working.

Julie has to solve $x^2 - 5x + 2 = 0$

13

(Total for Question 12 is 3 marks)

$$= -\frac{18}{9} = -2$$

-2

41 Cao

$$= \frac{7 - 25}{9} \quad M1$$

$$= \frac{(\sqrt{7+5})(\sqrt{7-5})}{9}$$

m1 expanding

Give your answer in its simplest form.

$$12 \quad \text{Work out the value of } \frac{\sqrt{7+5}}{3} \times \frac{\sqrt{7-5}}{3}$$

14 Rachel has 10 sweets in a bag.

7 of the sweets are yellow.
3 of the sweets are red.

Rachel takes random sweets from the bag, one at a time, until she gets a red sweet.
She does not replace the sweets that she takes from the bag.
Rachel stops as soon as she gets a red sweet.
Work out the probability that Rachel takes no more than three sweets from the bag.

$P(\text{more than 3 sweets}) = P(3 \text{ yellow sweets})$

$= \frac{7}{10} \times \frac{6}{9} \times \frac{5}{8}$

$= \frac{210}{720} = \frac{7}{24}$

$P(\text{no more than 3 sweets}) = 1 - \frac{7}{24} = \frac{17}{24}$

$\frac{10}{3} + \frac{21}{90} + \frac{126}{720}$

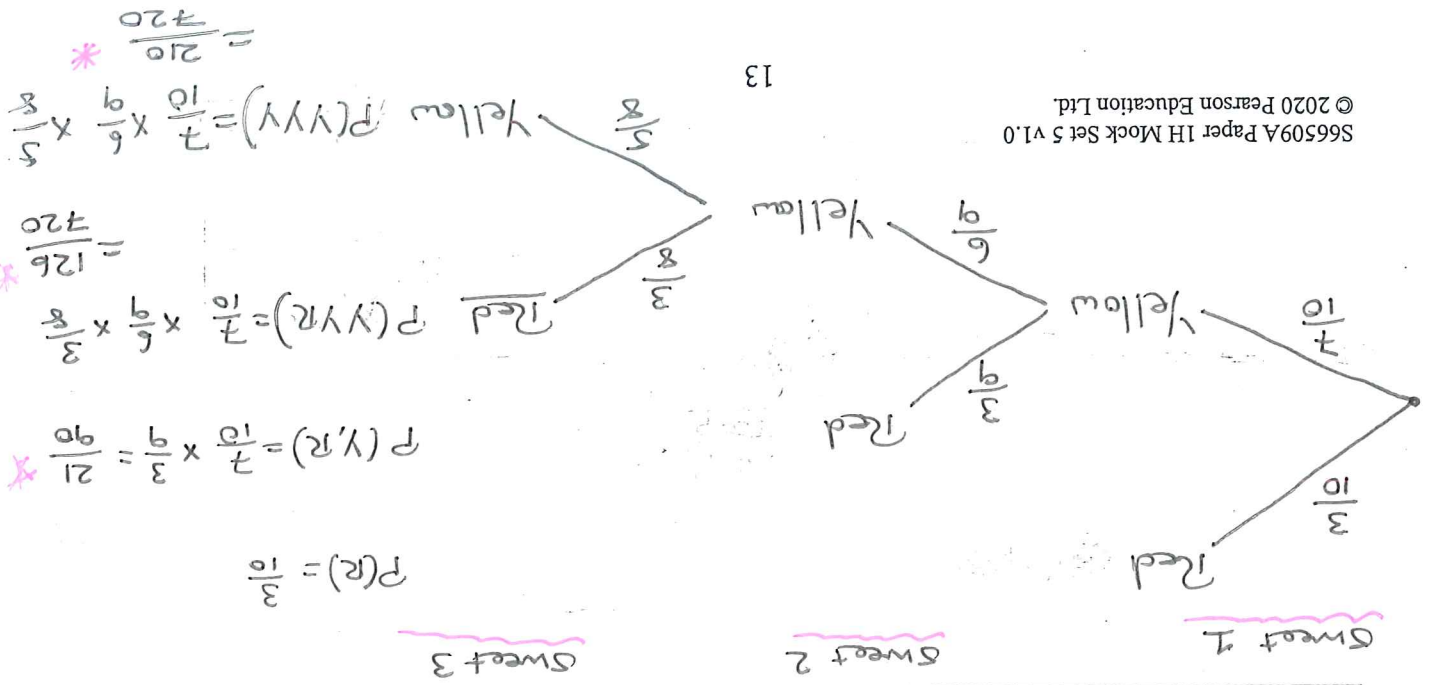


OR use a tree

(Total for Question is 14 is 3 marks)

$\frac{17}{24}$

* P1 any correct product (see below)



(Total for Question 15 is 4 marks)

or $x = \frac{-y-3}{2y-1} \pm \sqrt{\frac{-y-3}{2y-1}}$

✓ 1

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

✓ 1

$x^2 = \frac{-3-y}{2y-1}$

M1 oe

$2x^2y + y = x^2 - 3$

$2x^2y + y - x^2 = -3$

$x^2(2y-1) = -3-y$

$x^2(2y-1) = -3-y$

M1 method to isolate x^2 term

$y(2x^2+1) = x^2-3$

M1

15 Make x the subject of the formula $y = \frac{x^2-3}{2x^2+1}$

(Total for Question 16 is 4 marks)

15:12:9:25

$a:b:c:d$
60:48:36:100
15:12:9:25 $\div 4$

$c = \frac{4}{3}b$
 $c = \frac{4}{3} \times 48$
 $c = 36$

$4a = 5b$
 $4 \times 60 = 5b$
 $240 = 5b$
 $48 = b$

$a = 60$

$a:d$
3:5 $\times 20$
60:100 $\times 20$

Let $d = 100$ then

Find $a:b:c:d$

$a:d = 3:5$

$c = \frac{4}{3}b$

$4a = 5b$

16 a, b, c and d are integers.

Alternative method

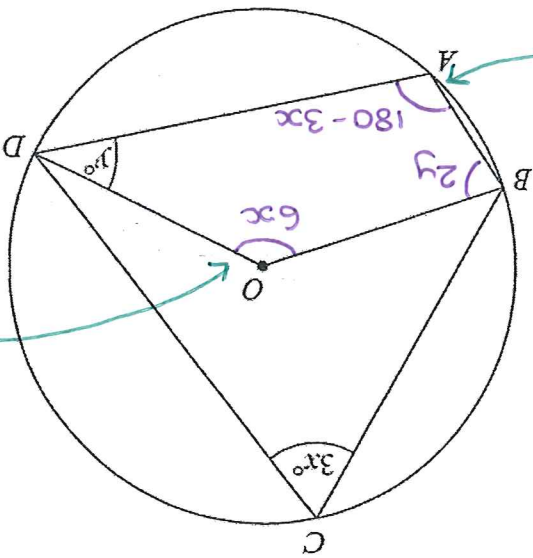
$4a = 5b$
 $\frac{a}{b} = \frac{5}{4}$
 $a:b = 5:4$

$c = \frac{4}{3}b$
 $4c = 3b$
 $\frac{c}{b} = \frac{3}{4}$
 $c:b = 3:4$

$a:b:c$
5:4:3 $\times 3$
15:12:9

$a:d$
3:5 $\times 5$
15:25

now we have
 $a:b:c:d$
15:12:9:25



Angle at the circumference is half the angle at the centre. *M1*

Opposite angles in a cyclic quadrilateral (A and C) add to 180°

M1

A, B, C and D are points on a circle with centre O.

size of angle ABO : size of angle ODA = 2 : 1

Find an expression for y in terms of x.

You must show all your working.

$$\begin{aligned}
 2y + 6x + y + 180 - 3x &= 360 \\
 3y + 3x + 180 &= 360 \\
 3y + 3x &= 180 \\
 3y &= 180 - 3x \\
 y &= 60 - x
 \end{aligned}$$

M1 complete process

A1

$$y = 60 - x$$

(Total for Question 17 is 4 marks)

(Total for Question 19 is 4 marks)

$$\begin{aligned}
 &= \frac{\sqrt{3}}{+2} \\
 &= \frac{1}{24\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\
 &= \frac{1}{8 \times 3\sqrt{3}} \\
 &= \frac{1}{(2\sqrt{3})^3} \\
 &= \frac{1}{(4\sqrt{3})^3} \\
 &= \frac{1}{(\sqrt{12})^3} \\
 &= \frac{1}{12^{\frac{3}{2}}}
 \end{aligned}$$

either for m1

m1 method to rationalise denominator

m1 $(\sqrt{12} = 2\sqrt{3})$

19 Show that $12^{-\frac{2}{3}}$ can be written in the form $\frac{\sqrt{3}}{h}$ where h is an integer.

(Total for Question 18 is 2 marks)

$$3(x+2y)(x-2y)$$

B1

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

18 Factorise fully $3x^2 - 12y^2 = 3(x^2 - 4y^2)$ B1

$$\begin{aligned}
 &(3x+6y)(x-2y) \\
 \text{or} \\
 &(3x-6y)(x+2y)
 \end{aligned}$$

scores B1

21

The diagram shows the lines OX , OY and OZ .

(Total for Question 20 is 3 marks)

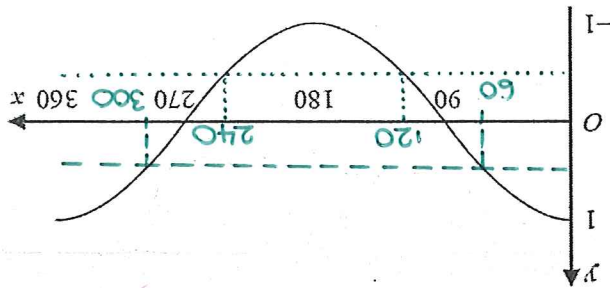
(i) 120° or 240°
B1

(ii) Write down one solution of the equation $\cos x^\circ = -0.5$

(i) 0.5
B1 CAO

(b) (i) Write down the exact value of $\cos 300^\circ$

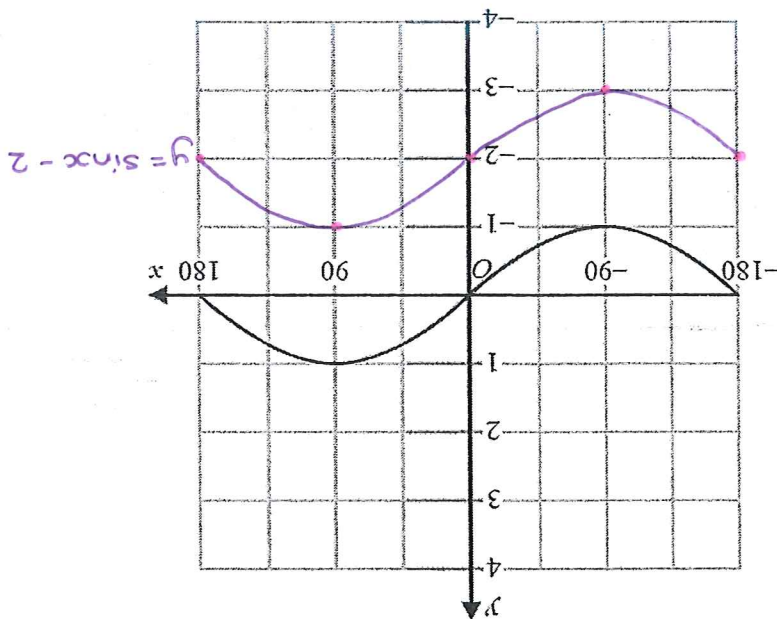
The exact value of $\cos 60^\circ$ is 0.5



Here is the graph of $y = \cos x^\circ$ for $0 \leq x \leq 360$

(i)

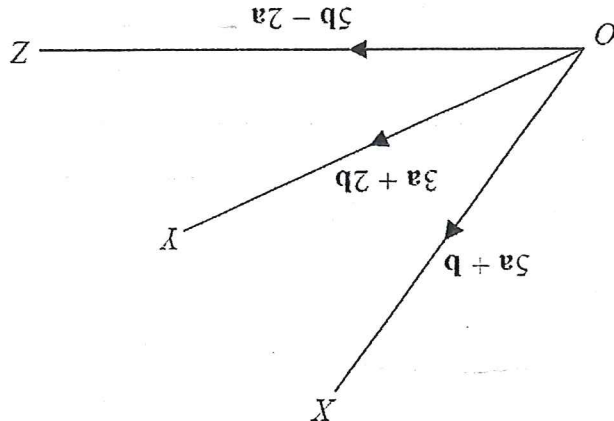
(a) On the grid above, sketch the graph of $y = \sin x^\circ - 2$ for $-180 \leq x \leq 180$



Here is the graph of $y = \sin x^\circ$ for $-180 \leq x \leq 180$

20

The diagram shows the lines OX , OY and OZ .



$$\vec{OX} = 5a + b$$

$$\vec{OY} = 3a + 2b$$

$$\vec{OZ} = 5b - 2a$$

Determine whether or not XYZ is a straight line.
You must show how you get your answer.

$$\vec{XY} = \vec{XO} + \vec{OY}$$

$$= -5a - b + 3a + 2b$$

$$= -2a + b$$

$$\vec{XZ} = \vec{XO} + \vec{OZ}$$

$$= -5a - b + 5b - 2a$$

$$= -7a + 4b \text{ which is not a multiple of } \vec{XY}.$$

C1

$\therefore XYZ$ is not a straight line because XY and XZ

are not parallel.

(Total for Question 21 is 3 marks)

(Total for Question 22 is 4 marks)

(1)

(.....,)

81 ft

$$\text{of } y = 3x^2 - 24x + 38$$

(b) Hence, or otherwise, write down the coordinates of the turning point on the graph

(3)

.....
 $3(x-4)^2 - 10$

$$\begin{aligned} 3x^2 - 24x + 38 &= 3(x^2 - 8x) + 38 \\ &= 3((x-4)^2 - 16) + 38 \\ &= 3(x-4)^2 - 48 + 38 \\ &= 3(x-4)^2 - 10 \end{aligned}$$

$a=3$ $b=4$ $c=10$

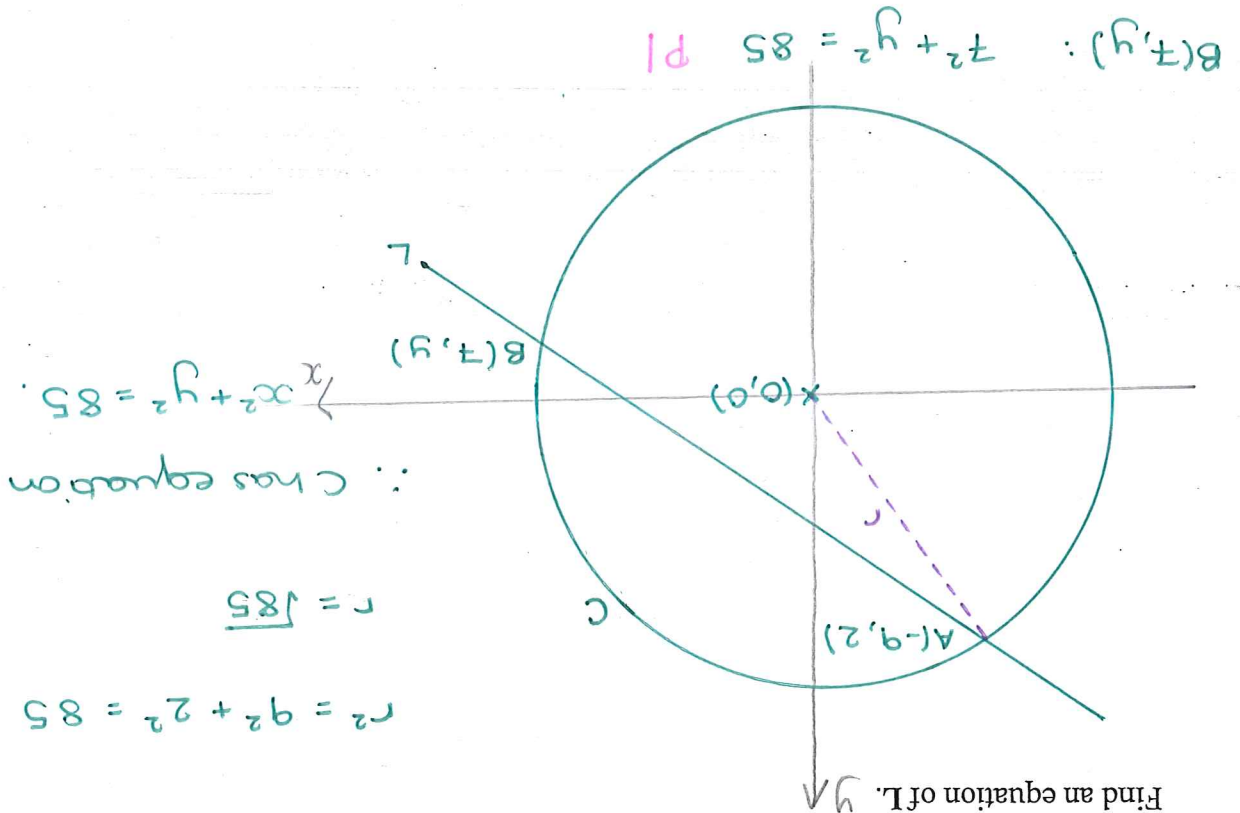
22 (a) Write $3x^2 - 24x + 38$ in the form $a(x-b)^2 - c$ where a , b and c are integers.

23.

C is a circle with centre $(0,0)$.
L is a straight line with negative gradient.

The circle C and the line L intersect at the points A and B.
The coordinates of A are $(-9, 2)$
The x coordinate of B is 7

Find an equation of L.



$$r^2 = 9^2 + 2^2 = 85$$

$$r = \sqrt{85}$$

$\therefore$ C has equation

$$x^2 + y^2 = 85$$

$$B(7, y): 7^2 + y^2 = 85$$

$$49 + y^2 = 85$$

$$y^2 = 36$$

$$y = -6 \text{ (not 6 as gradient is negative)}$$

$$\text{gradient } AB = \frac{-8}{16} = -\frac{1}{2}$$

$$y = -\frac{1}{2}x + c$$

$$(7, -6): -6 = -\frac{1}{2} \times 7 + c$$

$$c = -\frac{5}{2}$$

(Total for Question 23 is 5 marks)

$$y = -\frac{1}{2}x - \frac{5}{2}$$

TOTAL FOR PAPER IS 80 MARKS

