Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Time 2 hours

Paper reference **4MA1/2H**

Mathematics A

PAPER 2H

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.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
- Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.

Turn over ▶

P72443A

©2023 Pearson Education Ltd.

J:1/1/1/1/1/

P 7 2 4 4 3 A 0 1 2 8

Pearson

International GCSE Mathematics

Formulae sheet – Higher Tier

Arithmetic series

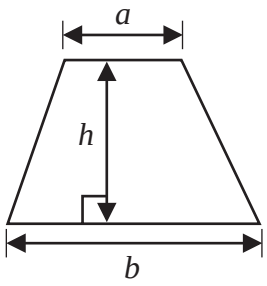
Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

The quadratic equation

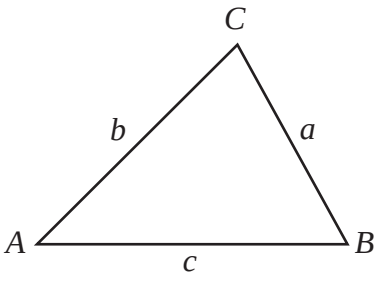
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

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

Area of trapezium $= \frac{1}{2}(a + b)h$



Trigonometry



In any triangle *ABC*

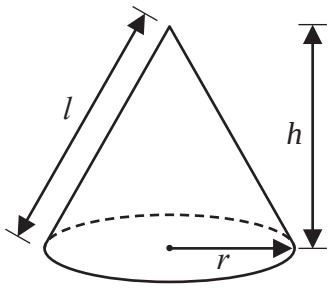
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

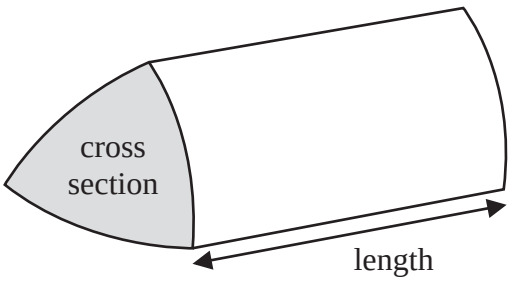
Area of triangle $= \frac{1}{2}ab\sin C$

Volume of cone $= \frac{1}{3}\pi r^2 h$

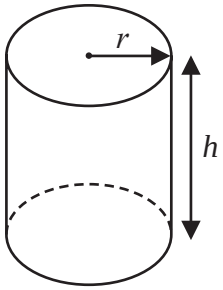
Curved surface area of cone $= \pi r l$



Volume of prism
= area of cross section × length

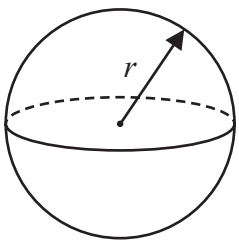


Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi r h$



Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Show that $3\frac{5}{7} \div 1\frac{5}{8} = 2\frac{2}{7}$

$\frac{26}{7} \div \frac{13}{8}$ (1)

$\frac{26^{2}}{7} \times \frac{8}{13_{1}}$ (1)

$= \frac{16}{7} = 2\frac{2}{7}$ (1)

(Total for Question 1 is 3 marks)

2 Change a speed of 90 kilometres per hour to a speed in metres per second.
Show your working clearly.

$90\ \frac{km}{h} \times \frac{1000\ m}{1\ km} \times \frac{1\ h}{3600\ s}$ (1)

$= \frac{90 \times 1000}{3600}$

$= \frac{90\ 000}{3\ 600}$ (1)

$= 25$ (1)

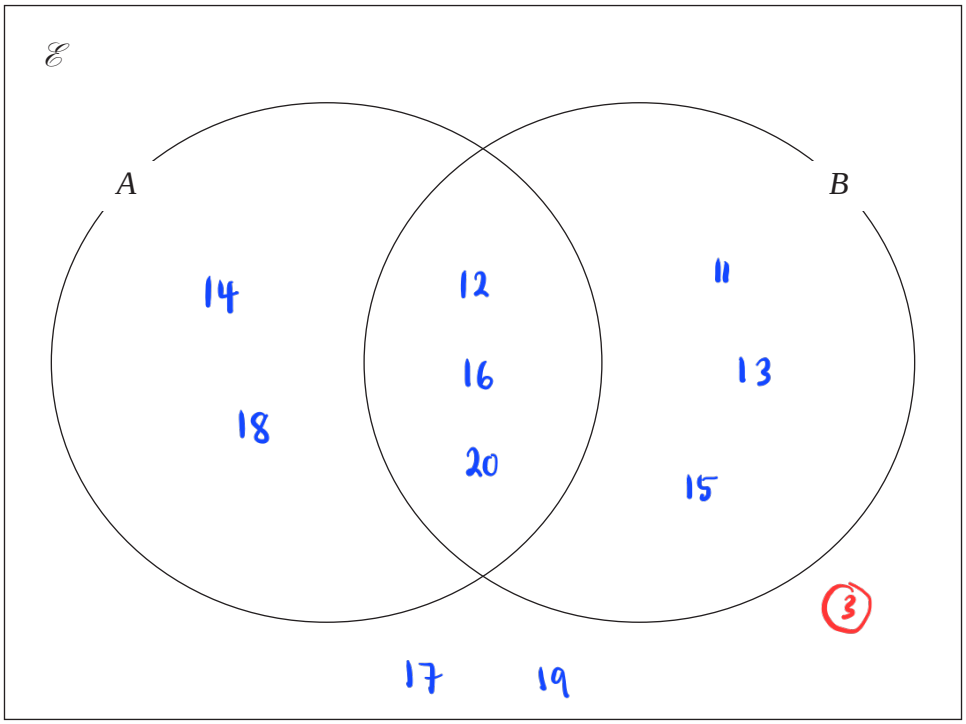
25 m/s

(Total for Question 2 is 3 marks)

3 $\mathscr{E} = \{11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$A = \{\text{even numbers}\}$
$A \cap B = \{12, 16, 20\}$
$(A \cup B)' = \{17, 19\}$

Complete the Venn diagram for the sets $\mathscr{E}$, A and B



(Total for Question 3 is 3 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

4 The diagram shows rectangle *ABCD*

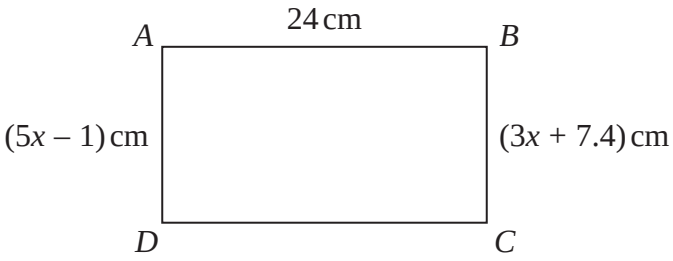


Diagram **NOT** accurately drawn

Work out the perimeter of the rectangle.
Show your working clearly.

$5x - 1 = 3x + 7.4$ (1)

$2x = 8.4$

$x = 4.2$ (1)

Perimeter $= 24 + 24 + 5(4.2) - 1 + 3(4.2) + 7.4$ (1)

$= 24 + 24 + 20 + 20$

$= 88$ (1)

88 cm

(Total for Question 4 is 4 marks)

5 The weight of a cake is 2.75 kg, correct to 2 decimal places.

(a) Write down the lower bound of the weight of the cake.

2.745 (1) ..... kg

(1)

(b) Write down the upper bound of the weight of the cake.

2.755 (1) ..... kg

(1)

Penny has worked out $\frac{81.3 \times 59.2}{1.9^2}$ on her calculator.

Her answer is 13 332.299 17

Penny's answer is not sensible.

(c) By rounding each number to one significant figure, work out a suitable estimate to show that her answer is not sensible.
Show your working clearly.

$$\frac{80 \times 60}{2^2} \quad (1)$$

$$= \frac{4800}{4}$$

$$= 1200 \quad (1)$$

(2)

(Total for Question 5 is 4 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

6 The points A and B are on a coordinate grid.

The coordinates of A are (6, 4)
The coordinates of B are (17, j) where j is a constant.

The midpoint of AB has coordinates (k, 15) where k is a constant.

Find the value of j and the value of k

$k = \frac{6+17}{2}$ (1)

$= 11.5$

$\frac{4+j}{2} = 15$ (1)

$j = 30 - 4$

$= 26$ (1)

$j =$ 26

$k =$ 11.5

(Total for Question 6 is 3 marks)

7 Solve the simultaneous equations

$$5x + 4y = -2 \quad (1)$$
$$2x - y = 4.4$$

Show clear algebraic working.

$y = 2x - 4.4$ (2)

$5x + 4(2x - 4.4) = -2$ (1)

$5x + 8x - 17.6 = -2$

$13x = 15.6$ (1)

$x = \frac{15.6}{13}$

$= 1.2$

$y = 2(1.2) - 4.4$

$= 2.4 - 4.4$ (1)

$= -2$

$x =$ 1.2

$y =$ -2

(Total for Question 7 is 3 marks)

8 Matteo is going to invest 5000 Swiss francs for two years.

He can invest his money in Bank **G** or in Bank **H**.

Bank **G**	Bank **H**
1.6% per year compound interest	2.9% interest added after two years

The total amount of interest Matteo would receive at the end of two years from Bank **G** is more than the amount of interest Matteo would receive at the end of two years from Bank **H**.

How much more?

H : $\frac{2.9}{100} \times 5000 = 145$ (1)

G : $\frac{1.6}{100} \times 5000 = 80$

$\frac{1.6}{100} \times 5080 = 81.28$ (1)

$80 + 81.28 = 161.28$

$161.28 - 145 = 16.28$ (1)

(1)

16.28 Swiss francs

(Total for Question 8 is 4 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

9 (a) Write down the value of $(m + 2)^0$ where m is a positive integer.

1 (1)

.....

(1)

(b) Simplify $(3a^2b^4)^3$

$3^3 \times a^{2(3)} \times b^{4(3)}$ (1)

$= 27a^6b^{12}$ (1)

$27a^6b^{12}$

.....

(2)

(c) Factorise fully $14x^2y^4 + 21x^3y^2$

$7(2x^2y^4 + 3x^3y^2)$

$7x^2(2y^4 + 3xy^2)$ (1)

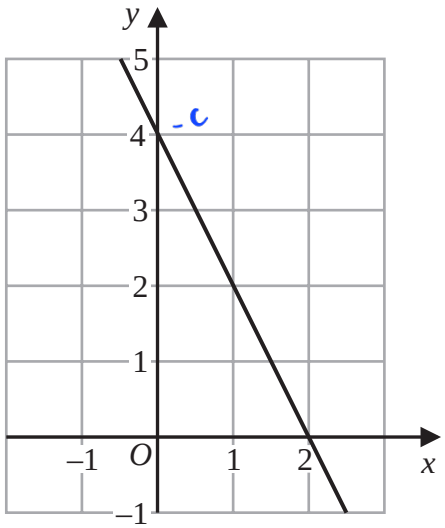
$7x^2y^2(2y^2 + 3x)$ (1)

$7x^2y^2(2y^2 + 3x)$

.....

(2)

The diagram shows a straight line drawn on a grid.



(d) Write down an equation of the line.

$m = \frac{4-0}{0-2}$ (1)

$= -2$

$y = -2x + 4$ (1)

$y = -2x + 4$

.....

(2)

(Total for Question 9 is 7 marks)

10 The diagram shows an isosceles triangle, with base length 24 cm.

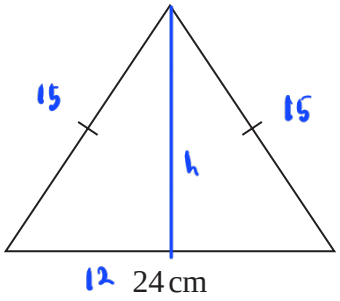


Diagram **NOT** accurately drawn

The perimeter of the triangle is 54 cm.

Work out the area of the triangle.

$2x + 24 = 54$

$x = 15$ (1)

$h^2 = 15^2 - 12^2$ (1)

$h = \sqrt{81}$ (1)

$= 9$

Area $= \frac{1}{2} \times 9 \times 24$ (1)

$= 108$ (1)

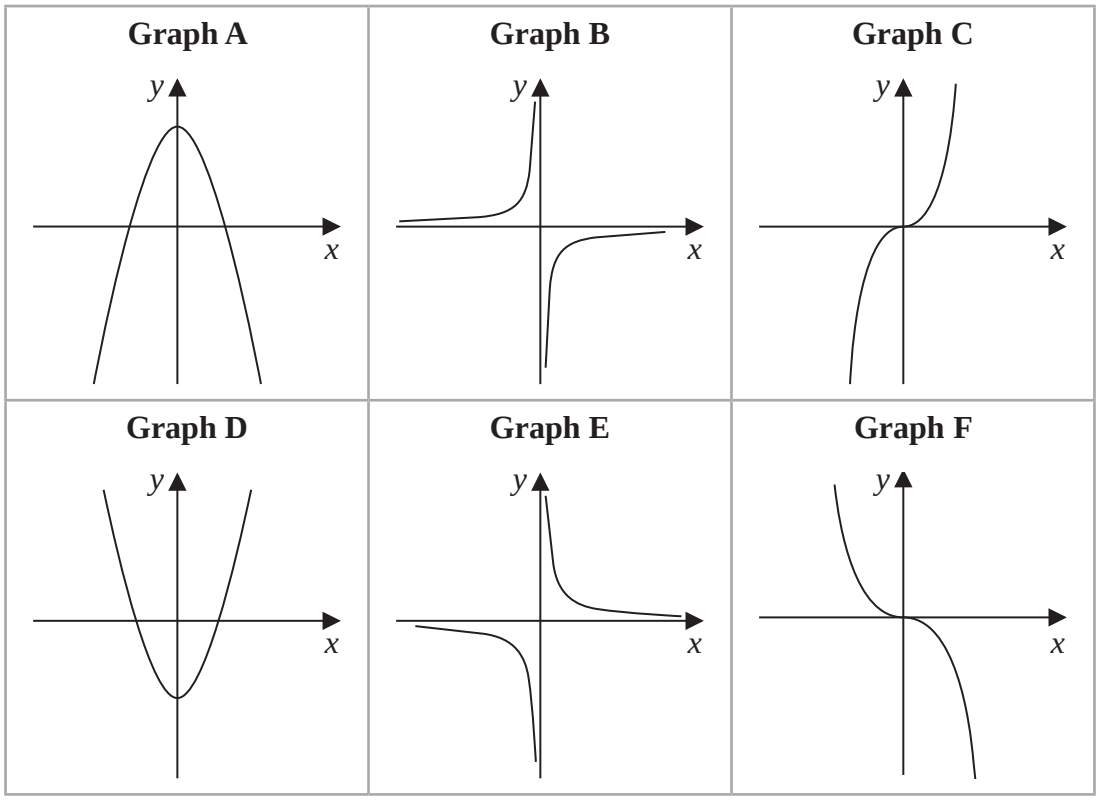
108 ..... cm^2

(Total for Question 10 is 5 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

11 Here are six graphs.

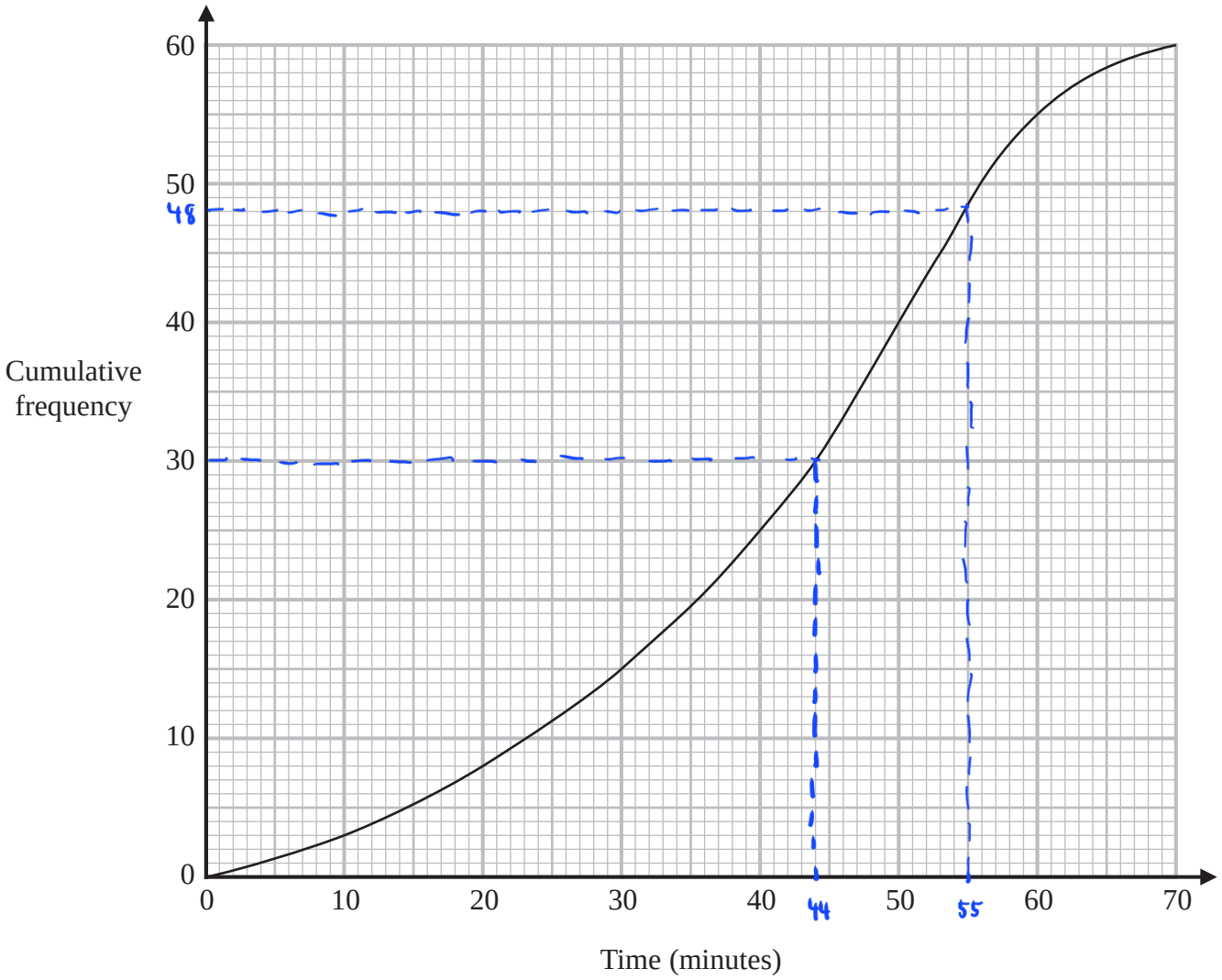


Complete the table below with the letter of the graph that could represent each given equation.
Write your answers on the dotted lines.

Equation	Graph
$y = -\frac{2}{x}$	B
$y = 5 - x^2$	A (3)
$y = -2x^3$	F

(Total for Question 11 is 3 marks)

12 The cumulative frequency graph gives information about the time, in minutes, each of 60 people took to shop in a market.



(a) Use the graph to find an estimate for the median time people took to shop in the market.

44 (1) ..... minutes

(1)

(b) Use the graph to find an estimate for the number of people who took longer than 55 minutes to shop in the market.

60 − 48 = 12 (1) (1)

12 .....

(2)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Use the graph to complete the frequency table to give information about the time, in minutes, each of the 60 people took to shop in the market.

Time taken to shop in the market (m minutes)	Frequency
$0 < m \leqslant 10$	3
$10 < m \leqslant 20$	5
$20 < m \leqslant 30$	7
$30 < m \leqslant 40$	10
$40 < m \leqslant 50$	15
$50 < m \leqslant 60$	15
$60 < m \leqslant 70$	5

(2)

(Total for Question 12 is 5 marks)

13 Solve $\frac{x+3}{4} - \frac{7-x}{5} = 4.3$

Show clear algebraic working.

$5(x+3) - 4(7-x) = 4.3 \times 5 \times 4$ (1)

$5x + 15 - 28 + 4x = 4.3 \times 20$ (1)

$5x + 4x = 86 - 15 + 28$

$9x = 99$

$x = 11$ (1)

$x =$ 11

(Total for Question 13 is 3 marks)

14 *A*, *B*, *C* and *D* are points on a circle, centre *O*

EBF is the tangent to the circle at *B*

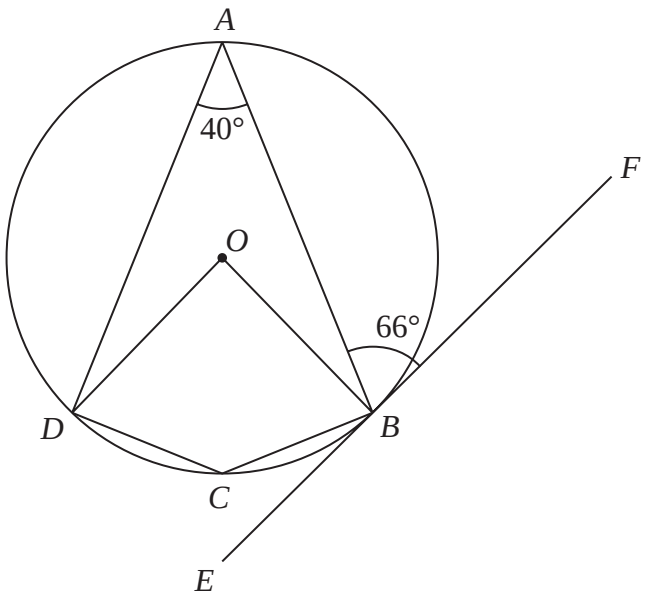


Diagram **NOT** accurately drawn

(a) (i) Work out the size of angle *DCB*

140 (1) °

(1)

(ii) Give a reason for your answer to (a)(i)

opposite angles in cyclic quadrilateral add up to 180° (1)

(1)

(b) Work out the size of angle *ADO*

ABO = 90 - 66 = 24 (1)

DOB (reflex) = 140 × 2 = 280 (1)

ADO = 360 - 40 - 280 - 24

= 16 (1)

16 °

(3)

(Total for Question 14 is 5 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

15 Here is a list giving the numbers of runs scored last week by the eleven members of cricket team **A**.

		Q_1			median			Q_3		
2	3	4	6	21	26	27	32	34	61	72

The interquartile range of the numbers of runs scored last week by the eleven members of cricket team **B** was 42

Using a suitable calculation, write down one comparison between the numbers of runs scored by the members of cricket team **A** and the members of cricket team **B**.
Show your working clearly.

$IQR_A = 34 - 4$ (1)

$= 30$ (1)

IQR for Team B is higher than Team A. The runs scored were more spread out for Team B than Team A. (1)

(Total for Question 15 is 3 marks)

16 Use algebra to show that $0.4\dot{3}\dot{8} = \frac{217}{495}$

let $x = 0.438\ldots$

let $100x = 43.838\ldots$

$100x - x = 43.838\ldots - 0.438\ldots$ (1)

$99x = 43.4$

$x = \frac{43.4}{99}$ (1)

$= \frac{217}{495}$

(Total for Question 16 is 2 marks)

17 Given that $8\sqrt{m} + \sqrt{49m} - \sqrt{9m} = k\sqrt{m}$
where k is an integer and m is a prime number,

(a) work out the value of k

$8\sqrt{m} + 7\sqrt{m} - 3\sqrt{m}$

$= 12\sqrt{m}$ (1)

$k =$ 12

(1)

(b) Show that $\dfrac{5 - \sqrt{18}}{1 - \sqrt{2}}$ can be written in the form $a + b\sqrt{2}$
where a and b are integers.
Show each stage of your working clearly.

$\dfrac{5 - \sqrt{18}}{1 - \sqrt{2}} \times \dfrac{1 + \sqrt{2}}{1 + \sqrt{2}}$ (1)

$= \dfrac{5 + 5\sqrt{2} - \sqrt{18} - 6}{1 - 2}$

$= \dfrac{5 - 6 + 5\sqrt{2} - 3\sqrt{2}}{-1}$ (1)

$= 1 - 2\sqrt{2}$ (1)

(3)

(Total for Question 17 is 4 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

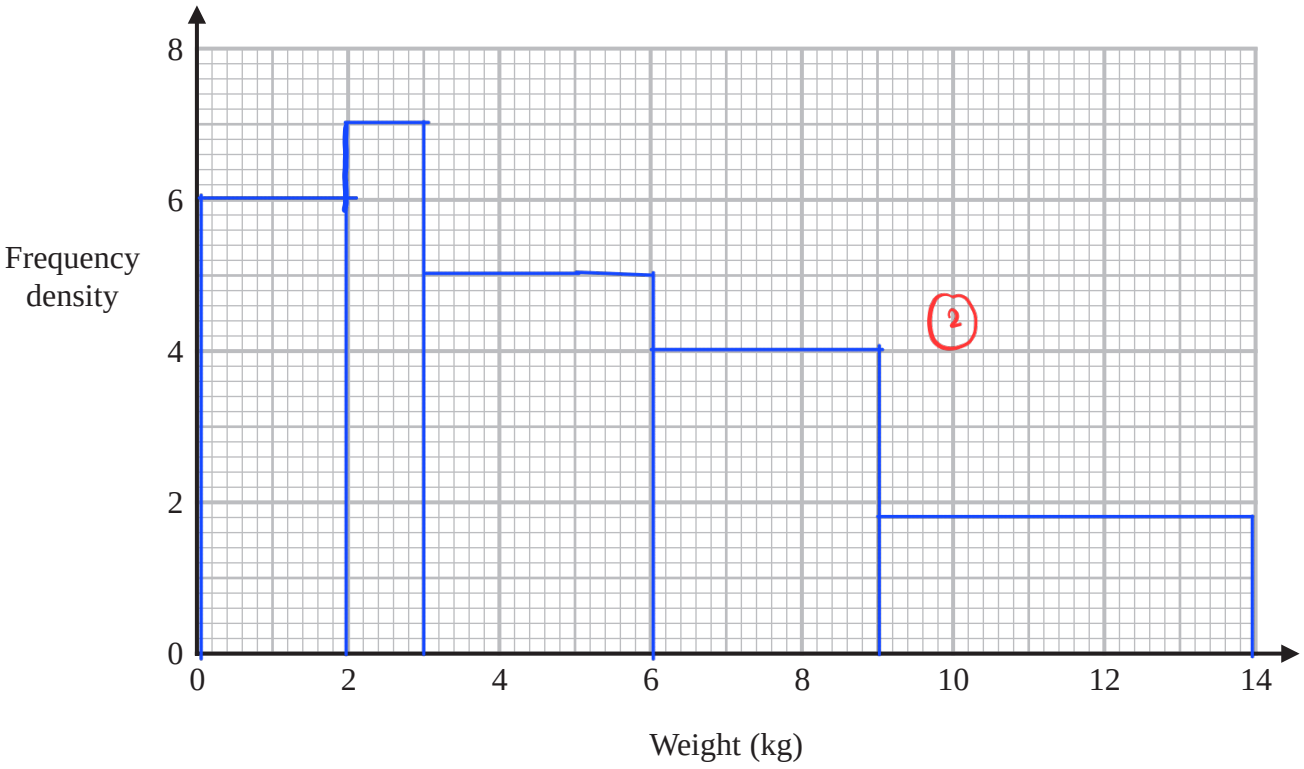
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

18 The table gives information about the weights, in kg, of the parcels that Pedro delivers on Monday.

Weight (w kg)	Frequency
$0 < w \leqslant 2$	12
$2 < w \leqslant 3$	7
$3 < w \leqslant 6$	15
$6 < w \leqslant 9$	12
$9 < w \leqslant 14$	9

PD
$12/2 = 6$
$7/1 = 7$
$15/3 = 5$
$12/3 = 4$
$9/5 = 1.8$
(1)

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



(3)

One of the parcels that Pedro delivered on Monday is chosen at random.

(b) Using the information in the table, find an estimate for the probability that this parcel weighs more than 7 kg.

Total : $12 + 7 + 15 + 12 + 9$
$= 55$

$\frac{2}{3} \times 12 + 9$ (1)
$= 8 + 9 = 17$

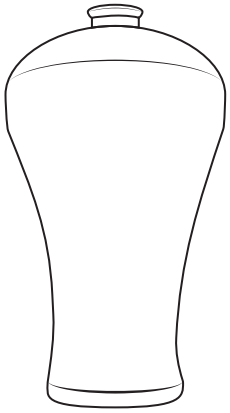
$\frac{17}{55}$ (1)

$\frac{17}{55}$

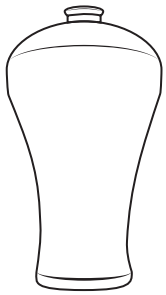
(2)

(Total for Question 18 is 5 marks)

19 **A** and **B** are two similar vases.



A



B

Diagram **NOT** accurately drawn

The vases are such that

$$\text{surface area of vase } \mathbf{B} = \frac{25}{64} \times \text{surface area of vase } \mathbf{A}$$

and that

$$\text{volume of vase } \mathbf{A} - \text{volume of vase } \mathbf{B} = 541.8\,\text{cm}^3$$

Calculate the volume of vase **B**

scale factor of length : $B = \sqrt{\frac{25}{64}}\ A$

$B = \frac{5}{8} A$ (1)

Volume : $\left(\frac{8}{5}\right)^3 B - B = 541.8$

$\frac{512}{125} B - B = 541.8$ (1)

$B\left(\frac{512}{125} - 1\right) = 541.8$

$B(3.096) = 541.8$ (1)

$B = 175$ (1)

175 ..... cm^3

(Total for Question 19 is 4 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

20 Solve the simultaneous equations

$$y = 7 - 2x \quad -(1)$$
$$x^2 + y^2 = 34 \quad -(2)$$

Show clear algebraic working.

(1) into (2) :

$x^2 + (7-2x)^2 = 34$ (1)

$x^2 + 49 - 28x + 4x^2 = 34$

$5x^2 - 28x + 15 = 0$ (1)

$(5x-3)(x-5) = 0$ (1)

$x = 0.6$, $x = 5$

$y = 7 - 2(0.6)$, $y = 7 - 2(5)$ (1)

$= 5.8$ $= -3$

(1)

$x = 0.6$, $y = 5.8$, $x = 5$, $y = -3$

(Total for Question 20 is 5 marks)

21 Given that the surface area of a sphere is $49\pi \text{ cm}^2$

find the volume of the sphere.
Give your answer correct to the nearest integer.

$4\pi r^2 = 49\pi$

$r^2 = \frac{49\pi}{4\pi}$ (1)

$r = \sqrt{\frac{49\pi}{4\pi}}$

$= \frac{7}{2} = 3.5$

$V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 3.5^3$ (1)

$= 180$ (1)

180 ..... cm^3

(Total for Question 21 is 3 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

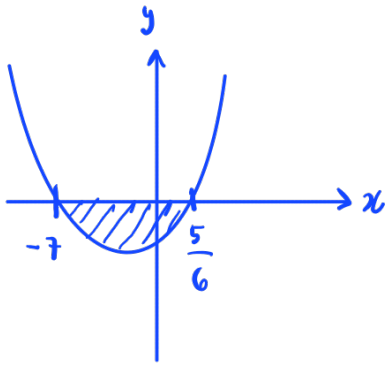
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

22 Solve the inequality $6x^2 + 37x \leqslant 35$
Show clear algebraic working.

$6x^2 + 37x - 35 \leq 0$

$(6x - 5)(x + 7) \leq 0$ (1)

$x = \frac{5}{6}$, $x = -7$ (1)



$-7 \leq x \leq \frac{5}{6}$ (1)

$-7 \leq x \leq \frac{5}{6}$

(Total for Question 22 is 3 marks)

Turn over for Question 23

23 The diagram shows a solid prism *ABCDEFGHIJ*

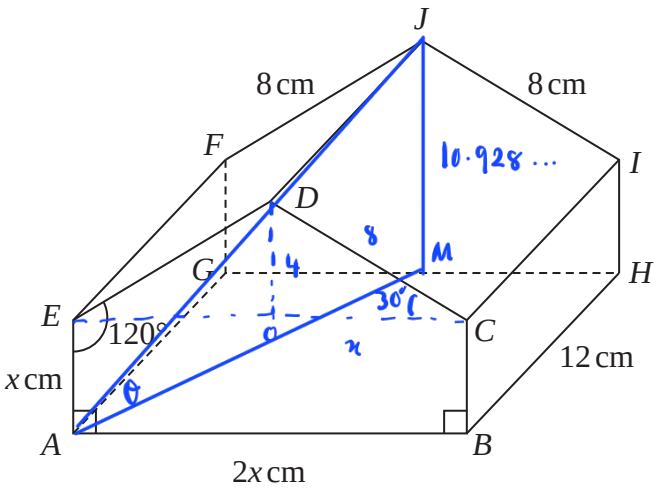


Diagram **NOT** accurately drawn

The prism is such that each cross section is a pentagon where

$AE = BC = x$ cm $AB = 2x$ cm $ED = CD = 8$ cm

angle EAB = angle $CBA = 90°$ angle AED = angle $BCD = 120°$

Given that $AG = BH = EF = DJ = CI = 12$ cm

calculate the angle that AJ makes with the base $ABHG$ of the prism.
Give your answer correct to 3 significant figures.

$DO = 8 \sin 30°$

$= 4$ (1)

$x = 8 \cos 30° = 6.928\ldots$ (1)

$2x = 2 \times 6.928\ldots = 13.85\ldots$

$AM = \sqrt{12^2 + 6.928\ldots^2}$ (1)

$= 13.856\ldots$

$JM = 4 + 6.928\ldots = 10.928\ldots$

$\tan\theta = \dfrac{10.928\ldots}{13.856\ldots}$ (1)

$\theta = \tan^{-1}\dfrac{10.928\ldots}{13.856\ldots}$

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

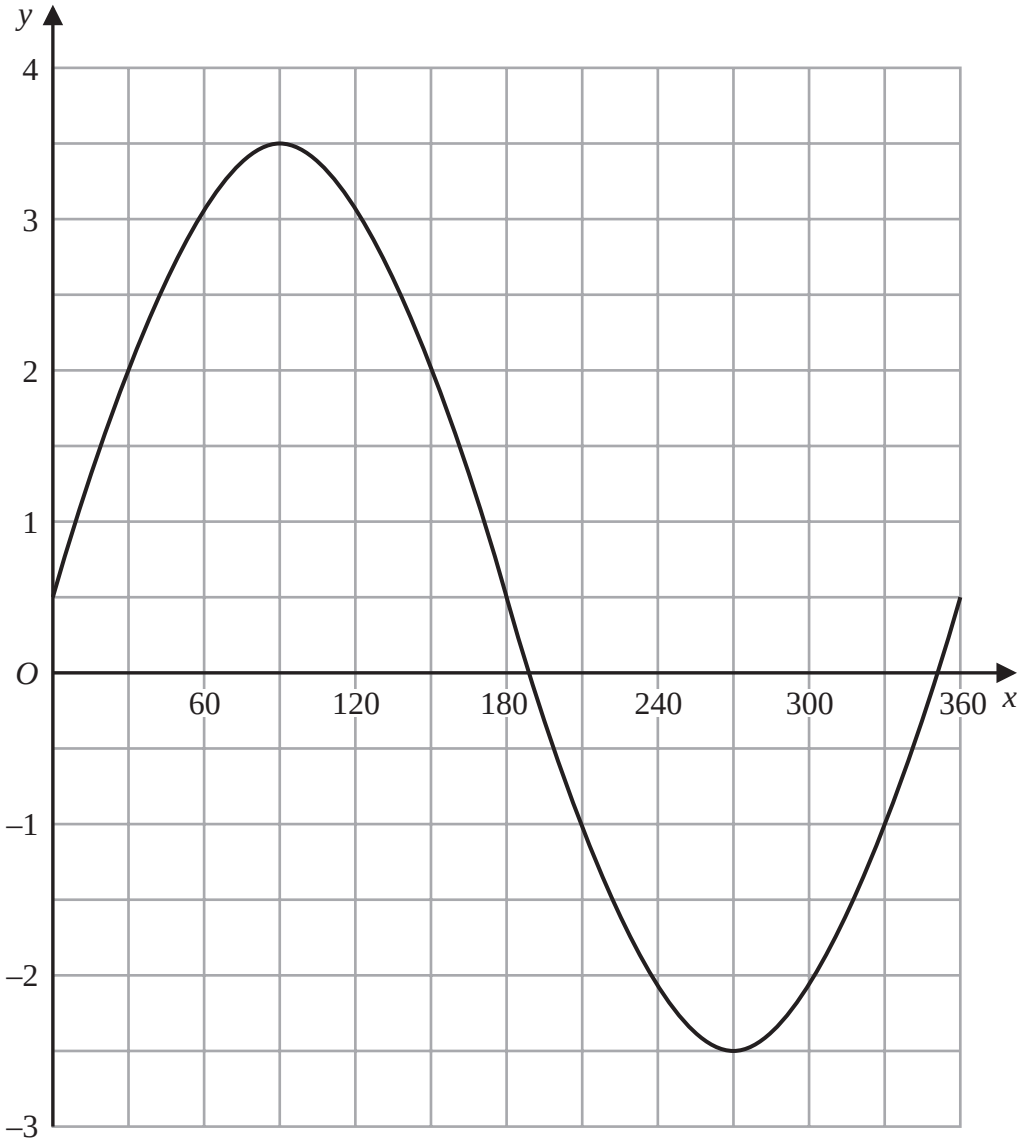
$\theta = 38.3$ (1)

38.3 °

(Total for Question 23 is 5 marks)

Turn over for Question 24

24 The graph of $y = a\sin x° + b$ is drawn on the grid.



Find the value of a and the value of b

$a =$ 3 (1)

$b =$ 0.5 (1)

(Total for Question 24 is 2 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

25 The function f is such that $f(x) = 3x^2 - 12x + 7$ where $x \leqslant 2$

Express the inverse function f^{-1} in the form $f^{-1}(x) = \ldots$

let $f(x) = y$

$y = 3x^2 - 12x + 7$

$y = 3(x^2 - 4x) + 7$ (1)

$= 3[(x-2)^2 - 4] + 7$

$= 3(x-2)^2 - 12 + 7$

$y = 3(x-2)^2 - 5$ (1)

$\frac{y+5}{3} = (x-2)^2$

$\pm\sqrt{\frac{y+5}{3}} = x - 2$

$x = 2 \pm \sqrt{\frac{y+5}{3}}$ (1)

$f^{-1}(x) = 2 \pm \sqrt{\frac{x+5}{3}}$

since domain of x of $f(x)$: $x \leq 2$,

range of $f^{-1}(x) \leq 2$

Hence, $f^{-1}(x) = 2 - \sqrt{\frac{x+5}{3}}$ (1)

$f^{-1}(x) =$ $2 - \sqrt{\frac{x+5}{3}}$

(Total for Question 25 is 4 marks)

26 Find the values of n such that

$$\frac{10^{4n} \times 2^{3(n^2-5n)} \times 5^{2(1-2n)}}{20^2} = 1$$

Show clear algebraic working.

$10^{4n} = (5 \times 2)^{4n}$

$20^2 = (5 \times 2^2)^2$ (1)

$$\frac{5^{4n} \times 2^{4n} \times 2^{3n^2-15n} \times 5^{2-4n}}{5^2 \times 2^4} = 1$$

$$= \frac{5^{4n+2-4n} \times 2^{4n+3n^2-15n}}{5^2 \times 2^4} = 1$$

$$= \frac{5^2 \times 2^{3n^2-11n}}{5^2 \times 2^4} = 1$$ (1)

$2^{3n^2-11n-4} = 2^0$ (1)

$3n^2 - 11n - 4 = 0$ (1)

$(3n+1)(n-4) = 0$

$n = -\frac{1}{3}, \; n = 4$ (1)

$-\frac{1}{3}, 4$

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

BLANK PAGE

BLANK PAGE

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA