OCR
Oxford Cambridge and RSA

H

Tuesday 7 June 2022 – Morning
GCSE (9–1) Mathematics
J560/05 Paper 5 (Higher Tier)

Time allowed: 1 hour 30 minutes

You must have:
- the Formulae Sheet for Higher Tier (inside this document)

You can use:
- geometrical instruments
- tracing paper

Do not use:
- a calculator

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space, use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method even if your answer is wrong.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
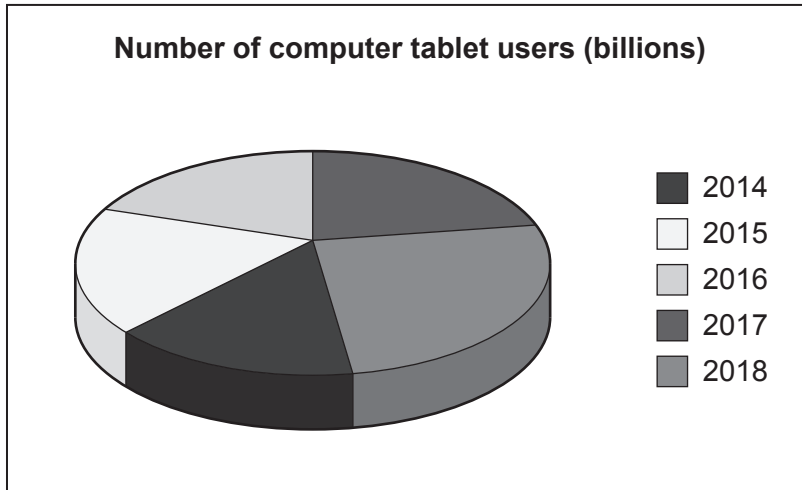- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

Turn over

Answer **all** the questions.

1 Two pupils are given data that shows the estimated number of computer tablet users worldwide from 2014 to 2018.
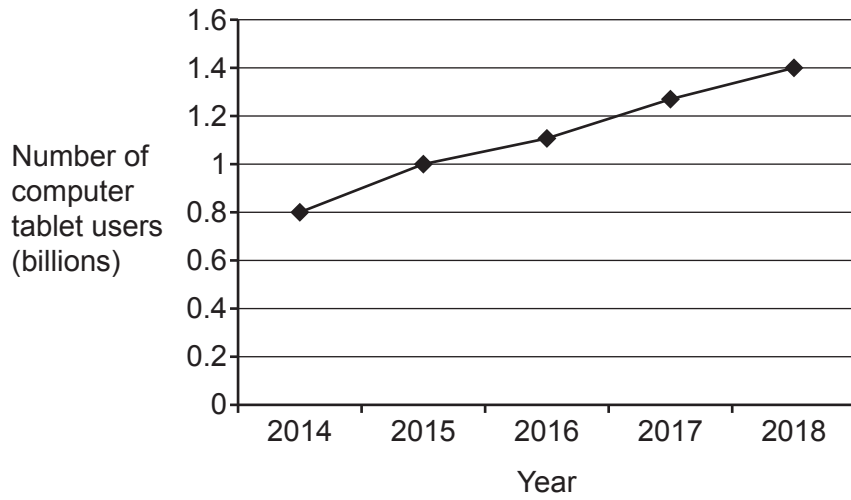
(a) Li creates this pie chart to show the data.

Number of computer tablet users (billions)

- 2014
- 2015
- 2016
- 2017
- 2018

Write down two reasons why Li's pie chart is not suitable to represent the data.

1 ....

....

2 ....

....

[2]

(b) Amaya creates this line graph to show the same data.

Work out the percentage increase in the number of computer tablet users from 2014 to 2018.

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

2   The scale diagram below shows the position of two castles, J and K.

Scale: 1 cm represents 2 km

North

↑

K•

North

↑

J•

The bearing of a tower from castle J is 072°.
The bearing of the tower from castle K is 116°.

Use construction to find the distance from castle J to the tower.
Give your answer to the nearest 0.1 km.

.... km **[4]**

3 Dinosaurs first appeared on Earth 2.4×10^8 years ago.
Dinosaurs became extinct on Earth 7×10^7 years ago.

(a) Explain why it is appropriate to use standard form for these numbers.

....

....

.... **[1]**

(b) Use the given information to work out how long dinosaurs existed on Earth.
Give your answer in standard form.

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

Turn over

4 **(a)** Complete this statement by writing the missing power in the box.

$$784 = 2^{\boxed{}} \times 7^2$$

[1]

(b) Use your answer to part **(a)** to find the value of $\sqrt{784}$.

(b) .... [2]

5 Recipes measure small quantities in teaspoons and tablespoons.
3 teaspoons is equivalent to 1 tablespoon.

A cake recipe uses $\frac{3}{4}$ of a teaspoon of salt and 1 tablespoon of baking powder.

The ratio of salt to baking powder used in the recipe can be written in the form 1 : *n*.

Find the value of *n*.

n = ... **[3]**

Turn over

6 Morgan is playing a computer game.
They can score 0, 1, 2 or 3 points on each turn.
They record their scores for 100 turns.
The table shows the relative frequencies of their scores.

Score	0	1	2	3
Relative frequency	0.08	0.42	0.38	

(a) Complete the table. **[2]**

(b) Morgan says

I scored more than 160 points **in total** in my 100 turns.

Is Morgan correct?
Show how you decide.

.... **[4]**

7 **(a)** A car accelerates at $4.06 \, \text{m/s}^2$ for 10.1 seconds from an initial velocity of $2.93 \, \text{m/s}$.

Harper rounds each value to 1 significant figure.
Harper uses the rounded values and the formula

$$s = ut + \frac{1}{2}at^2$$

to estimate the distance travelled in the 10.1 seconds.
Harper's answer is 430 metres.

Using Harper's method, show that their answer is wrong. **[4]**

(b) Rearrange this formula to make t the subject.

$$s = \frac{1}{2}at^2$$

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

8   A bag only contains red marbles, blue marbles and yellow marbles.

- The probability of picking a red marble is $\frac{2}{5}$.
- There are nine yellow marbles.
- The probability of picking a blue marble is three times as likely as picking a yellow marble.

Work out the **total** number of marbles in the bag.
You must show your working.

.... **[5]**

9 The diagram shows the scale drawing of a sandpit, ABCD.
It also shows the arc of all points in the sandpit that are 80 cm from corner A.

Scale: 1 cm represents 20 cm
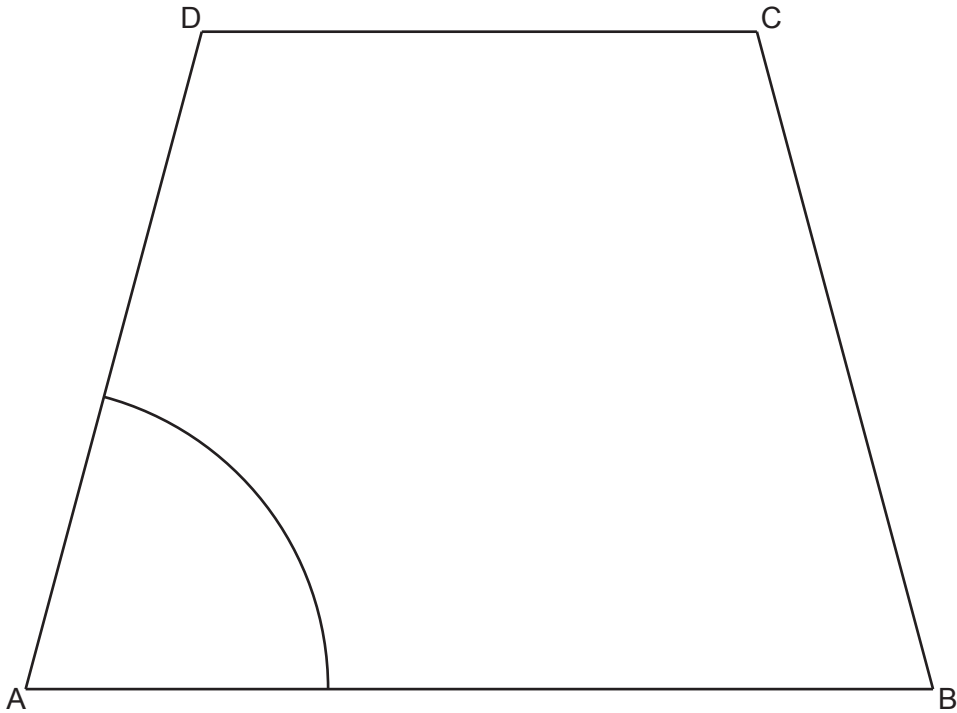
A game is played by throwing a ball into the sandpit.
Points may be scored when the ball lands in the sandpit.

- 1 point if the ball lands within 80 cm of corner A,
  and
- 1 point if the ball is closer to side AB than side AD,
  and
- 1 point if the ball is closer to corner A than corner B.

By completing the construction, find and shade the regions where 2 points can be scored.
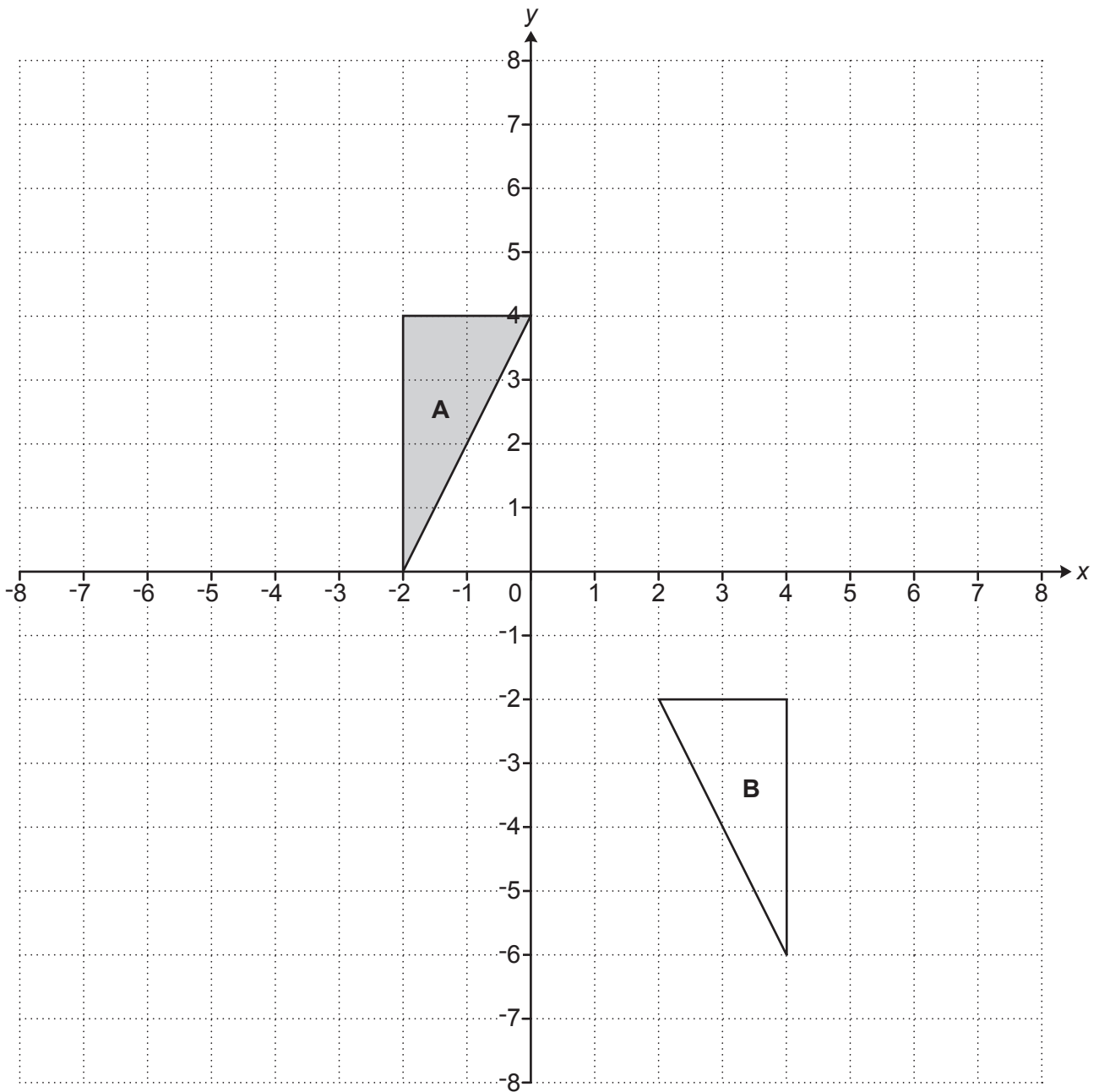Show all your construction lines. **[6]**

Turn over

10 (a) Enlarge triangle **A** with scale factor 1.5 and centre of enlargement (-8, 0).
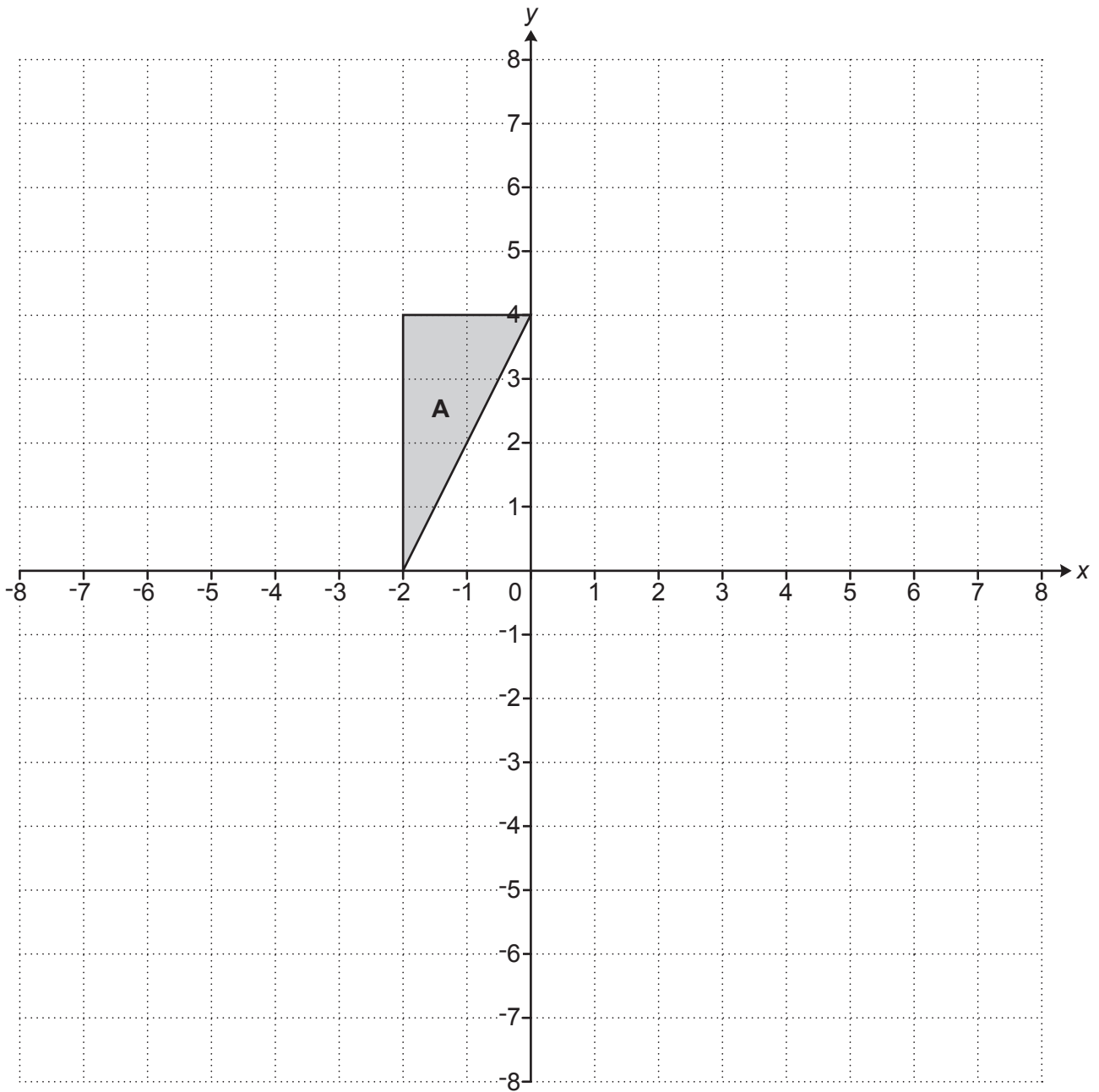
[3]

(b) Triangle **A** and triangle **B** are shown on the coordinate grid below.

Triangle **A** is mapped onto triangle **B** using a combination of two transformations:

- a transformation T, followed by
- a reflection in the *x*-axis.

Describe fully transformation T.

....

.... **[4]**

Turn over

11 y is inversely proportional to x^2.
$y = 9$ when $x = 2$.

Find the value of y when $x = 10$.

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

12 An athlete goes for a training run.
The graph shows their speed as they run.
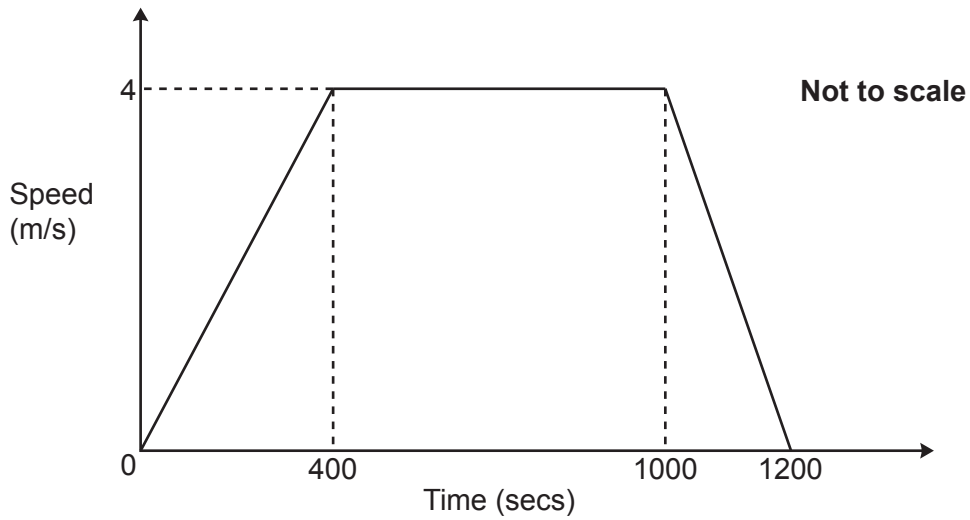
(a) Write down the athlete's acceleration between 400 seconds and 1000 seconds.

(a) .... m/s^2 **[1]**

(b) Work out the athlete's average speed, in m/s, during the 1200 seconds.
You must show your working.

(b) .... m/s **[5]**

Turn over

13 The graph of $y = x^2 + 6x - 2$ is shown below.
The roots of the equation $x^2 + 6x - 2 = 0$ are at p and q.
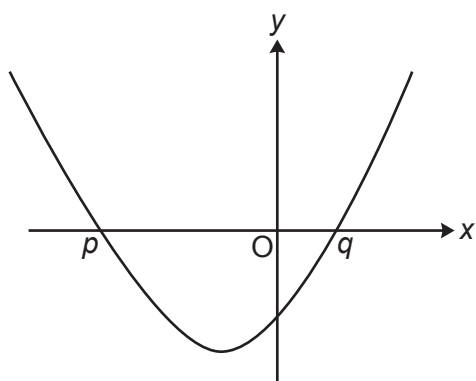
(a) (i) Calculate y when $x = 1$.

(a)(i) $y = $ .... **[1]**

(ii) Without solving the equation, explain why q must lie between 0 and 1.

....

.... **[2]**

(iii) Explain why using a method of iteration is not the most appropriate way of finding a solution to this equation.

....

.... **[1]**

(b) The exact value of q is $\dfrac{^-6 + \sqrt{44}}{2}$.

Write $\dfrac{^-6 + \sqrt{44}}{2}$ in the form $a + \sqrt{b}$.

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

14 In a survey about music, some students were asked whether they like pop (P) and whether they like rap (R).

The Venn diagram shows some of the results.
x students liked both types of music.
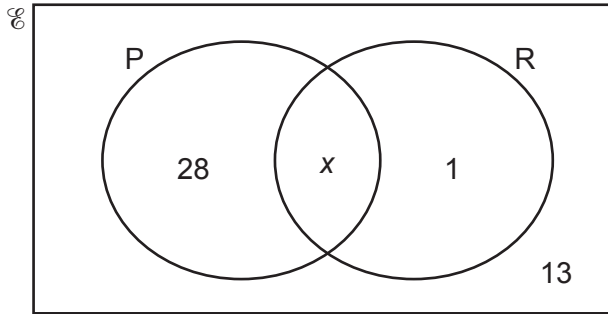
(a) The ratio of the number of students who liked pop to the number who liked rap was 5 : 2.

Work out the **total** number of students in the survey.

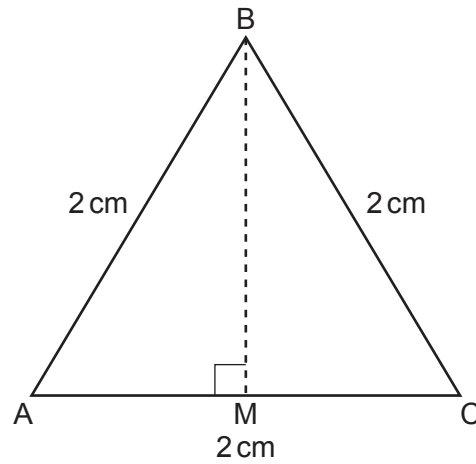(a) .... **[4]**

(b) One of the students is selected at random.

Find the probability that this student does **not** like rap given that they like pop.

(b) .... **[2]**

Turn over

15 ABC is an equilateral triangle of side length 2 cm.
M is the midpoint of AC.

B

Not to scale

2 cm   2 cm

A   M   C
        2 cm

Using this diagram, show that $\tan 30° = \dfrac{1}{\sqrt{3}}$.

[4]

16 Work out $0.\dot{6} \times 0.\dot{5}\dot{4}$ giving your answer as a fraction in its simplest form.
You must show your working.

.... **[5]**

Turn over

17 Charlie is making some wooden frames.
Charlie has a strip of wood 1.6 m long and 2 cm wide.

Not to scale

2 cm $\updownarrow$ [   ]

← 1.6 m →

Each frame will be made from four pieces of wood cut from the strip to form a rectangle, as shown below.

$\updownarrow 2$ cm **Not to scale**

x cm
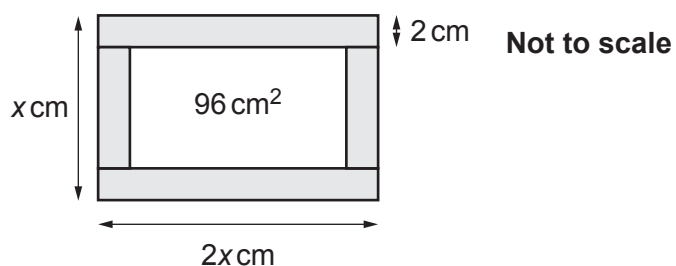
96 cm^2

$2x$ cm

The width of each frame is x cm.
The length of each frame is $2x$ cm.
The area enclosed by each frame must be 96 cm^2.

Work out the maximum number of frames Charlie can make from the 1.6 m length of wood.
You must show your working.

.... **[6]**

18 The diagram shows a shaded shape made by removing sector OAB from sector OCD.
Both sectors have an angle of 60°.
The radius, OA, of the smaller sector is r cm.
The ratio of radius OA to radius OC is 2 : 3.
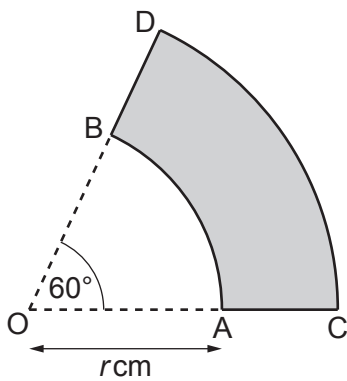
Not to scale

Work out, in terms of π and r, the **total** length of arc AB and arc CD.
Give your answer in its simplest form.
You must show your working.

.... cm **[5]**

19 The graph below shows a circle with centre (0, 0) and equation $x^2 + y^2 = 169$.
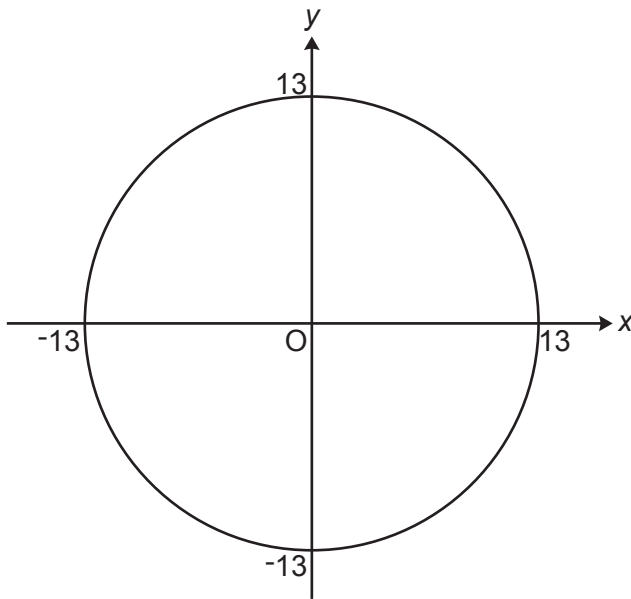
(a) Show that the point (‾12, 5) lies on the circumference of the circle. **[2]**

(b) Find the equation of the tangent to the circle at the point (⁻12, 5), giving your answer in the form $y = mx + c$.

(b) .... **[5]**

END OF QUESTION PAPER

24

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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