Maths Made Easy

Candidate surname

Other names

Centre Number

Candidate Number

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

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.
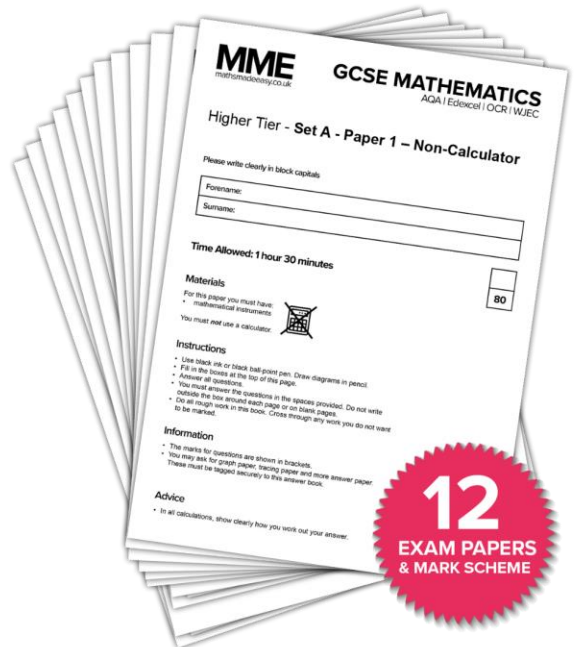- Check your answers if you have time at the end.

Turn over ▶
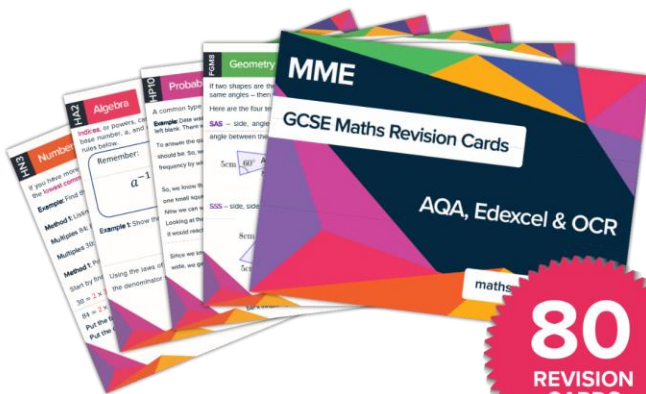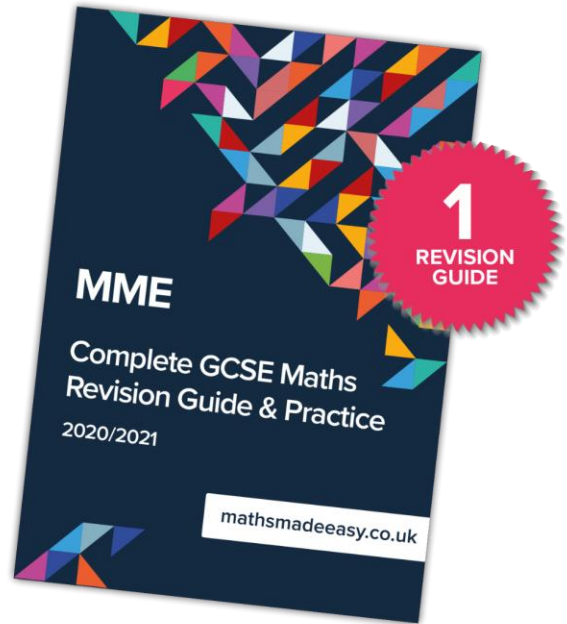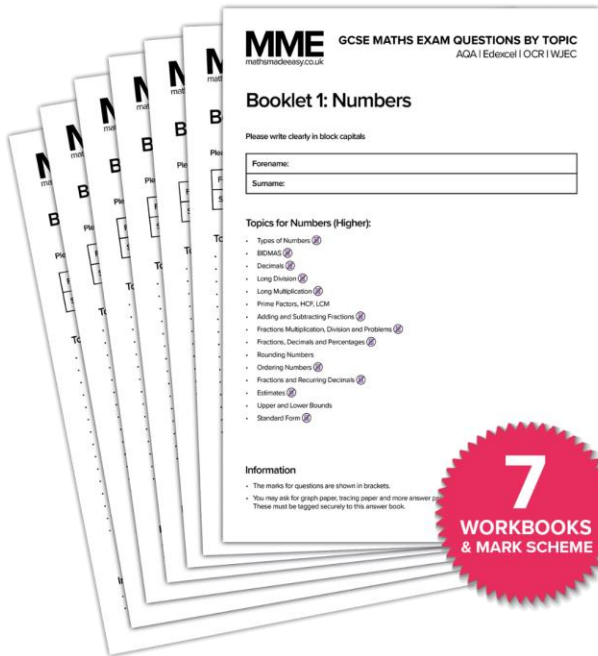
Pearson

MME.

GCSE Maths Products

7 WORKBOOKS & MARK SCHEME

1 REVISION GUIDE

80 REVISION CARDS

1 FORMULAE Z-CARD

12 EXAM PAPERS & MARK SCHEME

Available in the course in a box or for purchase separately.

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

$$1 \quad 4 \quad 7 \quad 10 \quad 13$$

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

$$3n - 2$$

(Total for Question 1 is 2 marks)

2   Show that

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

$$2\frac{1}{3} = \frac{7}{3} \qquad\qquad 3\frac{3}{4} = \frac{15}{4}$$

$$\frac{7}{3} \times \frac{15}{4} = \frac{105}{12} = \frac{35}{4} = 8\frac{3}{4}$$

(Total for Question 2 is 3 marks)

3   The diagram shows four graphs.
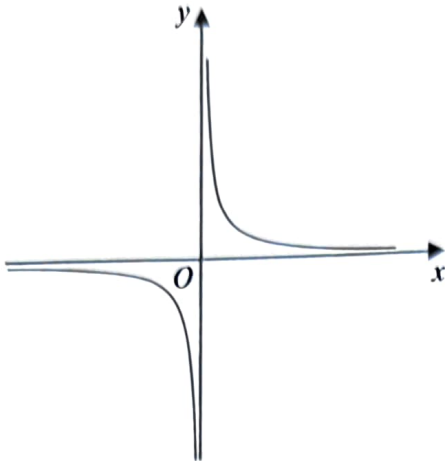
Graph A
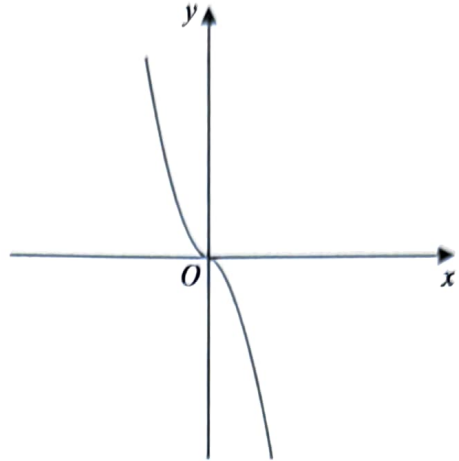
Graph B

Graph C
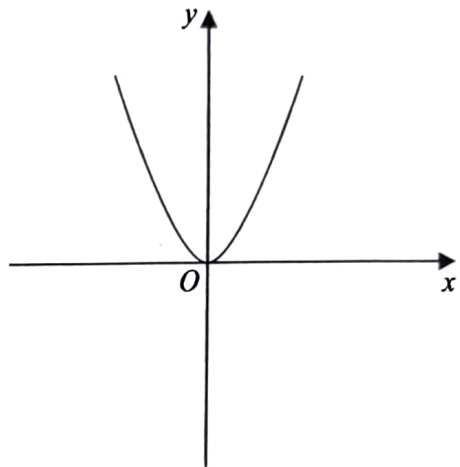
Graph D

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
$y = x^3$	C
$y = x^2$	D
$y = \dfrac{1}{x}$	A

(Total for Question 3 is 2 marks)

4   The diagram shows four triangles.
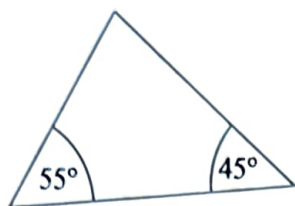
Triangle **A**
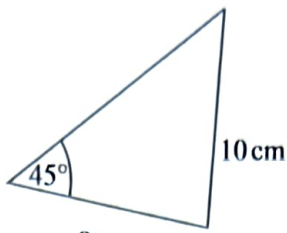
Triangle **B**
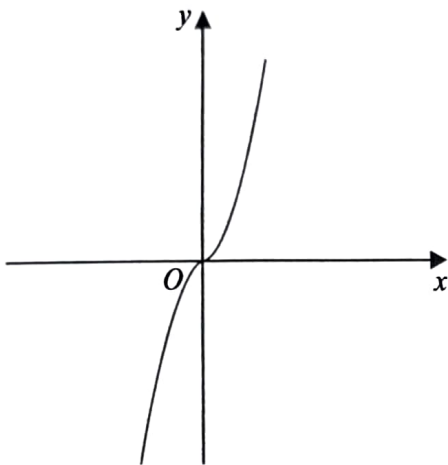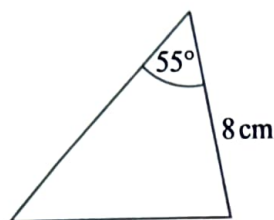
Triangle **C**
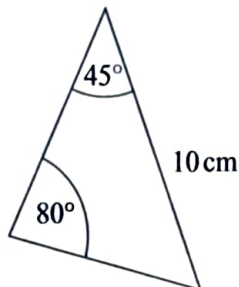
Triangle **D**

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.

$$24 \times £0.50 = £12.$$

$$\frac{12-10}{10} \times 100\% = 20\% \ \text{profit}$$

___20___ %

(Total for Question 5 is 3 marks)

6 *ADC* is a triangle.
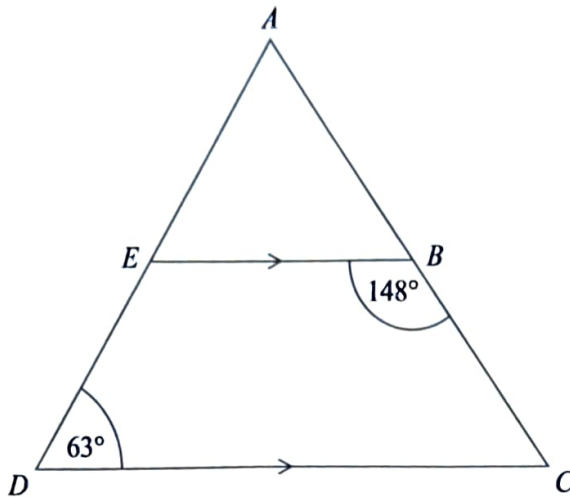
AED and *ABC* are straight lines.
EB is parallel to *DC*.

Angle *EBC* = 148°
Angle *ADC* = 63°

Work out the size of angle *EAB*.
You must give a reason for each stage of your working.

$AEB = 63°$ because corresponding angles
are equal.

$ABE = 32°$ because angles on a straight
line add up to 180°.

$EAB = 85°$ because angles in a triangle
add up to 180°.

(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

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

15	8 9 8
16	4 5 7 7 8
17	0 0 4 4 7
18	0 2

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 boys were slightly taller on average, with a median of 164 cm compared to 165 cm.
The boys had a greater range of heights - a range of 24 cm compared to 20 cm

(Total for Question 7 is 3 marks)

8 The diagram shows a prism placed on a horizontal floor.
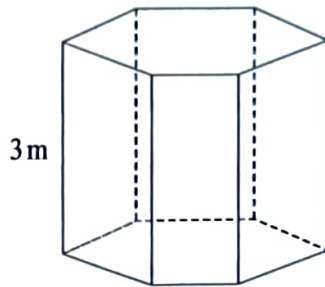
$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

3 m

The prism has height 3 m
The volume of the prism is 18 m³

The pressure on the floor due to the prism is 75 newtons/m²

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

Area = 18 ÷ 3 = 6.

Force = Pressure × Area.

F = 75 × 6

F = 450 N

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

(Total for Question 8 is 3 marks)

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

6.72×10^5 67.2×10^{-4} 672×10^4 $0.000\,672$

0.000672,   67.2 × 10⁻⁴,   6.72 × 10⁵   672 × 10⁴

(Total for Question 9 is 2 marks)

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

find $a:b:c$

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

$$5a = 2b$$

$$a:b = 2:5$$

$$a:b = 6:15 \longleftarrow$$

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

$$4b = 3c$$

$$b:c = 3:4$$

$$b:c = 15:20$$

$$a:b:c = 6:15:20$$

6 : 15 : 20

(Total for Question 10 is 3 marks)

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

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

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

$$3 \times 10^2 =$$

$$300$$

300

(2)

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

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

$\frac{1}{8}$

(2)

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

$$\frac{3^n}{9^{n-1}} = \frac{3^n}{(3^2)^{n-1}} = \frac{3^n}{3^{2n-2}}$$

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

3^{2-n}

(2)

(Total for Question 11 is 6 marks)

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

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

(a) Complete the cumulative frequency table.

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

(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.

No. The 55th percentile is £400, so the 60th percentile must be greater than £400, so greater than £360.

(3)

10
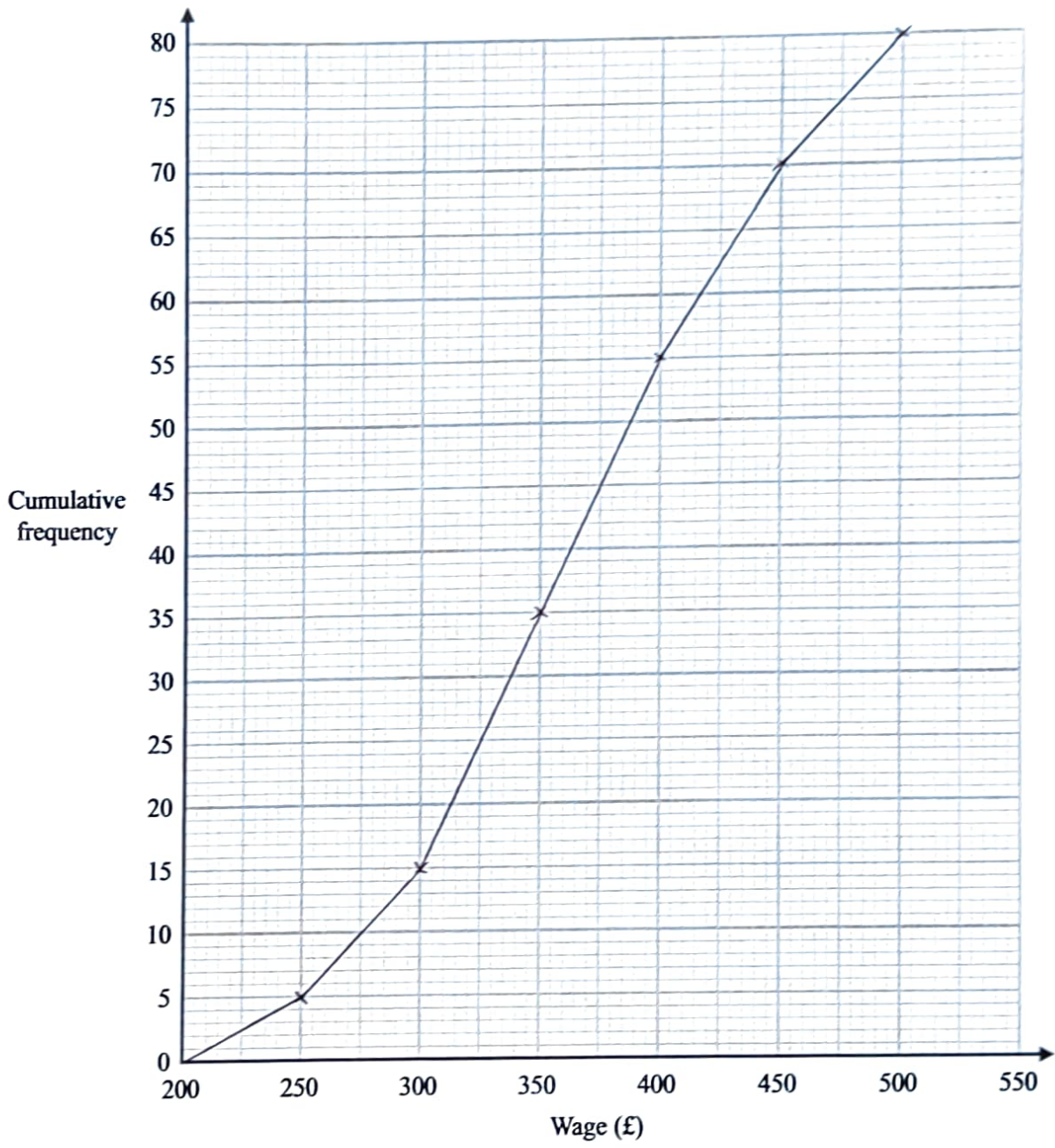
13 Liquid **A** and liquid **B** are mixed to make liquid **C**.

Liquid **A** has a density of 70 kg/m³
Liquid **A** has a mass of 1400 kg

$vol = \dfrac{1400}{70} = 20 m^3$

Liquid **B** has a density of 280 kg/m³
Liquid **B** has a volume of 30 m³

$mass = 30 \times 280 = 8400 kg.$

Work out the density of liquid **C**.

$mass \ of \ C = 1400 + 8400 = 9800 kg.$

$vol \ of \ C = 20 + 30 = 50 m^3.$

$\dfrac{9800}{50} = 196 \ kg/m^3.$

196 .... kg/m³

(Total for Question 13 is 3 marks)

14 Sally plays two games against Martin.
In each game, Sally could win, draw or lose.

In each game they play,
the probability that Sally will win against Martin is 0.3
the probability that Sally will draw against Martin is 0.1

Work out the probability that Sally will win **exactly** one of the two games against Martin.

$$2 \times 0.3 \times 0.7 = 0.42$$

0.42

(Total for Question 14 is 3 marks)

15 The straight line L_1 has equation $y = 3x - 4$
The straight line L_2 is perpendicular to L_1 and passes through the point (9, 5)

Find an equation of line L_2

L_2 has gradient $-\frac{1}{3}$.

$y = -\frac{1}{3}x + c$

$5 = -\frac{1}{3} \times 9 + c$

$5 = -3 + c$

$c = 8$.

$y = -\frac{1}{3}x + 8$

$-\frac{1}{3}x + 8$

(Total for Question 15 is 3 marks)

13

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.

$$\frac{20}{120} = \frac{1}{6}.$$

So 90 bees is $\frac{1}{6}$ of the total.

$90 \times 6 = 540$ bees

540

(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).

If marks have been rubbed off, the actual number of bees will be lower than 540.

(1)

(Total for Question 16 is 4 marks)

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

$$d = \frac{3(1-f)}{f-4}$$

$$(f-4)d = 3(1-f)$$

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

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

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

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

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

(Total for Question 17 is 4 marks)

---

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

y is increased by 44%

Work out the percentage increase in x.

$$y \text{ increased by } 1.44$$

$$x \text{ increased by } \sqrt{1.44} = 1.2$$

$$x \text{ increased by } 20\%$$

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)

$$g(5) = 3(2 \times 5 + 1)$$
$$= 3(10 + 1)$$
$$= 3(11)$$
$$= 33$$

33

(1)

(b) Find gf(9)

$$gf(9) = g\left(\frac{12}{\sqrt{9}}\right)$$
$$= g\left(\frac{12}{3}\right)$$
$$= g(4)$$
$$= 3(2 \times 4 + 1)$$
$$= 3(8 + 1)$$
$$= 3(9)$$
$$= 27$$

27

(2)

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

$$g(x) = 3(2x+1)$$
$$g(x) = 6x + 3$$
$$g(x) - 3 = 6x$$
$$x = \frac{g(x) - 3}{6}$$
$$g^{-1}(x) = \frac{x - 3}{6}$$
$$g^{-1}(6) = \frac{6 - 3}{6}$$
$$= \frac{3}{6} = \frac{1}{2}$$

$\frac{1}{2}$

(2)

(Total for Question 19 is 5 marks)

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

$$\frac{\sqrt{180} - 2\sqrt{5}}{5\sqrt{5} - 5} = \frac{\sqrt{36 \times 5} - 2\sqrt{5}}{5\sqrt{5} - 5}$$

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

$$= \frac{4\sqrt{5}}{5\sqrt{5} - 5}$$

$$= \frac{4}{5 - \sqrt{5}}$$

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

$$= \frac{20 + 4\sqrt{5}}{25 - 5}$$

$$= \frac{20 + 4\sqrt{5}}{20}$$

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

(Total for Question 20 is 4 marks)

21 *DEF* is a triangle.
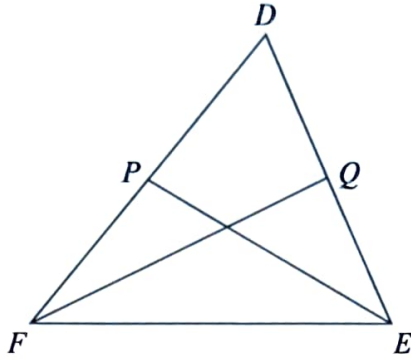
P is the midpoint of *FD*.
Q is the midpoint of *DE*.

$\overrightarrow{FD} = \mathbf{a}$ and $\overrightarrow{FE} = \mathbf{b}$

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

$$DE = b - a$$
$$PD = \tfrac{1}{2}a$$
$$DQ = \tfrac{1}{2}(b - a)$$
$$PQ = \tfrac{1}{2}a + \tfrac{1}{2}(b - a)$$
$$PQ = \tfrac{1}{2}a + \tfrac{1}{2}b - \tfrac{1}{2}a$$
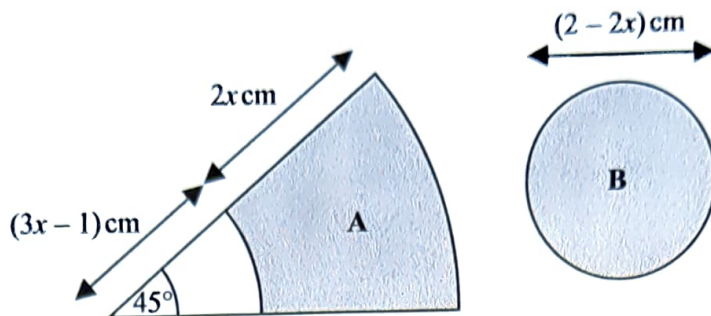$$PQ = \tfrac{1}{2}b.$$

Hence, $FE = 2PQ$ so they are 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**.

Find the value of x.
You must show all your working.

Sector is $\frac{1}{8}$ of circle.
Radius is $3x-1+2x = 5x-1$.

Area of whole sector $= \frac{1}{8}\pi(5x-1)^2$

Area of non-shaded $= \frac{1}{8}\pi(3x-1)^2$.

$A = \frac{1}{8}\pi\left((5x-1)^2 - (3x-1)^2\right)$

$B = \pi r^2 = \pi\left(\frac{1}{2}(2-2x)\right)^2 = \pi(1-x)^2$.

$\pi(1-x)^2 = \frac{1}{8}\pi\left((5x-1)^2 - (3x-1)^2\right)$

$(1-x)^2 = \frac{1}{8}\left((5x-1)^2 - (3x-1)^2\right)$

$x^2 - 2x + 1 = \frac{1}{8}(25x^2 - 10x + 1 - 9x^2 + 6x - 1)$

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

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

$x^2 + \frac{3}{2}x - 1 = 0$

$2x^2 + 3x - 2 = 0$

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

$x = \frac{1}{2}$ $\qquad$ $x = -2$

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

Negative x makes no sense

$x = \frac{1}{2}$ only

(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.

$$\boxed{\bullet} \quad \boxed{\circ} \quad \boxed{\blacktriangle} \quad \boxed{\triangle}$$

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

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

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

$\frac{3}{8}$ of total cards have black shape.

$\frac{7}{9}$ of total cards have triangle.

$$\frac{3}{8} \div \frac{7}{9} = \frac{3}{8} \times \frac{9}{7} = \frac{27}{56}$$

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

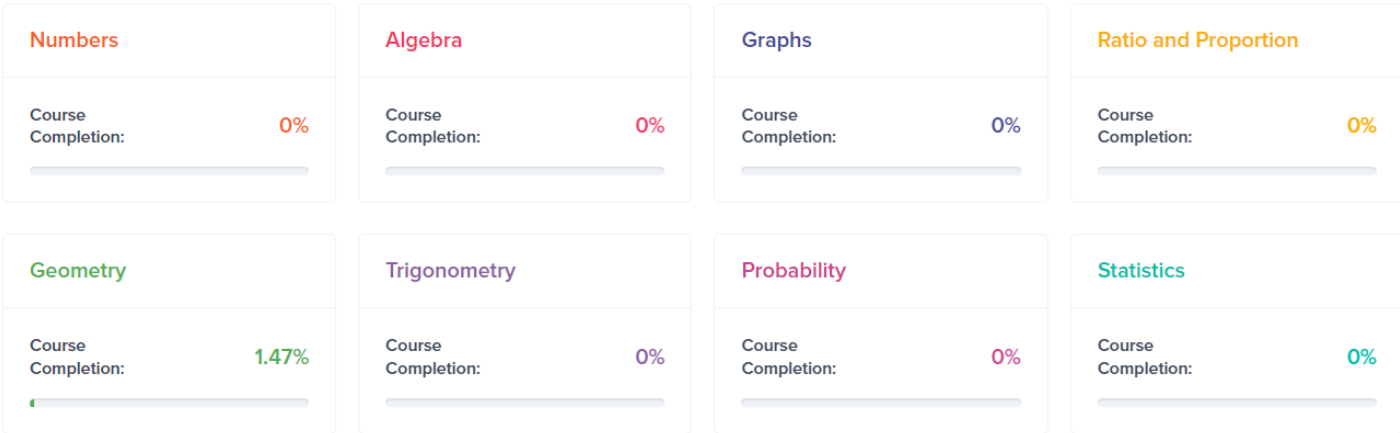**(Total for Question 23 is 3 marks)**

TOTAL FOR PAPER IS 80 MARKS

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Track your progress through the course and your performance on practice questions

AVERAGE SCORE

Practice Questions

77% → -4%

Calculate the following:

$$\frac{(15-3)}{2} \div 3$$

0% Completed

2. Algebra
0% Completed

3. Graphs
0% Completed

3.1 Gradients of Straight Line Graphs

3.2 y=mx+c

3.3 Coordinates and Midpoints

3.4 Drawing Straight Line Graphs

3.5 Parallel Lines

Item	Status	Latest Result
▶ Revision	Incomplete	-
❓ Practice Tests	0/3 Complete	-
📄 Online Exam	Incomplete	-

3.6 Quadratic and Cubic Graphs

3.7 Turning Points of Quadratic Graphs

3.8 Circle Graphs and Tangents

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