Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

Cambridge IGCSE

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS

Paper 2 (Extended)

0580/22

February/March 2018

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator   Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **12** printed pages.

CAMBRIDGE
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[Turn over

1   "We eat more ice cream as the temperature rises."

    What type of correlation is this?

    .... positive ....[1]

2   Write 0.000 052 3 in standard form.

    $\overset{-1\ -2\ -3\ -4\ -5}{0.0\,0\,0\,0\,5.2\,3}$

    5.23×10^{-5}

    .... 5.23×10^{-5} ....[1]

3   Calculate $\sqrt{17.8} - 1.3^{2.5}$.

    .... 2.29 ....[1]

4   Write the recurring decimal $0.\dot{8}$ as a fraction.

    ⋆ Let $x = 0.\dot{8}$ $\Rightarrow 10x - x = 8.\dot{8} - 0.\dot{8}$

    $10x = 8.\dot{8}$ $\Rightarrow 9x = 8$

    $\Rightarrow x = \dfrac{8}{9}$

    .... $\dfrac{8}{9}$ ....[1]

5
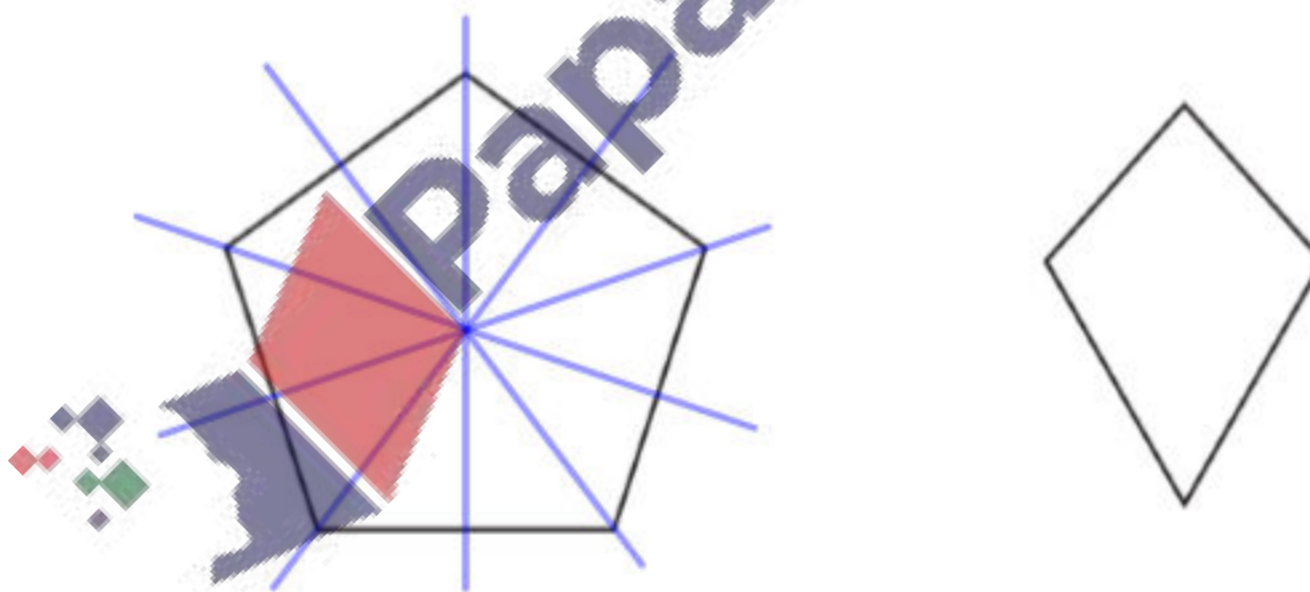
    The diagram shows a regular pentagon and a kite.

    Complete the following statements.

    (a) The regular pentagon has .... 5 .... lines of symmetry.   [1]
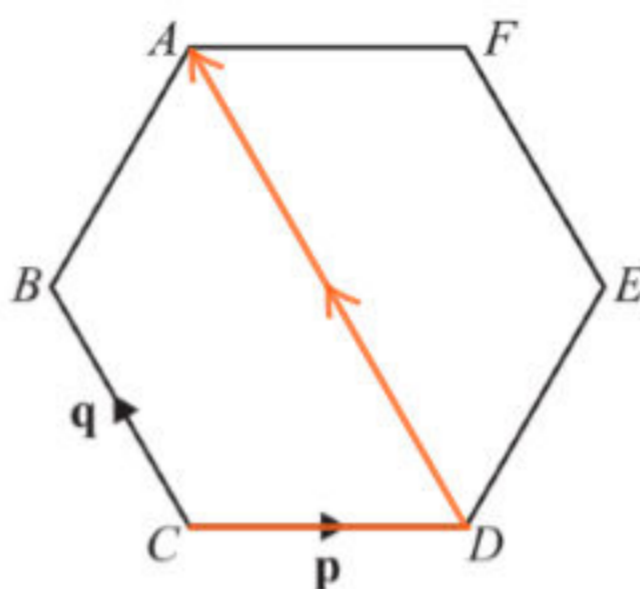
    (b) The kite has rotational symmetry of order .... 1 ....   [1]

6 Factorise completely.
$$15k^2m - 20m^4$$

$5m(3k^2-4m^3)$ .... [2]

7

The diagram shows a regular hexagon *ABCDEF*.
$\overrightarrow{CD} = \mathbf{p}$ and $\overrightarrow{CB} = \mathbf{q}$.

Find $\overrightarrow{CA}$, in terms of **p** and **q**, giving your answer in its simplest form.

★ $\overrightarrow{CA} = \overrightarrow{CD} + \overrightarrow{DA}$

⇒ $\overrightarrow{CA} = p + 2q$

$\overrightarrow{CA} = $ .... $p + 2q$ .... [2]

8 Newton has a population of 23 000.
The population decreases exponentially at a rate of 1.4% per year.

Calculate the population of Newton after 5 years.

★ $A = a\left(1 - \dfrac{r}{100}\right)^t$

⇒ $A = 23\,000\left(1 - \dfrac{1.4}{100}\right)^5$

⇒ A = 21 400 (3 sig. figs.)

.... 21 400 .... [2]

9   $2^p = \dfrac{1}{8^4}$

Find the value of p.

$\Rightarrow 2^p = \dfrac{1}{(2^3)^4}$ $\Rightarrow 2^p = 2^{-12}$

Since the bases are equal,

$\Rightarrow 2^p = \dfrac{1}{2^{12}}$ $\Rightarrow p = -12$

$p = \underset{\textstyle -12}{\dots\dots\dots\dots\dots\dots}$ [2]

10   y is inversely proportional to x.
     When $x = 9$, $y = 8$.

     Find y when $x = 6$.

* $y \propto \dfrac{1}{x}$ Finding k   * When $x = 6$,

$\Rightarrow y = \dfrac{k}{x}$ $\Rightarrow 8 = \dfrac{k}{9}$ $\Rightarrow y = \dfrac{72}{6}$

$\Rightarrow k = 72$ $\Rightarrow y = 12$

$y = \underset{\textstyle 12}{\dots\dots\dots\dots\dots\dots}$ [3]

11   Dev makes 600 cakes.
     18% of the 600 cakes go to a hotel and $\frac{2}{3}$ of the 600 cakes go to a supermarket.

     Calculate how many cakes he has left.

* $N = 600 - \left(\dfrac{18}{100} \times 600\right) - \left(\dfrac{2}{3} \times 600\right)$

$\Rightarrow N = 600 - 108 - 400$

$\Rightarrow N = 92$

$\underset{\textstyle 92}{\dots\dots\dots\dots\dots\dots}$ [3]

12   **Without using your calculator**, work out $\frac{7}{8} + \frac{1}{6}$.

You must show all your working and give your answer as a mixed number in its simplest form.

$$\Rightarrow \frac{21+4}{24}$$

$$\Rightarrow \frac{25}{24} = 1\frac{1}{24}$$

.... $1\frac{1}{24}$ .... [3]

13   Solve the simultaneous equations.
You must show all your working.

$$2x + \frac{1}{2}y = 13 \quad -(1)$$
$$3x + 2y = 17 \quad -(2)$$

$(1) \times 3 : 6x + 1.5y = 39 - (3)$

$(2) \times 2 : 6x + 4y = 34 - (4)$

$(4) - (3) : 2.5y = -5$

$y = -2$

Put y in (2)

★ $3x + 2(-2) = 17$

$\Rightarrow 3x - 4 = 17$

$\Rightarrow 3x = 21$
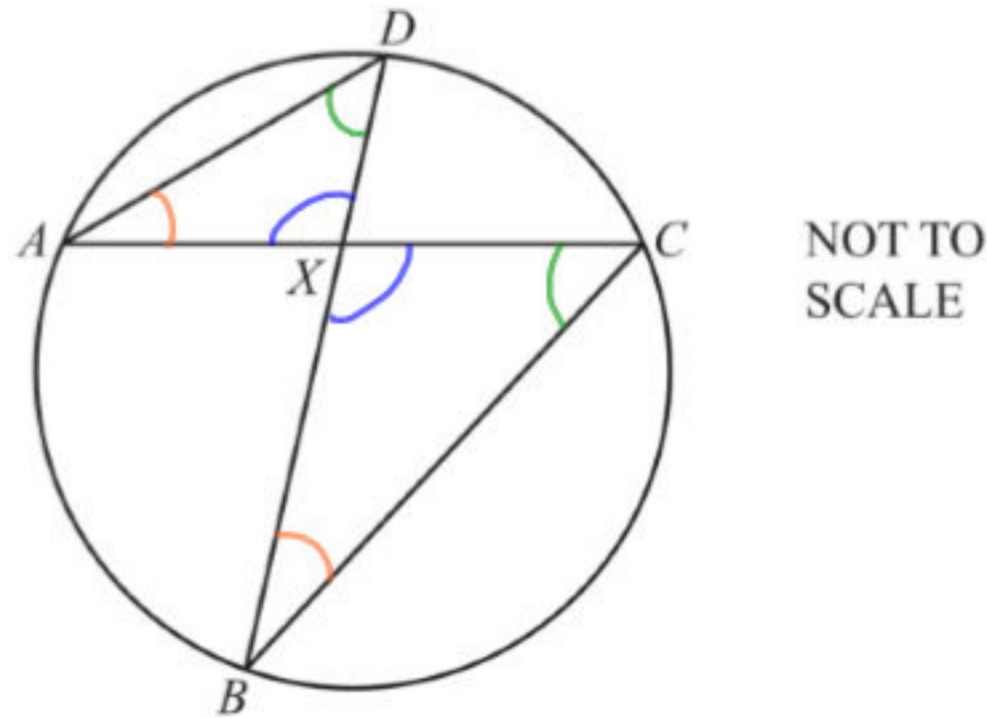
$\Rightarrow x = 7$

$x =$ .... 7 ....

$y =$ .... -2 .... [3]

14

NOT TO SCALE

A, B, C and D are points on the circumference of the circle.
AC and BD intersect at X.

(a) Complete the statement.

Triangle ADX is .... **similar** .... to triangle BCX. [1]

(b) The area of triangle ADX is $36\,cm^2$ and the area of triangle BCX is $65.61\,cm^2$.
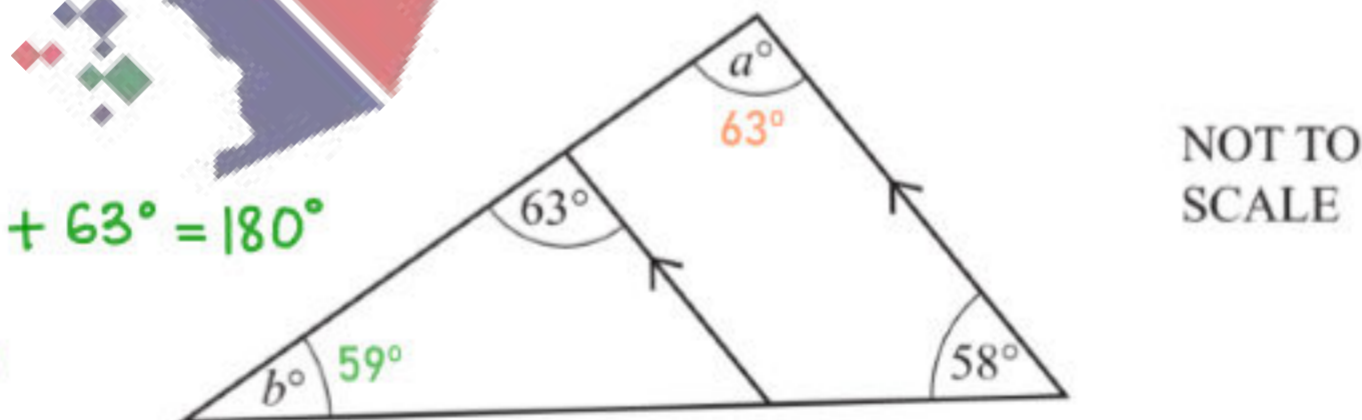$AX = 8.6\,cm$ and $DX = 7.2\,cm$.

Find BX.

$$* \left(\frac{BX}{8.6\,cm}\right)^2 = \frac{65.61\,cm^2}{36\,cm^2}$$

$$\Rightarrow BX = \sqrt{\frac{65.61}{36}} \times 8.6\,cm$$

$$\Rightarrow BX = 11.61\,cm$$

$BX = $ ....**11.61**................ cm [3]

15

NOT TO SCALE

$* \; b + 58° + 63° = 180°$

$\Rightarrow b = 59°$

Complete the statements.

$a = $ ....**63**............... because **corresponding angles are equal.**

....

$b = $ ....**59**............... because **angles in a triangle add up to 180°.**

.... [4]

16

NOT TO SCALE

1.6 m

2.8 m
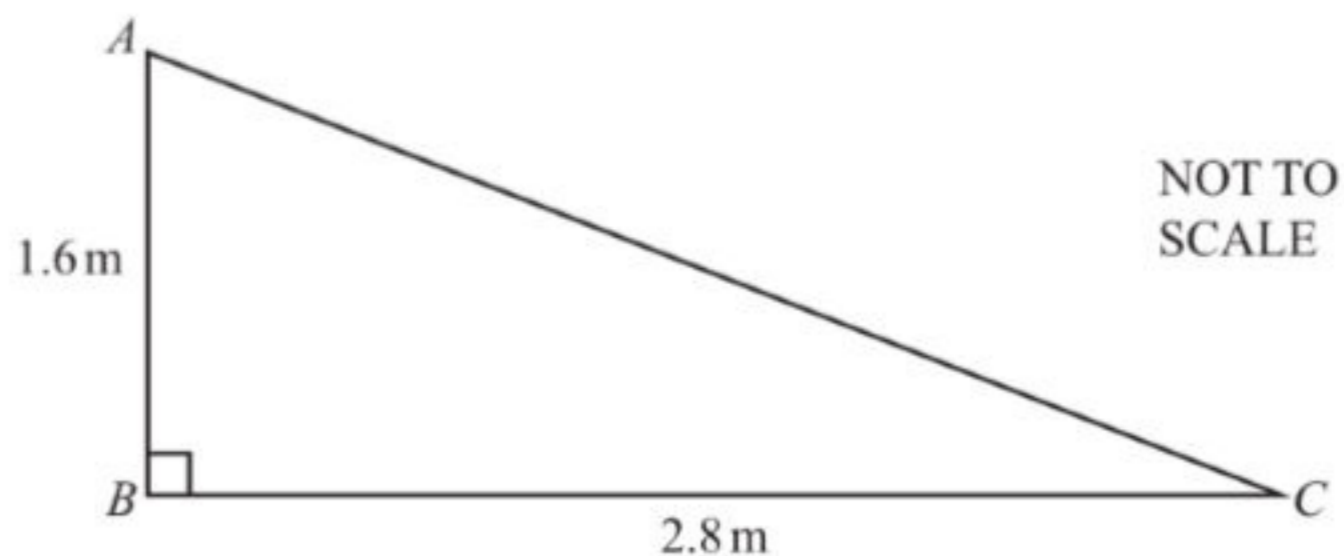
(a) Find the area of triangle *ABC*.

$\ast\ A = \frac{1}{2} \times b \times h$

$\Rightarrow A = \frac{1}{2} \times 2.8m \times 1.6m$

$\Rightarrow A = 2.24m^2$

.... 2.24 .... m² [2]

(b) Calculate *AC*.

$\ast\ AC^2 = AB^2 + BC^2$

$\Rightarrow AC = \left(\sqrt{1.6^2 + 2.8^2}\right)m$

$\Rightarrow AC = 3.22m$ (3 sig. figs)

AC = ... 3.22 .... m [2]

17 Solve the equation $2x^2 + 7x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$\Rightarrow x = \dfrac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2(2)}$

$\Rightarrow x = \dfrac{-7 \pm \sqrt{73}}{4}$
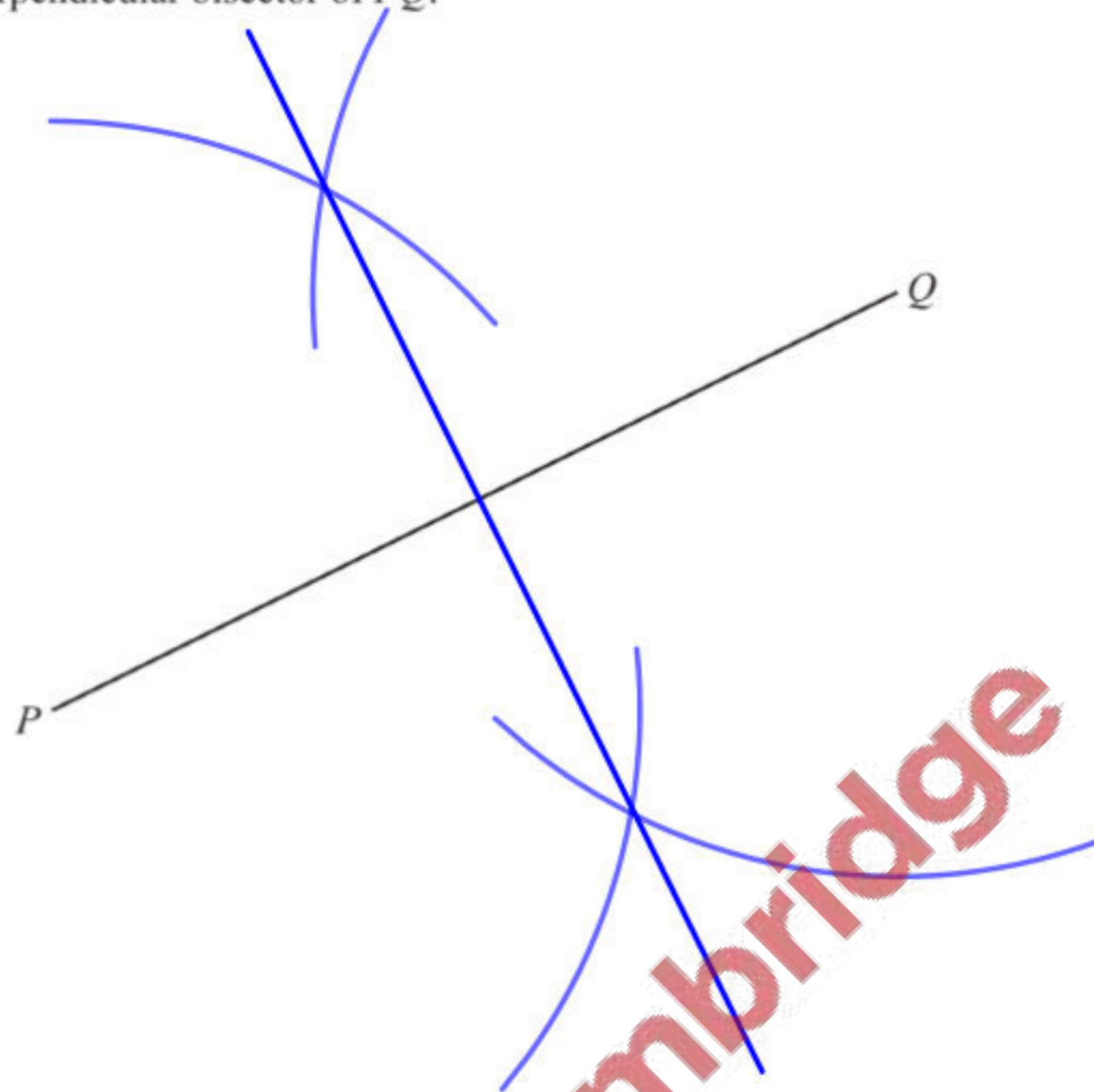
$x_1 = \dfrac{-7 + \sqrt{73}}{4}$ 　　$x_2 = \dfrac{-7 - \sqrt{73}}{4}$

$x_1 = 0.39$ (2dp)　　$x_2 = -3.89$ (2dp)

$x =$ .... 0.39 .... or $x =$ .... -3.89 .... [4]
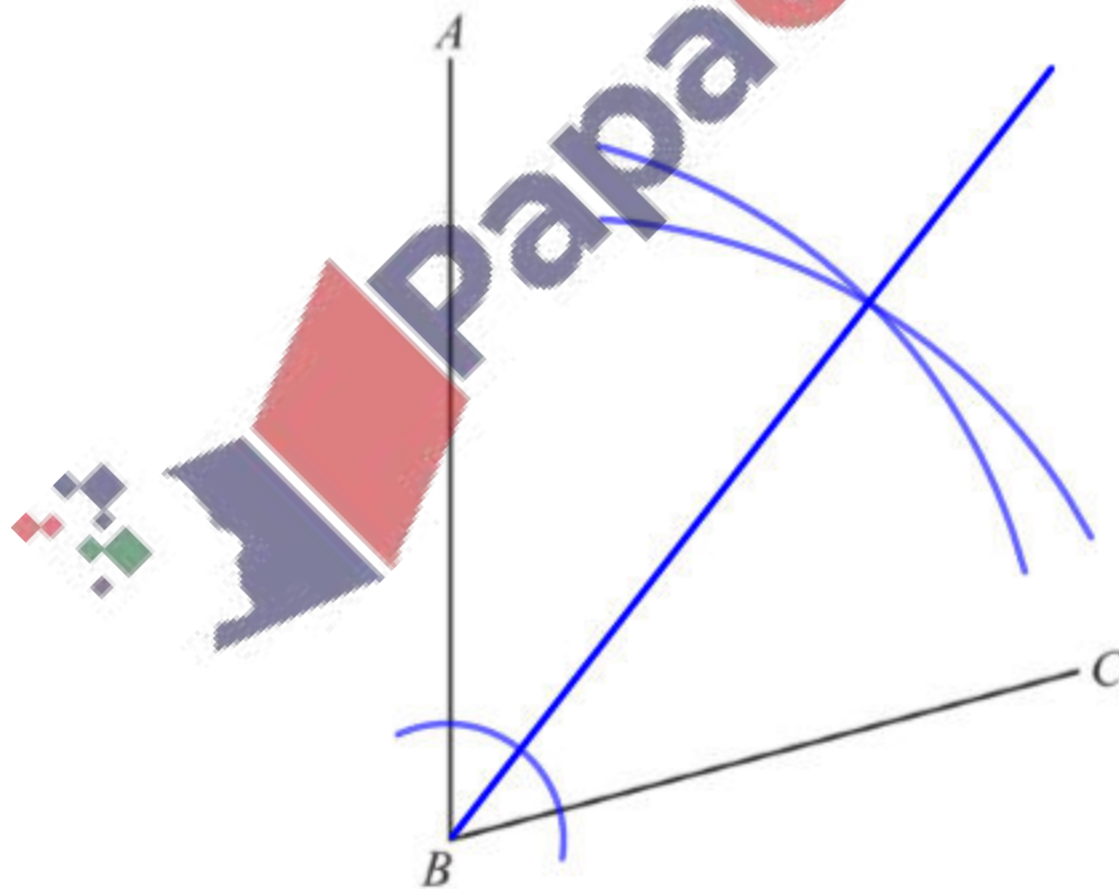
18 In this question, **use a straight edge and compasses only** and show all your construction arcs.

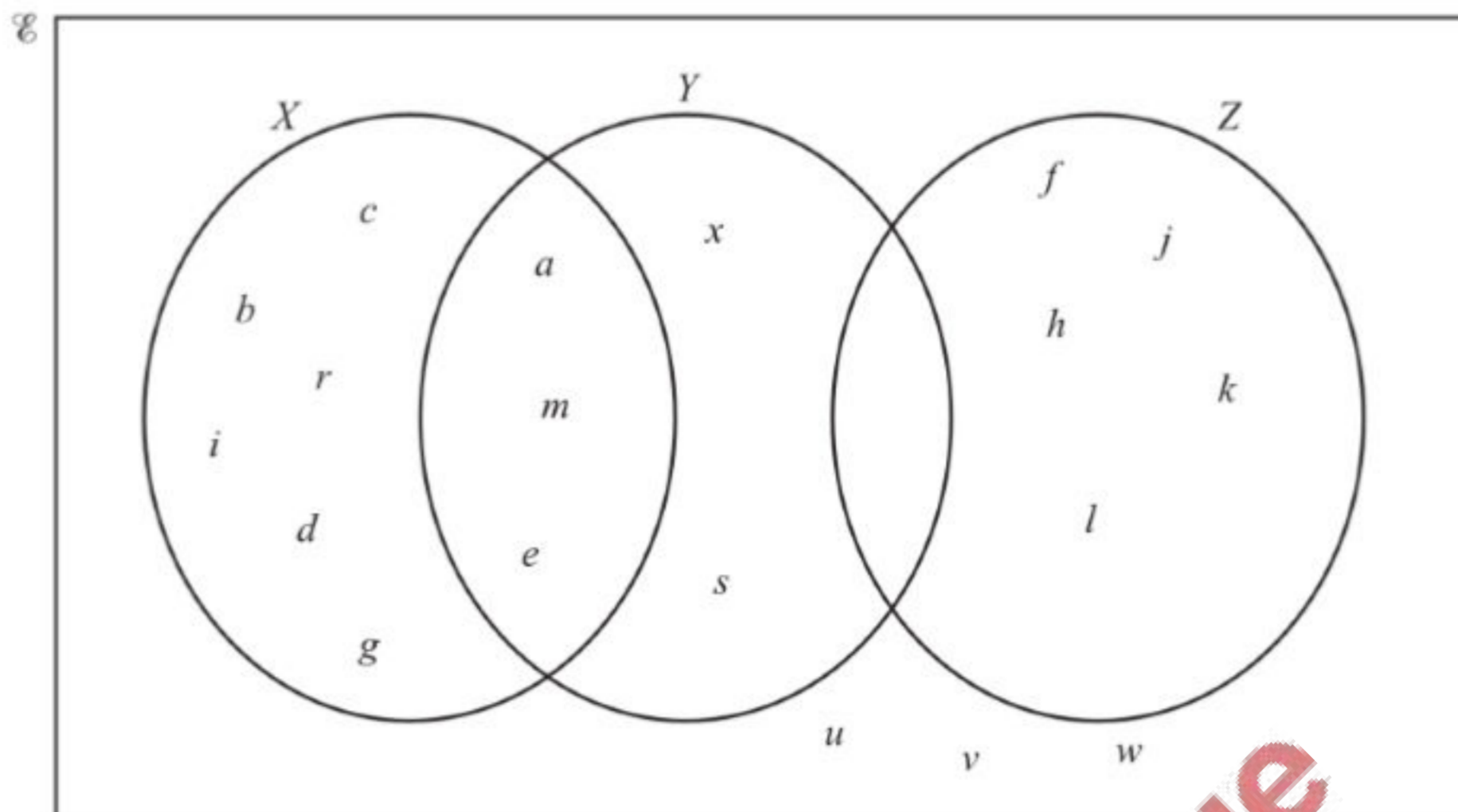**(a)** Construct the perpendicular bisector of *PQ*.

[2]

(b) Construct the bisector of angle *ABC*.

[2]

19

(a) Use set notation to complete the statements for the Venn diagram above.

(i) c ....$\in$......... X [1]

(ii) ....$X \cap Y$......... $= \{\, a, m, e \,\}$ [1]

(iii) $Y \cap Z =$ ....$\emptyset$......... [1]

(b) List the elements of $(X \cup Y \cup Z)'$.

.........u, v, w......... [1]

(c) Find $n(X' \cap Z)$.

.........5......... [1]

20
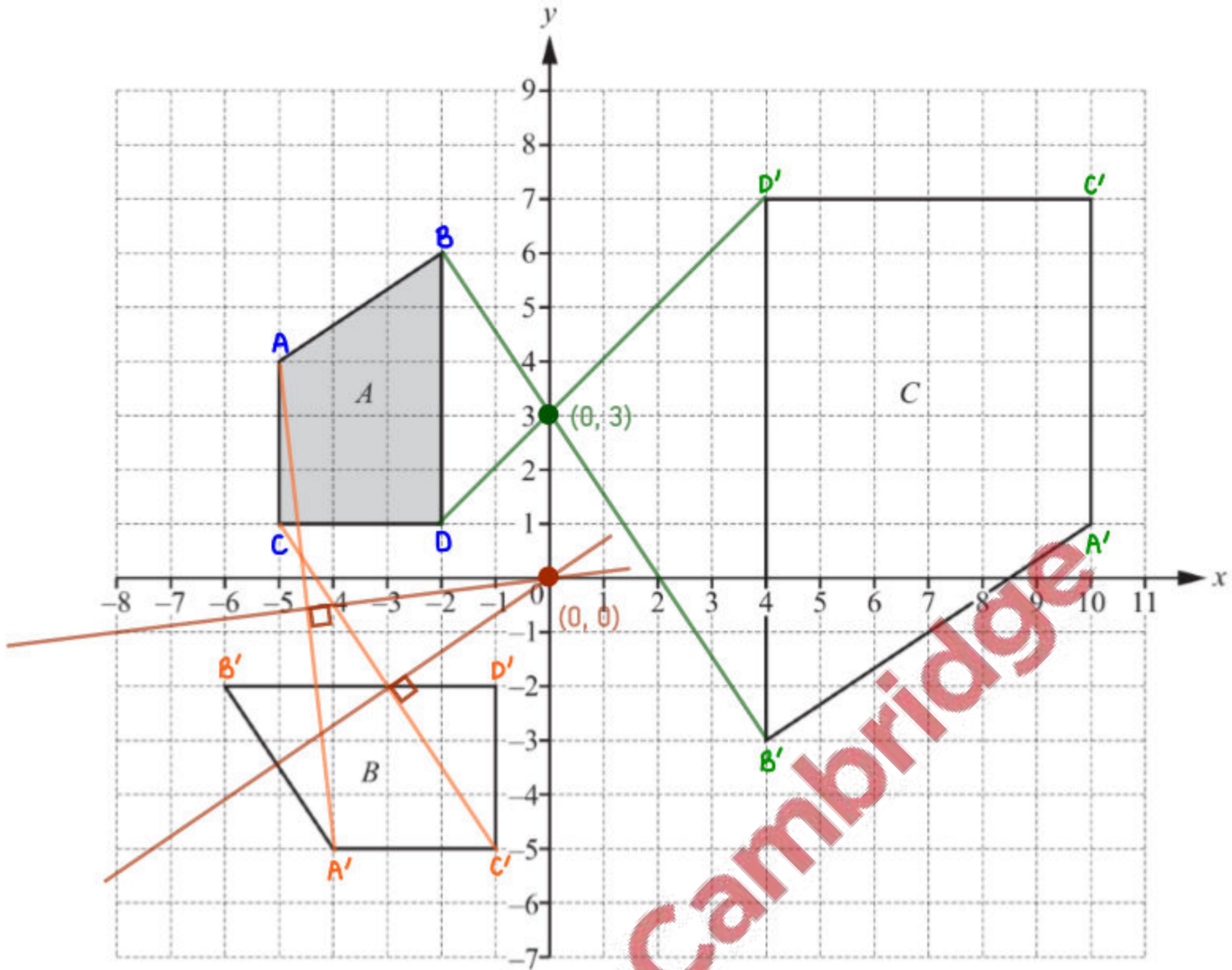
Describe fully the **single** transformation that maps

(a) shape *A* onto shape *B*,

Rotation 90° anti-clockwise about the origin

.... [3]

(b) shape *A* onto shape *C*

Enlargement by a scale factor of –2 about the centre (0, 3)

.... [3]

21 $f(x) = 7 - x$ $g(x) = 4x + 2$ $h(x) = 15 - x^2$

(a) Find ff(2).

$\cdot \; f(2) = 7 - 2 = 5$

$\cdot \; f(5) = 7 - 5 = 2$

...........................2........................... [2]

(b) Find gf(x) in its simplest form.

$\star \; gf(x) = 4(7 - x) + 2$

$\qquad = 28 - 4x + 2$

$\qquad = 30 - 4x$

.... $30 - 4x$ .... [2]

(c) Find h(2x) in its simplest form.

$\star \; h(2x) = 15 - (2x)^2$

$\qquad = 15 - 2^2 x^2$

$\qquad = 15 - 4x^2$

.... $15 - 4x^2$ .... [2]

Question 22 is printed on the next page.

22 Samira and Sonia each have a bag containing 20 sweets.
    In each bag, there are 5 red, 6 green and 9 yellow sweets.

(a) Samira chooses one sweet at random from her bag.

Write down the probability that she chooses a yellow sweet.

$$\star\ P(Y) = \frac{n(Y)}{n(Total)} = \frac{9}{20}$$

$$\frac{9}{20}$$ .... [1]

(b) Sonia chooses two sweets at random, without replacement, from her bag.

(i) Show that the probability that she chooses two green sweets is $\frac{3}{38}$.

$$\star\ P = P(G)\ and\ P(G)$$

$$\Rightarrow P = \frac{6}{20} \times \frac{5}{19}$$

$$\Rightarrow P = \frac{3}{38}$$

[2]

(ii) Calculate the probability that the sweets she chooses are **not** both the same colour.

$$\star\ P = 1 - [P(R\ and\ R)\ or\ P(G\ and\ G)\ or\ P(B\ and\ B)]$$

$$\Rightarrow P = 1 - \left[\left(\frac{5}{20} \times \frac{4}{19}\right) + \left(\frac{6}{20} \times \frac{5}{19}\right) + \left(\frac{9}{20} \times \frac{8}{19}\right) \right]$$

$$\Rightarrow P = \frac{129}{190}$$

$$\frac{129}{190}$$ .... [4]