For **OCR**

H

GCSE (9–1) Mathematics

Paper 6 (Higher Tier)

Churchill Paper 6E

Time allowed: 1 hour 30 minutes

You may use:
- A scientific or graphical calculator
- Geometrical instruments
- Tracing paper

Name	
Class	

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Write your name and class in the boxes above.
- Answer **all** the questions.
- Read each question carefully before you start 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.

INFORMATION

- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
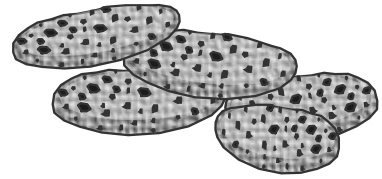- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.

Churchill Maths

Written by Shaun Armstrong

1 Here are the ingredients for a recipe to make 30 cookies.

225 g butter
110 g caster sugar
270 g plain flour
85 g chocolate chips

(a) Work out the weight of the raw ingredients in one cookie.

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

(b) Jack has 180 g of plain flour and plenty of the other ingredients.

Work out how many cookies Jack could make.

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

Here are the prices for the cookie ingredients in Jill's local supermarket.

Butter   85 p for 250 g
Caster sugar   £2.45 for 2 kg
Plain flour   £1 for 1.5 kg
Chocolate chips 80 p for 100 g

(c) Jill is going to make cookies every week. That means she will never waste any of the ingredients that she buys.

Work out how much the ingredients cost Jill for each cookie she makes.

Give your answer in pence to 1 decimal place.

(c) .... p **[3]**

2 75 students from Year 10 and Year 11 go on a camping trip.

33 of the students are in Year 11.
37 of the students are boys.
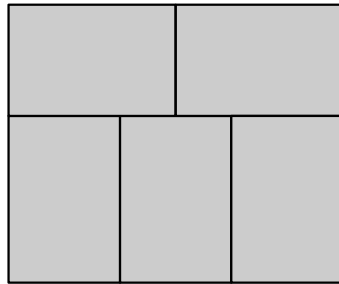13 of the students are boys are in Year 11.

One of the students is chosen at random to be camp leader.

Work out the probability that the student is a Year 10 girl.

.... **[4]**

3 Bobby is playing with plastic rectangles.
Each rectangle measures 6 cm by 4 cm.

He takes 5 of the rectangles and arranges them into a larger rectangle like this.

Not to scale

Bobby then moves two of the rectangles to make a different large rectangle like this.
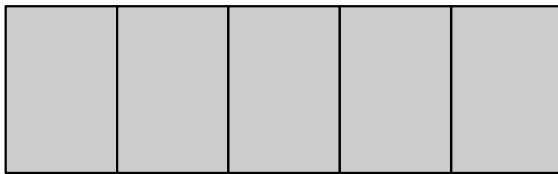
The two larger rectangles have different perimeters.

Work out the percentage change in the perimeter as a result of the change Bobby made.

State clearly whether the change is an increase or decrease.

.... **[4]**

4

Mrs. Bugle's House

A
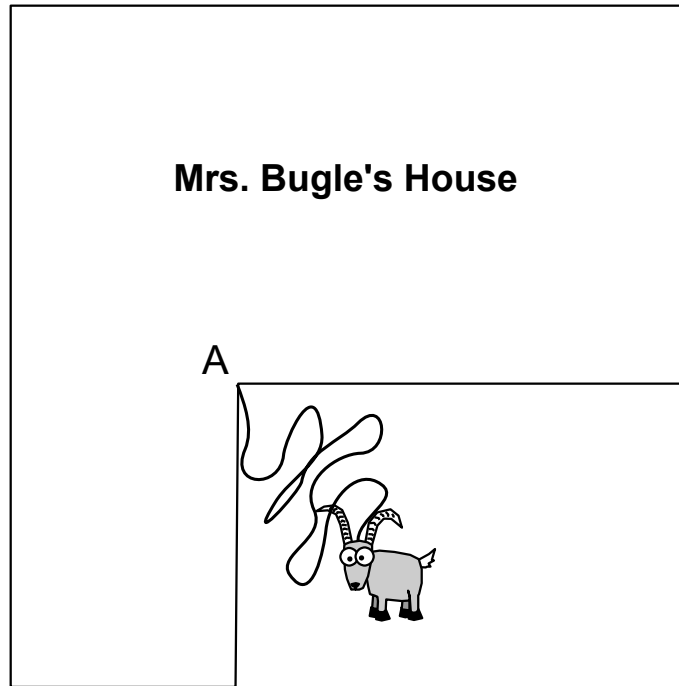
Scale: 1 : 100

The map shows Mrs Bugle's house using a scale of 1 : 100

Mrs. Bugle owns a goat called Billy.
There is grass all around the house which Billy likes to graze on.
However, he is tethered to the corner of the house labelled A by a 10 metre long rope.

Construct the region of grass that Billy is able to reach.

[4]

5
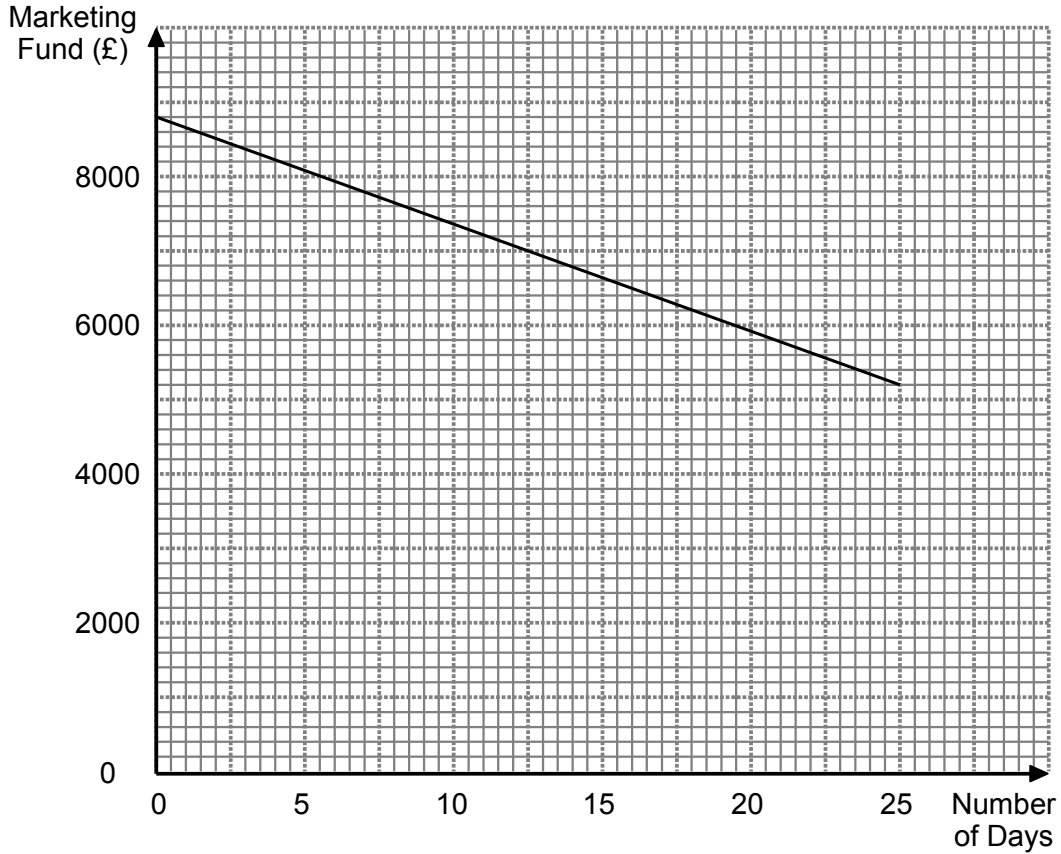
The graph shows the amount of money in a charity's marketing fund and the number of days since it launched an appeal.

(a) How much money was in the marketing fund at the start of the appeal?

(a) £ .... [1]

(b) Find the gradient of the graph.

(b) .... [2]

(c) Explain what this gradient represents.

....

.... [1]

Money will not be added to the marketing fund until after the appeal.

(d) **(i)** Work out how many days in total the appeal can run for.

(d)(i) .... days **[2]**

(ii) State an assumption you have made in your answer to part **(i)**.

....

.... **[1]**

6 70% of the animals that visit a pet grooming salon are dogs.

75% of the dogs that visit come back within one month.

40% of the other animals that visit come back within one month.

Work out the percentage of all the animals that visit the salon that come back within one month.

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

7   Three friends, Ayyub, Bran and Curtis, each have some mini chocolate eggs.

Bran has 1 more egg than Ayyub.
Curtis has 50% more eggs than Bran.
Altogether, Ayyub, Bran and Curtis have 48 chocolate eggs.

Curtis gives eggs to each of Ayyub and Bran so that they all have the same number of eggs.

Work out how many eggs Curtis gives away in total.

.... **[5]**

8   **(a)**   Explain why the median of five odd numbers will always be an odd number.

....

....

.... **[2]**

   (b)   Pat says

   The mean of five even numbers is always an even number.

   Is she correct?

   You must justify your answer.

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

© Churchill Maths Limited
Licensed to Thomas Telford School

9

Not to scale
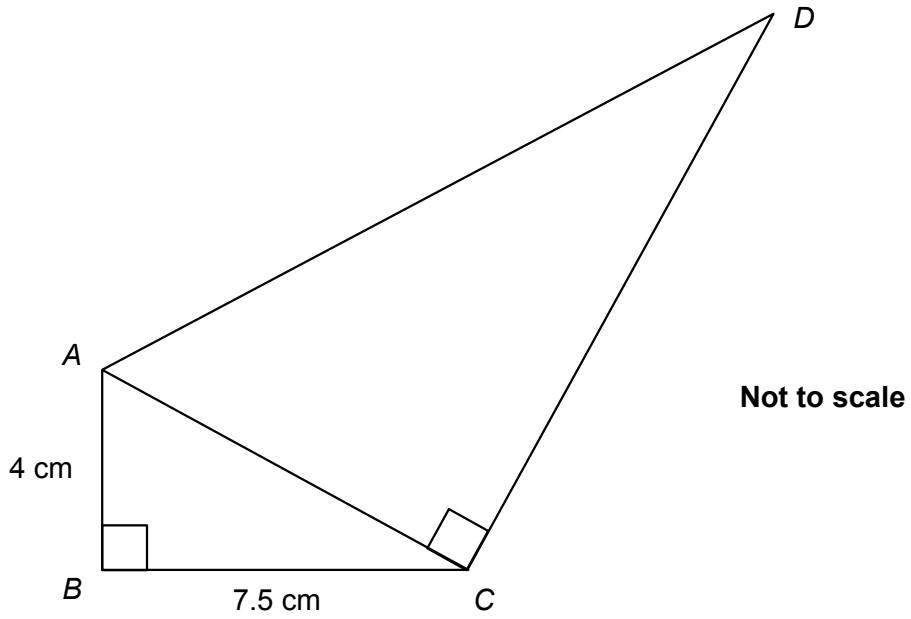
Triangle *ACD* is similar to triangle *ABC*.

Angle *ACD* = angle *ABC* = 90º.

AB = 4 cm and *BC* = 7.5 cm.

Work out the area of quadrilateral *ABCD*, giving your answer correct to 3 significant figures.

.... cm² **[5]**

10 *p* and *q* are both prime numbers.

(a) Faruq says

2*p* + 1 will always be a prime number.

Show that Faruq is not correct.

[2]

(b) Graham says

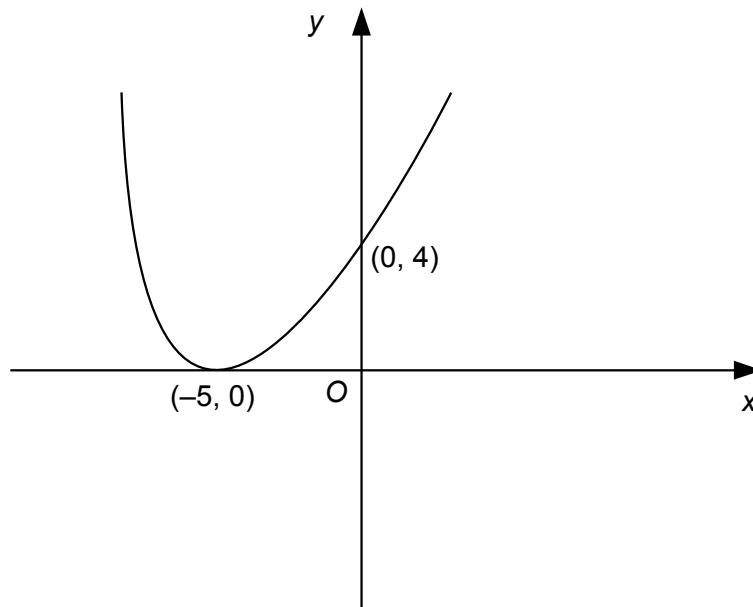If *p* and *q* are both greater than 2 then *pq* + 1 cannot be a prime number.

Prove that Graham is correct.

[3]

11 A sketch of the graph $y = f(x)$ is shown on each diagram below.
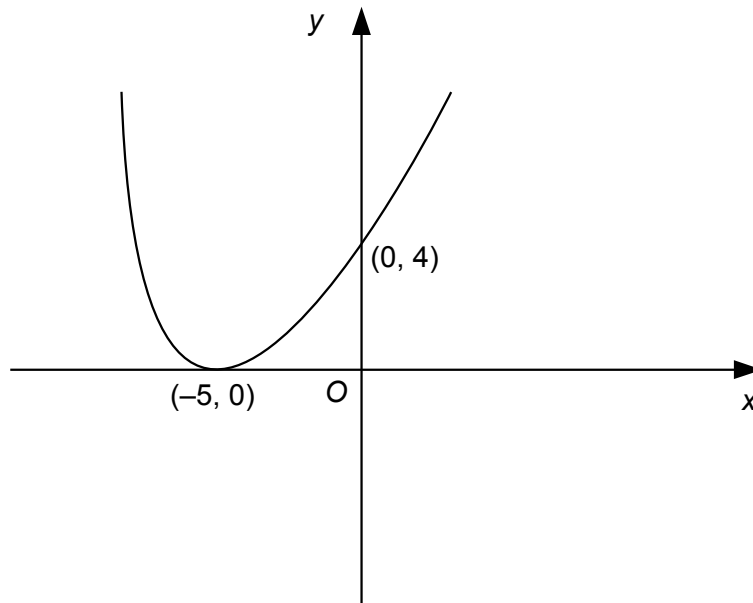
(a)

On the diagram above, sketch the graph of $y = f(x - 5)$.

[2]

(b)

On the diagram above, sketch the graph of $y = f(-x)$.

[1]

© Churchill Maths Limited
Licensed to Thomas Telford School

12 John and Gemma are asked to solve the equation $x(x + 4) = x + 10$

(a) Here is John's working.

$$x(x + 4) = x + 10$$

$$x = \frac{x + 10}{x + 4}$$

$$x = \frac{\cancel{x} + 10}{\cancel{x} + 4}$$

$$x = \frac{10}{4}$$

$$x = 2.5$$

John has made a mistake.

Circle his mistake and **explain why** it is a mistake.

....

....

.... **[2]**

(b) Here is Gemma's working.

$$x(x + 4) = x + 10$$

$$x^2 + 4 = x + 10$$

$$x^2 - x - 6 = 0$$

$$(x + 3)(x - 2) = 0$$

$$x = -3 \text{ or } 2$$

Describe the mistake or mistakes in her working.

....

....

....

.... **[2]**

(c) Solve the equation $x(x + 4) = x + 10$

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

13 T is directly proportional to m^2.

When $m = 2$, $T = 15$.

(a) Show that when $m = 6$, $T = 135$.

[4]

(b) Jacob says

So whenever m increases by 4, T increases by 120.

Show that Jacob is not correct.

[2]

14 In a TV gameshow, a contestant starts with a pot of money containing £8000.
The contestant has to complete a task to win some or all of this money.

If the contestant completes the task in less than a minute, they keep all £8000.
After each full minute spent doing the task, the money in the pot decreases by 20%.

(a) James says

If they take longer than 5 minutes they don't win any money.

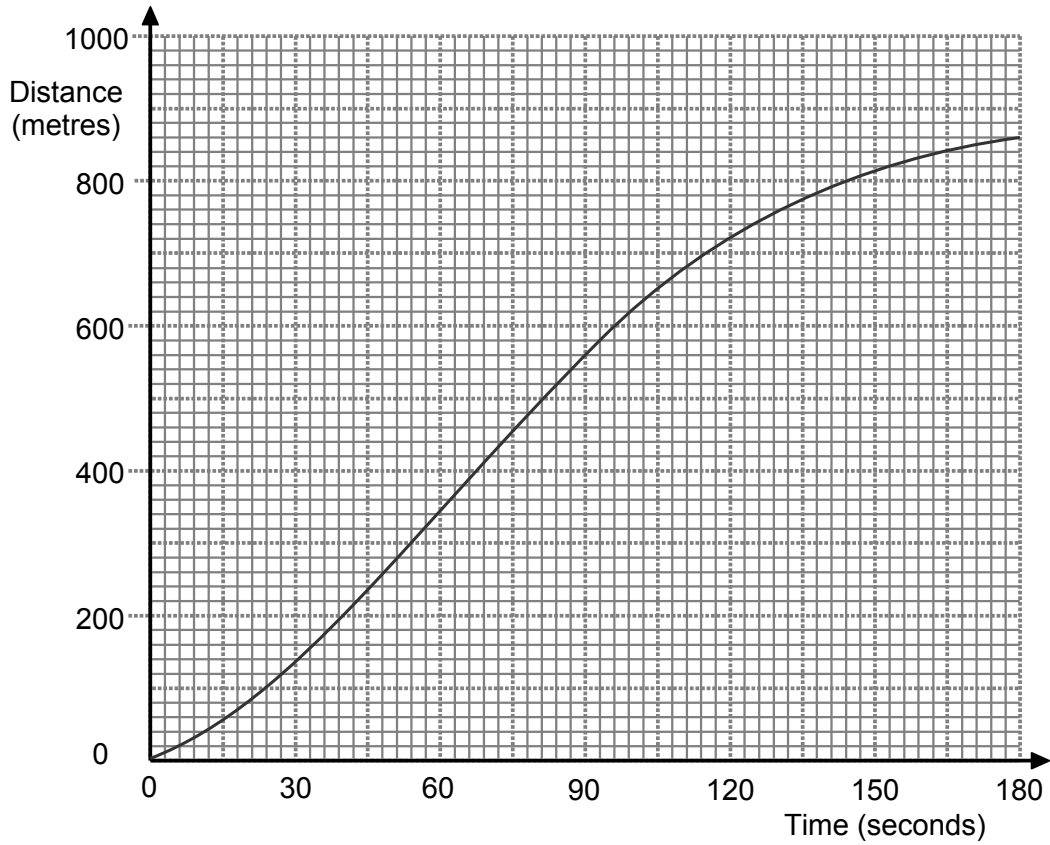Explain why James is not correct.

....

....

....

.... **[2]**

(b) Show that a contestant who completes the task in 2 minutes and 21 seconds wins
£5120.

[2]

(c) Work out how much money is won by a contestant who completes the task in 6 minutes
and 8 seconds.

(c) £ .... **[2]**

15

The distance-time graph above is for a runner from the start of an 800 m race.

(a) How long did this runner take to complete the race?

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

(b) Gill says   At the end of the race, the runner's speed was less than half of
his speed at the halfway point of the race.

Is Gill correct?

Show how you decide.

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

© Churchill Maths Limited

16 **(a)** Show that, correct to 1 significant figure, $x = 2$ is a solution to the equation

$$x^2 - \sqrt{x} = 4$$

[3]

(b) Show that the equation $x^2 - \sqrt{x} = 4$ can be rearranged to give
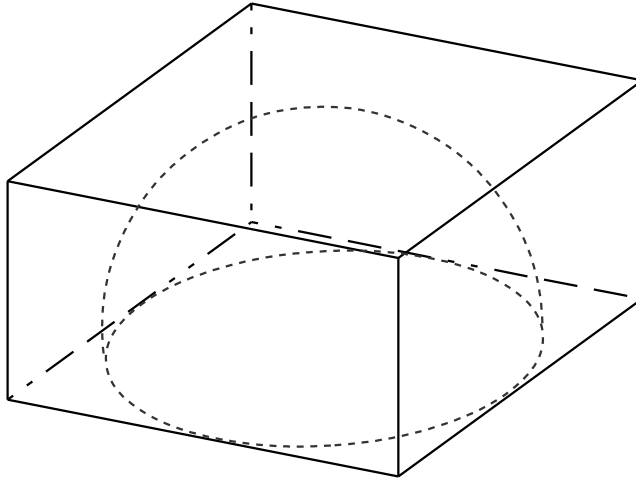
$$x = \sqrt{(\sqrt{x} + 4)}$$

[1]

(c) Using your answer to part **(b)**, or otherwise, find a solution to the equation $x^2 - \sqrt{x} = 4$ correct to 4 significant figures.

(c) .... **[3]**

(d) Prove that your answer to part **(c)** is a solution correct to 4 significant figures.

[1]

© Churchill Maths Limited

17

Not to scale

The diagram shows a box in the shape of a square prism.

Inside the box is a glass paperweight in the shape of a hemisphere.
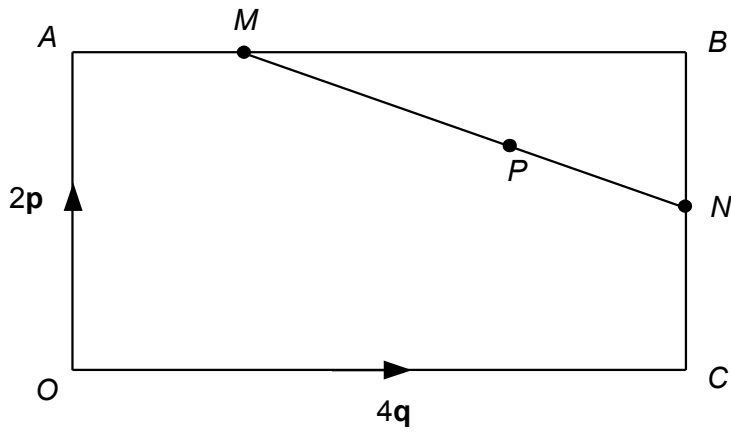The paperweight fits tightly and touches each side of the box.

The mass of the paperweight is 400g.
The density of the glass is 3 g/cm^3.

Work out the volume of the box.

[The volume of a sphere of radius r is $\frac{4}{3}\pi r^3$]

.... cm^3 **[5]**

© Churchill Maths Limited
Licensed to Thomas Telford School

18

Not to scale

OABC is a rectangle.

M is the point on *AB* such that *AM* : *MB* = 1 : 3

N is the midpoint of *BC*.

P is the point on *MN* such that *MP* : *PN* = 3 : 2

$\overrightarrow{OA}$ = 2**p** and $\overrightarrow{OC}$ = 4**q**.

(a) Show that $\overrightarrow{MN}$ = − **p** + 3**q**.

[3]

© Churchill Maths Limited
Licensed to Thomas Telford School

Dinesh says that *P* lies on *OB*.

(b)   Is Dinesh correct?

Justify your answer.

(b) .... **[4]**
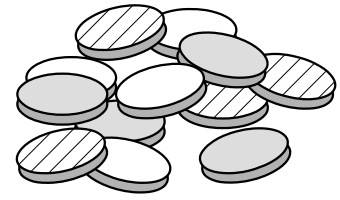
19 Kelli has a bottle containing 12 tablets.

There are 3 different types of tablet in the bottle.

The bottle contains 4 of tablet A, 4 of tablet B and 4 of tablet C.

Kelli tips the bottle until 3 tablets come out into her hand.

(a) Work out the probability that Kelli has one of each type of tablet in her hand.

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

(b) **(i)** State an assumption you have made in working out your answer to part **(a)**.

....

.... **[1]**

(ii) Explain how your assumption is likely to have affected your answer to part **(a)**.

....

....

....

.... **[1]**