Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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

Wednesday 8 November 2023

Morning (Time: 1 hour 30 minutes)

Paper reference **1MA1/1H**

Mathematics

PAPER 1 (Non-Calculator)
Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, Formulae Sheet (enclosed). 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 not be used**.

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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P69533A

P 6 9 5 3 3 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 Work out 6.3×2.4

×10 ↓ ↓ ×10

63 x 24

$$\begin{array}{r} {}^{1}6\ 3 \\ \times\ 2\ 4 \\ \hline {}^{1}2\ 5\ 2 \\ 1\ 2\ 6\ 0 \\ \hline 1\ 5\ 1\ 2 \end{array}$$

↓ ÷ 100

15.12

15.12

(Total for Question 1 is 3 marks)

2 (a) (i) Write down the value of 5^0

1

(1)

(ii) Write down the value of 5^{-2}

$x^{-a} \rightarrow \frac{1}{x^a}$

$5^{-2} \rightarrow \frac{1}{5^2} = \frac{1}{25}$

$\frac{1}{25}$

(1)

(b) Write $\frac{2^5 \times 2^4}{2^3}$ in the form 2^n where n is an integer.

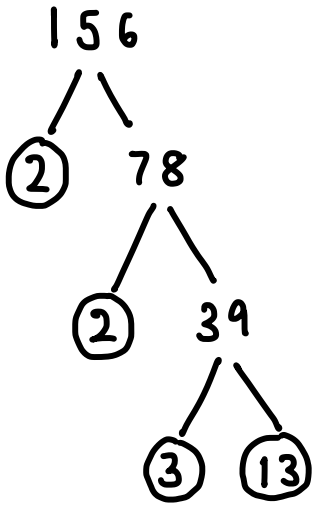
$\frac{2^9}{2^3} = 2^6$

2^6

(2)

(Total for Question 2 is 4 marks)

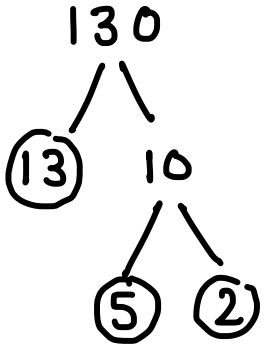
3 (a) Write 156 as a product of its prime factors.



$2 \times 2 \times 3 \times 13$

(2)

(b) Find the highest common factor (HCF) of 156 and 130



$156 = 2 \times 2 \times 3 \times 13$

$130 = 2 \times 5 \times 13$

$HCF = 2 \times 13$

$= 26$

26

(2)

(Total for Question 3 is 4 marks)

4 The mean length of 5 sticks is 4.2 cm.

Nawal measured the length of one of the sticks as 7 cm.

Mean = $\frac{\text{total}}{\text{no. of sticks}}$

(a) Work out the mean length of the other 4 sticks.

$4.2 = \frac{\text{total}}{5}$

$\times 5 \qquad \times 5$

$21 = \text{total}$

$21 - 7 = 14$

$\text{Mean} = \frac{14}{4}$

$= 3.5 \text{ cm}$

3.5 cm

(3)

Nawal made a mistake.
The stick was not 7 cm long.
It was 17 cm long.

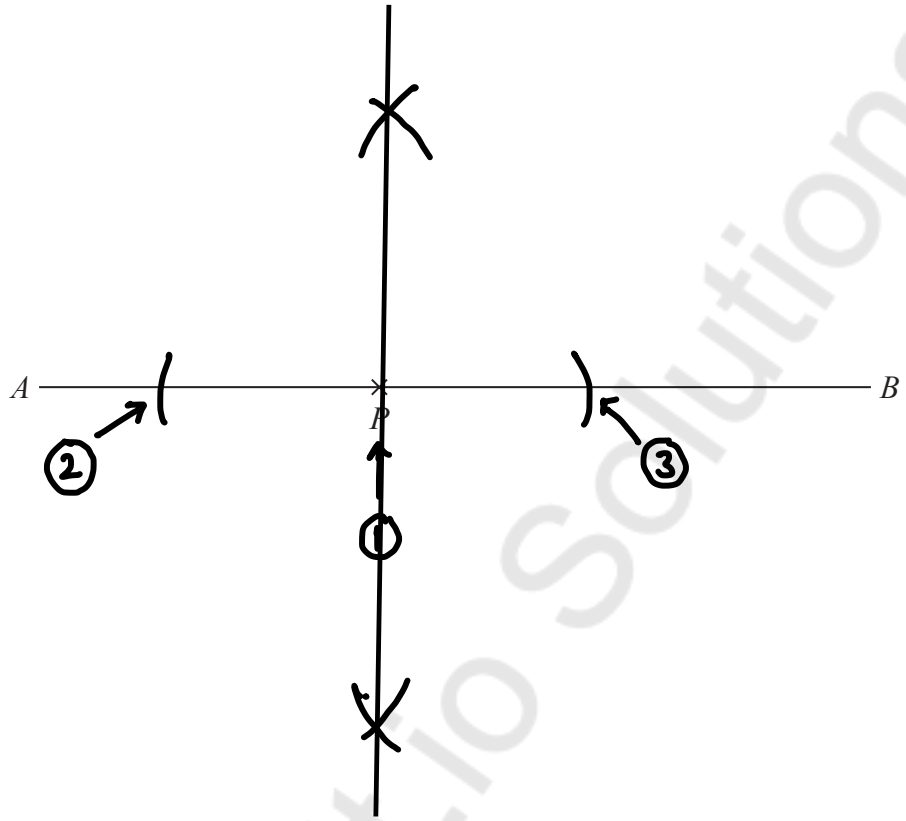
(b) How does this affect your answer to part (a)?

It will be less

(1)

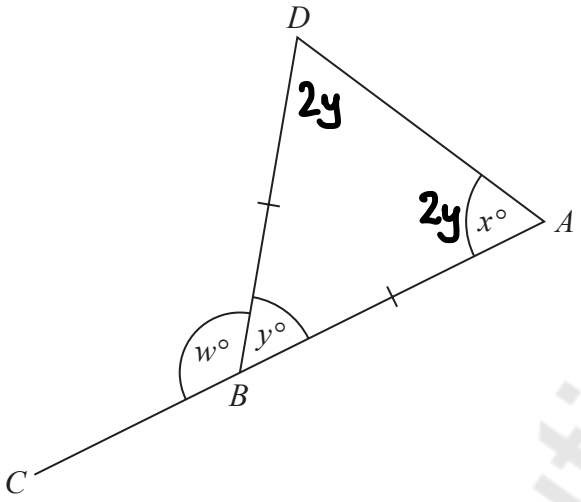
(Total for Question 4 is 4 marks)

5 The point P lies on the line AB.
Use ruler and compasses to construct an angle of 90° at P.
You must show all your construction lines.



(Total for Question 5 is 2 marks)

6 The diagram shows an isosceles triangle ABD and the straight line ABC.



$BA = BD$

$x : y = 2 : 1$

Work out the value of w.

$x : y$

$2 : 1$

$\times 2$

$x = 2y$

$2y + 2y + y = 180$

$5y = 180$

$\div 5 \qquad \div 5$

$y = 36$

$w = 180 - 36$

$= 144$

$w =$ 144

(Total for Question 6 is 4 marks)

7 Mano has three shelves of books.

There are x books on shelf **A**.
There are $(3x + 1)$ books on shelf **B**.
There are $(2x - 5)$ books on shelf **C**.

There is a total of 44 books on the three shelves.

All the books have the same mass.

The books on shelf **B** have a total mass of 7500 g.

Work out the total mass of the books on shelf **A**.

Total books = $x + 3x + 1 + 2x - 5$

$44 = 6x - 4$

$+4 \qquad +4$

$48 = 6x$

$\div 6 \qquad \div 6$

$8 = x$

Shelf B : $3x + 1$

$3(8) + 1 = 25$ books

Mass of one book = $7500\text{g} \div 25$

$= 300\text{g}$

Mass of books on shelf A : $8 \times 300\text{g}$

$= 2400\text{g}$

2400 g

(Total for Question 7 is 5 marks)

8 The normal price of a mattress is reduced by 40% in a sale.
The price of the mattress in the sale is £660

Work out the normal price of the mattress.

100% − 40% = 60%

÷6 (60% = £660) ÷6
10% = £110
×10 (100% = £1100) ×10

£ 1100

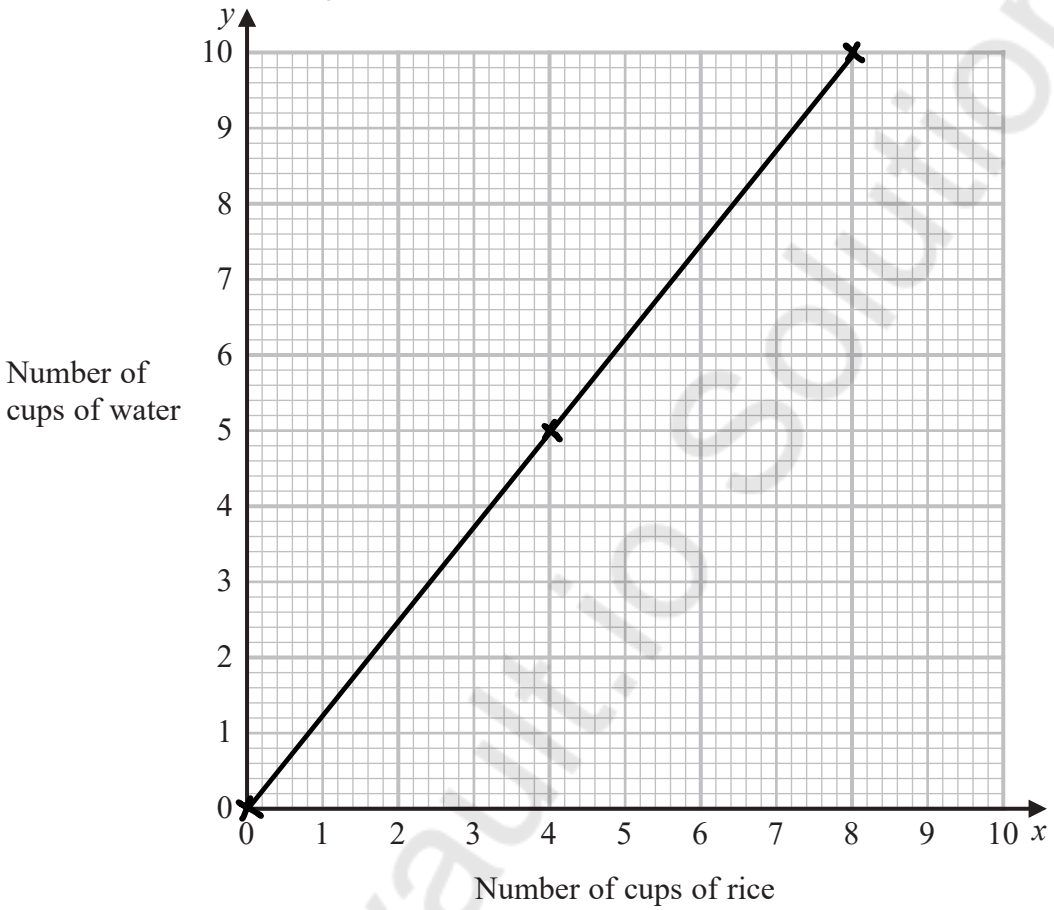
(Total for Question 8 is 2 marks)

9 To cook rice

the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.

x	4	8	0
y	5	10	0



(2)

(b) (i) Find the gradient of the line drawn in part (a).

$\frac{10}{8} = \frac{5}{4}$

$\frac{5}{4}$

(1)

(ii) Explain what this gradient represents.

Number of cups of water for each cup of rice.

(1)

(Total for Question 9 is 4 marks)

10 The circumference of a circle is 10 m.

Work out the area of the circle.
Give your answer in terms of π.

$C = 2\pi r$

$10 = 2\pi r \quad \div 2$

$\div 2$

$5 = \pi r \quad \div \pi$

$\div \pi$

$r = \frac{5}{\pi}$

$A = \pi r^2$

$= \pi \left(\frac{5}{\pi}\right)^2$

$= \pi \left(\frac{25}{\pi^2}\right)$

$= \frac{25\pi}{\pi^2_1} = \frac{25}{\pi}$

$\frac{25}{\pi}$ ..... m^2

(Total for Question 10 is 3 marks)

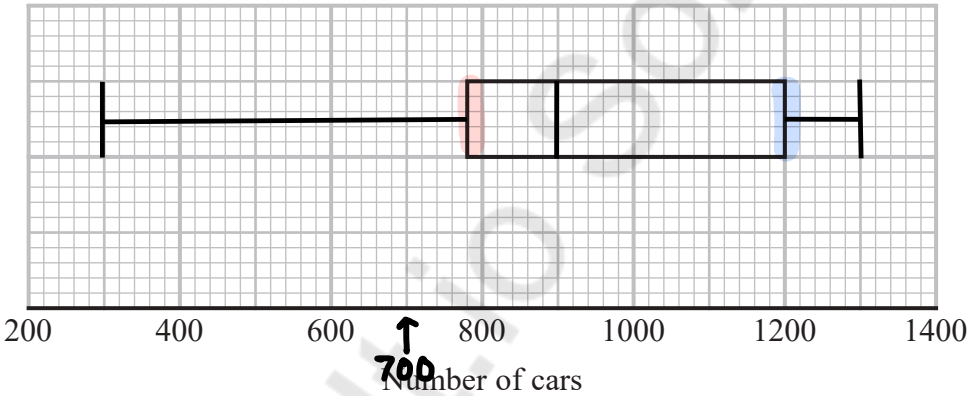
11 Alice recorded the number of cars going into a village on each of 80 days.

The incomplete table and the incomplete box plot give information about her results.

	Number of cars
Least number	300
Lower quartile	780
Median	900
Upper quartile	1200
Range	1000

300 + 1000 = 1300

Greatest number 1300



(a) (i) Use the information in the table to complete the box plot.

(ii) Use the information in the box plot to complete the table.

(3)

On some of these 80 days Alice saw fewer than 1200 cars going into the village.

(b) Work out an estimate for the number of days Alice saw fewer than 1200 cars going into the village.

UQ = 1200

$\frac{3}{4}$ of 80 = 80 ÷ 4 = 20 × 3 = 60

60

(2)

(Total for Question 11 is 5 marks)

12 The straight line **L** has equation $2y = 3x - 7$

Find an equation of the straight line perpendicular to **L** that passes through (6, –5)

L $2y = 3x - 7 \longrightarrow y = mx + c$

$\div 2 \qquad \div 2$

$y = \frac{3}{2}x - \frac{7}{2}$

$m = \frac{3}{2}$

Perpendicular gradient $= -\frac{2}{3} = m$

$y = mx + c$

$y = -\frac{2}{3}x + c \qquad (6, -5)$ $x \quad y$

$-5 = -\frac{2}{3}(6) + c$

$-5 = -4 + c$

$+4 \quad +4$

$-1 = c$

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

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

(Total for Question 12 is 3 marks)

13 Solid **A** and solid **B** are similar.

The ratio of the height of solid **A** to the height of solid **B** is 2 : 5

The volume of solid **A** is 12 cm^3

Work out the volume of solid **B**.

	A	B	SF
L	2	5	$\frac{5}{2}$
V	12		$\frac{125}{8}$

$\square^3$

$^3\cancel{12} \times \frac{125}{\cancel{8}^2} = \frac{375}{2} = 187.5$

187.5 cm^3

(Total for Question 13 is 3 marks)

14 Work out the value of $27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$

$x^{\frac{a}{b}} = (\sqrt[b]{x})^a$ $\quad$ $x^{-a} = \frac{1}{x^a}$

$27^{\frac{2}{3}} = (\sqrt[3]{27})^2$ $\quad$ $\left(\frac{1}{2}\right)^{-3} = 2^3$

$= 3^2$ $\quad$ $= 8$

$= 9$

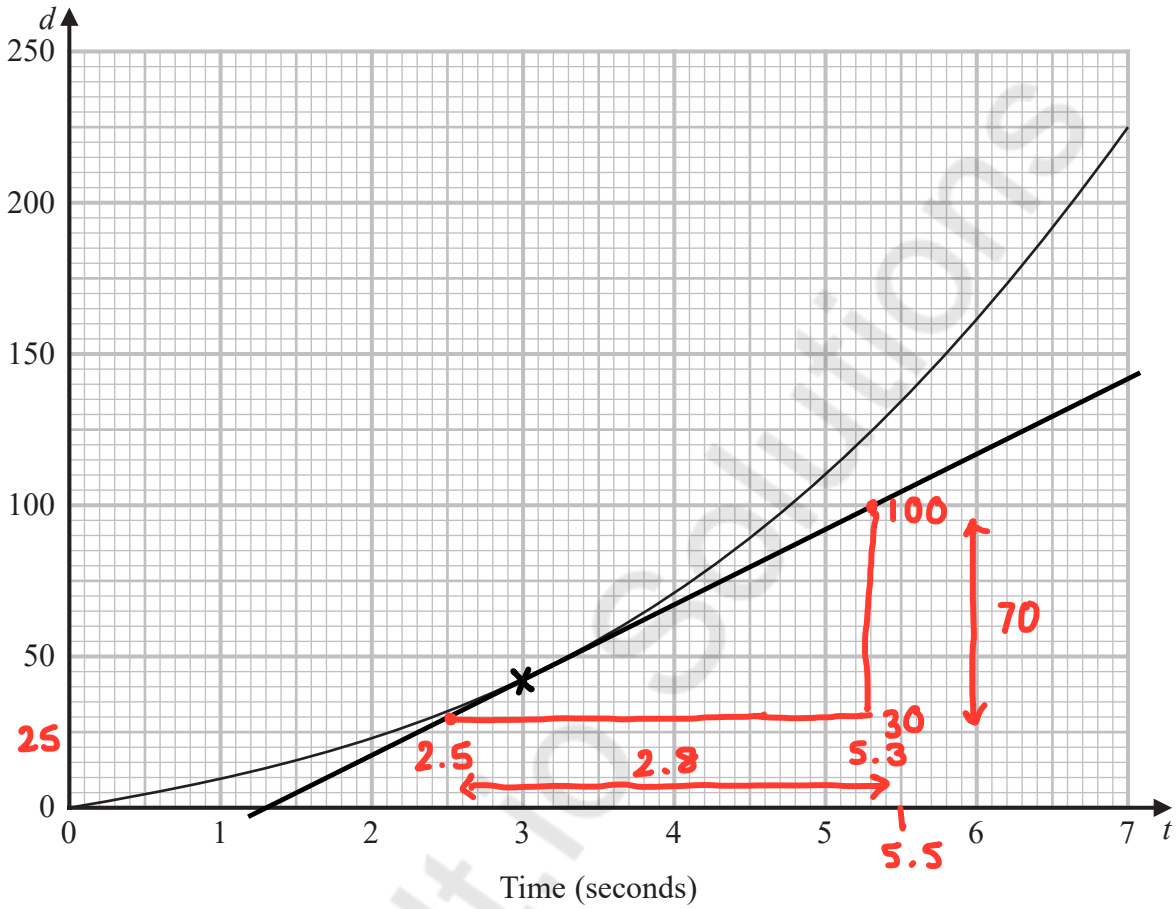
$9 + 8 = 17$

17

(Total for Question 14 is 3 marks)

15 An object falls from rest.

Here is the distance-time graph for the distance (d metres) fallen by the object t seconds after it starts to fall.



Work out an estimate for the gradient of the graph at $t = 3$
You must show how you get your answer.

$$m = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{70}{2.8}$$

$$= \frac{700}{28}$$

$$= \frac{100}{4}$$

$$= 25$$

25

(Total for Question 15 is 3 marks)

16 At the start of year n the population of a species is P_n

At the start of the following year the population of the species is given by

$$P_{n+1} = kP_n \quad \text{where } k \text{ is a positive constant.}$$

The population of the species at the start of year 1 is 8 million.
The population of the species at the start of year 2 is 6 million.

(a) Work out the population of the species at the start of year 3

$P_{\text{year 2}} = k\,P_{\text{year 1}}$

6 million $=$ k $\times$ 8 million

$\div$ 8 million $\qquad$ $\div$ 8 million

0.75 million $= k$

$P_{n+1} = 0.75 \text{ million } P_n$

$P_{\text{year 3}} = 0.75 \text{ million} \times 6 \text{ million}$

$= 4.5 \text{ million}$

$\frac{3}{4} \times 6 = \frac{18}{4}$

$= 4.5$

4.5 million

(3)

At the start of year 5 the value of k is increased by 0.3 to a new constant value.

Louise thinks that from the start of year 5 the population of the species would increase year on year.

(b) Is Louise correct?
You must give a reason for your answer.

$0.75 + 0.3 = 1.05$ (5% increase)

Yes, as 1.05 represents a 5% increase.

(1)

(Total for Question 16 is 4 marks)

17 (a) Factorise $6x^2 - 5x - 4$

$6 \times 4 = 24$

$3 \quad -8$

$6x^2 + 3x - 8x - 4$

$3x(2x+1) - 4(2x+1)$

$(3x-4)(2x+1)$

$(3x-4)(2x+1)$

(2)

(b) Hence, or otherwise, solve $6x^2 - 5x - 4 < 0$

$(3x-4)(2x+1) = 0$

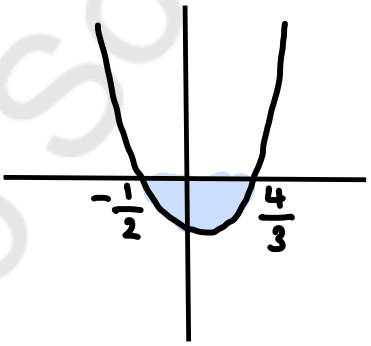
$3x - 4 = 0$ $\quad$ $2x + 1 = 0$

$+4 \quad +4$ $\quad$ $-1 \quad -1$

$3x = 4$ $\quad$ $2x = -1$

$\div 3 \quad \div 3$ $\quad$ $\div 2 \quad \div 2$

$x = \frac{4}{3}$ $\quad$ $x = -\frac{1}{2}$



$-\frac{1}{2} < x < \frac{4}{3}$

(2)

(Total for Question 17 is 4 marks)

18 Spinner **A** and spinner **B** are each spun once.

The probability that spinner **A** lands on red is $\frac{1}{4}$

The probability that both spinner **A** and spinner **B** land on red is $\frac{1}{24}$

Work out the probability that one spinner lands on red and the other spinner does **not** land on red.

Spinner A

$p(\text{red}) = \frac{1}{4}$

$p(\text{not red}) = \frac{3}{4}$

Spinner B

$p(\text{red}) = \frac{1}{6}$

$p(\text{not red}) = \frac{5}{6}$

$p(\text{both spinners red}) = \frac{1}{24}$

$\frac{1}{24} \div \frac{1}{4} = \frac{1}{24} \times \frac{4}{1} = \frac{4}{24} = \frac{1}{6}$

$p(RR') + p(R'R)$

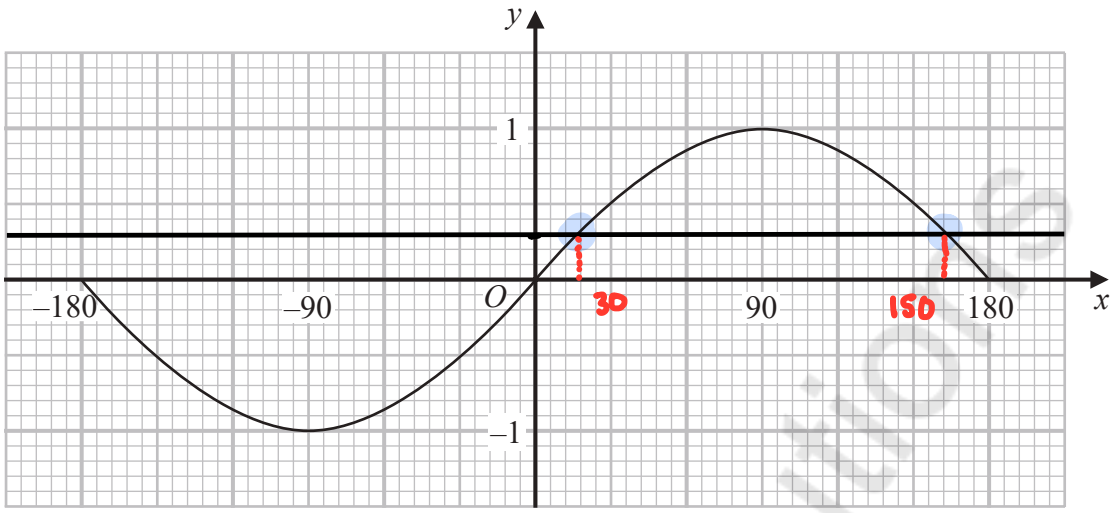
$\left(\frac{1}{4} \times \frac{5}{6}\right) + \left(\frac{3}{4} \times \frac{1}{6}\right)$

$\frac{5}{24} + \frac{3}{24} = \frac{8}{24}$

$\frac{8}{24}$

(Total for Question 18 is 4 marks)

19 Here is the graph of $y = \sin x°$ for $-180 \leqslant x \leqslant 180$



(a) Use the graph to find estimates for the solutions of

$\sin x° = 0.3$ for $-180 \leqslant x \leqslant 180$

sinx = y

y = 0.3

18° and 162°

(2)

(b) Write down a value of x such that

$\sin(x + 20)° = 0$ for $-180 \leqslant x \leqslant 180$

sin 0° = 0

x + 20 = 0

- 20 - 20

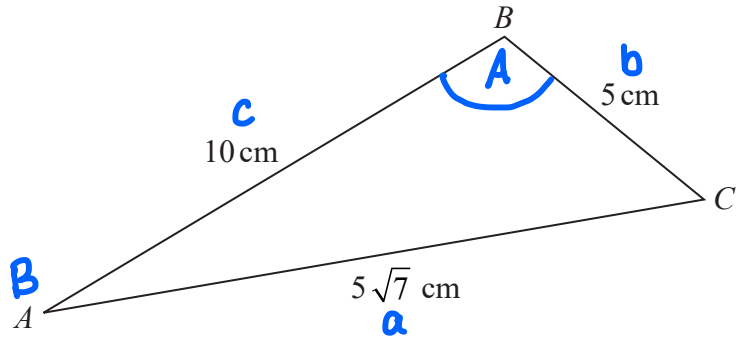
x = -20

$x =$ -20

(1)

(Total for Question 19 is 3 marks)

20 Here is triangle ABC.



Find the size of angle ABC.
You must show all your working.

$a^2 = b^2 + c^2 - 2bc \cos A$

$2bc \cos A = b^2 + c^2 - a^2$

$\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

$5\sqrt{7} \times 5\sqrt{7}$

$25 \times 7 = 175$

$\cos A = \dfrac{5^2 + 10^2 - (5\sqrt{7})^2}{2(5)(10)}$

$= \dfrac{125 - 175}{100}$

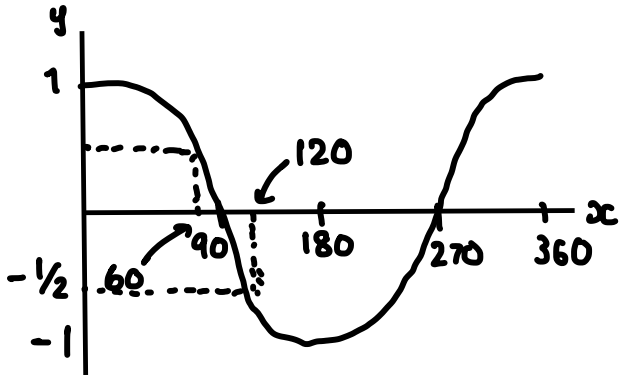
$= \dfrac{-50}{100} = -\dfrac{1}{2}$

120 °

(Total for Question 20 is 4 marks)

$\cos x = -\dfrac{1}{2}$

$x = 120°$

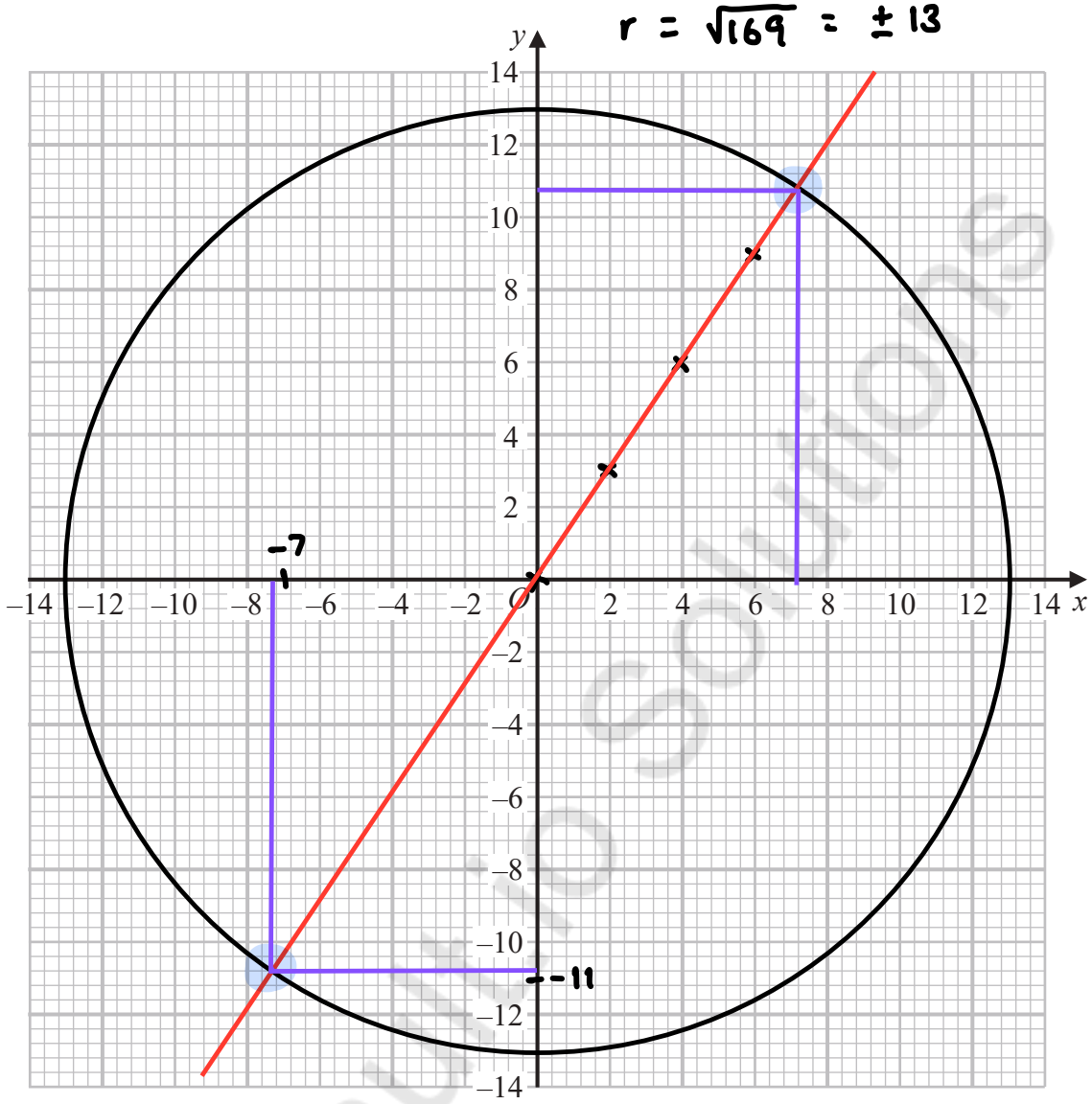


21 (a) On the grid, draw the graph of $x^2 + y^2 = 169$

$x^2 + y^2 = r^2$

$r^2 = 169$

$r = \sqrt{169} = \pm 13$



(2)

(b) Use your graph to find estimates for the solutions of the simultaneous equations

$x^2 + y^2 = 169$

$2y = 3x$

$2y = 3x$

$\div 2 \quad \div 2$

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

x	0	2	4	6
y	0	3	6	9

$x = -7.2 \quad y = -10.8$

$x = 7.2 \quad y = 10.8$

(3)

(Total for Question 21 is 5 marks)

22 The 2nd term of a geometric sequence is $3 + 2\sqrt{2}$
The 3rd term of the sequence is $13 + 9\sqrt{2}$

Find the value of the common ratio of the sequence.
Give your answer in the form $a + \sqrt{b}$ where a and b are integers.
You must show all your working.

$$\frac{13 + 9\sqrt{2}}{3 + 2\sqrt{2}} \times \frac{3 - 2\sqrt{2}}{3 - 2\sqrt{2}}$$

$$\frac{(13 + 9\sqrt{2})(3 - 2\sqrt{2})}{(3 + 2\sqrt{2})(3 - 2\sqrt{2})}$$

$9\sqrt{2} \times -2\sqrt{2}$
$-18 \times 2 = -36$

$2\sqrt{2} \times -2\sqrt{2}$
$-4 \times 2 = -8$

$$\frac{39 - 26\sqrt{2} + 27\sqrt{2} - 36}{9 - 6\sqrt{2} + 6\sqrt{2} - 8}$$

$$\frac{3 + \sqrt{2}}{1} = 3 + \sqrt{2}$$

$3 + \sqrt{2}$

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

BLANK PAGE

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE