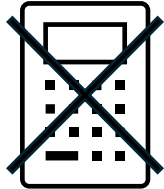


Surname:

Forename(s):

GCSE Mathematics – Higher Tier

Paper 1 – Non Calculator



Practice Set C

ANSWERS



Materials

/40

- **Formulae Sheet** (on the next page)
- **Black** ink or ball-point pen
- Pencil
- Eraser
- Protractor
- Compass
- Tracing Paper
- **No calculator allowed**

Instructions

- Time allowed: **45 minutes**.
- The total mark for this paper is **40**.
- Show **all** of your working.
- Draw diagrams in pencil.
- Plot graphs in pencil.
- Diagrams are **not** accurately drawn, unless otherwise indicated.
- Cross through any work you don't want to be marked

Higher Tier Formulae Sheet

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

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

Volume of a prism = area of cross section $\times$ length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

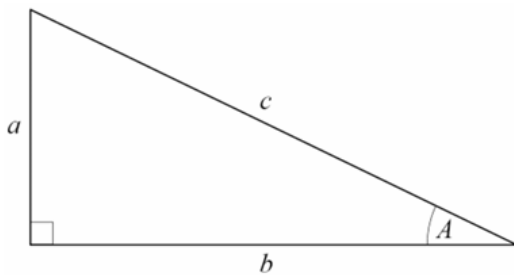
Area of a circle = πr^2

Quadratic Formula

The solution of $ax^2 + bx + c = 0$ where $a \neq 0$

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

Pythagoras' Theorem and Trigonometry

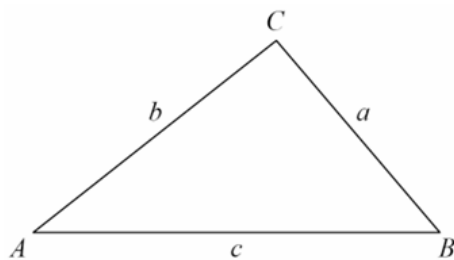


In any right-angled triangle where a , b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a , b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$



In any triangle ABC where a , b and c are the length of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A$$

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

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

$$\text{Total accrued} = P \left(1 + \frac{r}{100} \right)^n$$

Probability

Where $P(A)$ is the probability of outcome A and $P(B)$ is the probability of outcome B :

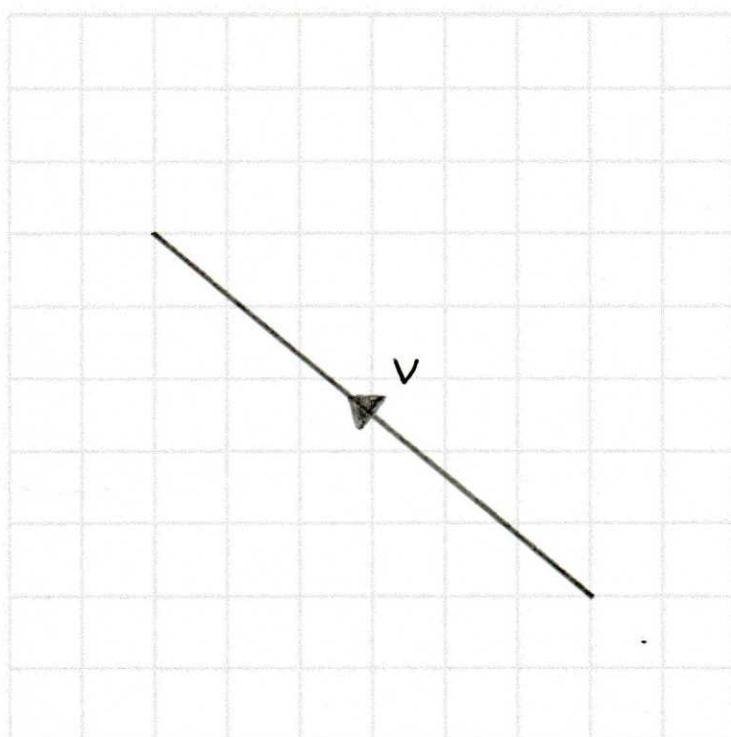
$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A \text{ given } B) P(B)$$

1 $v = \begin{pmatrix} -6 \\ 5 \end{pmatrix}$

$\begin{pmatrix} -6 \\ 5 \end{pmatrix}$ 6 left
5 up

On the grid below, draw the vector v .



(Total for question 1 is 1 mark)

- 2 The mean weight of a group of 5 people is 80kg.
 Another person who weighs 50kg joins the group.
 Work out the mean weight of the group of 6 people.

$$\text{Total weight of 5 people} = 5 \times 80 = 400 \text{ kg}$$

$$\text{Total weight of 6 people} = 400 + 50 = 450 \text{ kg}$$

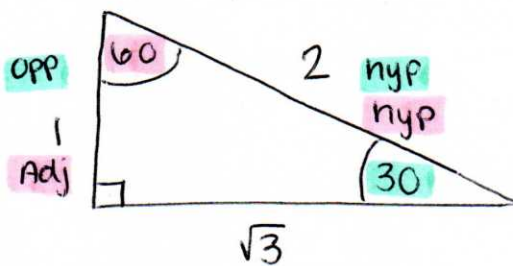
$$\text{mean weight of 6 people} = \frac{450}{6} = 75 \text{ kg}$$

$$\begin{array}{r} 075 \\ 6 \overline{) 450} \end{array}$$

$$\underline{\quad 75 \quad} \text{ kg}$$

(Total for question 2 is 3 marks)

- 3 Write down the exact value of $\cos 60 + \sin 30$



$$\sin = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 30 = \frac{1}{2}$$

$$\cos = \frac{\text{adj}}{\text{hyp}}$$

$$\cos 60 = \frac{1}{2}$$

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

$$\underline{\quad 1 \quad}$$

(Total for question 3 is 2 marks)

4 (a) Work out an estimate for the value of $\sqrt{63.7 \times 24.8}$

$$= \sqrt{64 \times 25}$$

$$= \sqrt{64} \times \sqrt{25}$$

$$= 8 \times 5$$

$$= 40$$

40

(2)

(b) $(2.3)^8 = 783$ correct to 3 significant figures.

Find the value of $(23)^8$ correct to 3 significant figures.

Give your answer in standard form.

$$\hookrightarrow (23)^8$$

$$\hookrightarrow (2.3 \times 10)^8$$

$$\hookrightarrow 2.3^8 \times 10^8$$

$$\hookrightarrow 783 \times 10^8$$

$$\hookrightarrow 7.83 \times 10^{10}$$

7.83×10^{10}

(2)

(b) Work out the value of $\left(\frac{125}{27}\right)^{-\frac{1}{3}}$

$$\left(\frac{125}{27}\right)^{-\frac{1}{3}} = \left(\frac{27}{125}\right)^{\frac{1}{3}}$$

$$= \frac{\sqrt[3]{27}}{\sqrt[3]{125}}$$

$$= \frac{3}{5}$$

$\frac{3}{5}$

(2)

(Total for question 4 is 6 marks)

- 5 Two families go to the theatre to watch a show.

The Lincoln family consists of 2 adults and 4 children.

The Graham family consists of 3 adults and 5 children.

The cost of the tickets for the Lincoln family came to a total of £28

The cost of the tickets for the Graham family came to a total of £39

Work out the cost of one child ticket and one adult ticket.

$$2A + 4C = 28$$

$$3A + 5C = 39$$

$$\begin{array}{l} \textcircled{\times 3} \\ 6A + 12C = 84 \end{array}$$

—

$$\begin{array}{l} \textcircled{\times 2} \\ 6A + 10C = 78 \end{array}$$

$$\begin{array}{l} 2C = 6 \\ \textcircled{\div 2} \qquad \textcircled{\div 2} \\ \boxed{C = 3} \end{array}$$

$$2A + 4C = 28$$

$$2A + 4(3) = 28$$

$$\begin{array}{l} 2A + 12 = 28 \\ \textcircled{-12} \quad \textcircled{-12} \end{array}$$

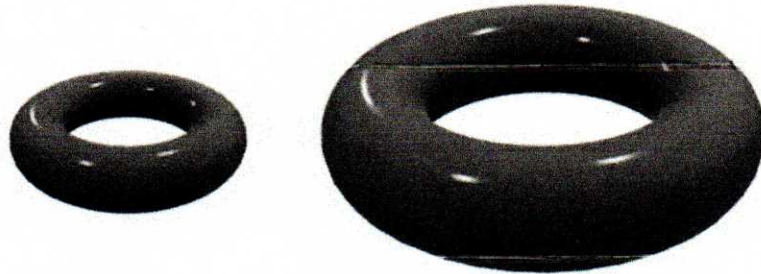
$$\begin{array}{l} 2A = 16 \\ \textcircled{\div 2} \quad \textcircled{\div 2} \\ \boxed{A = 8} \end{array}$$

Child ticket = £3

Adult ticket = £8

(Total for question 5 is 4 marks)

6 Here are two mathematically similar rings.



radius of the smaller ring : radius of the larger ring = $1:3$

The volume of the larger ring is 108cm^3

Work out the volume of the smaller ring.

$S : L$
 radius $1 : 3$
 Volume $1 : 27$ (cubed)

$S : L$
 $1 : 27$
 $\times 4$ $\swarrow$ $\searrow$ $\times 4$
 $4 : 108$

4 cm^3

(Total for question 6 is 3 marks)

7 Prove that $0.\dot{3} = \frac{1}{3}$

$$\begin{aligned}
 x &= 0.\dot{3} \\
 10x &= 3.\dot{3} \\
 10x &= 3.\dot{3} \\
 \ominus x &= 0.\dot{3} \\
 \hline
 9x &= 3 \\
 (\div 9) \quad (\div 9) \\
 x &= \frac{3}{9} \\
 x &= \frac{1}{3}
 \end{aligned}$$

(Total for question 7 is 3 marks)

8 Show that $\frac{4-\sqrt{12}}{\sqrt{3}-1}$ can be written in the form $\sqrt{3} + k$ where k is an integer

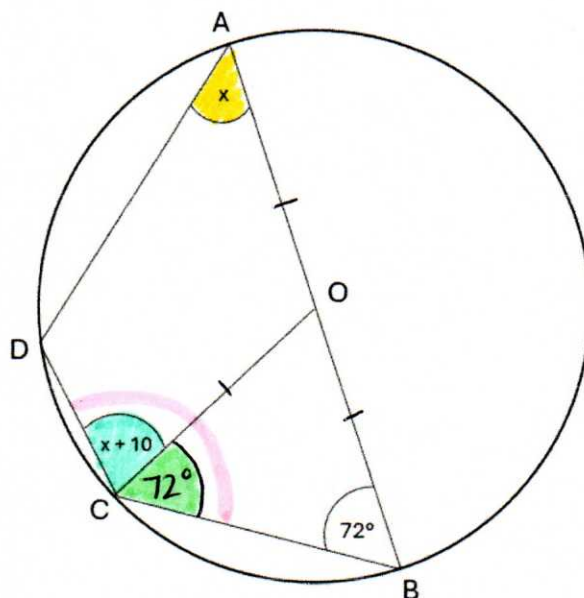
$$\sqrt{12} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$$

$$\begin{aligned}
 \frac{(4-2\sqrt{3})}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)} &= \frac{4\sqrt{3}+4-6-2\sqrt{3}}{3+\sqrt{3}-\sqrt{3}-1} \\
 &= \frac{2\sqrt{3}-2}{2} \\
 &= \sqrt{3}-1
 \end{aligned}$$

$$k = -1$$

(Total for question 8 is 3 marks)

- 9 The diagram shows the circle with centre O.
The straight line AB is the diameter of the circle.
A, B, C and D are all points on the circumference of the circle.



Work out the value of x

State any angle rules or circle theorems that you use.

$$\text{radius} = OA = OB = OC$$

$\angle OCB = 72^\circ$ because base angles in an isosceles are equal.

Opposite angles in a cyclic quadrilateral sum to 180° .

$$\angle OAD + \angle BCD = 180^\circ$$

$$x + x + 10 + 72 = 180$$

$$2x + 82 = 180$$

$$2x = 98$$

$$x = 49$$

$$x = 49^\circ$$

$$x = 49$$

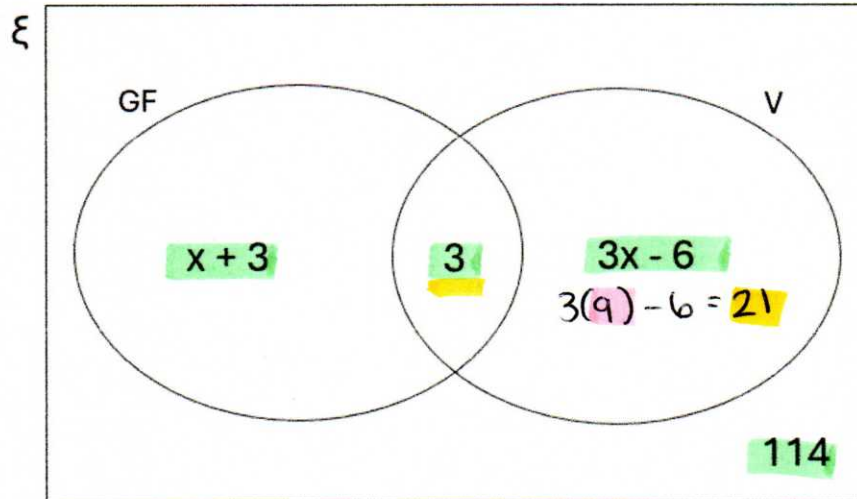
(Total for question 9 is 3 marks)

10 The venn diagram shows information about people's dietary requirements in a restaurant.

$\xi = 150$ people in the restaurant

GF = Gluten free

V = Vegetarian



A person is chosen at random.

What is the probability that this person is vegetarian.

$$x + 3 + 3 + 3x - 6 + 114 = 150$$

$$4x + 114 = 150$$

$$4x = 36$$

$$x = 9$$

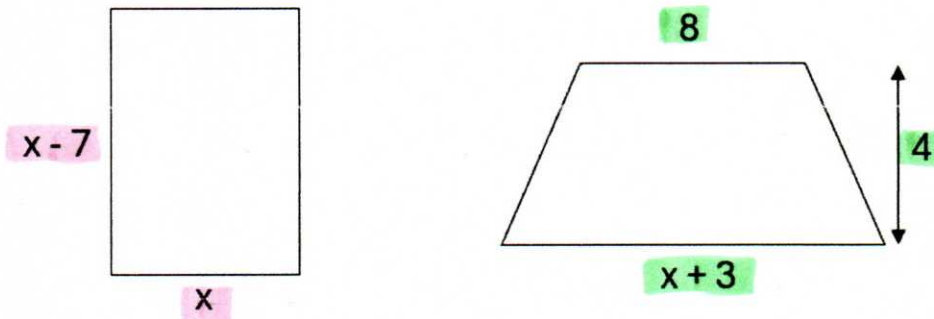
$$\text{vegetarian} = 3 + 21 = 24$$

$$\frac{24}{150}$$

$$\frac{24}{150} \text{ or equivalent}$$

(Total for question 10 is 4 marks)

11 The diagram shows a rectangle and a trapezium

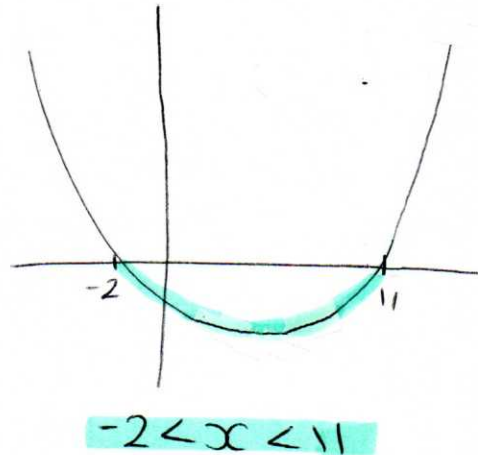


All measurements are in centimetres.

The area of the rectangle is smaller than the area of the trapezium.

Find the possible range of the values of x .

$$\begin{aligned}
 & \boxed{b \times h} < \boxed{\frac{a+b}{2} \times h} \\
 & x(x-7) < \frac{8+x+3}{2} \times 4 \\
 & x^2 - 7x < \frac{x+11}{2} \times 4 \\
 & x^2 - 7x < 2x + 22 \\
 & (-2x) \quad (-22) \quad (-2x) \quad (-22) \\
 & x^2 - 9x - 22 < 0 \\
 & (x-11)(x+2) < 0 \\
 & \downarrow \qquad \qquad \downarrow \\
 & x = 11 \qquad \qquad x = -2
 \end{aligned}$$

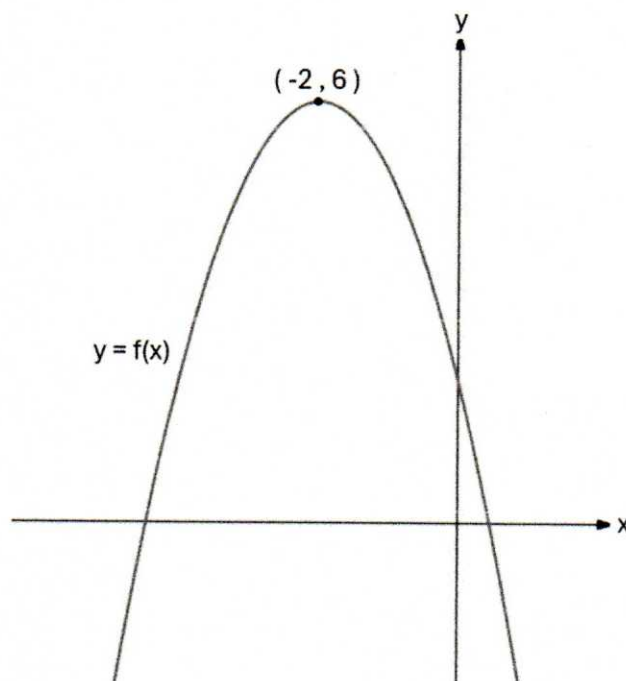


$x-7$ is the height of the rectangle
 So $x-7 > 0 \Rightarrow x > 7$

$$\underline{7 < x < 11}$$

(Total for question 11 is 5 marks)

12 Here is the graph of $y = f(x)$



The coordinates of the turning point of this curve are $(-2, 6)$

Write down the turning point of the curve with equation

(a) $y = 2f(x)$



stretch in y axis
Scale factor 2

$$(-2, 12)$$

(1)

(b) $y = f(x+2) - 1$



translation in y
axis 2 down

translation in x
axis 2 left

$$(-4, 5)$$

(2)

(Total for question 12 is 3 marks)

END OF TEST

TOTAL FOR THIS PAPER IS 40 MARKS