MODEL SOLUTIONS

OCR
Oxford Cambridge and RSA

F

GCSE (9–1) Mathematics

J560/03 Paper 3 (Foundation Tier)

Practice Paper

Date – Morning/Afternoon

Time allowed: 1 hour 30 minutes

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

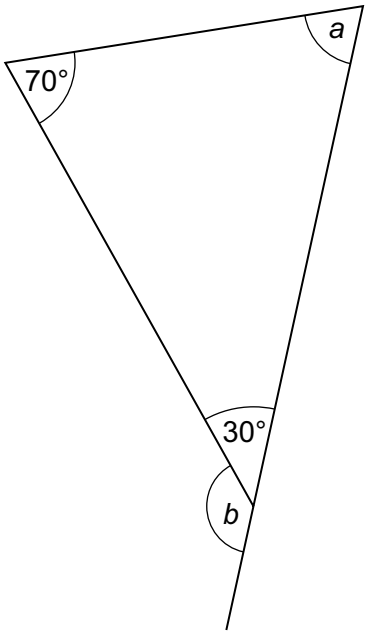
First name									
Last name									
Centre number						**Candidate number**				

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 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 **[ ]**.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- This document consists of **20** pages.

Answer **all** the questions

1 Here is a diagram.



Not to scale

(a) Work out angle *a*.

180 - 70 - 30 = 80°
Interior angles of a triangle sum to 180°

(a) *a* = 80 ° **[1]**

(b) Work out angle *b*.

180 - 30 = 150°
Angles on a straight line sum to 180°

(b) *b* = 150 ° **[1]**

2 **(a)** Write down a number between 1.56 and 1.57.

The first three digits must be 1 . 56...

(a) 1.565 ..... **[1]**

(b) Write down a prime number between 14 and 22.

17 is prime as it has no factors other than 1 and itself (17).

(b) 17 ..... **[1]**

(c) Find a fraction between $\frac{1}{4}$ and $\frac{1}{3}$.

$\frac{1}{4} \overset{\times 3}{=} \frac{3}{12} \overset{\times 2}{=} \frac{6}{24}$ ← common denominator

$\frac{1}{3} \overset{\times 4}{=} \frac{4}{12} \overset{\times 2}{=} \frac{8}{24}$

$\frac{6}{24}, \frac{7}{24}, \frac{8}{24}$

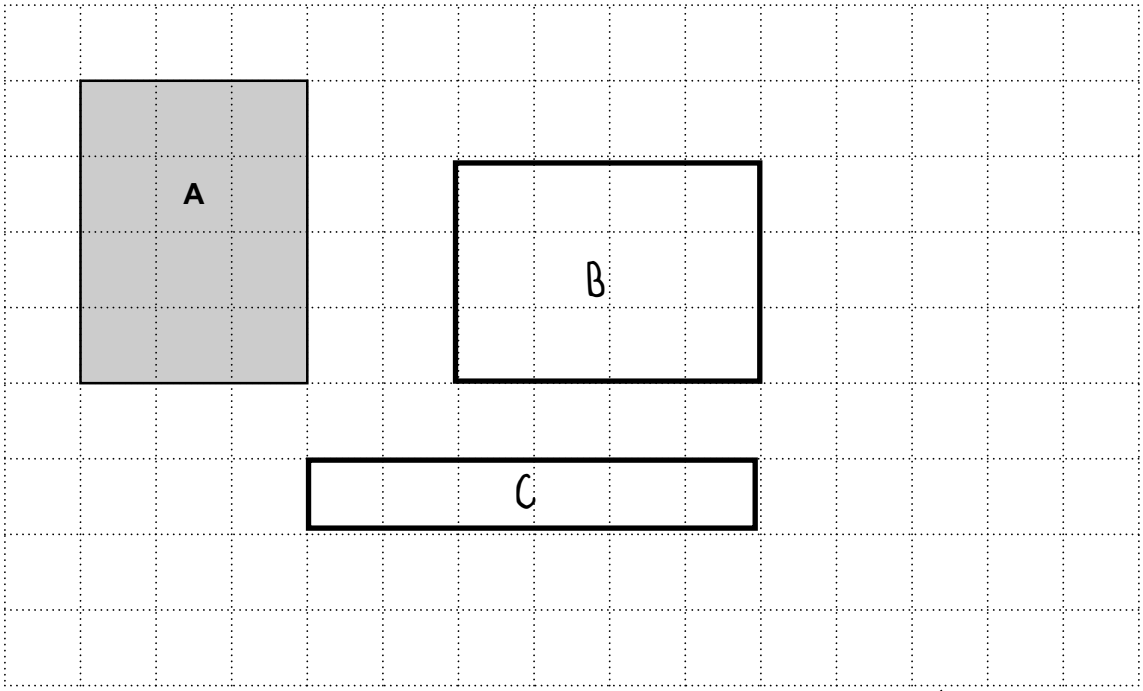
(c) $\frac{7}{24}$ ..... **[2]**

3 **(a)** **(i)** Draw a rectangle that is congruent to rectangle **A**.
Label it **B**. **[1]**

Congruent = equal sides and angles

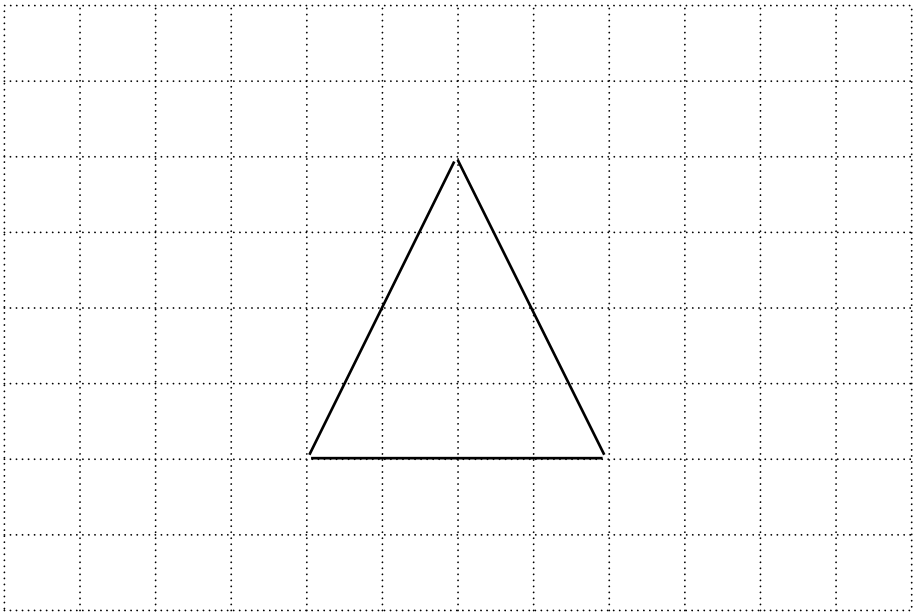
(ii) Draw a rectangle that has the same perimeter as rectangle **A,** but a different area.
Label it **C**. **[2]**

Perimeter = 14cm



(b) Draw an isosceles triangle with area 8 cm^2 on the grid below.

Area = $\frac{1}{2}$ X base X height
= $\frac{1}{2}$ X 4 X 4
= 8



[2]

4 **(a)** Ken has a bag containing counters.
2 are white, 3 are black and 4 are red.
He takes one of these counters at random.

What is the probability that the counter is white?

$\frac{2}{2+3+4} = \frac{2}{9}$

(a) $\frac{2}{9}$ ..... **[2]**

(b) Abi has a bag containing black counters and white counters.
The ratio of black to white counters is 1 : 2.
Abi takes one of these counters at random.

What is the probability that it is black?

$\frac{1}{1+2} = \frac{1}{3}$

(b) $\frac{1}{3}$ ..... **[1]**

(c) Jemma has a bag containing 24 balls.

(i) The probability that a ball taken from the bag at random is green is $\frac{1}{3}$.

How many of the 24 balls are green?

$\frac{1}{3} \times 24 = 8$

(c)(i) 8 ..... **[2]**

(ii) 12 of the 24 balls are blue.
Jemma takes a ball from the bag at random and then puts it back.
She then takes a ball again at random.

What is the probability that **both** balls are blue?

$\frac{12}{24} \times \frac{12}{24} = \frac{1}{4}$

'and'

(ii) $\frac{1}{4}$ ..... **[2]**

5 Amy is making a rectangular quilt by sewing together squares of fabric.

Each square is 12 cm by 12 cm.
The finished quilt must be at least 1.5 m wide and at least 2.1 m long.

(a) What is the smallest number of squares that Amy can use?
Show how you decide.

$12 \div 100 = 0.12\text{m}$ ← 100cm = 1m
$1.5 \div 0.12 = 12.5$
$2.1 \div 0.12 = 18.5$
$13 \times 18 = 234$ tiles

must be a whole number of tiles.

(a) ..... 234 ..... squares **[5]**

(b) The area of the finished quilt is about 3.4 m^2.
Amy says

> 3.4 m^2 is the same as 340 cm^2.

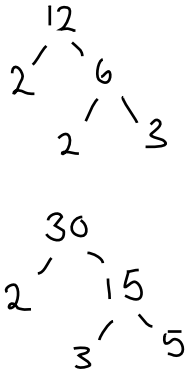
Show that Amy is wrong. **[3]**

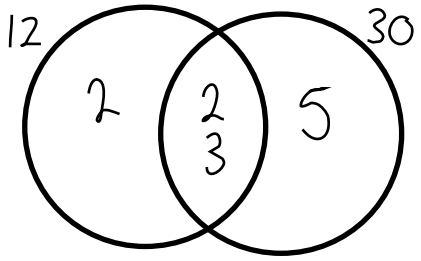
$1m^2 = 100cm \times 100cm$
$= 10,000cm^2$

$3.4m^2 = 34,000cm^2$

not $340cm^2$

6 **(a)** Show that the highest common factor of 12 and 30 is 6. **[2]**





HCF = 12 ∩ 30
= 2 × 3
= 6

(b) Show that 77 is **not** a square number. **[2]**

$8^2 = 64$
$9^2 = 81$

$8^2 < 77 < 9^2$

7 Helen needs to buy 6 packs of tea.
This table shows the offers available in two shops.

Shop	Offer
A	3 for the price of 2
B	Buy one, get one half price

A single pack of tea costs the same in each shop.

Which shop is cheaper for Helen?
Explain how you decide.

p = price of pack

A: 4p (2 free packs)
B: 3p 3 × 0.5p = 4.5p

Shop A is cheaper (4 < 4.5).

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

8 Hardeep asks 25 people how many portions of fruit and vegetables they ate yesterday. The results are shown in this table.

Number of portions	Frequency	
4	4	
5	6	
6	8	
7	5	
8	2	

(a) Calculate the mean number of portions.

$$\frac{4 \times 4 + 5 \times 6 + 6 \times 8 + 7 \times 5 + 8 \times 2}{4 + 6 + 8 + 5 + 2} = 5.8$$

(a) 5.8 **[3]**

(b) Hardeep ate no portions of fruit and vegetables yesterday. He decides to include this in his results.

Explain how this will affect

(i) the mode,

No effect Mode - most common number. A single entry of 0 will not be the most common number.

[1]

(ii) the range.

Will increase to 8 - 0 = 8 Range - the difference between the highest and lowest values.

[1]

9 **(a)** Evaluate.

$$\frac{3}{0.4^2} = \frac{3}{0.16} = \frac{75}{4} = 18.75$$

(a) 18.75 **[1]**

(b) Find p if $p^3 = 37$.
Give your answer correct to 2 decimal places.

$$p = \sqrt{37} = 3.33$$

(b) 3.33 **[2]**

(c) Find the value of $a - b$ when $a = 3$ and $b = -2$.

$$a - b = (3) - (-2) = 3 + 2 = 5$$

(c) 5 **[1]**

10 **(a)** Look at this table.

Odd numbers	Total
1	1^2
$1 + 3$	2^2
$1 + 3 + 5$	3^2
$1 + 3 + 5 + 7$	4^2

The pattern in the table continues.

(i) Complete the next row of the table. **[1]**

(ii) What will be written in the Total column of the 100th row?

(a)(ii) 100^2 **[1]**

(b) Here is another table.

Even numbers	Total
2	$1^2 + 1$
$2 + 4$	$2^2 + 2$
$2 + 4 + 6$	$3^2 + 3$
$2 + 4 + 6 + 8$	$4^2 + 4$

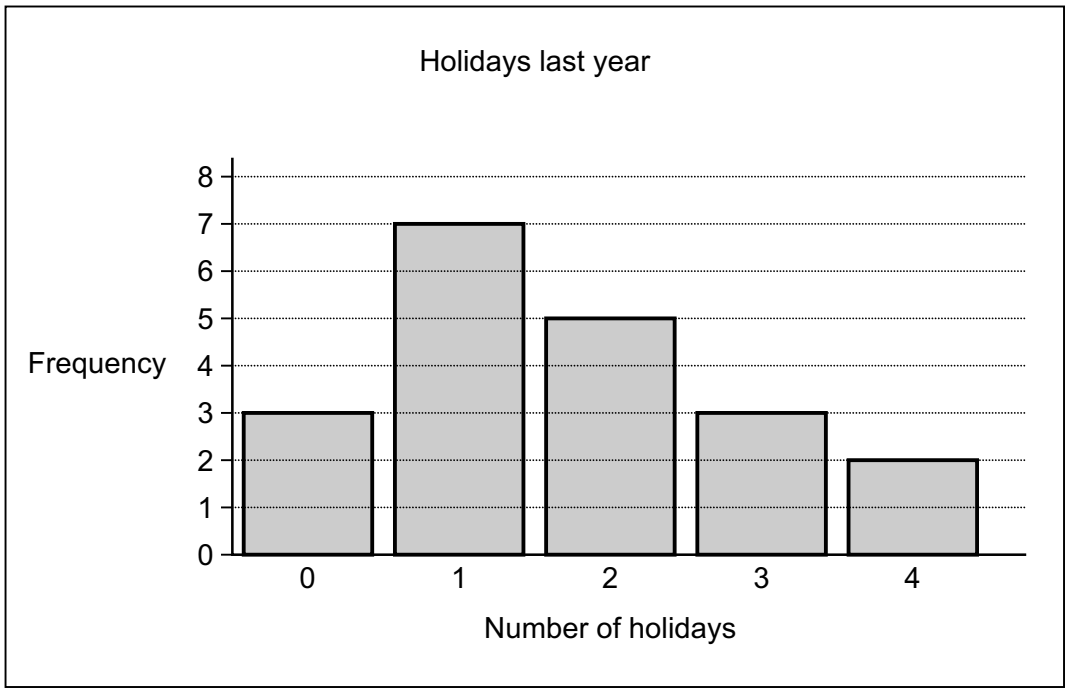
The pattern in this table continues.

Write an expression for the total of the first n even numbers.

When $n = 1$, $1^2 + 1$.
When $n = 2$, $2^2 + 2$.
etc...

(b) $n^2 + n$ **[2]**

11 Noelle asks her friends how many holidays they had last year.
Her results are shown in this bar chart.



(a) Show that Noelle asked 20 friends. **[1]**

Add frequencies: 3 + 7 + 5 + 3 + 2 = 20

(b) Find the median number of holidays.

20 ÷ 2 = 10
so 1.5

The 10th person falls between 1 and 2.

(b) 1.5 **[2]**

(c) Noelle says

Based on my sample, I estimate 10% of people in the UK had 4 holidays last year.

Give two reasons why Noelle should **not** base this estimate on her sample.

Reason 1 Her sample is too small to represent the entire population.

Reason 2 Noelle asked only her friends instead of taking a random sample so it may be biased. **[2]**

12 **(a)** Solve.

$3a + 10 = a + 40$

$2a + 10 = 40$
$2a = 30$
$a = 15$

(a) $a =$ 15 **[3]**

(b) Factorise.

$x^2 - 2x - 8$

$-4 \times 2 = 8$ makes the c term
$-4 + 2 = -2$ makes the b term

$(x - 4)(x + 2)$

(b) $(x - 4)(x + 2)$ **[2]**

13 A sequence is generated using the rule

- multiply the previous term by 2
- then subtract 30.

The first term of the sequence is 40.

(a) Find the second term.

$40 \times 2 - 30 = 50$

(a) 50 **[2]**

(b) Find the fourth term.

$50 \times 2 - 30 = 70$
$70 \times 2 - 30 = 110$

(b) 110 **[2]**

14 **(a)** Paul invests £500 at a rate of 1.5% per year **compound** interest.

Find the value of the investment after 3 years.
Give your answer correct to the nearest penny.

$500 \times 1.015 = £522.84$

$101.5\% = \frac{101.5}{100} = 1.015$

(a) £ 522.84 **[4]**

(b) By what percentage has the value of Paul's investment increased after 3 years?

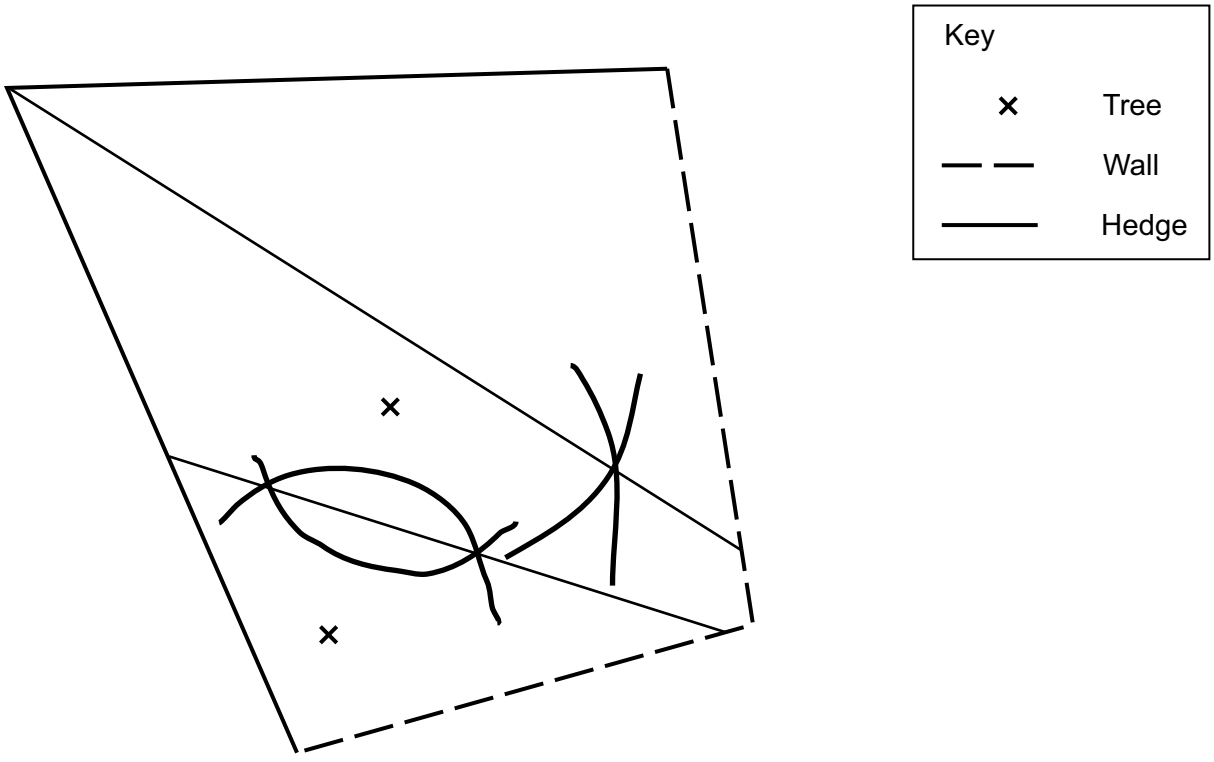
$\frac{522.84 - 500}{500} \times 100 = 4.57\%$

$\%\ \text{change} = \frac{\text{final value} - \text{initial value}}{\text{initial value}}$

(b) 4.57 % **[3]**

15 Jez finds a gold coin in a field.
This is a scale drawing of the field.

Scale: 1 cm represents 50 m



Jez says that the coin was

- an equal distance from each hedge
- an equal distance from each tree.

Show by construction that Jez is wrong. **[5]**

There is no point where the coin is both an equal distance from each hedge and equal distance from each tree because the lines do not meet.

16 A triangle has sides of length 23.8 cm, 31.2 cm and 39.6 cm.

Is this a right-angled triangle?
Show how you decide.

$a^2 + b^2 = c^2$ ← Pythagoras' Theorem
$23.8^2 + 31.2^2 = 1539.88$

$\sqrt{1539.88} = 39.2$

$39.2 \neq 39.6$ so not right-angled.

.....

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

17 John is going to drive from Cambridge to Newcastle.

Scale: 1cm represents 50 miles

(a) John needs to be in Newcastle at 11 am.
He drives at an average speed of 60 miles per hour.

What time does he need to leave Cambridge?

time = distance / speed

$= \frac{4 \times 50}{60}$

$= \frac{10}{3}$

$= 3\frac{1}{3}$ hours

$\frac{1}{3} \times 60 = 20$ mins

11am − $3\frac{1}{2}$ hours = 7:40am

(a) 7:40am **[5]**

(b) State one assumption you have made.
Explain how this has affected your answer to part **(a)**.

Assumed distance is a straight line so distance is an underestimate.

Actual time taken will increase.

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

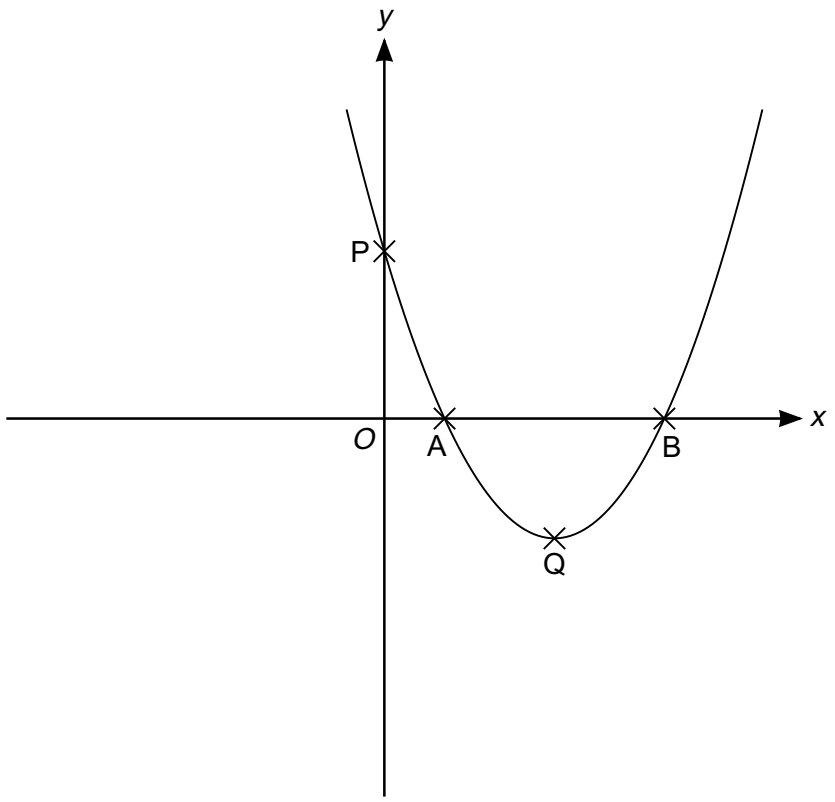
18 When water freezes into ice its volume increases by 9%.

What volume of water freezes to make 1962 cm^3 of ice?

$1962 \div 1.09 = 1800 cm^3$

1800 cm^3 **[3]**

19 This is a sketch of the graph of $y = (x - 1)(x - 3)$.



(a) Write down the coordinates of points A and B.

$y = 0$

$(x - 1)(x - 3) = 0$

$x - 1 = 0$ so $x = 1$
$x - 3 = 0$ so $x = 3$

(a) A (1 , 0)

B (3 , 0) **[2]**

(b) Work out the coordinates of point P.

$x = 0$
$y = (0 - 1)(0 - 3)$
$y = -1 \times -3$
$= 3$
$(0, 3)$

(b) P (0 , 3) **[2]**

(c) Work out the coordinates of the turning point Q.

$\frac{3+1}{2} = 2$ x-coordinate halfway between $x = 3$ and $x = 1$ because quadratic curves are symmetrical

$x = 2$
$y = (2 - 1)(2 - 3)$
$y = 1 \times -1$
$y = -1$

(2, -1)

(c) Q (2 , -1) **[3]**

TURN OVER FOR QUESTION 20

20 The table shows data for the UK about its population and the total amount of money spent on healthcare in 2002, 2007 and 2012.

Year	Population	Total spent on healthcare (£)
2002	5.94×10^7	8.14×10^{10}
2007	6.13×10^7	1.20×10^{11}
2012	6.37×10^7	1.45×10^{11}

(a) How much more was spent on healthcare in 2007 than in 2002?
Give your answer in millions of pounds.

$1.20 \times 10^{11} - 8.14 \times 10^{10} = £3.86 \times 10$
$= £38,600$ million

(a) £ 38,600 million **[3]**

(b) Marcia says

The amount spent on healthcare **per person** in the UK doubled in 10 years.

Use the information in the table to comment on whether Marcia is correct.

$\frac{8.14 \times 10^{10}}{5.94 \times 10^7} = £1370.37$

$\frac{1.45 \times 10^{11}}{6.37 \times 10^7} = £2276.30$

$2276.30 \div 1370.37 = 1.66$

$1.66 \neq 2$ so spending per person has not doubled.

[4]