OCR
Oxford Cambridge and RSA

H

GCSE (9–1) Mathematics
J560/05 Paper 5 (Higher Tier)
Sample Question Paper

Date – Morning/Afternoon
Time allowed: 1 hour 30 minutes

You may use:
* Geometrical instruments
* Tracing paper

Do not use:
* A calculator

First name	
Last name	

| Centre number						Candidate number				

INSTRUCTIONS
* Use black ink. You may use an HB pencil for graphs and diagrams.
* Complete the boxes above with your name, centre number and candidate number.
* 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).
* Do **not** write in the bar codes.

INFORMATION
* The total mark for this paper is **100**.
* The marks for each question are shown in brackets **[ ]**.
* This document consists of **20** pages.

2

Answer **all** the questions

1 (a) Here is a coordinate grid.
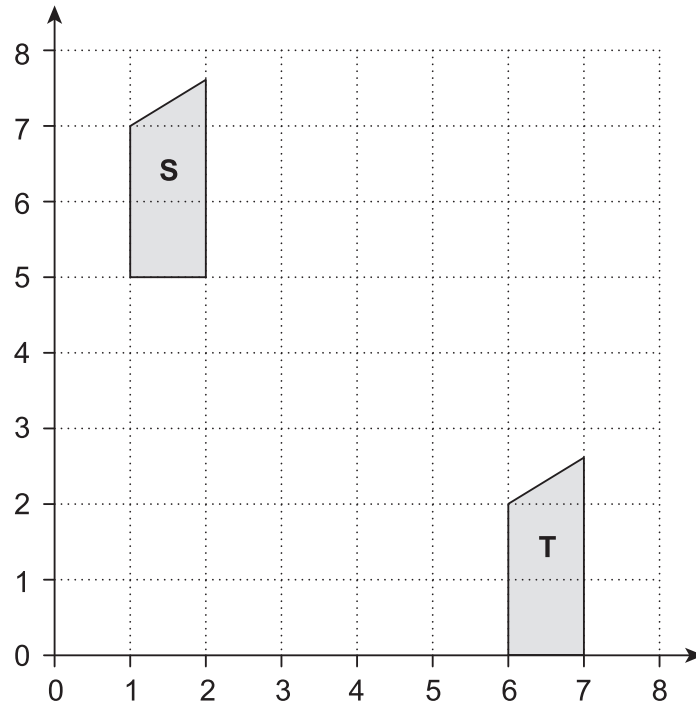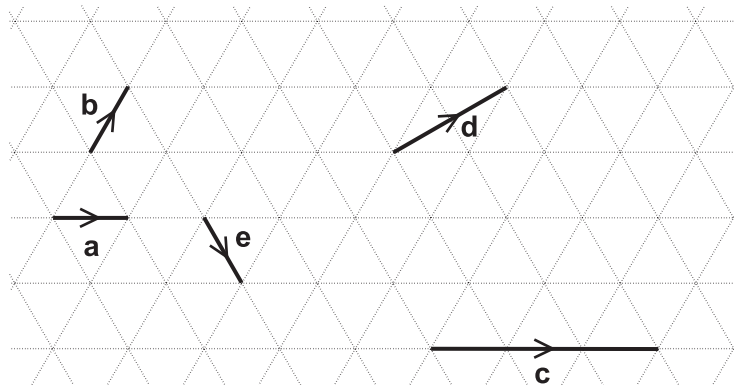

Shape S is translated to Shape T using vector $\begin{pmatrix} p \\ q \end{pmatrix}$.

Write down the values of p and q.

(a) $p =$ ....

$q =$ .... **[2]**

(b) Vectors **a**, **b**, **c**, **d** and **e** are drawn on an isometric grid.

Write each of the vectors **c**, **d** and **e** in terms of **a** and/or **b**.

c = ...

d = ...

e = ...

[3]

2 Sam and two friends put letters in envelopes on Monday.
The three of them take two hours to put 600 letters in envelopes.

(a) On Tuesday Sam has three friends helping.

Working at the same rate, how many letters should the **four** of them be able to put in envelopes in two hours?

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

(b) Working at the same rate, how much longer would it take **four** people to put 1000 letters in envelopes than it would take **five** people?

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

(c) Sam says

It took two hours for three people to put 600 letters in envelopes.
If I assume they work all day, then in one day three people will put 7200 letters in envelopes because $600 \times 12 = 7200$.

Why is Sam's assumption not reasonable?
What effect has Sam's assumption had on her answer?

....

.... **[2]**

3 Abi, Ben and Carl each drop a number of identical drawing pins, and count how many land with the pin upwards. The table shows some of their results.

	Number of pins dropped	Number landing 'pin up'
Abi	10	4
Ben	30	9
Carl	100	35

(a) Abi says

> As a drawing pin can only land with its pin up or with its pin down, the probability of a drawing pin landing 'pin up' is $\frac{1}{2}$.

Criticise her statement.

....

.... **[1]**

(b) Carl's results give the best estimate of the probability of a drawing pin landing 'pin up'. Explain why.

....

.... **[1]**

(c) Two pins are dropped.

Estimate the probability that both pins land 'pin up'.

(c) .... **[2]**

4 John is going to make chocolate squares to sell.

There are just three ingredients, chocolate, peanut butter and crisped rice, mixed in the ratio 4 : 2 : 3 respectively.

(a) How much of each ingredient will he need to make 900 g of mixture?

(a) chocolate .... g

peanut butter .... g

crisped rice .... g

[2]

(b) A bar of chocolate weighs 200 g and costs £2.50.
A jar of peanut butter contains 250 g and costs £1.70.
A packet of crisped rice contains 300 g and costs £2.00.

John makes 4.5 kg of mixture, from which he can cut 100 chocolate squares.
He charges 60p for each square and sells all 100 squares.

How much **profit** does he make?

(b) £ .... **[5]**

5 The perimeter of the triangle is the same length as the perimeter of the square.
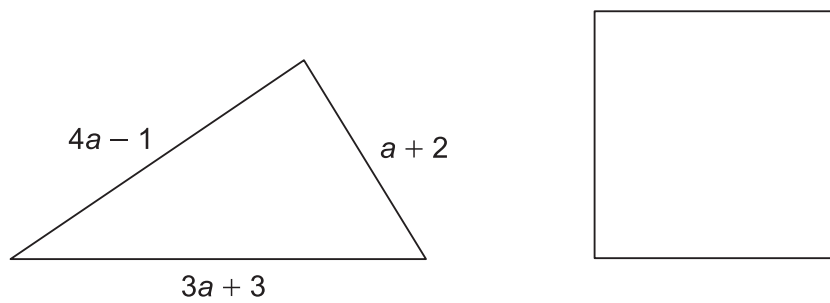
Find an expression for the length of one side of the square in terms of *a*.
Give your answer in its simplest form.

.... **[4]**

6 A bag contains only red and blue marbles.

Yasmine takes one marble at random from the bag.
The probability that she takes a red marble is $\frac{1}{5}$.

Yasmine returns the marble to the bag and adds five more red marbles to the bag.
The probability that she takes one red marble at random is now $\frac{1}{3}$.

How many marbles of each colour were originally in the bag?

.... red marbles

.... blue marbles

[3]

7   The lengths of the sides of two squares are integers, when measured in cm.
    The difference between the areas of the two squares is $36\,cm^2$.

    Find the lengths of the sides of the two squares.

    .... cm

    .... cm

    [3]

8   Safety rules on a campsite require Sarah to set up her barbecue at least 4 m from her tent.
    She decides to measure this distance using her stride length.
    Sarah knows that her stride length is 0.8 m, rounded to the nearest 0.1 m.

    Find the minimum number of strides Sarah will need to take to **guarantee** that her barbecue is a
    safe distance from her tent.

    .... **[3]**

9 A sculptor needs to lift a piece of marble.
It is a cuboid with dimensions 1 m by 0.5 m by 0.2 m.
Marble has a density of 2.7 g/cm^3.
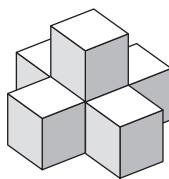The sculptor's lifting gear can lift a maximum load of 300 kg.

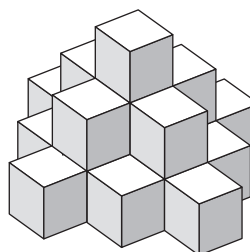Can the lifting gear be used to lift the marble?
Justify your decision.

....

.... **[4]**

10 Here is a picture of three towers.
Not all the cubes can be seen in the towers.
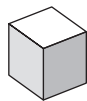
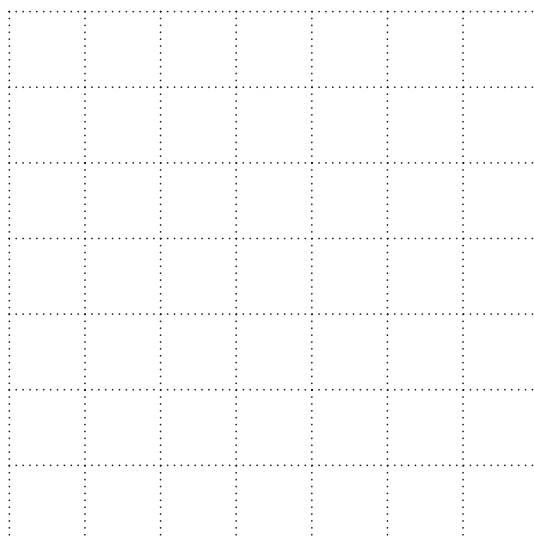Tower 1   Tower 2   Tower 3

Edith uses 1 cube to build tower 1.
Edith uses 6 cubes to build tower 2. There are 5 cubes on the bottom layer.

(a) Write down the total number of cubes in tower 3.

(a) .... [1]

(b) Draw a plan view of the arrangement of cubes Edith will use for the bottom layer of tower 4.

[1]

(c) Continue this sequence to show the number of cubes used for the bottom layer of each tower.

Tower 1	Tower 2	Tower 3	Tower 4
1	5	....	....

[2]

(d) Find an expression for the number of cubes used in the bottom layer of tower n.

(d) .... [4]

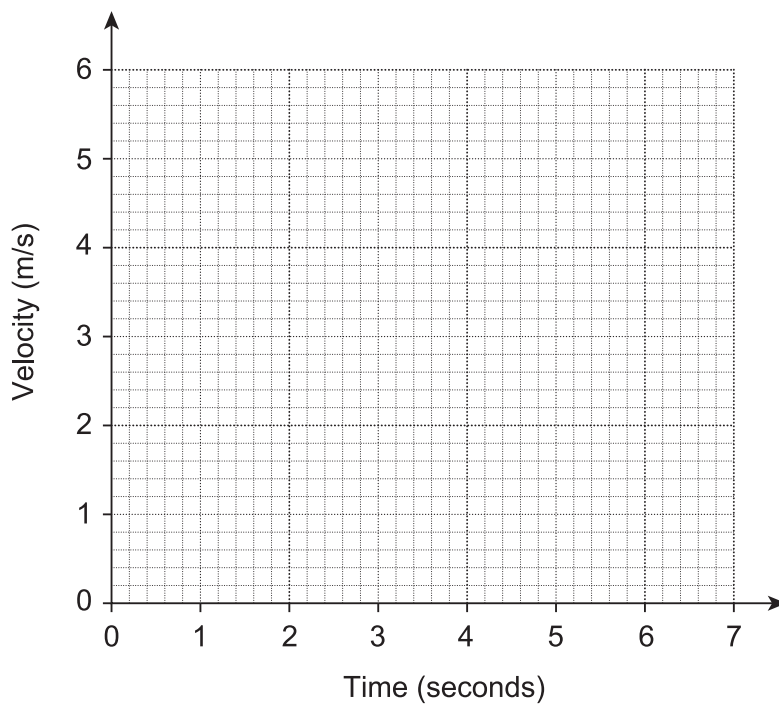**11** A toy car is placed on the floor of a sports hall.

It moves in a straight line starting from rest.
It travels with constant acceleration for 4 seconds reaching a velocity of 5 m/s.
It then slows down with constant deceleration of 1 m/s² for 2 seconds.
It then hits a wall and stops.
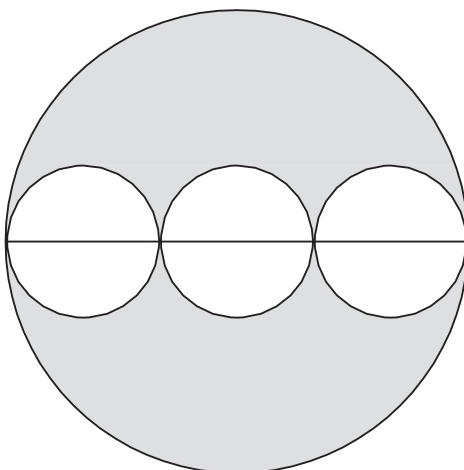
(a) Draw a velocity-time graph for the toy car.

[3]

(b) Work out the total distance travelled by the toy car.

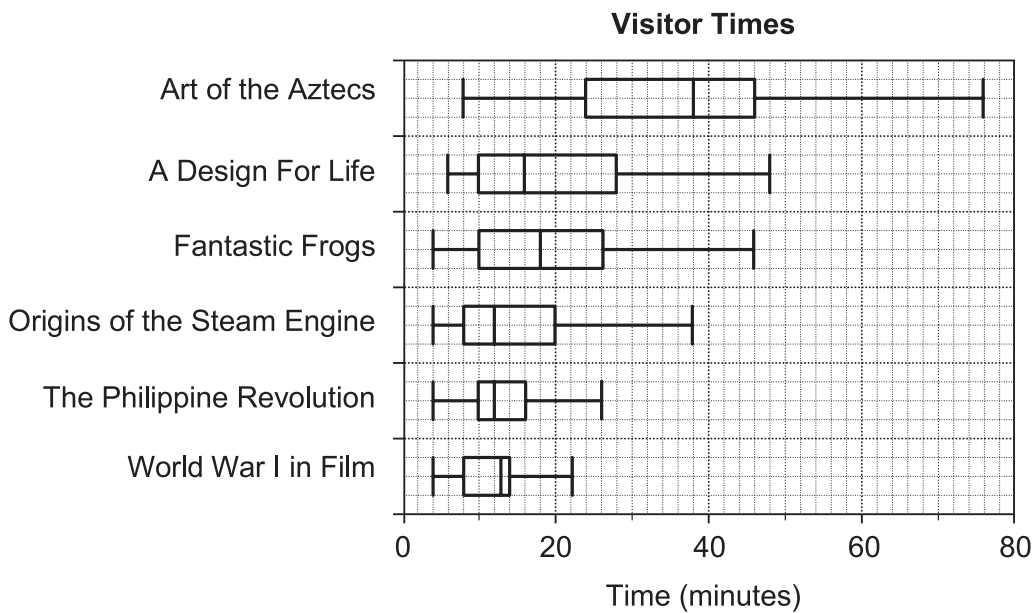**(b)** .... m **[3]**

12 Three identical small circles are drawn inside one large circle, as shown in the diagram.
The centres of the small circles lie on the diameter of the large circle.

Find the fraction of the large circle that is shaded.

.... **[3]**

13 One day a museum monitored the time spent by visitors at six exhibitions.
The visitor times are summarised in the box plots below.

Visitor Times

(a) Work out the **range** in visitor times at the **Fantastic Frogs** exhibition.

(a) .... [2]

(b) At which exhibition were visitor times the most consistent?
Give a reason for your answer.

....

....

.... [2]

(c) Give one similarity and one difference between the **distributions** of the visitor times for **Origins of the Steam Engine** and **The Philippine Revolution**.

Similarity ....

....

Difference ....

....

[2]

(d) Is it possible to work out from the box plots which exhibition had the most visitors? Justify your answer.

....

....

....

.... **[2]**

14 Show that line $3y = 4x - 14$ is perpendicular to line $4y = {}^{-}3x + 48$. **[4]**

15 **(a)** Write this list of numbers in order, smallest first.

$$\sqrt{35}, \quad \frac{20}{3}, \quad 2.5^2, \quad 6.83$$

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

smallest

(b) Write $(1 + \sqrt{3})^2$ in the form $a + b\sqrt{3}$.

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

16 Bethany says that $(2x)^2$ is always greater than or equal to $2x$.

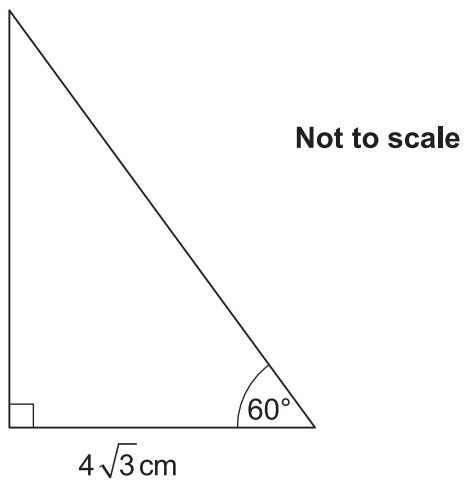Decide whether she is correct or not.
Show your working to justify your decision. **[3]**

17 (a) Write down the exact value of tan 60°.

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

(b) Find the exact area of this triangle.

Not to scale

$4\sqrt{3}$ cm

60°

(b) .... cm^2 **[4]**

18 P, Q, R and S are the midpoints of OX, XY, YZ and OZ respectively.
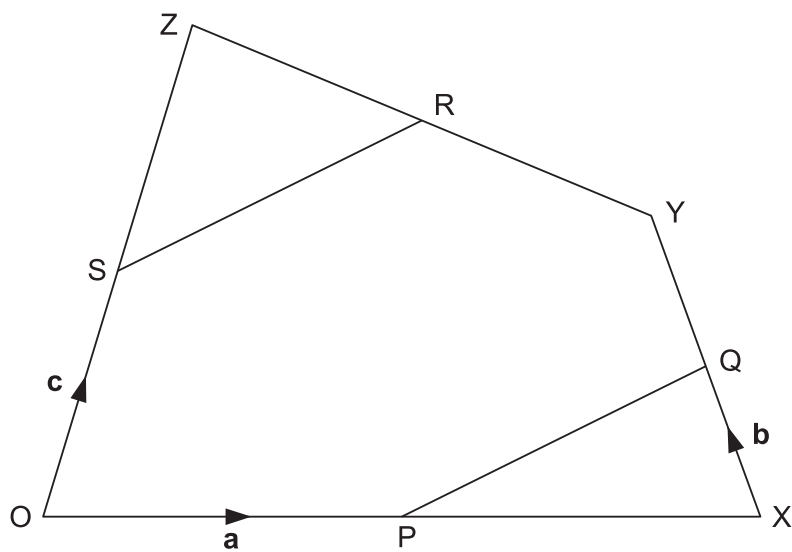
$\overrightarrow{OP} = \mathbf{a}$, $\overrightarrow{XQ} = \mathbf{b}$ and $\overrightarrow{OS} = \mathbf{c}$.

Show that PQ is parallel to SR. **[5]**

19 The prices of two phones are in the ratio $x : y$.

When the prices are both increased by £20, the ratio becomes 5 : 2.
When the prices are both reduced by £5, the ratio becomes 5 : 1.

Express the ratio $x : y$ in its lowest terms.

.... : .... **[6]**

20 (a) Find the interval for which $x^2 - 7x + 10 \leqslant 0$.

(a) .... $\leqslant x \leqslant$ .... **[3]**

(b) The point ($^-3$, $^-4$) is the turning point of the graph of $y = x^2 + ax + b$, where a and b are integers.

Find the values of a and b.

(b) $a =$ .... $b =$ .... **[3]**