

Admissions Test

Specimen Paper 2

1½ hours

This admissions test is designed to assess your mathematical thinking.

All questions require no more than the content of GCSE mathematics, but they may not be of the style you are accustomed to.

You may find some of the questions challenging. As schools teach the GCSE mathematics content in different orders, there may be a small number of questions that you have not yet covered in your maths lessons. You may be able to work out how to do these questions anyway.

Remember that if you find something challenging, it is likely that others are finding it similarly challenging.

Consider carefully how to distribute your time across the three sections.

Instructions to candidates

Please read these instructions carefully, but do not open the paper until you are told you may do so.

Answer **all** questions.

You may **not** use a calculator.

Enter your answers in the appropriate spaces in the answer booklet.

If you run out of space, you may ask for additional paper.

There are three sections.

Section A is worth 20 marks. It consists of 10 multiple choice questions which test your understanding of GCSE Mathematics content.

Section B is worth 20 marks. It consists of 10 multiple choice questions which test your reasoning and thinking skills.

There are no marks for showing working out in sections A and B but you can do working on the paper to help you find the correct answer.

If you change your mind about the answer to a multiple choice question, make it clear which answer you are choosing.

Section C is worth 20 marks. It consists of 3 questions which test presentation of mathematical arguments and problem solving. You should show full working and reasoning for section C.

If you require more space for working, you may ask for additional paper. The question numbers and your name must be written on any additional paper.

Total: 60 marks

You should not discuss the content of this paper with anyone, either online or in person. Any candidates found to have shared details about this paper may have their applications terminated, or offer or place at the school withdrawn.

Section A

20 marks

Answer all questions

Each question is worth 2 marks.

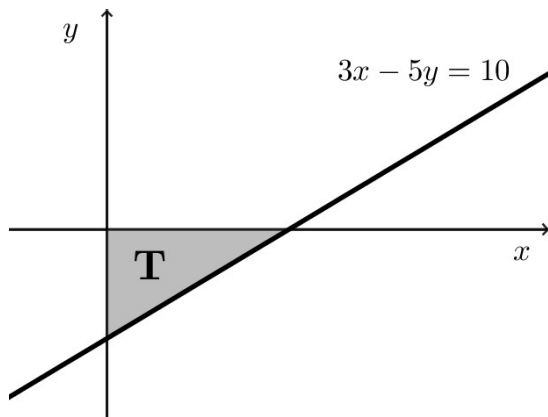
Put a circle around the one correct answer in the answer booklet. If you change your mind about an answer, make it clear which answer you are choosing.

1 Which of the following has the **greatest** area?

- A** A right-angled triangle with sides 6 cm, 8 cm and 10 cm
- B** A square of side length 5 cm
- C** A circle of radius 3 cm
- D** A rectangle with side lengths 3 cm and 9 cm
- E** A semi-circle of radius 4 cm

2 The diagram below shows the straight line with equation $3x - 5y = 10$.

The line makes a triangle, T, with the x -axis and the y -axis.



Which of the following gives the area of T in square units?

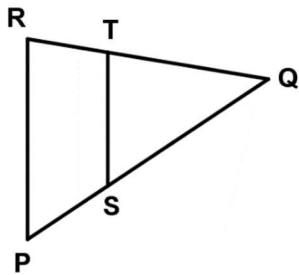
- A** $7\frac{1}{2}$ square units
- B** 4 square units
- C** 3 square units
- D** $3\frac{1}{3}$ square units
- E** $6\frac{2}{3}$ square units

3 Which of the following is the correct value of $\frac{(3.2 \times 10^6) \times (4.5 \times 10^4)}{7.2 \times 10^3}$?

- A 2×10^7
- B 2.5×10^7
- C 2×10^6
- D 2.5×10^6
- E 200 000

4 The diagram below shows the triangle PQR.

The line ST is parallel to the side PR and $PS = \frac{1}{3}PQ$.



What is the ratio area of triangle PQR : area of triangle SQT?

- A 2:3
- B 3:2
- C 4:9
- D 9:4
- E It depends on the size of triangle PQR.

5 Three children of different ages have £50 shared between them.

The middle child receives $\frac{5}{6}$ of the amount which the oldest child receives.

The youngest child receives $\frac{4}{5}$ of the amount which the middle child receives.

How much does the oldest child receive?

- A £16 B £18 C £20 D £24 E £30

6 Four of the following statements simplify to the same expression. Which one is the odd one out?

A $\frac{9p^3q^4}{6p^5} \times \frac{p^2}{q^3}$

B $\frac{1}{8}(pq)^3 \times \frac{12}{p^3q^2}$

C $\frac{q^3}{4p} \times \frac{6p}{q^2}$

D $5 \times \frac{p^3}{10q^2} \times \frac{3}{(pq)^3}$

E $\frac{3p}{q^3} \times \frac{q^5}{p^2} \times \frac{p}{2q}$

7 Which of the following is a true statement about the sum of three consecutive positive integers?

- A Their sum must be a multiple of 3.
B Their sum must be an even number.
C Their sum must be an odd number.
D Their sum cannot be a square number.
E Their sum can be a prime number.

- 8 A six-sided dice is known to be “unfair” so there is not an equal probability of rolling each number from 1 to 6.

The probability of rolling a 5 is $\frac{1}{12}$.

The probability of rolling a multiple of 3 is $\frac{1}{3}$.

The probability of rolling a 2 is $\frac{1}{12}$.

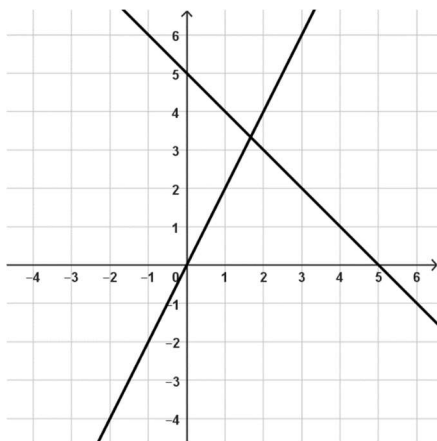
What is the probability of rolling a square number?

- A $\frac{1}{2}$ B $\frac{1}{3}$ C $\frac{1}{4}$ D $\frac{1}{6}$ E $\frac{1}{12}$

- 9 In this question x and y are integers.

The diagram below shows the coordinate axes and the lines $x + y = 5$ and $y = 2x$.

The lines have not been labelled.

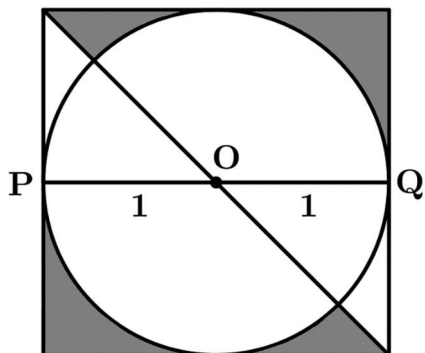


How many points with coordinates (x, y) satisfy all of the following inequalities?

- $x > 0$
- $y > 0$
- $x + y < 5$
- $y < 2x$?

- A 1 B 4 C 8 D 9 E 14

- 10** The diagram shows a circle of radius 1 unit with centre O .
 A square is drawn so that each side is a tangent to the circle.
 The line PQ lies along the diameter of the circle and is parallel to two sides of the square.
 A diagonal of the square passes through O .



Which of the following gives the shaded area?

- A** $3\left(\frac{\pi}{4} - 1\right)$ **B** $3\left(1 - \frac{\pi}{4}\right)$ **C** $3\left(\frac{1}{2} - \frac{\pi}{8}\right)$ **D** $3\left(\frac{\pi}{8} - \frac{1}{2}\right)$ **E** $2 - \frac{\pi}{4}$

Section B starts on the next page.

Section B

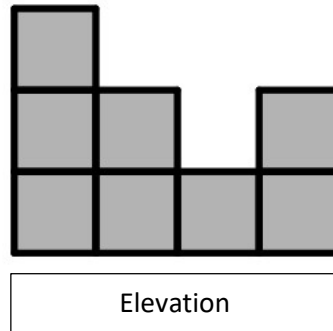
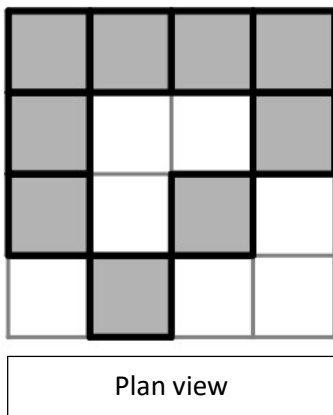
20 marks

Answer all questions

Each question is worth 2 marks.

Put a circle around the one correct answer in the answer booklet. If you change your mind about an answer, make it clear which answer you are choosing.

- 11** The diagram shows a plan view (from above) and an elevation of a model made from 1 cm cubes placed on a 4 cm × 4 cm grid.



You do not know which direction the elevation is drawn from.

What is the maximum number of cubes that could be used to make a model with this plan view and elevation?

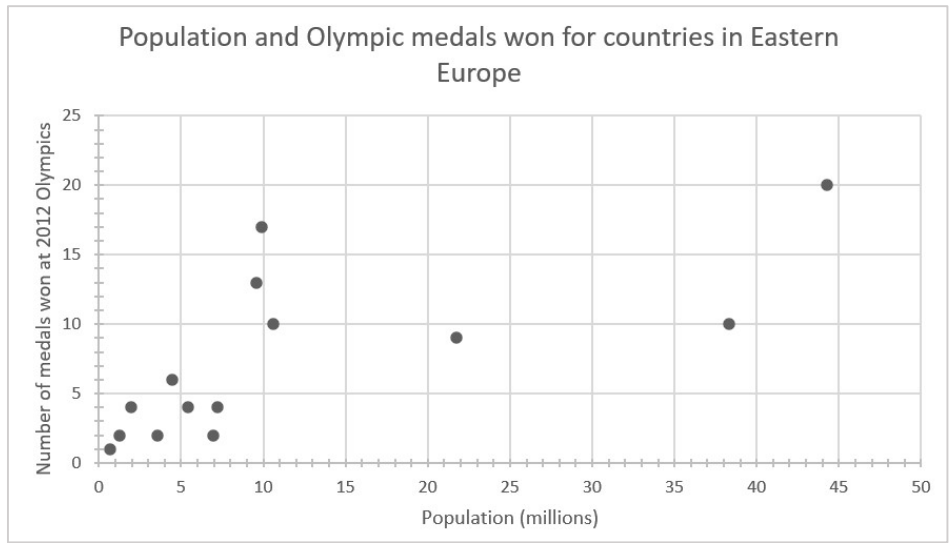
- A** 17 **B** 18 **C** 19 **D** 20 **E** 21
- 12** p and q are prime numbers.
Both p and q are between 20 and 50 and p is less than q .
When the digits of p are swapped, the resulting number is also a prime number.
When the digits of q are swapped, the resulting number is also a prime number.
What is the value of $q - p$?

- A** 2 **B** 4 **C** 6 **D** 8 **E** 10

13 Each point in the scatter graph below represents a country in Eastern Europe.

For each country the graph shows

- the number of people who live in the country (the population)
- the number of medals the country won at the 2012 Olympic games.



Three countries from Eastern Europe did not win any medals. They are shown in the table below.

Countries which did not win any medals

Country	Population
Albania	3.0 million
Bosnia and Herzegovnia	3.9 million
Kosovo	1.9 million

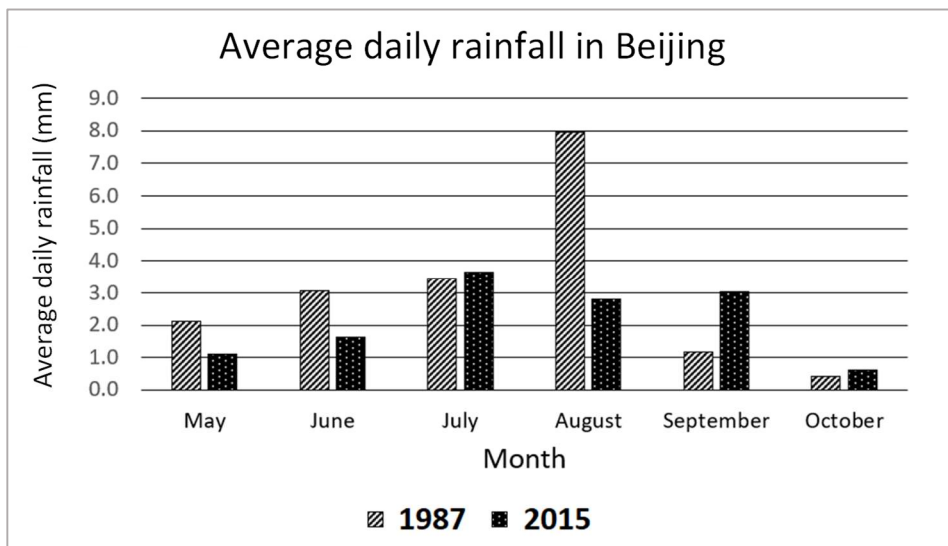
The following statements are about countries in Eastern Europe and the medals they won at the 2012 Olympic games. Which statement is a reasonable conclusion to draw from the graph and the table?

- A The country with the smallest population won the smallest number of medals.
- B The bigger the area of a country the more medals it won.
- C All the countries with a population of less than 10 million won fewer than 15 medals.
- D The richest countries won the most medals.
- E The country with the largest population won the most medals.

- 14** There are n houses in a particular street numbered from 1 to n , where $100 < n < 250$.
The probability of a house selected at random having a number whose first digit is 1 is 0.5.
What is the value of n ?

A 200 **B** 198 **C** 196 **D** 178 **E** 176

- 15** The bar chart below shows a comparison between the average daily rainfall in each month from May to October in Beijing for the years 1987 and 2015.



Which of the following is a valid conclusion that can be made from the bar chart?

- A** There was more rain in Beijing in May, June and July of 1987 than there was in August September and October of 1987.
- B** Twice as much rain fell in Beijing in the months from May to October in 1987 than fell in the same months in 2015.
- C** Around the same amount of rain fell in Beijing in May, June and July of 2015 as fell in August September and October of 2015.
- D** Around the same amount of rain fell in Beijing in August, September and October of 1987 as fell in August September and October of 2015.
- E** August is always the wettest month in Beijing.

16 A Hattie number is a number which

- has four digits
- starts with the digit 1
- only uses the digits 0, 1 and 2

The Hattie number 1120 has the additional property that the sum of the first two digits of the number is equal to the sum of the last two digits.

How many Hattie numbers have this property?

- A** 8 **B** 7 **C** 6 **D** 5 **E** 4

17 A manufacturer has produced 5 400 apple flavoured sweets, 4 500 blueberry flavoured sweets and 6 000 raspberry flavoured sweets.

The sweets are put into packets.

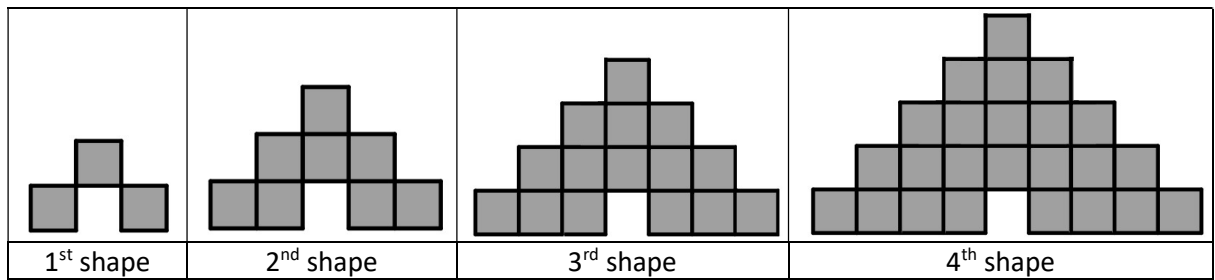
All the packets contain the same number of sweets.

Each packet contains sweets of only one flavour.

What is the maximum number of sweets in each packet if no sweets are left over?

- A** $2^2 \times 3 \times 5^2$
- B** $2^2 \times 3^2 \times 5^2$
- C** $2^3 \times 3 \times 5^2$
- D** $2^3 \times 3^2 \times 5^2$
- E** $2^2 \times 3 \times 5^3$

- 18 Square tiles are used to make this sequence of shapes:



How many tiles are needed to make the 10th shape?

- A 110 B 200 C 100 D 240 E 120
- 19 Sugar starfish have 4 legs, shrimps have 6 legs and octopuses have 8 legs.
If 200 creatures have 1400 legs, how many more octopuses are there than starfish?

- A 250 B 150 C 50 D 200 E 100

- 20 a and b are two numbers such that $\left(\frac{1}{a} - \frac{1}{b}\right)$ is 60% of $\left(\frac{1}{a} + \frac{1}{b}\right)$.

a as a percentage of b is

- A 12.5% B 25% C 50% D 75% E 87.5%

Section C starts on the next page.

Section C

20 marks

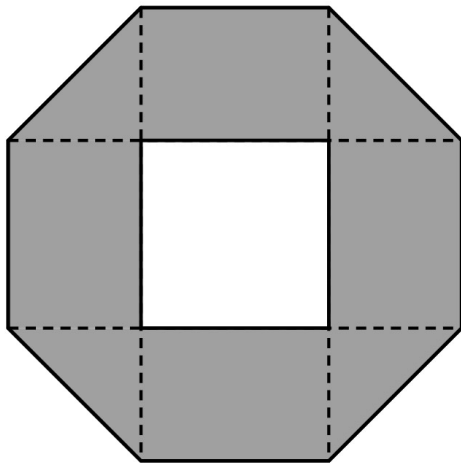
Answer all questions

It is important to show full working in this section. Write your full answers to each question in the answer booklet.

Mark allocations are shown in square brackets [].

21 The diagram below shows a regular octagon with sides of length 2 cm.

A square of side length 2 cm is drawn inside the octagon.



Calculate the shaded area.

Give your answer in an exact form.

[5]

22 Aysha rolls three fair six-sided dice.

The dice are different colours; red, blue and yellow.

Aysha rolls the three dice **once**.

The red dice shows the number 2.

Aysha notices that the mean of all three dice scores is a whole number.

(a) Write down all of the possible scores on the blue and yellow dice.

[3]

Aysha also notices that the sum of all three scores is a square number.

(b) Write down all of the possible scores on the blue and yellow dice.

[2]

23 Asha is trying to solve the puzzle shown below.

She has to enter each of the integers 1 to 12 into a different box.

The sum of the four numbers along each of the four edges of the square has to be the same.

She enters 10, 11 and 12 in the corner boxes as shown.

12			10
11			n

Asha can't decide what number to put in the final corner. She decides to call the missing number n .

- (a) Calculate the sum $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12$. [1]
- (b) Show that the sum of all four edge totals is $111 + n$. [2]
- (c) Explain why the expression in part (b) needs to be equal to a multiple of 4. [1]
- (d) Find the three possible values of n which will result in the expression in part (b) being a multiple of 4. [3]
- (e) Explain why only one of the values you found in (d) will allow Asha to solve the puzzle. [3]

End of test.