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|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--|
| Candidate surname    |                      |                      |                      |                      | Other names          |                      |                      |                      |  |
| Centre Number        |                      |                      |                      |                      | Candidate Number     |                      |                      |                      |  |
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## Pearson Edexcel International GCSE (9–1)

Sample assessment material for first teaching September 2024

Time 2 hours

Paper  
reference

**4WM2H/01**

### Mathematics A (Modular) UNIT 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 unit 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.

## International GCSE Mathematics

## Formulae sheet – Higher Tier

**Arithmetic series**

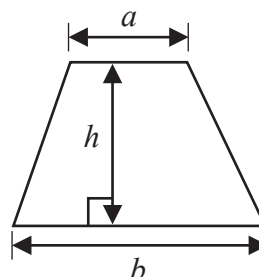
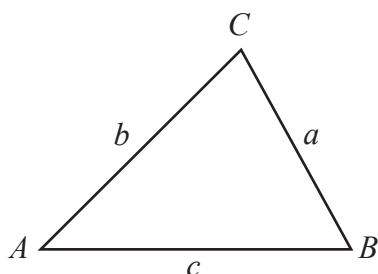
Sum to  $n$  terms,  $S_n = \frac{n}{2} [2a + (n-1)d]$

**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  $ABC$** 

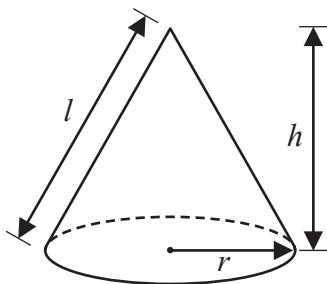
**Sine Rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

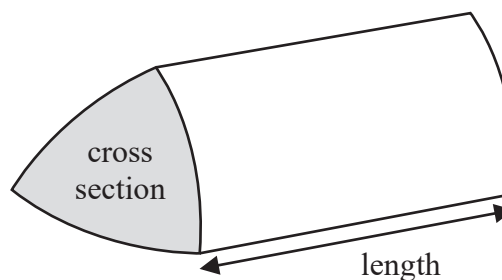
**Area of triangle**  $= \frac{1}{2}ab \sin C$

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

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

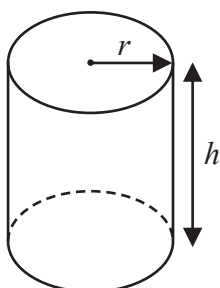
**Volume of prism**

$= \text{area of cross section} \times \text{length}$



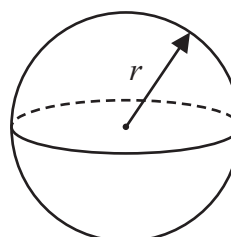
**Volume of cylinder**  $= \pi r^2 h$

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



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

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

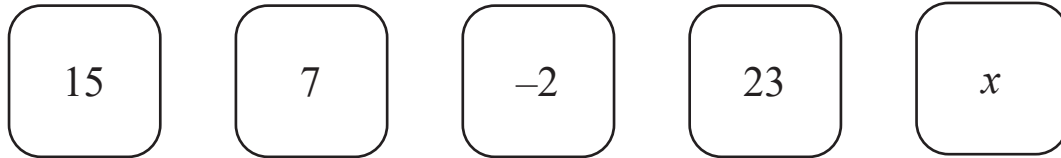


**Answer ALL TWENTY FOUR questions.**

**Write your answers in the spaces provided.**

**You must write down all stages in your working.**

- 1** Here are five cards, where  $x$  represents a number.



The mean of the five numbers is 12

Work out the value of  $x$

$$5 \times 12 - 15 - 7 + 2 - 23 = 17$$

$$x = 17$$

**(Total for Question 1 is 3 marks)**

- 2 (a) Find the highest common factor (HCF) of 56 and 84  
Show your working clearly.

$$\begin{array}{r|rr}
 7 & 56 & 84 \\
 \hline
 4 & 8 & 12 \\
 \hline
 & 2 & 3
 \end{array}$$

$$\begin{array}{r|l}
 4 \times 7 & \\
 \hline
 & 28
 \end{array}$$

(2)

- (b) Find the lowest common multiple (LCM) of 60 and 72  
Show your working clearly.

$$\begin{array}{r|rr}
 6 & 60 & 72 \\
 \hline
 2 & 10 & 12 \\
 \hline
 & 5 & 6
 \end{array}$$

$$\begin{array}{r|l}
 60 \times 6 & \\
 \hline
 & 360
 \end{array}$$

(2)

(Total for Question 2 is 4 marks)

3  $\frac{2^k}{4^n} = 2^x$

Find an expression for  $x$  in terms of  $k$  and  $n$

$$\frac{2^k}{2^{2n}} = 2^{k-2n}$$

$$x = k - 2n$$

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(Total for Question 3 is 2 marks)

- 4 The diagram shows parts of three regular polygons, **A**, **B** and **C**, meeting at a point.

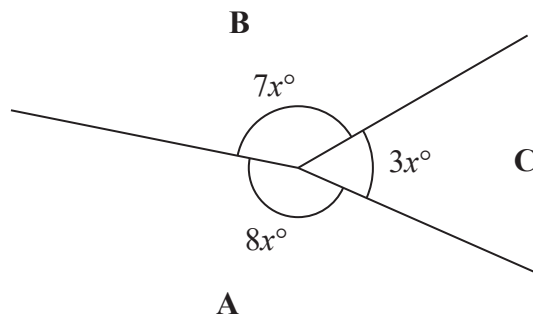


Diagram **NOT**  
accurately drawn

Polygon **B** has  $n$  sides.  
Work out the value of  $n$

$$18x = 360$$

$$x = 20$$

$$\text{ext } B = 180 - 140 = 40$$

$$360 \div 40$$

$$n = 9$$

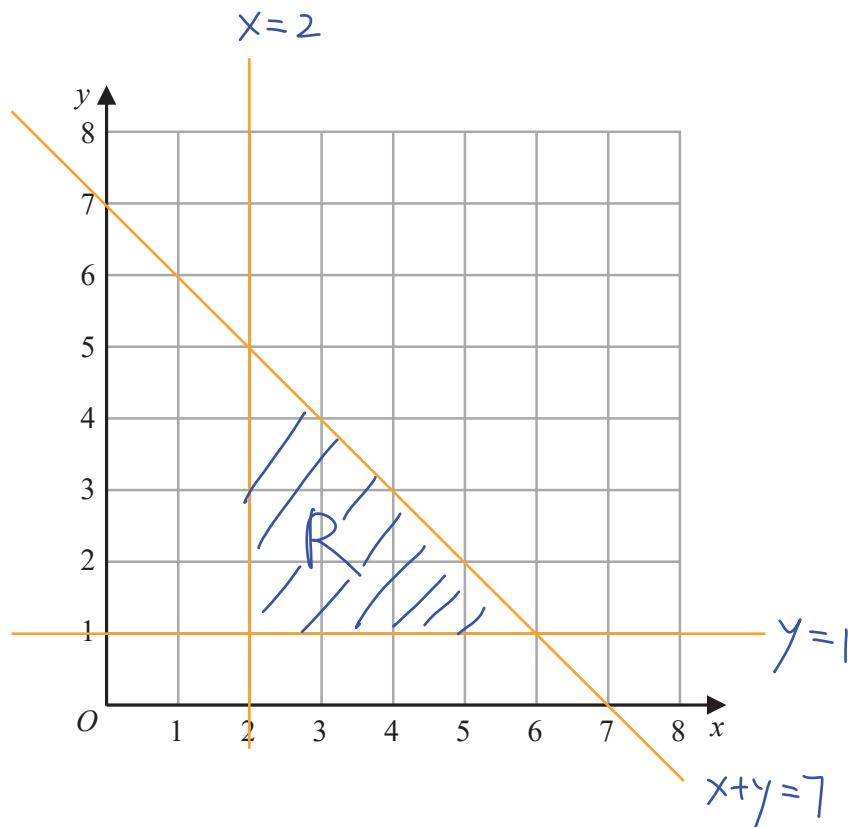
(Total for Question 4 is 4 marks)

5 (a) On the grid, draw and label with its equation the straight line with equation

(i)  $y = 1$

(ii)  $x = 2$

(iii)  $x + y = 7$



(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

$y \geq 1$

$x \geq 2$

$x + y \leq 7$

Label the region **R**

(1)

(Total for Question 5 is 4 marks)

6 Here are some integers where  $a < b < c < d$

$a \quad b \quad c \quad d \quad d \quad d$

The mode of the integers is 9  $\rightarrow d = 9$

The range of the integers is 4  $\rightarrow a = 5$

The median of the integers is 8  $\rightarrow c + d = 16 \quad c = 7 \quad b = 6$

Work out the value of  $a$ , the value of  $b$ , the value of  $c$  and the value of  $d$

$a = \dots\dots\dots 5$   
 $b = \dots\dots\dots 6$   
 $c = \dots\dots\dots 7$   
 $d = \dots\dots\dots 9$

(Total for Question 6 is 3 marks)



- 7 A cylinder is placed on the ground.

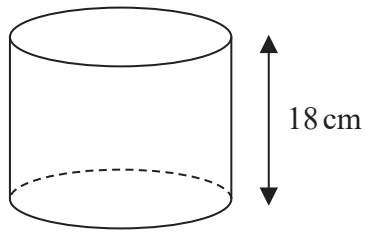


Diagram **NOT**  
accurately drawn

The height of the cylinder is 18 cm

The force exerted by the cylinder on the ground is 72 newtons.

The pressure on the ground due to the cylinder is 1.4 newtons/cm<sup>2</sup>

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

$$p = \frac{F}{A}$$

Work out the volume of the cylinder.

Give your answer correct to 3 significant figures.

$$1.4 = \frac{72}{A}$$

$$A = \frac{360}{7} \text{ cm}^2$$

$$V = 18A = \frac{6480}{7}$$

Ans x 18

925.7142857

926 cm<sup>3</sup>

(Total for Question 7 is 4 marks)

- 8 In 2021, the value of Asha's apartment was 634 400 euros.  
The value of Asha's apartment had increased by 4% from its value in 2020

(a) Work out the value of Asha's apartment in 2020

$$1.04x = 634\,400$$

A calculator screen showing the calculation: 634400 divided by 1.04, resulting in 610000. The display shows '634400' over '1.04' with an equals sign, and '610000' at the bottom.

..... euros

(3)

Pam bought a boat.

In each year after Pam bought the boat, the value of the boat depreciated by 15%

- (b) Work out the total percentage by which the value of the boat had depreciated by the end of the second year after Pam bought the boat.

A calculator screen showing the calculation: 1 minus (1 minus 0.15) squared, resulting in 0.2775. The display shows '1-(1-.15)^2' and '0.2775'.

27.75

..... %

(3)

(Total for Question 8 is 6 marks)

- 9 (a) Write 0.000089 in standard form.

$$8.9 \times 10^{-5}$$

(1)

- (b) Write  $8.34 \times 10^4$  as an ordinary number.

83 400

(1)

(Total for Question 9 is 2 marks)

10 Payel makes 300 celebration cards so that

$$\begin{array}{ccccc} \text{number of} & & \text{number of} & & \text{number of} \\ \text{birthday cards} & : & \text{anniversary cards} & : & \text{congratulations cards} \end{array} = 7 : 5 : 3$$

$\frac{2}{5}$  of the birthday cards have numbers on them. 56

36% of the anniversary cards have numbers on them. 36  
None of the congratulations cards have numbers on them.

Work out what fraction of the 300 cards have numbers on them.  
Give your answer in its simplest form.

$$300 \div 15 = 20$$

$$\begin{array}{r} 56 + 36 \\ \hline 300 \end{array} = \frac{23}{75}$$

(Total for Question 10 is 5 marks)

**11** Solve the simultaneous equations

$$7x + 3y = 3 \quad \textcircled{1}$$

$$3x - y = 7 \quad \textcircled{2}$$

Show clear algebraic working.

$$9x - 3y = 21 \quad \textcircled{3} = \textcircled{2} \times 3$$

$$\textcircled{1} + \textcircled{3}$$

$$16x = 24$$

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

$$\frac{27}{2} - 3y = 21$$

$$3y = -\frac{15}{2}$$

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

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

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

(Total for Question 11 is 3 marks)

12 Zimo is going on holiday.

He makes 3 separate payments to cover the total cost of his holiday.

The following table shows how much money Zimo pays to the holiday company.

| Payment   | Amount paid                     |
|-----------|---------------------------------|
| Payment 1 | $\frac{2}{5}$ of the total cost |
| Payment 2 | 45% of the total cost           |
| Payment 3 | \$405                           |

Work out how much Zimo has to pay for Payment 2

|                         |                |
|-------------------------|----------------|
| $1 - 2 \div 5 = .45$    |                |
|                         | $\frac{3}{20}$ |
| $405$                   |                |
| Ans                     | 2700           |
| $\text{Ans} \times .45$ |                |
|                         | 1215           |

$$\frac{3}{20} x = 405$$

$$x = 2700$$

TOTAL

\$.....1215

(Total for Question 12 is 5 marks)

13 The function  $f$  is defined as

$$f : x \mapsto \frac{2x}{x-6}$$

(a) Find  $f(10)$

$$\frac{20}{4}$$

5

(1)

(b) Express the inverse function  $f^{-1}$  in the form  $f^{-1} : x \mapsto \dots$

$$y = \frac{2x}{x-6}$$

$$xy - 6y = 2x$$

$$x(y-2) = 6y$$

$$x = \frac{6y}{y-2}$$

$$\frac{6x}{x-2}$$

$$f^{-1} : x \mapsto$$

(3)

(Total for Question 13 is 4 marks)

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

$EBF$  is the tangent to the circle at  $B$

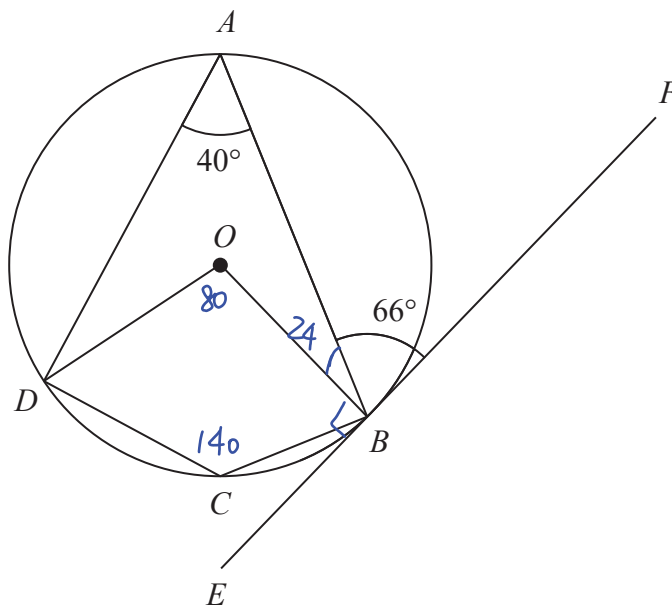


Diagram **NOT** accurately drawn

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

140°

(1)

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

OPPOSITE ANGLES IN CYCLIC QUADRILATERAL -

(1)

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

$$90 - 66 = 24$$

$$360 - 40 - 24 - (360 - 80) = 16$$

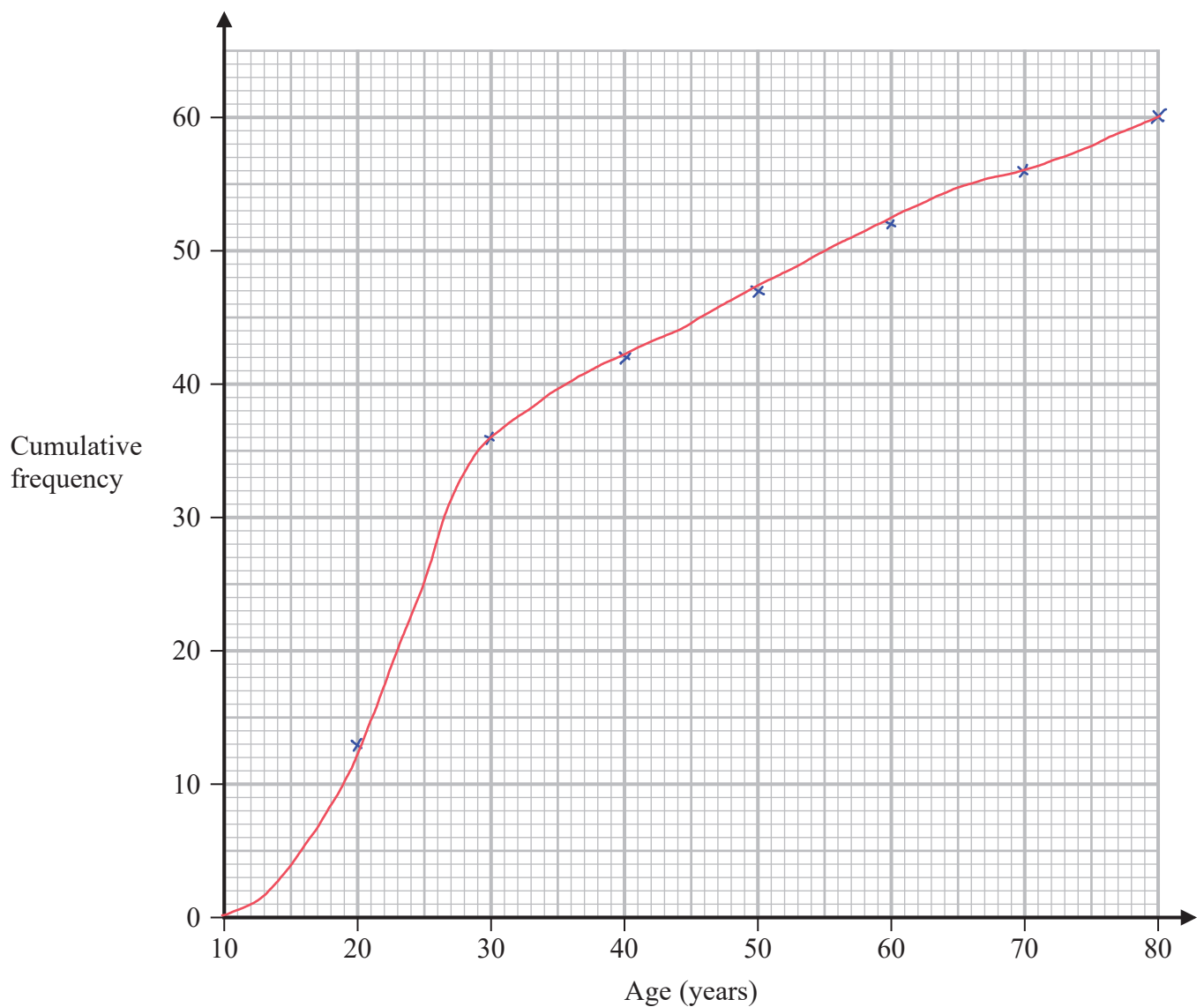
(3)

(Total for Question 14 is 5 marks)

- 15 The cumulative frequency table shows information about the ages of 60 people who went to a gym on Saturday.

| Age ( $a$ years) | Cumulative frequency |
|------------------|----------------------|
| $10 < a \leq 20$ | 13                   |
| $10 < a \leq 30$ | 36                   |
| $10 < a \leq 40$ | 42                   |
| $10 < a \leq 50$ | 47                   |
| $10 < a \leq 60$ | 52                   |
| $10 < a \leq 70$ | 56                   |
| $10 < a \leq 80$ | 60                   |

- (a) On the grid, draw a cumulative frequency graph for the information in the table.





(b) Use your graph to find an estimate for the median of the ages of these people.

$26$   
 $\}$   
 $28$  ..... years  
 (1)

(c) Use your graph to find an estimate for the interquartile range of the ages of these people.

$24 - 28$  ..... years  
 (2)

(d) Use your graph to find an estimate for the number of these people who are older than 55 years.

$10$   
 $OK$       $11$  .....  
 (2)

---

(Total for Question 15 is 7 marks)

**16**  $M$  is directly proportional to  $h^3$

$M = 4$  when  $h = 0.5$

Find the value of  $h$  when  $M = 500$

$$M = kh^3$$

$$4 = k \cdot \frac{1}{8}$$

$$k = 32$$

$$M = 32h^3$$

$$500 = 32 \cdot h^3$$

$$h^3 = \frac{125}{8}$$

$$h = \frac{5}{2}$$

---

(Total for Question 16 is 4 marks)

- 17 A particle  $P$  moves along a straight line.  
The fixed point  $O$  lies on this line.

The displacement of  $P$  from  $O$  at time  $t$  seconds,  $t \geq 1$ , is  $s$  metres where

$$s = 4t^2 + \frac{125}{t}$$

The velocity of  $P$  at time  $t$  seconds,  $t \geq 1$ , is  $v$  m/s

Work out the distance of  $P$  from  $O$  at the instant when  $v = 0$

$$v = 8t - \frac{125}{t^2} = 0$$

$$8t = \frac{125}{t^2}$$

$$t^3 = \frac{125}{8}$$

$$t = \frac{5}{2}$$

$$s = 4 \cdot \frac{25}{4} + \frac{125}{5/2}$$

$$= 25 + 50$$

75

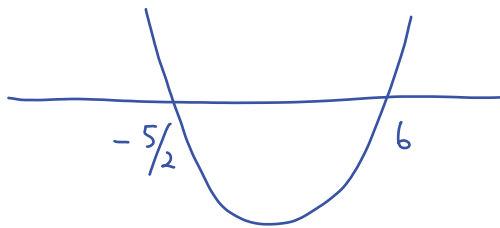
..... m

(Total for Question 17 is 5 marks)

- 18** Solve the inequality  $2y^2 - 7y - 30 \leq 0$   
Show your working clearly.

$$\begin{array}{r} 2 \quad + \quad 5 \\ 1 \quad \times \quad - \quad 6 \end{array}$$

$$(2y+5)(y-6) \leq 0$$



$$-\frac{5}{2} \leq y \leq 6$$

$$-\frac{5}{2} \leq y \leq 6$$

(Total for Question 18 is 3 marks)

19 The diagram shows two similar metal statues.



A

 $V$   
 $S$ 


B

 $0.8V$ 
 $(1 - k/100)S$ 

Diagram **NOT**  
accurately drawn

The volume of statue **B** is 20% less than the volume of statue **A**

The surface area of statue **B** is  $k\%$  less than the surface area of statue **A**

Work out the value of  $k$

Give your answer correct to 3 significant figures.

$$\left( \sqrt[3]{\frac{0.8V}{V}} \right)^2 = \frac{(1 - k/100)S}{S}$$

$$0.8^{2/3} = 1 - k/100$$

$$\frac{k}{100} = 1 - 0.8^{2/3}$$

$$k = 13.8$$

(Total for Question 19 is 4 marks)

20 Solve the simultaneous equations

$$\begin{aligned} x - 2y &= 3 & x &= 3 + 2y \\ x^2 - y^2 + 2x &= 10 \end{aligned}$$

Show clear algebraic working.

$$(3+2y)^2 - y^2 + 2(3+2y) = 10$$

$$9 + 12y + 4y^2 - y^2 + 6 + 4y = 10$$

$$3y^2 + 16y + 5 = 0$$

$$\begin{array}{cc} 3 & +1 \\ 1 & +5 \end{array}$$

$$(3y+1)(y+5) = 0$$

$$\begin{cases} y = -\frac{1}{3} \\ x = \frac{7}{3} \end{cases} \quad \begin{cases} y = -5 \\ x = -7 \end{cases}$$

$$\begin{cases} x = \frac{7}{3} \\ y = -\frac{1}{3} \end{cases} \quad \text{or} \quad \begin{cases} x = -7 \\ y = -5 \end{cases}$$

(Total for Question 20 is 5 marks)

21  $a = \frac{14}{3x-7} \quad x = \frac{7}{4y-3}$

Express  $a$  in the form  $\frac{py+q}{ry+s}$  where  $p, q, r$  and  $s$  are integers.

Give your answer in its simplest form.

$$\begin{aligned}
 a &= \frac{14}{\frac{21}{4y-3} - 7} = \frac{56y - 42}{21 - 7(4y-3)} \\
 &= \frac{56y - 42}{42 - 28y} \\
 &= \frac{8y - 6}{-4y + 6} \\
 &= \frac{4y - 3}{-2y + 3}
 \end{aligned}$$

$$a = \frac{4y-3}{-2y+3}$$

(Total for Question 21 is 3 marks)

22 A solid is made from a cone and a hemisphere.

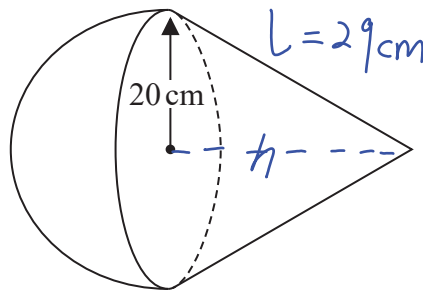


Diagram **NOT**  
accurately drawn

The circular plane face of the hemisphere coincides with the circular base of the cone.  
The radius of the hemisphere and the radius of the circular base of the cone are both 20 cm

The curved surface area of the cone is  $580\pi \text{ cm}^2$

The volume of the solid is  $k\pi \text{ cm}^3$

Work out the exact value of  $k$

$$580\pi = \pi \cdot 20 \cdot l$$

$$l = 29$$

$$h^2 = 29^2 - 20^2 = 441$$

$$h = 21 \text{ cm}$$

$$V = \frac{1}{2}\pi \cdot \frac{4}{3} \cdot 20^3 + \frac{1}{3} \cdot \pi \cdot 20^2 \cdot 21$$

$$= \frac{24400}{3}\pi$$

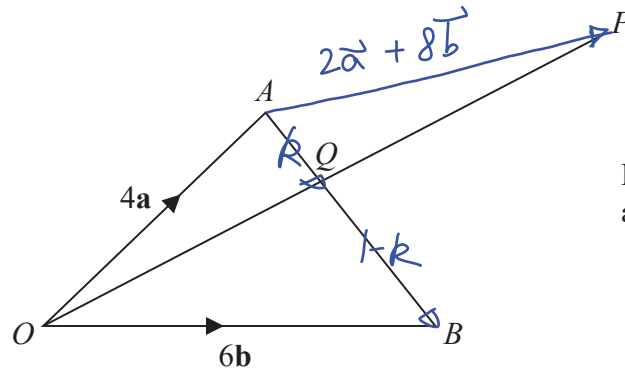


$$k = \frac{24\,400}{3}$$

---

(Total for Question 22 is 5 marks)

23

Diagram NOT  
accurately drawn $OAB$  is a triangle. $Q$  is the point on  $AB$  such that  $OQP$  is a straight line.

$$\vec{OA} = 4\mathbf{a}$$

$$\vec{OB} = 6\mathbf{b}$$

$$\vec{AP} = 2\mathbf{a} + 8\mathbf{b}$$

Using a vector method, find the ratio  $AQ : QB$ 

$$\vec{AB} = 6\mathbf{b} - 4\mathbf{a} \quad \text{Let } \vec{AQ} = 2k(3\mathbf{b} - 2\mathbf{a})$$

$$\vec{OQ} = 4\mathbf{a} + 2k(3\mathbf{b} - 2\mathbf{a}) = (4 - 4k)\mathbf{a} + 6k\mathbf{b}$$

$$\vec{OP} = 6\mathbf{a} + 8\mathbf{b}$$

$$\frac{4 - 4k}{6} = \frac{6k}{8}$$

$$36k = 32(1 - k)$$

$$9k = 8 - 8k$$

$$17k = 8$$

$$k = 8/17$$

$$\frac{AQ}{QB} = \frac{8/17}{1 - 8/17} = \frac{8}{17 - 8}$$

$$AQ : QB = 8 : 9$$

(Total for Question 23 is 5 marks)

- 24 The sum of the first 10 terms of an arithmetic series is 4 times the sum of the first 5 terms of the same series.

The 8th term of this series is 45

AP

$$u_8 = a + 7d = 45$$

Find the first term of this series.

Show clear algebraic working.

$$S_{10} = \frac{10}{2} [2a + 9d] = 4 \cdot \frac{5}{2} [2a + 4d] = 4 \cdot S_5$$

$$2a + 9d = 2[2a + 4d]$$

$$9d = 2a + 8d$$

$$d = 2a$$

$$a + 14a = 45$$

$$15a = 45$$

$$a = 3$$

$$a = 3$$

(Total for Question 24 is 5 marks)

TOTAL FOR UNIT IS 100 MARKS