Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

Time 2 hours

Paper reference **4MA1/1H**

Mathematics A

PAPER 1H

Higher Tier

You must have:
Ruler graduated in centimetres and millimetres, protractor, 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.
- Good luck with your examination.

Turn over ▶

P65914A

1/1/1/1/1/1/

P 6 5 9 1 4 A 0 1 2 8

Pearson

International GCSE Mathematics

Formulae sheet – Higher Tier

Arithmetic series

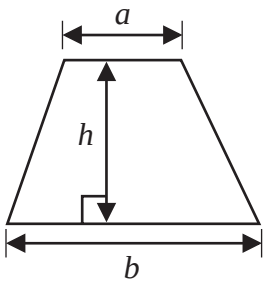
Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

The quadratic equation

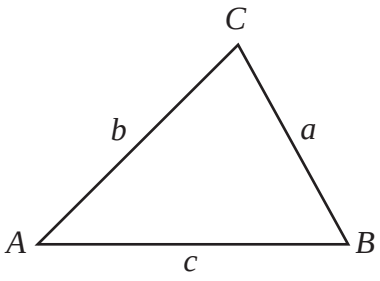
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

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

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



Trigonometry



In any triangle *ABC*

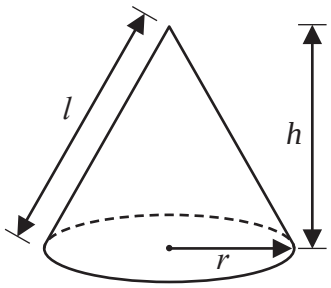
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

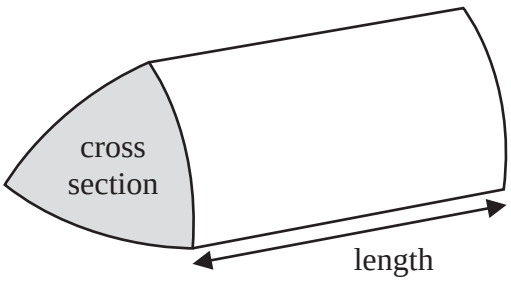
Area of triangle $= \frac{1}{2}ab\sin C$

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

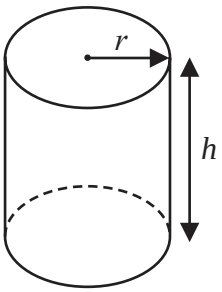
Curved surface area of cone $= \pi rl$



Volume of prism
= area of cross section × length

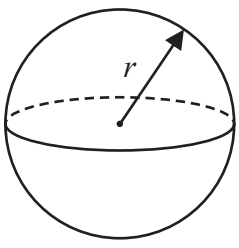


Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi rh$



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

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



Answer all TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 A plane flew from Madrid to Dubai.

The distance the plane flew was 5658 km.
The flight time was 8 hours 12 minutes.

Work out the average speed of the plane.

Speed = $\frac{\text{distance}}{\text{time}}$

×60
hour ⇄ minutes
÷60

Convert 12 minutes to hours :

$\frac{12}{60}$ = 0.2 hours

∴ Flight time is 8.2 hours (1)

Speed = $\frac{5658 \text{ km}}{8.2 \text{ h}}$ (1)

= 690 km/h (1)

690 km/h

(Total for Question 1 is 3 marks)

2 Here are the first 4 terms of an arithmetic sequence.

85 (−6) 79 (−6) 73 (−6) 67

Find an expression, in terms of n, for the nth term of the sequence.

Common difference, $d = -6$

first term, $a = 85$

$T_n = a + (n-1)d$

$T_n = 85 + (n-1)(-6)$ (1)

$= 85 - 6n + 6$

$= 91 - 6n$ (1)

$91 - 6n$

(Total for Question 2 is 2 marks)

3

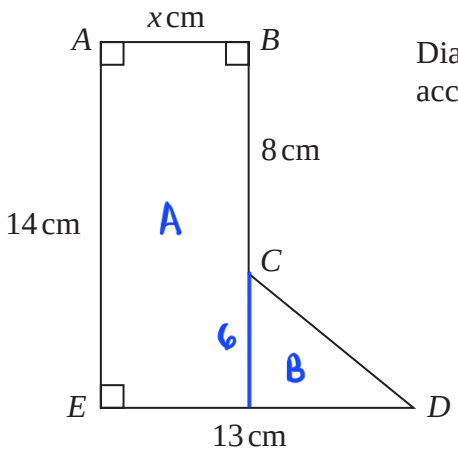


Diagram **NOT** accurately drawn

The diagram shows the shape *ABCDE*.

The area of the shape is 91.8 cm²

Work out the value of *x*.

Area of A = 14 cm × x cm

= 14x cm² (1)

Area of B = $\frac{1}{2}$ × 6 cm × (13 − x) cm

= (39 − 3x) cm²

Area of shape = Area of A + Area of B

91.8 = 14x + 39 − 3x (1)

91.8 − 39 = 11x (1)

52.8 = 11x

$x = \frac{52.8}{11}$

= 4.8 (1)

$x =$ 4.8

(Total for Question 3 is 4 marks)

4 On a farm there are chickens, ducks and pigs.

The ratio of the number of chickens to the number of ducks is 7 : 2
The ratio of the number of ducks to the number of pigs is 5 : 9
There are 36 pigs on the farm.

Work out the number of chickens on the farm.

Finding number of ducks :

$\frac{36}{9} \times 5 = 20$ ducks (1)

Finding number of chickens :

$\frac{20}{2} \times 7 = 70$ chickens

(1) (1)

70

(Total for Question 4 is 3 marks)

5 (a) Expand and simplify $3x(2x + 3) - x(3x + 5)$

$6x^2 + 9x - 3x^2 - 5x$ (1)

$6x^2 - 3x^2 + 9x - 5x$

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

$3x^2 + 4x$

(2)

(b) Make t the subject of the formula $p = at - d$

$p = at - d$

$p + d = at$ (1)

$t = \frac{p+d}{a}$ (1)

$t = \frac{p+d}{a}$

(2)

Given that $\frac{w^5 \times w^n}{w^3} = w^{10}$

(c) work out the value of n.

$w^{5+n-3} = w^{10}$

$5 + n - 3 = 10$ (1)

$n + 2 = 10$

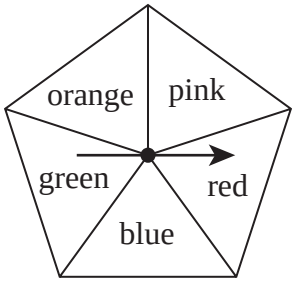
$n = 8$ (1)

$n =$ 8

(2)

(Total for Question 5 is 6 marks)

6 Grace has a biased 5-sided spinner.



Grace is going to spin the arrow on the spinner once.

The table below gives the probabilities that the spinner will land on red or on blue or on green.

Colour	Red	Blue	Green	Orange	Pink
Probability	0.20	0.12	0.08	0.45	0.15

The probability that the spinner will land on orange is 3 times the probability that the spinner will land on pink.

(a) Work out the probability that the spinner will land on orange.

Probability of the spinner landing on orange or pink :

$1 - 0.20 - 0.12 - 0.08$

$= 0.60$ (1)

$P(O) = 3P(p)$

$\frac{3}{4}(0.60) = 0.45$ (1) (1)

0.45

(3)

Grace spins the arrow on the spinner 150 times.

(b) Work out an estimate for the number of times the spinner lands on blue.

$0.12 \times 150 = 18$ (1) (1)

18

(2)

(Total for Question 6 is 5 marks)

7 $-4 \leqslant 2y < 6$

y is an integer.

(a) Write down all the possible values of y.

$-4 \leq 2y < 6$ $\div 2$

$-2 \leq y < 3$

$-2, -1, 0, 1, 2$ (2)

(2)

(b) Solve the inequality $7t - 3 \leqslant 2t + 31$

Show your working clearly.

$7t - 3 \leq 2t + 31$

$7t - 2t \leq 31 + 3$

$5t \leq 34$ (1)

$t \leq \frac{34}{5}$

$t \leq 6.8$ (1)

$t \leq 6.8$

(2)

(Total for Question 7 is 4 marks)

8 The table shows the populations of five countries.

Country	Population
China	1.4×10^9
Germany	8.2×10^7
Sweden	9.9×10^6
Fiji	9.1×10^5
Malta	4.3×10^5

(a) Work out the difference between the population of China and the population of Germany.
Give your answer in standard form.

China : $1.4 \times 10^9 = 140 \times 10^7$

Difference : $140 \times 10^7 - 8.2 \times 10^7$ (1)

$= (140 - 8.2) \times 10^7$

$= 131.8 \times 10^7$

$= 1.32 \times 10^9$ (1)

1.32×10^9

(2)

Given that

$$\text{population of Fiji} = \frac{1}{k} \times \text{population of Sweden}$$

(b) work out the value of k.
Give your answer correct to the nearest whole number.

Fiji : 9.1×10^5

Sweden : $9.9 \times 10^6 = 99 \times 10^5$

$9.1 \times 10^5 = \frac{1}{k} \times 99 \times 10^5$

$k = \frac{99 \times 10^5}{9.1 \times 10^5}$ (1)

$= 11$ (1)

$k =$ 11

(2)

(Total for Question 8 is 4 marks)

9 (a) Factorise fully $25a^4c^7d + 45a^9c^3h$

(2) $5a^4c^3(5c^4d + 9a^5h)$

(2)

(b) Solve $(2x + 5)^2 = (2x + 3)(2x - 1)$

$4x^2 + 20x + 25 = 4x^2 - 2x + 6x - 3$

$4x^2 + 20x + 25 = 4x^2 + 4x - 3$ (1)

$4x^2 - 4x^2 + 20x - 4x + 25 + 3 = 0$

$16x + 28 = 0$

$16x = -28$ (1)

$x = \frac{-28}{16}$

$= -1.75$ (1)

$x =$ -1.75

(3)

(Total for Question 9 is 5 marks)

10 Jethro has sat 5 tests.
Each test was marked out of 100 and Jethro's mean mark for the 5 tests is 74

Jethro has to sit one more test that is also to be marked out of 100

Jethro wants his mean mark for all 6 tests to be at least 77

Work out the least mark that Jethro needs to get for the last test.

Jethro's total marks for 5 tests :

$74 \times 5 = 370$ (1)

To get mean marks of 77 or more :

$\frac{370 + x}{6} = 77$ x : mark for 6th test

$370 + x = 77 \times 6$

$370 + x = 462$ (1)

$x = 462 - 370 = 92$ (1)

92

(Total for Question 10 is 3 marks)

11 $\sqrt{2} \times 16 = 2^x$

$\sqrt{2} = 2^{\frac{1}{2}}$

$16 = 2^4$

(a) Find the value of x.
Show your working clearly.

$2^{\frac{1}{2}} \times 2^4 = 2^x$ (1)

$2^{\frac{1}{2}+4} = 2^x$

$x = 4 + \frac{1}{2} = 4.5$ (1)

$x =$ 4.5

(2)

$$\frac{(11^{-6})^5}{11^4} = 11^n$$

(b) Find the value of n.
Show your working clearly.

$\frac{11^{-6\times5}}{11^4} = 11^n$

$\frac{11^{-30}}{11^4} = 11^n$ (1)

$11^{-30-4} = 11^n$

$n = -30 - 4 = -34$ (1)

$n =$ −34

(2)

(Total for Question 11 is 4 marks)

12 The diagram shows a sector of a circle with radius 7 cm.

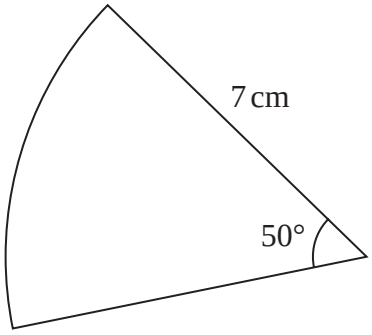


Diagram **NOT** accurately drawn

Work out the length of the arc of the sector.
Give your answer correct to one decimal place.

length of arc of a sector :

$\frac{\theta}{360^\circ} \times 2\pi r$

$\frac{50^\circ}{360} \times 2 \times \pi \times 7 = 6.1$ cm

(1) (1)

6.1 ..... cm

(Total for Question 12 is 2 marks)

13 Expand and simplify $4x(3x + 1)(2x - 3)$
Show your working clearly.

$4x(3x+1) = 12x^2 + 4x$ (1)

$= (12x^2 + 4x)(2x - 3)$

$= 24x^3 - 36x^2 + 8x^2 - 12x$ (1)

$= 24x^3 - 28x^2 - 12x$ (1)

$24x^3 - 28x^2 - 12x$

(Total for Question 13 is 3 marks)

14 Here is the number of goals that Henri's team scored one summer in each water polo match.

lower quartile: 5, 8, 9, 11, 13 — upper quartile: 14, 15, 16, 17, 20 — 13

9 = Q_1, 13 = median, 16 = Q_3

Find the interquartile range of the numbers of goals.
Show your working clearly.

Q_1 = median of lower quartile

Q_3 = median of upper quartile

Interquartile range : $Q_3 - Q_1$

$: 16 - 9$ (1)

$= 7$ (1)

7

(Total for Question 14 is 2 marks)

15 *P*, *Q* and *R* are points on a circle, centre *O*.
TRV is the tangent to the circle at *R*.

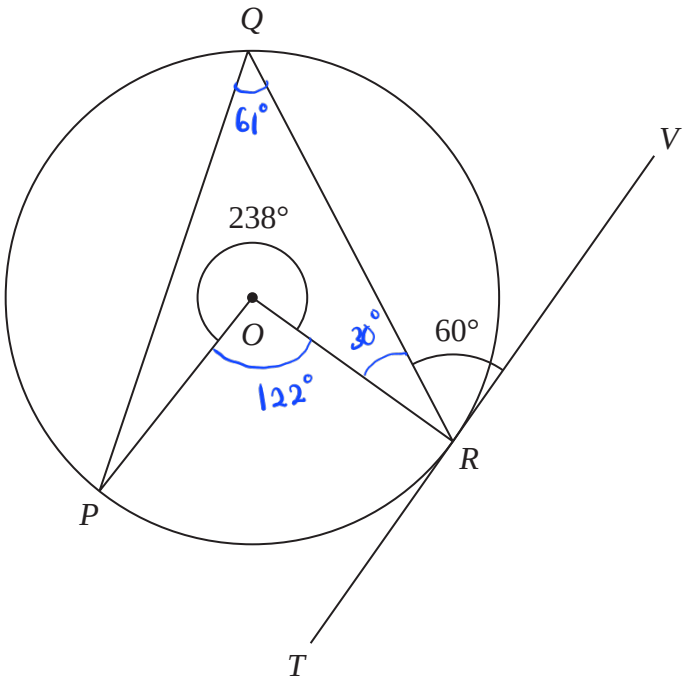


Diagram **NOT** accurately drawn

Reflex angle *POR* = 238°
Angle *QRV* = 60°

Calculate the size of angle *OPQ*.
Give a reason for each stage of your working.

angle ORQ = 90° - 60°
= 30°
(angle between a tangent and radius is 90°)

angle POR = 360° - 238°
= 122° (1)
(angle around a point is 360°)

angle PQR = $\frac{122°}{2}$ = 61° (1)
(angle at centre of circle is twice the angle at circumference) (1)

angle OPQ = 360° - 238° - 30° - 61°
= 31° (1)
(angle in quadrilateral = 360°)

31 °

(Total for Question 15 is 4 marks)

16 Use algebra to show that the recurring decimal $0.28\dot{1}\dot{3} = \frac{557}{1980}$

Let $x = 0.2813\ldots$

$100x = 28.1313\ldots$ (1)

$100x - x = 28.1313\ldots - 0.2813\ldots$

$99x = 27.85$

$x = \frac{27.85}{99}$ (1)

$= \frac{557}{1980}$

(Total for Question 16 is 2 marks)

17 Using algebra, prove that, given any 3 consecutive even numbers, the difference between the square of the largest number and the square of the smallest number is always 8 times the middle number.

Let 3 consecutive even numbers $= 2n, 2n+2, 2n+4$ (1)

Difference between square of largest and smallest number:

$(2n+4)^2 - (2n)^2$ (1)

$= (4n^2 + 16n + 16) - 4n^2$

$= 16n + 16$

$= 8(2n+2)$ (1)

$\therefore$ 8 times the middle number (shown)

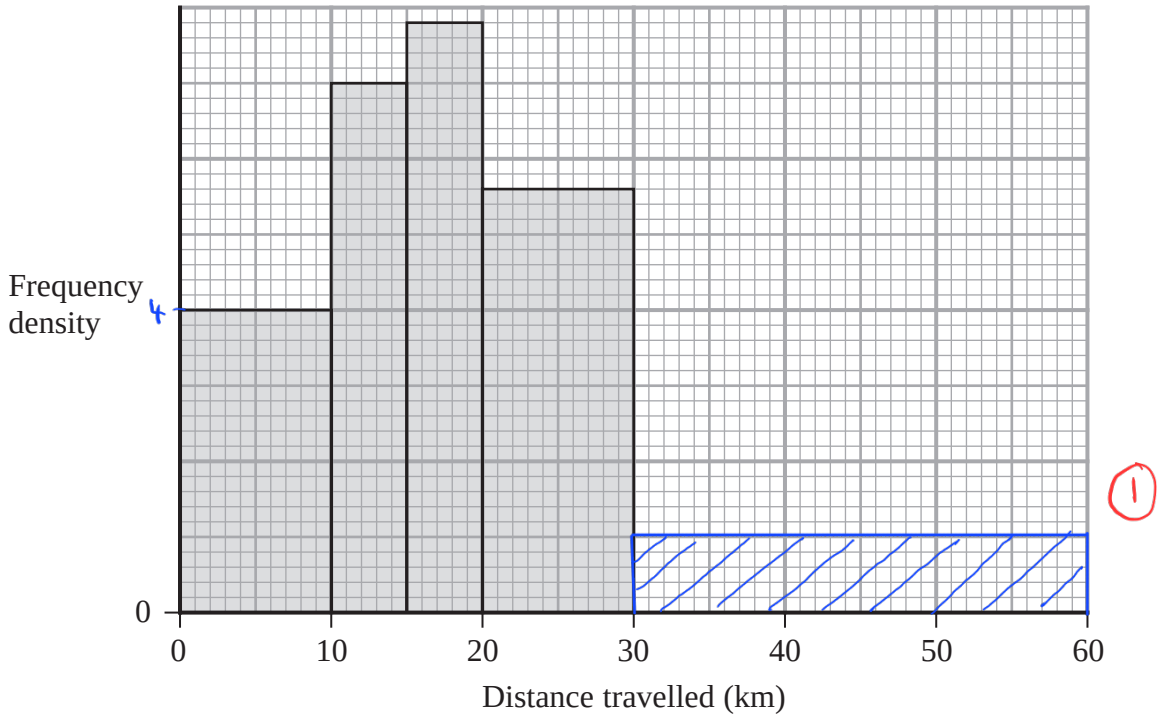
(Total for Question 17 is 3 marks)

18 The table and histogram give information about the distance travelled, in order to get to work, by each person working in a large store.

Distance (d km)	Frequency
$0 \leqslant d < 10$	40
$10 \leqslant d < 15$	35
$15 \leqslant d < 20$	39
$20 \leqslant d < 30$	56
$30 \leqslant d < 60$	30

(2)

frequency = Frequency density × class width



(1)

Finding height of first bar :

$$\text{Frequency density} = \frac{40}{10} = 4$$

∴ 5 small square = 1 frequency density

2nd bar : $5 \times 7 = 35$

3rd bar : $5 \times 7.8 = 39$

4th bar : $10 \times 5.6 = 56$

Using the information in the table and in the histogram,

(a) complete the table,

(2)

(b) complete the histogram.

(1)

One of the people working in the store is chosen at random.

(c) Work out an estimate for the probability that the distance travelled by this person, in order to get to work, was greater than 25 km.

From 25 to 30 km :

$0.5 \times 56 = 28$

From 30 to 60 km :

30

Total frequency : $40 + 35 + 39 + 56 + 30 = 200$ (1)

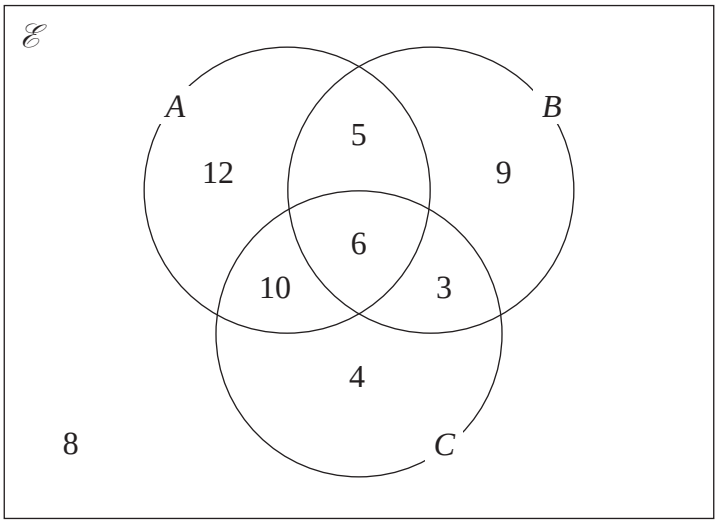
Probability $d > 25$ km $= \frac{30 + 28}{200} = \frac{58}{200}$ (1)

$\frac{58}{200}$

(2)

(Total for Question 18 is 5 marks)

19 The Venn diagram shows a universal set, $\mathscr{E}$ and sets A, B and C.



12, 5, 9, 10, 6, 3, 4 and 8 represent the **numbers** of elements.

Find

(i) $n(A \cup B)$

C is in A or in B

$10 + 12 + 6 + 5 + 3 + 9 = 45$

45 (1)

(1)

(ii) $n(A' \cap B')$

is not in A and B

$4 + 8 = 12$

12 (1)

(1)

(iii) $n([A \cap B] \cup C)$

is in A and B or in C

$5 + 6 + 4 + 10 + 3 = 28$

28 (1)

(1)

(Total for Question 19 is 3 marks)

20 $P = \dfrac{t - w}{y}$

t = 9.7 correct to 1 decimal place

w = 5.9 correct to 1 decimal place

y = 3 correct to 1 significant figure

Calculate the upper bound for the value of P.
Show your working clearly.

To get upper bound value of P :

$$\frac{\text{upper bound of T - lower bound of w}}{\text{lower bound of y}}$$

$T_{UB} = 9.75$

$w_{LB} = 5.85$ (1)

$y_{LB} = 2.5$

$P_{UB} = \dfrac{9.75 - 5.85}{2.5}$ (1)

$= 1.56$ (1)

1.56

(Total for Question 20 is 3 marks)

21 Given that $x = \dfrac{5}{9y + 5}$ and that $y = \dfrac{5}{5a - 2}$

find an expression for x in terms of a.
Give your expression as a single fraction in its simplest form.

$$x = \frac{5}{9\left(\frac{5}{5a-2}\right) + 5} \quad (1)$$

$$= \frac{5}{\frac{45}{5a-2} + \frac{5(5a-2)}{5a-2}}$$

$$= \frac{5}{\frac{45 + 25a - 10}{5a-2}} \quad (1)$$

$$= \frac{5(5a-2)}{35 + 25a}$$

$$= \frac{5(5a-2)}{5(7+5a)} \quad (1)$$

$$x = \frac{5a-2}{7+5a} \quad (1)$$

$x = \dfrac{5a-2}{7+5a}$

(Total for Question 21 is 4 marks)

22 The diagram shows a triangular prism *ABCDEF* with a horizontal base *ABEF*.

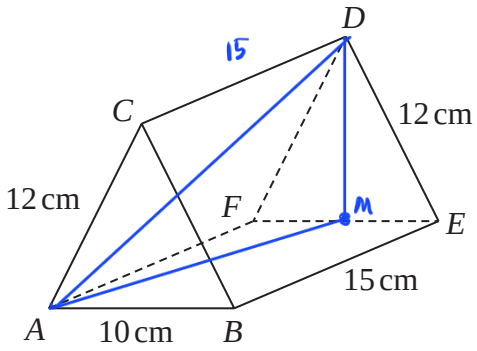


Diagram **NOT** accurately drawn

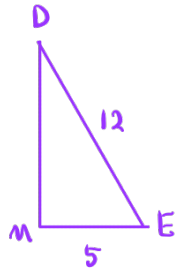
$AC = BC = FD = ED = 12\,\text{cm}$ $AB = 10\,\text{cm}$ $BE = 15\,\text{cm}$

Calculate the size of the angle between *AD* and the base *ABEF*.
Give your answer correct to 3 significant figures.

By using Pythagoras' theorem:

$DM = \sqrt{12^2 - 5^2}$

$= \sqrt{119}$ (1)



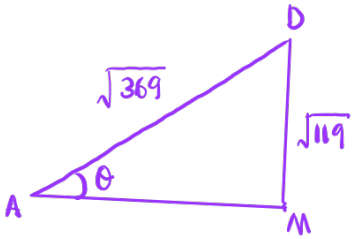
By using diagonal length length formula:

$AD = \sqrt{12^2 + 15^2}$

$= \sqrt{369}$ (1)

Angle between AD and base ABEF:

$\sin\theta = \frac{\sqrt{119}}{\sqrt{369}}$ (1)



$\theta = \sin^{-1}\frac{\sqrt{119}}{\sqrt{369}}$

$= 34.6^\circ$ (1)

34.6 °

(Total for Question 22 is 4 marks)

23 The sum of the first N terms of an arithmetic series, S, is 292
The 2nd term of S is 8.5
The 5th term of S is 13

Find the value of N.
Show clear algebraic working.

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

$T_n = a + (n-1)d$

$8.5 = a + (2-1)d$ $\quad$ $13 = a + (5-1)d$

$8.5 = a + d$ - ① $\quad$ $13 = a + 4d$ - ②

①

substitute ① into ②

$13 = (8.5 - d) + 4d$

$13 = 8.5 + 3d$

$3d = 4.5$

$\therefore d = 1.5$

$\therefore a = 8.5 - 1.5$

$= 7$ ①

$S_N = 292 = \frac{N}{2}[2(7) + (N-1)1.5]$

$584 = N(14 + 1.5N - 1.5)$

$584 = 1.5N^2 + 12.5N$

$1.5N^2 + 12.5N - 584 = 0$ ①

$3N^2 + 25N - 1168 = 0$

$N = \frac{-25 \pm \sqrt{25^2 - 4(3)(-1168)}}{2(3)}$ ①

$= \frac{-25 \pm \sqrt{14641}}{6}$

$= \frac{-25 \pm 121}{6}$ $\quad = 16$ or -24.3.

$N = 16$ ① ↘ positive integers

$N =$ 16

(Total for Question 23 is 5 marks)

24 The functions f and g are defined as

$f(x) = 5x^2 - 10x + 7$ where $x \geqslant 1$ → same as domain of $f^{-1}(x)$

$g(x) = 7x - 6$

(a) Find fg(2)

$g(2) = 7(2) - 6$

$= 14 - 6$

$= 8$ (1)

$fg(2) = f(8) = 5(8)^2 - 10(8) + 7$

$= 5(64) - 80 + 7$

$= 247$ (1)

247

(2)

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

Let $y = f(x)$

$y = 5x^2 - 10x + 7$

Find x in terms of y:

$y = 5(x^2 - 2x) + 7$ (1)

$y = 5[(x-1)^2 - 1] + 7$

$y = 5(x-1)^2 - 5 + 7$ (1)

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

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

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

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

$1 - \sqrt{\frac{y-2}{5}}$ is not a solution because domain of $f^{-1}(x) \geqslant 1$

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

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

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

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

(4)

(Total for Question 24 is 6 marks)

25 The diagram shows two circles such that the region **R**, shown shaded in the diagram, is the region common to both circles.

Area of sector:

$\frac{\theta}{360^\circ} \times \pi r^2$

Area of triangle:

$\frac{1}{2} ab \sin C$

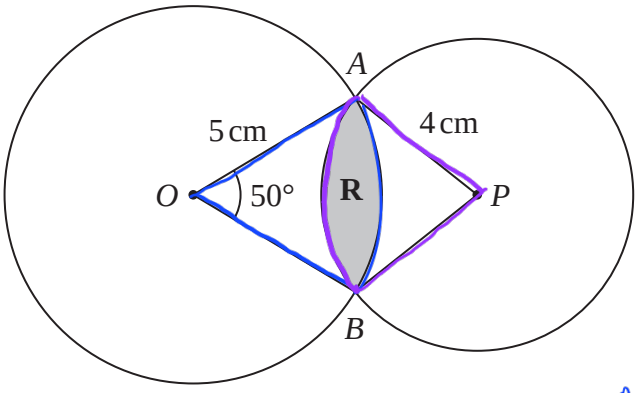
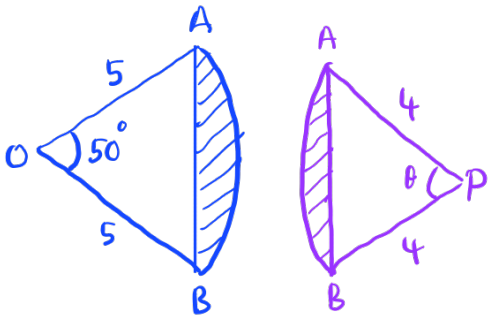


Diagram **NOT** accurately drawn

One of the circles has centre O and radius 5 cm.
The other circle has centre P and radius 4 cm.
Angle $AOB = 50°$

Calculate the area of region **R**.
Give your answer correct to 3 significant figures.



Finding length of AB (using cosine rule):

$AB^2 = 5^2 + 5^2 - 2(5)(5)\cos 50^\circ$

$AB^2 = 17.86...$

$AB = 4.226...$ (1)

Finding angle APB using known length of AB:

$4.226...^2 = 4^2 + 4^2 - 2(4)(4)\cos\theta$

$\cos\theta = \frac{4.226^2 - 4^2 - 4^2}{-2(4)(4)}$

$\cos\theta = 0.4418...$

$\theta = \cos^{-1} 0.4418...$

$= 63.78^\circ...$ (1)

Segment Area = Sector Area - Triangle Area

Large circle :

Segment Area : $\frac{50^\circ}{360^\circ} \times \pi \times 5^2 - \frac{1}{2}(5)(5)\sin 50^\circ$

$= 10.908\ldots$ (1) $- 9.576\ldots$

$= 1.332\ldots$

Small circle :

Segment Area $= \frac{63.78^\circ}{360^\circ} \times \pi \times 4^2 - \frac{1}{2}(4)(4)\sin 63.78^\circ$

$= 8.905\ldots$ (1) $- 7.1768\ldots$

$= 1.728\ldots$

Total segment area : $1.332\ldots + 1.728\ldots$ (1)

$= 3.06$ (1)

3.06 ..... cm^2

(Total for Question 25 is 6 marks)

Turn over for Question 26

26 *OACB* is a trapezium.

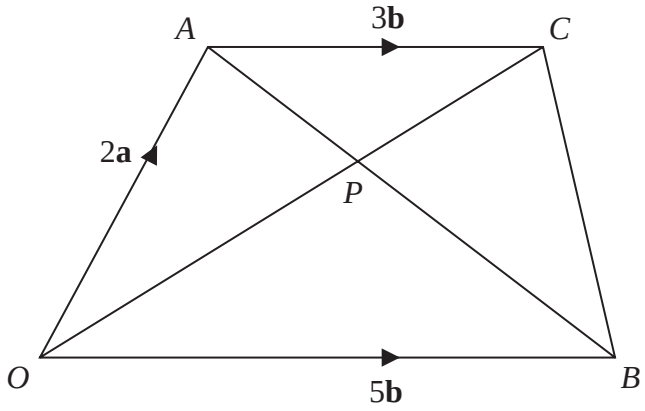


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = 2\mathbf{a}$ $\overrightarrow{OB} = 5\mathbf{b}$ $\overrightarrow{AC} = 3\mathbf{b}$

The diagonals, *OC* and *AB*, of the trapezium intersect at the point *P*.

Find and simplify an expression, in terms of **a** and **b**, for $\overrightarrow{OP}$
Show your working clearly.

$\overrightarrow{OC} = \overrightarrow{OA} + \overrightarrow{AC}$
$= 2\underline{a} + 3\underline{b}$

$\overrightarrow{OP} = n(\overrightarrow{OC})$
$= n(2\underline{a} + 3\underline{b})$ (1)

$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$
$= -2\underline{a} + 5\underline{b}$

$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$
$= 2\underline{a} + m(\overrightarrow{AB})$
$= 2\underline{a} + m(-2\underline{a} + 5\underline{b})$

$n(2\underline{a} + 3\underline{b}) = 2\underline{a} + m(-2\underline{a} + 5\underline{b})$ (1)

$2n\,\underline{a} + 3n\,\underline{b} = (2 - 2m)\underline{a} + 5m\,\underline{b}$

$\underline{a}$: $2n = 2 - 2m$
$n = 1 - m$ — (1)

$\underline{b}$: $3n = 5m$ — (2)

Substitute (1) into (2)

$3(1-m) = 5m$ (1)
$3 - 3m = 5m$
$3 = 8m$
$m = \frac{3}{8}$, $n = 1 - \frac{3}{8} = \frac{5}{8}$ (1)

$\overrightarrow{OP} = n(2\underline{a} + 3\underline{b})$

$= \frac{5}{8}(2\underline{a} + 3\underline{b})$

$= \frac{5}{4}\underline{a} + \frac{15}{8}\underline{b}$ (1)

$\overrightarrow{OP} =$ $\frac{5}{4}\underline{a} + \frac{15}{8}\underline{b}$

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

BLANK PAGE