Mathematics test

Paper 2

Calculator allowed

Please read this page, but do not open your booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below.

First name

Last name

School

Remember

▪ The test is 1 hour long.
▪ You may use a calculator for any question in this test.
▪ You will need: pen, pencil, rubber, ruler, a pair of compasses and a scientific or graphic calculator.
▪ Some formulae you might need are on page 2.
▪ This test starts with easier questions.
▪ Try to answer all the questions.
▪ Write all your answers and working on the test paper – do not use any rough paper. Marks may be awarded for working.
▪ Check your work carefully.
▪ Ask your teacher if you are not sure what to do.

For marker's use only

<table>
<thead>
<tr>
<th>Total marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borderline check</td>
</tr>
</tbody>
</table>

QCA/04/1200

PrimaryTools.co.uk
Instructions

Answers
This means write down your answer or show your working and write down your answer.

Calculators
You may use a calculator to answer any question in this test.

Formulae
You might need to use these formulae

Trapezium

Area = \(\frac{1}{2}(a + b)h\)

Prism

Volume = area of cross-section \times \text{length}
1. Look at this shape made from six cubes.
Four cubes are white.
Two cubes are grey.

Part of the shape is rotated through 90° to make the shape below.

After another rotation of 90°, the shape is a cuboid.
Draw this cuboid on the grid below.
There are high mountains in Nepal. At different heights, the temperature is different. The graph shows information about temperatures in one month.

For example:
At 1000 metres, the maximum temperature is 30°C.

(a) At 3000 metres, what is the minimum temperature?

(b) At 5000 metres, the minimum temperature is −3°C.
The range in temperature is 15°C.

On the graph above, draw a bar to show this information.
3. (a) A pupil measured the angles in a triangle.

She said:

The angles are 30°, 60° and 100°

Could she be correct? Tick (✓) Yes or No.

☐ Yes   ☐ No

Explain your answer.

(b) This diagram is not drawn accurately.

Calculate the size of angle $m$

Show your working.

1 mark

2 marks
4. The diagram shows part of a number grid. The grid has 6 columns. All the **prime numbers** in the grid are **circled**.

![Prime grid diagram](image)

(a) 35 is not circled.

Explain why 35 is **not** a prime number.
(b) There are no prime numbers circled in column Y.

Explain how you know there will never be a prime number in column Y.

(c) There is one prime number circled in column X.

Explain how you know there will never be another prime number in column X.

5. A box contains bags of crisps.

Each bag of crisps weighs 25 grams.

Altogether, the bags of crisps inside the box weigh 1 kilogram.

How many bags of crisps are inside the box?
6. The square grid below shows a quadrilateral that has four right angles.

(a) Draw a quadrilateral that has exactly two right angles.

(b) Draw a quadrilateral that has exactly one right angle.
7. Shoe sizes in Britain and Germany are different.
The rule below shows how to change a British shoe size to a German shoe size.

Multiply the British shoe size by 1.25,
then add 32,
then round the answer to the nearest whole number.

Tom’s British shoe size is 7, Karl’s British shoe size is $7\frac{1}{2}$

They say:

‘The rule shows that we have the same German shoe size’.

Are they correct? Tick (✓) Yes or No.

☐ Yes ☐ No

Show working to explain your answer.
8. (a) The square and the rectangle below have the **same area**.

![Square and rectangle](image1)

Work out the value of \( y \)

\[ y = \ldots \ldots \ldots \text{ cm} \]

(b) The triangle and the rectangle below have the **same area**.

![Triangle and rectangle](image2)

Work out the value of \( w \)

Show your working.

\[ w = \ldots \ldots \ldots \text{ cm} \]
9. (a) In 1976 the average yearly wage was £3275
   On average, people spent 17% of £3275 on their family holiday.

   How much is 17% of £3275?
   Show your working.

   £
   2 marks

(b) In 2001 the average yearly wage was £21842
   On average, people spent £1644 on their family holiday.

   What percentage of the average yearly wage is that?
   Show your working.

   ............. %
   2 marks
10. The graph shows a straight line.

(a) Fill in the table for some of the points on the line.

\[
\begin{array}{|c|c|c|c|}
\hline
(x, y) & ( , ) & ( , ) & ( , ) \\
\hline
x + y & & & \\
\hline
\end{array}
\]

(b) Write an equation of the straight line.

\[
.................................
\]

1 mark

(c) On the graph, draw the straight line that has the equation \( x + y = 6 \)

1 mark
11. There are 20 questions in a quiz.

A correct answer scores 2 points. An incorrect answer loses 1 point. A question not answered scores 0 points. A negative total is possible.

(a) What are the maximum and minimum points you could get on the quiz?

maximum ........... minimum ...........

1 mark

(b) A pupil answers 10 of the 20 questions.

8 are correct.

How many points does he score?

.............

1 mark

(c) Complete the table to show 3 different ways to score 24 points.

<table>
<thead>
<tr>
<th>Number of answers that are correct</th>
<th>Number of answers that are incorrect</th>
<th>Number of questions that are not answered</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

2 marks
12. (a) The cross-section of a cylindrical cotton reel is a circle. The diameter of this circle is 3 cm.

What is the circumference of this circle?

\[ \text{circumference} = \pi \times \text{diameter} \]

\[ = \pi \times 3 \]

\[ \approx 9.42 \text{ cm} \]

(b) 91 metres of cotton goes round the cotton reel.

About how many times does the cotton go round the reel? Show your working, and give your answer to the nearest ten.

\[ \text{times} = \frac{91}{3} \]

\[ \approx 30 \]

\[ \approx 30 \text{ times} \]
13. Doctors sometimes use this formula to calculate how much medicine to give a child.

\[ c = \frac{ay}{12 + y} \]

- \( c \) is the correct amount for a child, in ml
- \( a \) is the amount for an adult, in ml
- \( y \) is the age of the child, in years

(a) A child who is **4 years old** needs some medicine.

The amount for an adult is **20ml**.

Use the formula to work out the correct amount for this child.

You **must** show your working.

\[ \text{Given: } a = 20, y = 4 \]

\[ c = \frac{20 \times 4}{12 + 4} = \frac{80}{16} = 5 \text{ ml} \]

(b) Another child needs some medicine.

The amount for an adult is **30ml**.

The correct amount for this child is **15ml**.

How old is this child? Show your working.

\[ \text{Given: } a = 30, c = 15 \]

\[ 15 = \frac{30y}{12 + y} \]

Solving for \( y \):

\[ 12 + y = \frac{30y}{15} \]

\[ 12 + y = 2y \]

\[ y = 12 \text{ ml} \]

**How old is the child?** **12 years old**.
14. (a) A teacher asked her pupils if they recycled newspapers and glass.

The pie chart shows the results.

5 pupils answered ‘Neither’.

How many pupils answered ‘Newspapers only’?
Show your working.
(b) The teacher asked a **different class** if they recycled newspapers and glass.

There were **24 pupils** in the class.

**9 pupils** answered ‘Newspapers only’.

On a pie chart, what would the angle be for the sector ‘Newspapers only’?

Show your working.
15. The heights of Russian dolls are in the ratio $4 : 6 : 7$

(a) In a set of dolls, the height of the middle doll is $9\text{cm}$.

What are the heights of the other dolls?

\[
\begin{array}{ccc}
\text{smallest} & \hat{} & \text{middle} & \hat{} & \text{tallest} \\
\ldots & \ldots & 9 & \ldots & \ldots \\
\end{array}
\]

(b) In another set of dolls, the height of the tallest doll is $9\text{cm}$.

What are the heights of the other dolls?

Show your working, and give your answers to 1 decimal place.

\[
\begin{array}{ccc}
\text{smallest} & \hat{} & \text{middle} & \hat{} & \text{tallest} \\
\ldots & \ldots & \ldots & 9 & \ldots \\
\end{array}
\]
16. Altogether, I have 10 bags of sweets.

The mean number of sweets in the bags is 41

The table shows how many sweets there are in 9 of the bags.

<table>
<thead>
<tr>
<th>Number of sweets in a bag</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>3</td>
</tr>
<tr>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>41</td>
<td>1</td>
</tr>
<tr>
<td>42</td>
<td>1</td>
</tr>
<tr>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>44</td>
<td>2</td>
</tr>
</tbody>
</table>

Calculate how many sweets there are in the 10th bag.

You must show your working.
17. The diagram shows the net for a right-pyramid with a regular pentagon as its base. The net is constructed using five straight lines.

(a) Without measuring, explain why angle $a$ must be $108^\circ$

(b) Calculate the size of angle $b$. You must show your working.
(c) On these nets, the point marked P lies on the perpendicular bisector of a side of the pentagon.

On side CD of the regular pentagon below, use compasses and a straight edge to **construct** the **perpendicular bisector**.

You **must** leave in your construction lines.
18. Kali uses a running machine to keep fit.

The simplified distance-time graph shows how she used the machine during one run.
Use the graph to answer these questions.

(a) Between 0930 and 0940, what was her speed in kilometres per hour?

\[ \underline{\text{km/h}} \]  
1 mark

(b) Throughout the run, for how many minutes did she travel at this speed?

\[ \underline{\text{minutes}} \]  
1 mark

(c) At 0940, she increased her speed.

By how many kilometres per hour did she increase her speed?

\[ \underline{\text{km/h}} \]  
1 mark
19. Some numbers are **smaller** than their squares.

For example: \( 7 < 7^2 \)

Which numbers are **equal to** their squares?

20. **Is it possible** to have a triangle with the angle and lengths shown below?

Show calculations then tick (✔) Yes or No.

![Diagram of a triangle with sides 11.6 cm, 15.3 cm, and 8.7 cm]
21. Look at these expressions.

\[
\begin{align*}
\text{first expression} & : 5y - 8 \\
\text{second expression} & : 3y + 5
\end{align*}
\]

What value of \( y \) makes the two expressions equal?
Show your working.

\[
y = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots
\]

2 marks