OCR

Oxford Cambridge and RSA

H

Thursday 7 November 2019 – Morning

GCSE (9–1) Mathematics

J560/05 Paper 5 (Higher Tier)

Time allowed: 1 hour 30 minutes

You may use:
• geometrical instruments
• tracing paper

Do not use:
• a calculator

J56005

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number ☐☐☐☐☐   Candidate number ☐☐☐☐

First name(s) _____

Last name _____

INSTRUCTIONS
• Use black ink. You may use an HB pencil for graphs and diagrams.
• Answer **all** the questions.
• Read each question carefully before you start to write your answer.
• Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
• Write your answer to each question in the space provided.
• Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).

INFORMATION
• The total mark for this paper is **100**.
• The marks for each question are shown in brackets **[ ]**.
• This document consists of **16** pages.
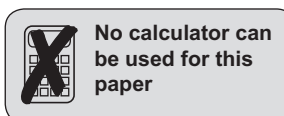
🚫 **No calculator can be used for this paper**

Turn over

Answer **all** the questions.

1 **(a)** Work out.

$$\frac{3}{4} + \frac{1}{6}$$

Give your answer in its simplest form.

(a) .... **[2]**

(b) By writing each number correct to 1 significant figure, use estimation to show that

$$\frac{39.6 \times 20.2}{\sqrt{99.2}} \approx 80.$$ **[3]**

2 Given that $168 = 2^3 \times 3 \times 7$, find the lowest common multiple (LCM) of 168 and 30.

.... **[3]**

3   Martina has answered some questions on algebra.
In each question, she has made an error.

Describe her error and give the correct answer to each problem.

(a) Question 1   Simplify. $2a \times a \times a$

Martina's answer $4a$

Martina's error is ....

....

Correct answer = ... **[2]**

(b) Question 2   Simplify. $\dfrac{x^{10}}{x^2}$

Martina's answer x^5

Martina's error is ....

....

Correct answer = ... **[2]**

(c) Question 3 $s = ut + \frac{1}{2}at^2$

Find s when $u = 0$, $t = 5$ and $a = 6$.

Martina's solution $s = 0 \times 5 + \frac{1}{2} \times 6 \times 5^2$

$s = 0 + 15^2$

$s = 225$

Martina's error is ....

....

Correct answer = ... **[2]**

Turn over

4 In 2017, a chocolate bar had a mass of 250 g.
In 2018, the mass of the chocolate bar was reduced to 220 g.

Work out the percentage decrease in the mass of the chocolate bar from 2017 to 2018.

.... % **[3]**

5 Solve.

$$6x - 10 = 4x + 1$$

$x =$ .... **[3]**

6 Solve by factorising.

$$x^2 + 9x + 20 = 0$$

$x =$ .... or $x =$ .... **[3]**

7 Sundip and Emma have some money.
The ratio of Sundip's money to Emma's money is 3 : 5.
Emma spends £450 of her money.
The ratio of Sundip's money to Emma's money is now 2 : 3.

Find how much money Sundip has.

£ .... **[4]**

Turn over

8 The diagram shows a kite, ABCD.
AFE and CEF are equilateral triangles.

Not to scale
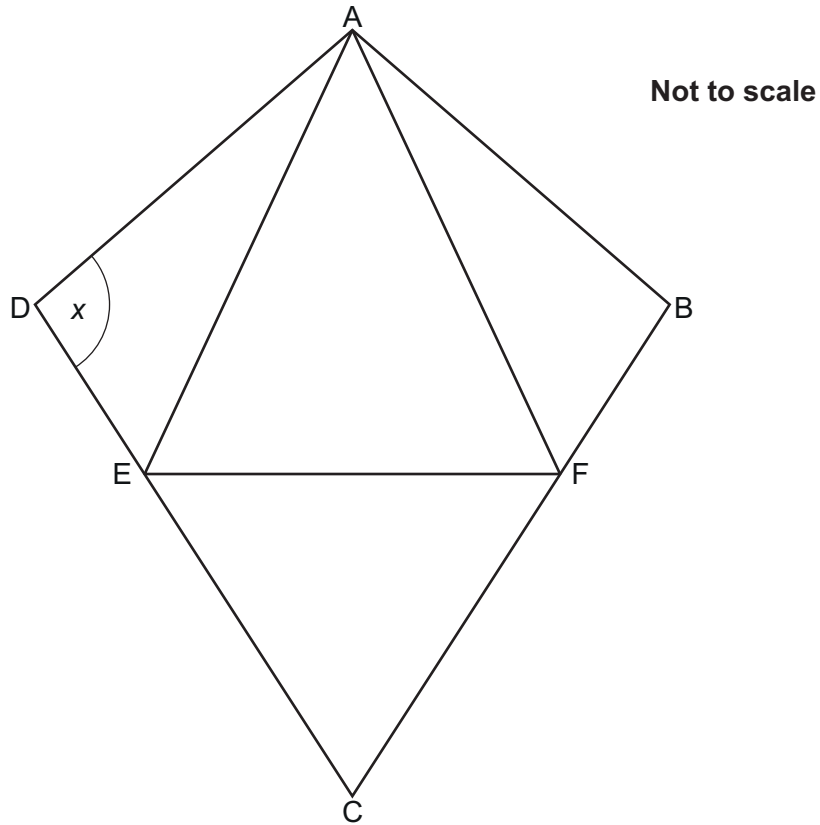
(a) Write down a mathematical name for quadrilateral AFCE.

(a) .... **[1]**

(b) The ratio of angle DAE : angle EAF = 1 : 4.

Work out angle *x*.
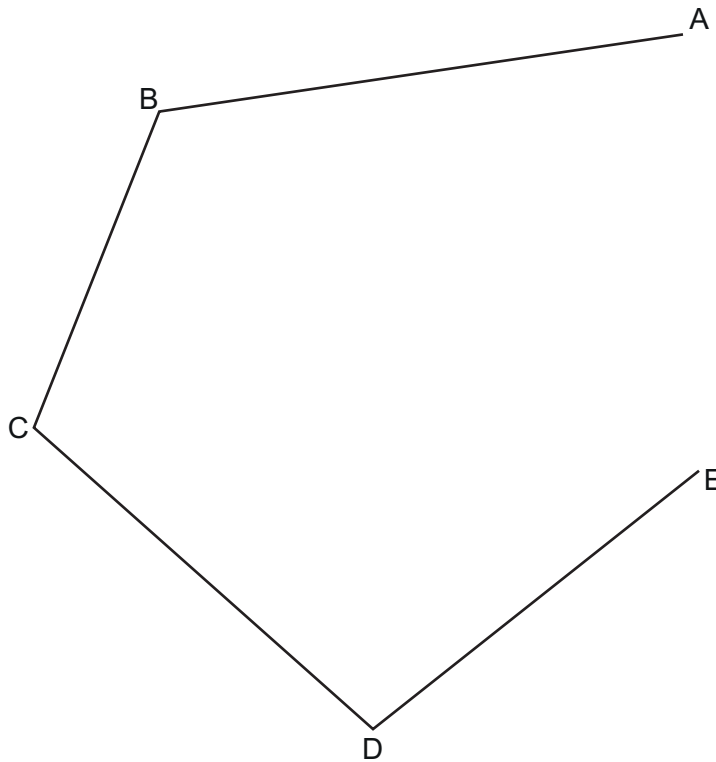Write on the diagram the values of any other angles you use in your working.

(b) *x* = ...° **[4]**

9 **(a)** The scale 1 cm represents 25 m can be written in the form 1 : k.

Find the value of k.

(a) $k =$ .... **[1]**

(b) The scale drawing represents a harbour.

Scale: 1cm represents 25 m

A boat leaves the harbour from point C and sails on a path that is equidistant from BC and CD. The harbour rules do not allow boats to sail within 75 m of point E.

Find by construction whether the path of the boat will follow the harbour rules.
Show all your construction lines.

.... **[5]**

Turn over

10 On a plane, $\frac{2}{5}$ of the passengers were British.

30% of the British passengers were men.
There were 36 British men on the plane.

Find the total number of passengers on the plane.

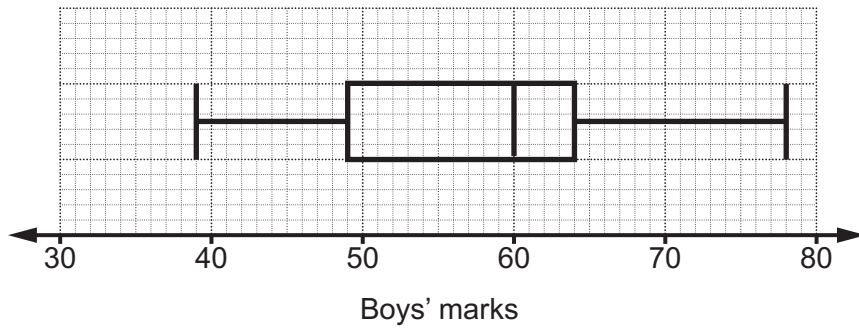.. **[5]**

11 A bag contains 100 pencils that are either red or green.

Describe a method you could use to estimate the number of red pencils in the bag without looking into the bag or having more than one of the pencils out of the bag at any one time.

....

....

....

.... **[4]**

12 The box plot shows the distribution of the marks scored by some boys in a test.

Boys' marks

(a) Find the interquartile range.

(a) .... **[2]**

(b) The marks for some girls in the same test are summarised below.

- median = 58
- lowest mark = 32
- range = 44
- upper quartile = 66
- interquartile range = 12

Draw a box plot to show the distribution of the marks scored by the girls.

Girls' marks
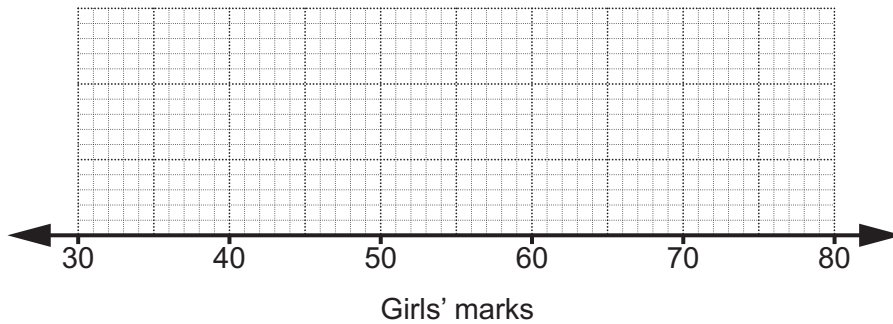
[3]

(c) Eleanor says

The boys did better, on average, in the test as they had a bigger interquartile range.

Is her statement correct?
Explain your reasoning.

....

.... **[2]**

Turn over

13 (a) (i) Write $\dfrac{1}{3}$ as a recurring decimal.

(a)(i) .... **[1]**

    (ii) Write $\dfrac{1}{30}$ as a recurring decimal.

(ii) .... **[1]**

(b) Simplify fully by rationalising the denominator.

$$\dfrac{20}{\sqrt{5}}$$

(b) .... **[3]**

14 y is inversely proportional to the square root of x.
$y = 7$ when $x = 25$.

Find the value of y when $x = 100$.

$y =$ .... **[3]**

15 You may use this coordinate grid to help you answer the following questions.
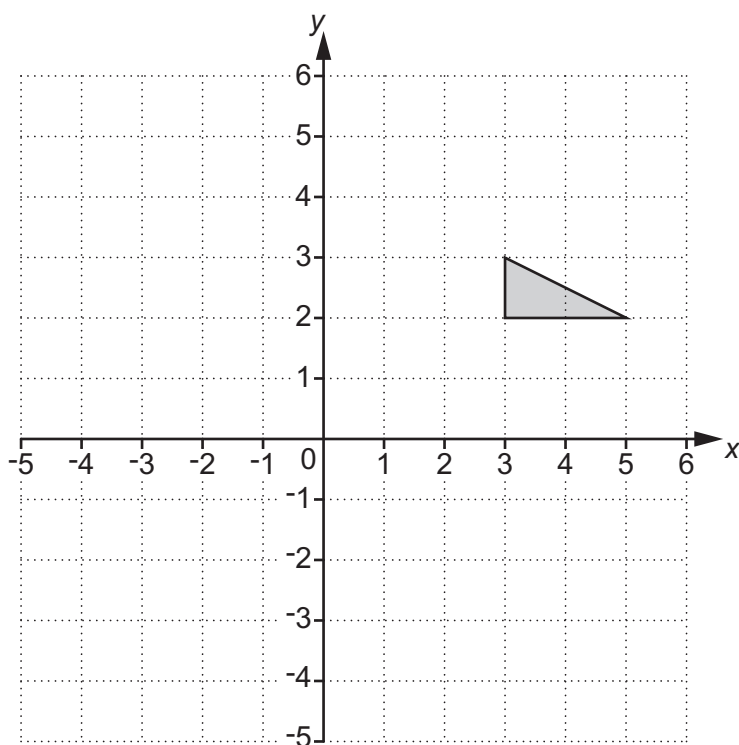
Describe fully the **single** transformation that is equivalent to

(a) a translation of $\begin{pmatrix} -7 \\ 2 \end{pmatrix}$ followed by a translation of $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$,

....

.... **[2]**

(b) a reflection in the line $y = x$ followed by a rotation of 90° clockwise around (0, 0).

....

.... **[3]**

16 50 people attended an outdoor activity day.

- 40 took part in walking.
- 18 took part in sailing.
- 3 did neither activity.

One of the people who walked is chosen at random.

Find the probability that this person also sailed.

.... **[5]**

17 Show that $\sqrt[3]{a^4} \times \dfrac{1}{a}$ can be expressed as $a^{\frac{1}{3}}$. **[3]**

18 The graph of $3y + 6x = 13$ is drawn on the grid.
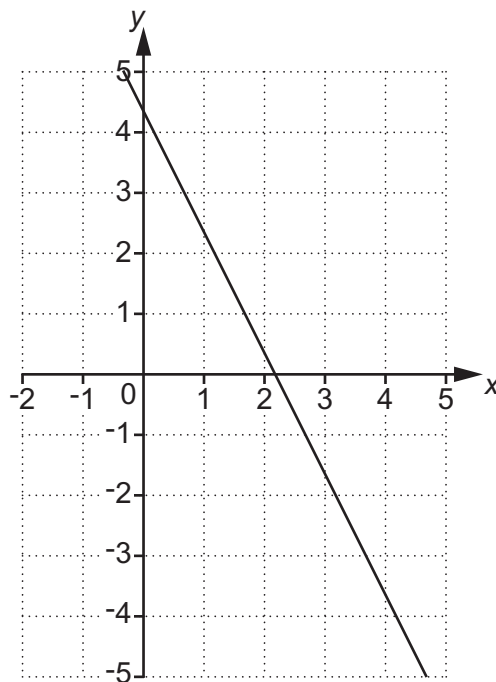
The region R satisfies these inequalities.

$$3y + 6x \geqslant 13 \qquad y \leqslant x - 2 \qquad x > 3$$

By drawing two more straight lines, find and label the region R. **[6]**

19 (a) Write down the value of sin 45°.

(a) .... **[1]**

(b) ADB and BCD are right-angled triangles.
BC = CD.
AD = $10\sqrt{6}$ mm.
Angle BAD = 30°.

$\tan 30° = \dfrac{1}{\sqrt{3}}$
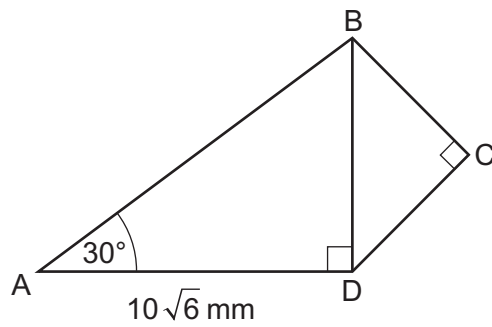
Not to scale

Work out the length of BC.

(b) ....mm **[6]**

20 (a) Write $x^2 - 6x + 11$ in the form $(x - a)^2 + b$.

(a) .... **[3]**

(b) Sketch the graph of $y = x^2 - 6x + 11$.
Show clearly the coordinates of any turning points.
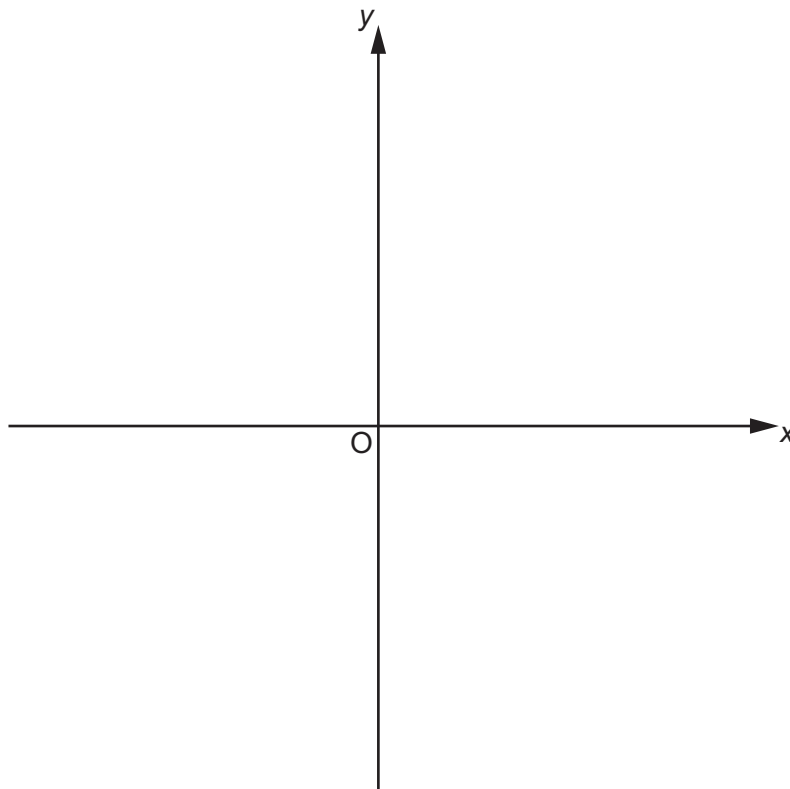
[3]

Turn over for Question 21

Turn over

21 In this question all units are in cm.

A circle has equation $x^2 + y^2 = 36$.

(a) Write down the radius and centre of the circle.

(a) radius: .... cm

centre: (............................, ...) **[2]**

(b) The distinct points A $(a, \sqrt{11})$ and B $(b, \sqrt{11})$ lie on the circumference of the circle.

Work out the length AB.

(b) .... cm **[4]**

END OF QUESTION PAPER