

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)**

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**Tuesday 19 May 2020**

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

Turn over ►

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P 6 2 2 7 7 R A 0 1 2 0



Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The first five terms of an arithmetic sequence are

$$\begin{array}{ccccccccc} 3 & & 6 & & 9 & & 12 & & 15 \\ \downarrow -2 & & \downarrow -2 & & \downarrow -2 & & \downarrow -2 & & \downarrow -2 \\ 1 & & 4 & & 7 & & 10 & & 13 \\ \uparrow +3 & & \uparrow +3 & & \uparrow +3 & & \uparrow +3 & & \end{array}$$

Write down an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

$$3n - 2$$

$$3n - 2$$

(Total for Question 1 is 2 marks)

- 2 Show that

$$2\frac{1}{3} \times 3\frac{3}{4} = 8\frac{3}{4}$$

$$2\frac{1}{3} = \frac{7}{3}$$

$$3\frac{3}{4} = \frac{15}{4}$$

$$\frac{7}{3} \times \frac{15}{4} = \frac{105}{12}$$

$$12 \times 8 = 96$$

$$105 - 96 = 9$$

$$= 8\frac{9}{12} \div 3$$

$$= 8\frac{3}{4}$$

(Total for Question 2 is 3 marks)

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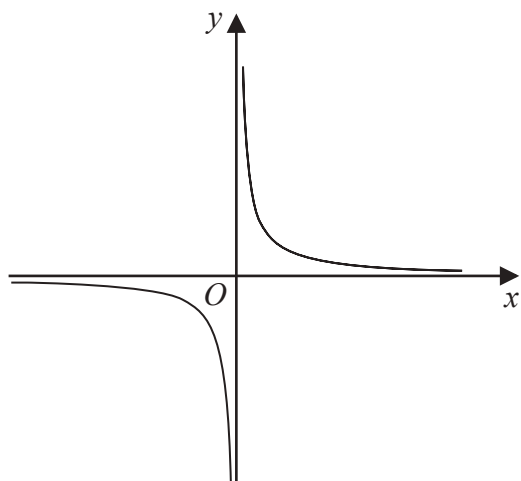


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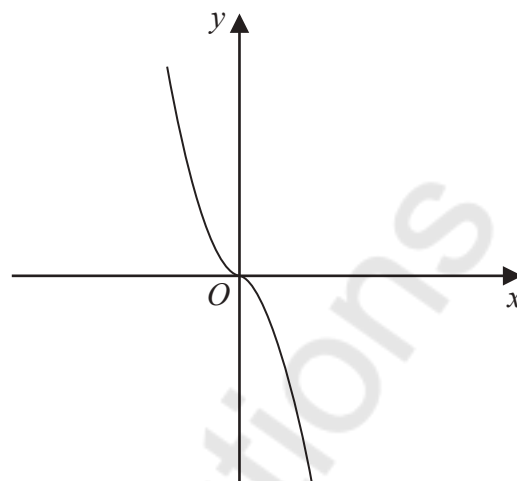
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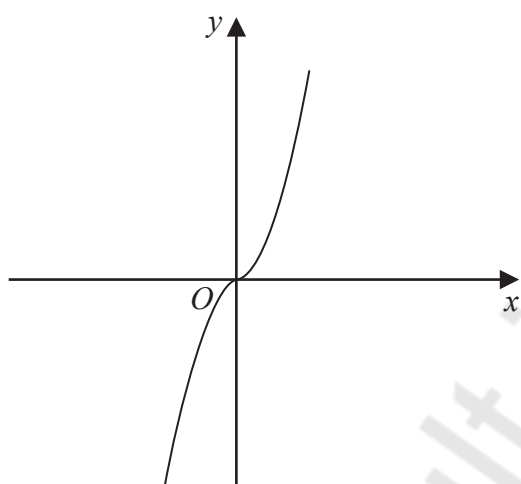
3 The diagram shows four graphs.



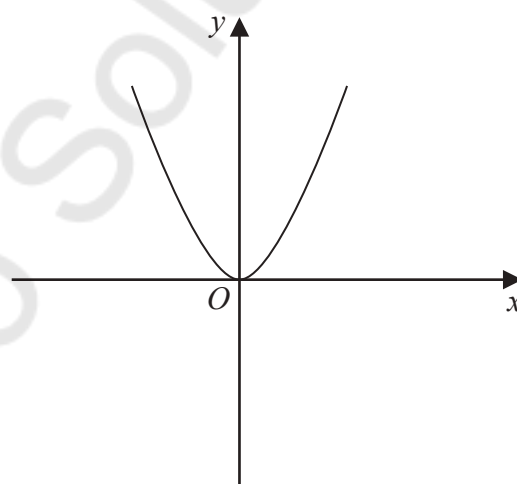
Graph A



Graph B



Graph C



Graph D

Each of the equations in the table is the equation of one of the graphs.

Complete the table.

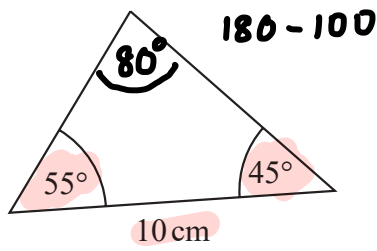
Equation	Letter of graph
$y = -x^3$	<b>B</b>
$y = x^3$	<b>C</b>
$y = x^2$	<b>D</b>
$y = \frac{1}{x}$	<b>A</b>

(Total for Question 3 is 2 marks)

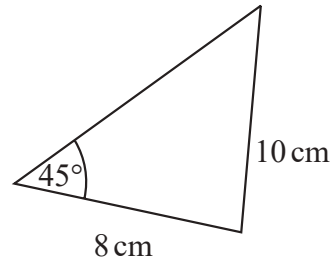


P 6 2 2 7 7 R A 0 3 2 0

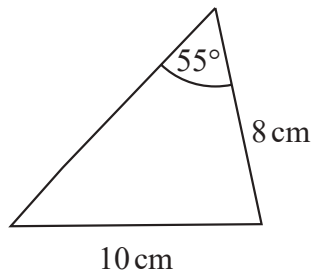
4 The diagram shows four triangles.



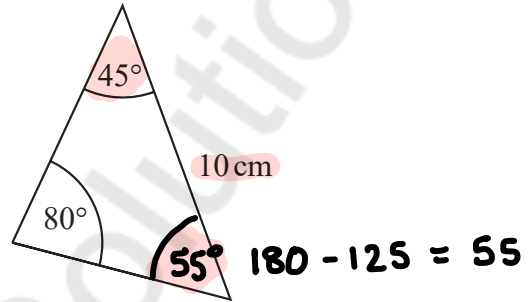
Triangle A



Triangle B



Triangle C



Triangle D

Two of these triangles are congruent.

Write down the letters of these two triangles.

    A     and     D    

(Total for Question 4 is 1 mark)

5 Sean pays £10 for 24 chocolate bars.

He sells all 24 chocolate bars for 50p each.

Work out Sean's percentage profit.

$$24 \times 50\text{p} = 1200\text{p} \xrightarrow{\div 100} \text{£}12$$

$$\text{Profit} = \text{£}12 - \text{£}10 = \text{£}2$$

$$\% \text{ profit} = \frac{\text{profit}}{\text{original}} \times 100$$

$$= \frac{2}{10} \times 100$$

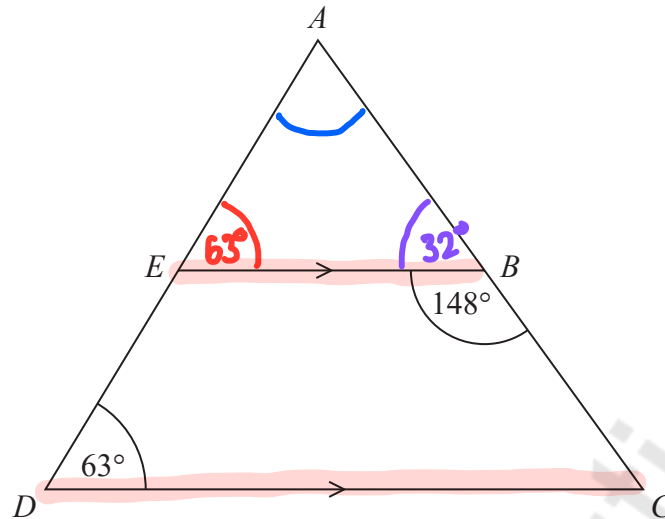
$$= 0.2 \times 100 = 20$$

..... 20 %

(Total for Question 5 is 3 marks)



6  $ADC$  is a triangle.



$AED$  and  $ABC$  are straight lines.  
 $EB$  is parallel to  $DC$ .

Angle  $EBC = 148^\circ$

Angle  $ADC = 63^\circ$

Work out the size of angle  $EAB$ .

You must give a reason for each stage of your working.

$$\angle AEB = 63^\circ \quad \text{Corresponding angles are equal}$$

$$\begin{aligned} \angle ABE &= 180^\circ - 148^\circ \\ &= 32^\circ \quad \text{Angles on a straight line sum to } 180^\circ \end{aligned}$$

$$\begin{aligned} \angle EAB &= 180^\circ - (63^\circ + 32^\circ) \\ &= 180^\circ - 95^\circ \\ &= 85^\circ \quad \text{Angles in a triangle sum to } 180^\circ \end{aligned}$$

(Total for Question 6 is 5 marks)

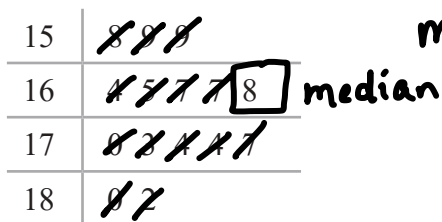


7 The table shows information about the heights, in cm, of a group of Year 9 girls.

least height	150 cm
median	165 cm
greatest height	170 cm

$$\begin{aligned} \text{Range} &= 170 - 150 \\ &= 20 \text{ cm} \end{aligned}$$

This stem and leaf diagram shows information about the heights, in cm, of a group of 15 Year 9 boys.



$$\begin{aligned} \text{Range} &= 182 - 158 = 24 \text{ cm} \\ \text{Median} &= 168 \text{ cm} \end{aligned}$$

Key: 15 | 8 represents 158 cm

Compare the distribution of the heights of the girls with the distribution of the heights of the boys.

The range of the year 9 girls' heights is lower than for the year 9 boys.

The median height for the year 9 girls is lower than for the year 9 boys.

(Total for Question 7 is 3 marks)

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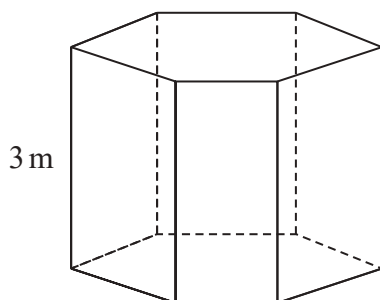


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- 8 The diagram shows a prism placed on a horizontal floor.



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

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

$$F = P \times A$$

The prism has height 3 m  
The volume of the prism is  $18 \text{ m}^3$

The pressure on the floor due to the prism is  $75 \text{ newtons/m}^2$

Work out the force exerted by the prism on the floor.

$$P = 75 \text{ N/m}^2$$

$$\text{Vol} = \text{area cross-section} \times \text{height}$$

$$18 = \text{area} \times 3$$

$$\text{area} = 6 \text{ m}^2$$

$$A = 6 \text{ m}^2$$

$$F = 75 \times 6$$

$$= 450 \text{ N}$$

..... **450** ..... newtons

(Total for Question 8 is 3 marks)

- 9 Write these numbers in order of size.  
Start with the smallest number.

$$6.72 \times 10^5$$

③

$$67.2 \times 10^{-4}$$

$$\begin{array}{l} \downarrow \div 10 \quad \downarrow +1 \\ 6.72 \times 10^{-3} \end{array}$$

②

$$672 \times 10^4$$

$$\begin{array}{l} \downarrow \div 100 \quad \downarrow +2 \\ 6.72 \times 10^6 \end{array}$$

④

$$0.000672$$

$$6.72 \times 10^{-4}$$

①

..... **0.000672** .....

.....  **$67.2 \times 10^{-4}$**  .....

.....  **$6.72 \times 10^5$**  .....

.....  **$672 \times 10^4$**  .....

(Total for Question 9 is 2 marks)



10 Given that  $\frac{a}{b} = \frac{2}{5}$  and  $\frac{b}{c} = \frac{3}{4}$

find  $a:b:c$

$$\frac{a}{b} = \frac{2}{5}$$

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

$$a : b$$

$$2 : 5$$

$$\times 3 \quad \times 3$$

$$6 : 15$$

$$b : c$$

$$3 : 4$$

$$\times 5 \quad \times 5$$

$$15 : 20$$

$$a : b : c$$

$$6 : 15 : 20$$

$$6 : 15 : 20$$

(Total for Question 10 is 3 marks)

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11 (a) Find the value of  $\sqrt[4]{81 \times 10^8}$

$$\sqrt[4]{81} \times \sqrt[4]{10^8}$$

$$3 \times (10^2)^{\frac{1}{4}}$$

$$3 \times 10^2$$

$$3 \times 100$$

$$= 300$$

300

(2)

(b) Find the value of  $64^{-\frac{1}{2}}$

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

$$64^{-\frac{1}{2}} \rightarrow \frac{1}{64^{\frac{1}{2}}} \rightarrow \frac{1}{\sqrt{64}} = \frac{1}{8}$$

$$x^{\frac{1}{2}} \rightarrow \sqrt{x}$$

$\frac{1}{8}$

(2)

(c) Write  $\frac{3^n}{9^{n-1}}$  as a power of 3

$$\frac{3^n}{(3^2)^{n-1}} = \frac{3^n}{3^{2n-2}} = 3^{n-(2n-2)}$$

$$= 3^{-n+2}$$

$3^{-n+2}$

(2)

(Total for Question 11 is 6 marks)



12 The table gives information about the weekly wages of 80 people.

Wage (£ $w$ )	Frequency
$200 < w \leq 250$	5
$250 < w \leq 300$	10
$300 < w \leq 350$	20
$350 < w \leq 400$	20
$400 < w \leq 450$	15
$450 < w \leq 500$	10

(a) Complete the cumulative frequency table.

Wage (£ $w$ )	Cumulative frequency
$200 < w \leq 250$	<b>5</b>
$200 < w \leq 300$	<b>15</b>
$200 < w \leq 350$	<b>35</b>
$200 < w \leq 400$	<b>55</b>
$200 < w \leq 450$	<b>70</b>
$200 < w \leq 500$	<b>80</b>

(1)

(b) On the grid opposite, draw a cumulative frequency graph for your completed table.

(2)

Juan says

“60% of this group of people have a weekly wage of £360 or less.”

(c) Is Juan correct?

You must show how you get your answer.

$$\frac{40}{80} = \frac{1}{2} = 50\%$$

No. 50% earn £360 or less.

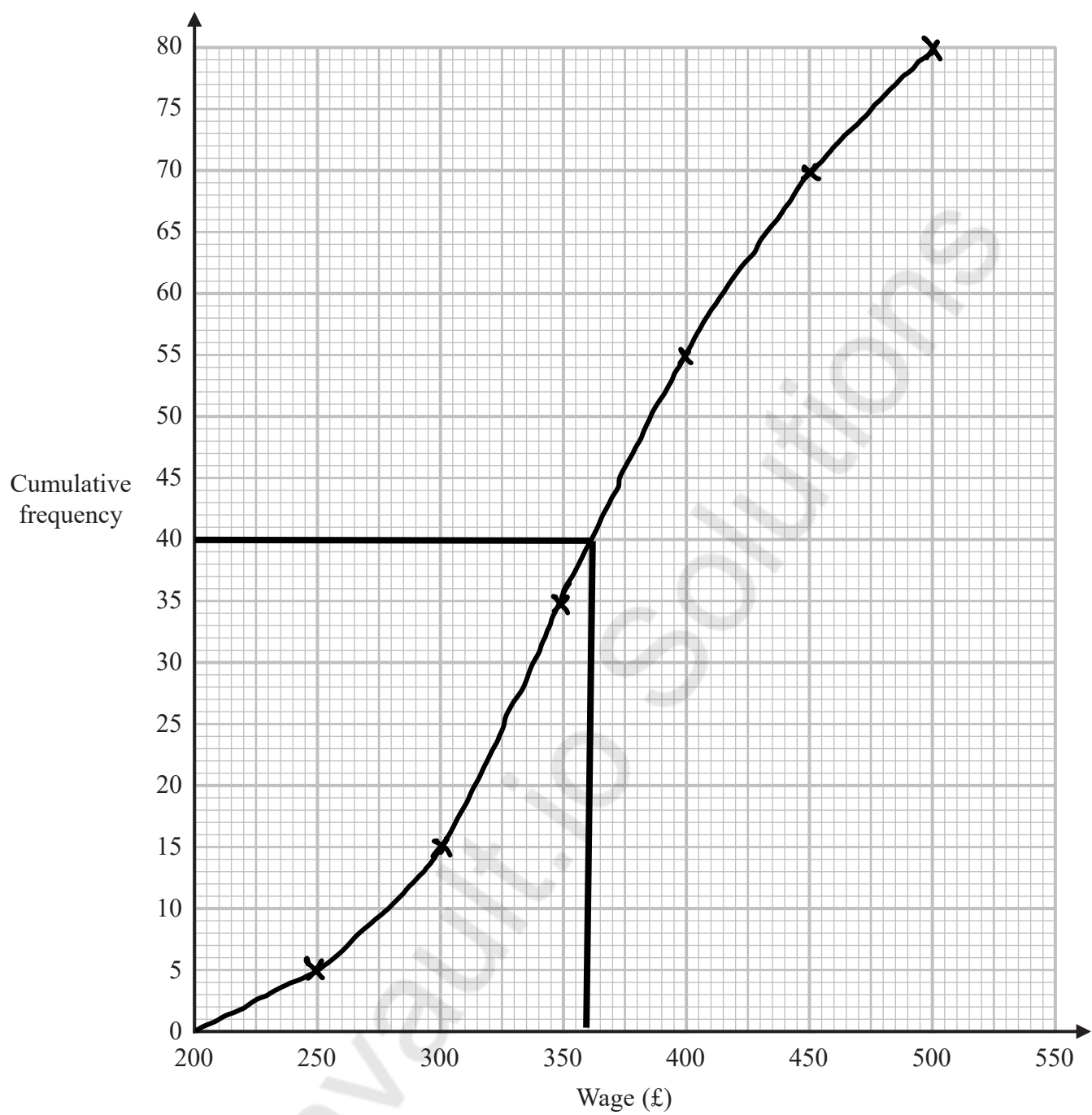
(3)



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(Total for Question 12 is 6 marks)

Maths Solutions



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13 Liquid A and liquid B are mixed to make liquid C.

Liquid A has a density of  $70 \text{ kg/m}^3$   
 Liquid A has a mass of  $1400 \text{ kg}$

Liquid B has a density of  $280 \text{ kg/m}^3$   
 Liquid B has a volume of  $30 \text{ m}^3$

Work out the density of liquid C.

	A	B	C
m	1400kg	8400kg	9800kg
D	$70 \text{ kg/m}^3$	$280 \text{ kg/m}^3$	$196 \text{ kg/m}^3$
V	$20 \text{ m}^3$	$30 \text{ m}^3$	$50 \text{ m}^3$

$280 \times 30$   
 $1400 + 8400$   
 $1400 \div 70$   
 $20 + 30$   
 $\frac{9800}{50}$   
 $5 \overline{) 9800}$   
 $196$   
 $196 \text{ kg/m}^3$

(Total for Question 13 is 3 marks)

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16 Shirley wants to find an estimate for the number of bees in her hive.

On Monday she catches 90 of the bees.  
She puts a mark on each bee and returns them to her hive.

On Tuesday she catches 120 of the bees.  
She finds that 20 of these bees have been marked.

(a) Work out an estimate for the total number of bees in her hive.

$$\frac{90}{x} \quad \times \quad \frac{20}{120}$$

$$\begin{array}{r} 10800 = 20x \\ \div 20 \qquad \qquad \qquad \div 20 \\ 450 = x \end{array}$$

450

(3)

Shirley assumes that none of the marks had rubbed off between Monday and Tuesday.

(b) If Shirley's assumption is wrong, explain what effect this would have on your answer to part (a).

It would be an overestimate

(1)

(Total for Question 16 is 4 marks)



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17 Make  $f$  the subject of the formula  $d = \frac{3(1-f)}{f-4}$

$$d = \frac{3-3f}{f-4}$$

$$\times (f-4) \qquad \qquad \times (f-4)$$

$$d(f-4) = 3-3f$$

$$df - 4d = 3-3f$$

$$+3f + 4d \qquad +3f + 4d$$

$$df + 3f = 3 + 4d$$

$$f(d+3) = 3 + 4d$$

$$\div (d+3) \qquad \qquad \div (d+3)$$

$$f = \frac{3+4d}{d+3} \qquad \qquad f = \frac{3+4d}{d+3}$$

(Total for Question 17 is 4 marks)

18  $x$  is proportional to  $\sqrt{y}$  where  $y > 0$

$y$  is increased by 44%  $100\% + 44\% = 144\% \xrightarrow{\div 100} 1.44$

Work out the percentage increase in  $x$ .

$$x \propto \sqrt{y}$$

$$x = k \sqrt{y}$$

$$x = k \sqrt{1.44}$$

$$x = k (1.2)$$

$$1.2 = 20\% \text{ increase}$$

..... **20** %

(Total for Question 18 is 3 marks)



19 f and g are functions such that

$$f(x) = \frac{12}{\sqrt{x}} \quad \text{and} \quad g(x) = 3(2x + 1)$$

(a) Find  $g(5)$

$$\begin{aligned} g(x) &= 6x + 3 \\ g(5) &= 6(5) + 3 \\ &= 30 + 3 \\ &= 33 \end{aligned}$$

33

(1)

(b) Find  $gf(9)$

$$f(9) = \frac{12}{\sqrt{9}} = \frac{12}{3} = 4$$

$$\begin{aligned} g(4) &= 6(4) + 3 \\ &= 24 + 3 \\ &= 27 \end{aligned}$$

27

(2)

(c) Find  $g^{-1}(6)$

$$\begin{aligned} g(x) &= 6x + 3 \\ y &= 6x + 3 \\ x &= \frac{y + 3}{6} \\ x - 3 &= \frac{y + 3}{6} \\ \frac{x - 3}{6} &= y \end{aligned}$$

$$\begin{aligned} g^{-1}(6) &= \frac{6 - 3}{6} \\ &= \frac{3}{6} \\ &= \frac{1}{2} \end{aligned}$$

$\frac{1}{2}$

(2)

(Total for Question 19 is 5 marks)



20 Show that  $\frac{\sqrt{180} - 2\sqrt{5}}{5\sqrt{5} - 5}$  can be written in the form  $a + \frac{\sqrt{5}}{b}$  where  $a$  and  $b$  are integers.

$$\sqrt{180} = \sqrt{36} \sqrt{5} = 6\sqrt{5}$$

$$\frac{6\sqrt{5} - 2\sqrt{5}}{5\sqrt{5} - 5}$$

$$\frac{4\sqrt{5}}{5\sqrt{5} - 5} \times \frac{5\sqrt{5} + 5}{5\sqrt{5} + 5}$$

$$\frac{4\sqrt{5} (5\sqrt{5} + 5)}{(5\sqrt{5} - 5)(5\sqrt{5} + 5)}$$

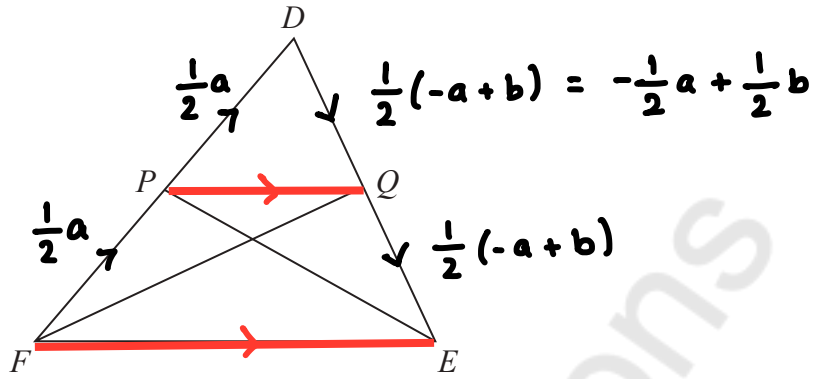
$$\frac{100 + 20\sqrt{5}}{125 + 25\sqrt{5} - 25\sqrt{5} - 25}$$

$$\frac{100 + 20\sqrt{5}}{100} = 1 + \frac{1}{5}\sqrt{5} = 1 + \frac{\sqrt{5}}{5}$$

(Total for Question 20 is 4 marks)



21  $DEF$  is a triangle.



$P$  is the midpoint of  $FD$ .  
 $Q$  is the midpoint of  $DE$ .

$$\vec{FD} = \mathbf{a} \text{ and } \vec{FE} = \mathbf{b}$$

Use a vector method to prove that  $PQ$  is parallel to  $FE$ .

$$\begin{aligned} \vec{DE} &= \vec{DF} + \vec{FE} \\ &= -\mathbf{a} + \mathbf{b} \end{aligned}$$

$$\begin{aligned} \vec{PQ} &= \vec{PD} + \vec{DQ} \\ &= \frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} \\ &= \frac{1}{2}\mathbf{b} \end{aligned}$$

$$\vec{FE} = \mathbf{b}$$

$$\vec{PQ} = \frac{1}{2}\vec{FE} \quad \therefore \text{parallel}$$

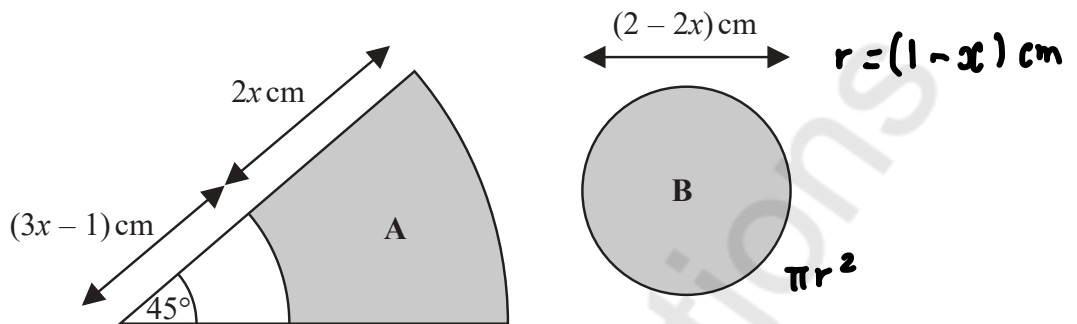
(Total for Question 21 is 4 marks)



22 The diagram shows two shaded shapes, A and B.

Shape A is formed by removing a sector of a circle with radius  $(3x - 1)$  cm from a sector of the circle with radius  $(5x - 1)$  cm.

Shape B is a circle of diameter  $(2 - 2x)$  cm.



The area of shape A is equal to the area of shape B.

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

Find the value of  $x$ .

You must show all your working.

$$\text{Area of A} = \text{Area large sector} - \text{Area small sector}$$

$$= \frac{45}{360} \times \pi (5x-1)^2 - \frac{45}{360} \times \pi (3x-1)^2$$

$$= \frac{45}{360} \pi \left[ (5x-1)(5x-1) - (3x-1)(3x-1) \right]$$

$$= \frac{45}{360} \pi \left[ (25x^2 - 10x + 1) - (9x^2 - 6x + 1) \right]$$

$$= \frac{45}{360} \pi (16x^2 - 4x)$$

$$\begin{aligned} \text{Area of B} &= \pi (1-x)^2 \\ &= \pi (1-x)(1-x) \\ &= \pi (1-2x+x^2) \end{aligned}$$

$$\frac{45}{360} \pi (16x^2 - 4x) = \pi (1 - 2x + x^2)$$

$$\frac{1}{8} (16x^2 - 4x) = 1 - 2x + x^2$$

$$16x^2 - 4x = 8 - 16x + 8x^2$$

$$8x^2 + 12x - 8 = 0$$

$$\begin{aligned} 8x^2 + 12x - 8 &= 0 \\ 8 \times 8 &= 64 \\ \hline 16 &- 4 \end{aligned}$$

$$\begin{aligned} 8x^2 + 16x &- 4x - 8 \\ 8x(x+2) &- 4(x+2) \\ (8x-4)(x+2) &= 0 \end{aligned}$$

$$8x - 4 = 0$$

$$8x = 4$$

$$x = \frac{4}{8} = \frac{1}{2}$$

$$\begin{aligned} x + 2 &= 0 \\ x &= -2 \end{aligned}$$

$$\frac{1}{2}$$

(Total for Question 22 is 5 marks)



23 There are four types of cards in a game.

Each card has a black circle or a white circle or a black triangle or a white triangle.



$$\begin{array}{l} \text{number of cards} \\ \text{with a black shape} \end{array} : \begin{array}{l} \text{number of cards} \\ \text{with a white shape} \end{array} = 3:5$$

$$\begin{array}{l} \text{number of cards} \\ \text{with a circle} \end{array} : \begin{array}{l} \text{number of cards} \\ \text{with a triangle} \end{array} = 2:7$$

Express the total number of cards with a black shape as a fraction of the total number of cards with a triangle.

$$\begin{array}{l} \text{Black : White} = 3 : 5 = 8 \text{ parts} \\ \quad \quad \quad \times 9 \quad \quad \times 9 \quad \quad \times 9 = 72 \text{ parts} \\ \quad \quad \quad 27 : 45 \end{array}$$

$$\begin{array}{l} \text{Circle : Triangle} = 2 : 7 = 9 \text{ parts} \\ \quad \quad \quad \times 8 \quad \quad \times 8 \quad \quad \times 8 = 72 \text{ parts} \\ \quad \quad \quad 16 : 56 \end{array}$$

$$\text{Black} = 27$$

$$\text{Triangle} = 56$$

$$\frac{27}{56}$$

$$\frac{27}{56}$$

(Total for Question 23 is 3 marks)

TOTAL FOR PAPER IS 80 MARKS

