Mathematics test

Paper 1

Calculator not allowed

First name ________________________________

Last name ________________________________

School ____________________________________

Remember

■ The test is 1 hour long.
■ You must not use a calculator for any question in this test.
■ You will need: pen, pencil, rubber, ruler and a pair of compasses.
■ 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.
Instructions

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

Calculators
You must not 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 \( \times \) length
1. (a) When $x = 8$, what is the value of $5x$?
   Tick (✓) the correct box below.

   $\square$ 5  $\square$ 13  $\square$ 40  $\square$ 58  $\square$ None of these

   1 mark

(b) When $x = 8$, what is the value of $3x - x$?
   Tick (✓) the correct box below.

   $\square$ 0  $\square$ 3  $\square$ 16  $\square$ 30  $\square$ None of these

   1 mark

(c) When $x = 8$, what is the value of $x^2$?
   Tick (✓) the correct box below.

   $\square$ 8  $\square$ 10  $\square$ 16  $\square$ 64  $\square$ None of these

   1 mark
2. Lisa uses a grid to multiply 23 by 15

\[
\begin{array}{c|c|c}
\times & 20 & 3 \\
10 & 200 & 30 \\
5 & 100 & 15 \\
\end{array}
\]

\[200 + 100 + 30 + 15 = 345\]

Answer: 345

Now Lisa multiplies two different numbers.
Complete the grid, then give the answer below.

\[
\begin{array}{c|c|c|c}
\times & & 40 & 3 \\
30 & & & \\
& 600 & & \\
\end{array}
\]

Answer: 

3 marks
3. Fred has a bag of sweets.

<table>
<thead>
<tr>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 yellow sweets</td>
</tr>
<tr>
<td>5 green sweets</td>
</tr>
<tr>
<td>7 red sweets</td>
</tr>
<tr>
<td>4 purple sweets</td>
</tr>
<tr>
<td>1 black sweet</td>
</tr>
</tbody>
</table>

He is going to take a sweet from the bag at random.

(a) What is the probability that Fred will get a black sweet?

(b) Write the missing colour in the sentence below.

The probability that Fred will get a _____________ sweet is $\frac{1}{4}$
4. Write a number in each box to make the calculations correct.

\[
\begin{array}{c}
+ \\
- \\
\end{array}
\begin{array}{c}
= -8 \\
= -8
\end{array}
\]

1 mark

5. A rectangle has an area of \(24\text{cm}^2\).

How long could the sides of the rectangle be?

Give three different examples.

\[
\begin{array}{c}
\quad \\
\quad \\
\quad \\
\quad
\end{array}
\begin{array}{c}
\quad \text{cm} \\
\quad \text{cm} \\
\quad \text{cm} \\
\quad \text{cm}
\end{array}
\]

2 marks
6. (a) Write the missing numbers.

50% of 80 = ________

5% of 80 = ________

1% of 80 = ________

(b) Work out 56% of 80

You can use part (a) to help you.
7. Look at this equation.

\[ y = 2x + 10 \]

(a) When \( x = 4 \), what is the value of \( y \)?

(b) When \( x = -4 \), what is the value of \( y \)?

(c) Which equation below gives the same value of \( y \) for both \( x = 4 \) and \( x = -4 \)?

Put a ring round the correct equation.

\[ y = 2x \quad y = 2 + x \quad y = x^2 \quad y = \frac{x}{2} \]
8. The diagram shows four different sized barrels.

<table>
<thead>
<tr>
<th>Barrel A</th>
<th>Barrel B</th>
<th>Barrel C</th>
<th>Barrel D</th>
</tr>
</thead>
<tbody>
<tr>
<td>holds 54 gallons</td>
<td>holds 36 gallons</td>
<td>holds 18 gallons</td>
<td>holds 9 gallons</td>
</tr>
</tbody>
</table>

Write the missing fractions as simply as possible.
The first one is done for you.

Barrel C holds \( \frac{1}{2} \) of the amount barrel B holds.

Barrel D holds \( \underline{\underline{}} \) of the amount barrel B holds.

Barrel C holds \( \underline{\underline{}} \) of the amount barrel A holds.

Barrel B holds \( \underline{\underline{}} \) of the amount barrel A holds.

2 marks
9. The line on the graph below represents a speed of 60km/hour.

(a) Draw a line on the graph to represent a speed of **30km/hour**.
   **Label the line** by writing 30km/hour.

(b) Now draw a line on the graph to represent a speed of **120km/hour**.
   **Label the line** by writing 120km/hour.
10. (a) In this design, the ratio of **grey** to **black** is $3:1$.

What percentage of the design is **black**?

\[
\text{\underline{\hspace{2cm}}} \% 
\]

1 mark

(b) In this design, $60\%$ is **grey** and the rest is black.

What is the ratio of **grey** to **black**?

Write your ratio in its simplest form.

\[
\underline{\hspace{2cm}} : \underline{\hspace{2cm}}
\]

2 marks
11. In a bag there are only red, blue and green counters.

(a) I am going to take a counter out of the bag at random. Complete the table below.

<table>
<thead>
<tr>
<th>Colour of counters</th>
<th>Number of counters</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td></td>
<td>$\frac{1}{5}$</td>
</tr>
<tr>
<td>Green</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

(b) Before I take a counter out of the bag, I put one extra blue counter into the bag. What effect does this have on the probability that I will take a red counter?

Tick (√) the correct box.

☐ The probability has increased.

☐ The probability has decreased.

☐ The probability has stayed the same.

☐ It is impossible to tell.
12. The diagram shows three straight lines.

Work out the sizes of angles \( a \), \( b \) and \( c \)

Give reasons for your answers.

\[ a = \quad ^\circ \quad \text{because} \quad \] 

\[ b = \quad ^\circ \quad \text{because} \quad \] 

\[ c = \quad ^\circ \quad \text{because} \quad \]
13. (a) Some of the fractions below are smaller than $\frac{1}{9}$.

Tick (✓) them.

\[ \begin{align*}
\square & \frac{1}{10} \\
\square & \frac{4}{9} \\
\square & \frac{1}{2} \\
\square & \frac{1}{100} \\
\square & \frac{1}{8}
\end{align*} \]

(b) To the nearest per cent, what is $\frac{1}{9}$ as a percentage?

Tick (✓) the correct percentage.

\[ \begin{align*}
\square & 0.9\% \\
\square & 9\% \\
\square & 10\% \\
\square & 11\% \\
\square & 19\%
\end{align*} \]

(c) Complete the sentence below by writing a fraction.

\[ \frac{1}{9} \text{ is half of } \underline{\quad} \]

1 mark
14. Solve this equation.

\[ 2(2n + 5) = 12 \]

\[ n = \underline{\phantom{00}} \]

1 mark

15. Kevin is working out the area of a circle with radius 4

He writes:

Area = \( \pi \times 8 \)

Explain why Kevin's working is wrong.

1 mark
16. Write the missing numbers in these fraction sums.

\[
\frac{1}{4} + \frac{8}{8} = 1
\]

1 mark

\[
\frac{1}{3} + \frac{8}{8} = 1
\]

1 mark

17. Look at the cube.

The area of a face of the cube is \(9x^2\)

Write an expression for the total surface area of the cube.

Write your answer as simply as possible.
18. Chris read the first 55 numbers from a book of random numbers. As he read each number he recorded it in the diagram below.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>5</th>
<th>9</th>
<th>9</th>
<th>8</th>
<th>3</th>
<th>4</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>4</td>
<td>7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>6</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key**

1 | 3 represents 13

(a) What was the **largest** number he recorded?

(b) Explain how Chris could change the diagram to make it easier for him to find the **median** of his data set.
19. Here is the rule to find the **geometric mean** of two numbers.

**Multiply** the two numbers together, then find the **square root** of the result.

Example: geometric mean of 4 and 9 = $\sqrt{4 \times 9}$

= $\sqrt{36}$

= 6

(a) For the two numbers 10 and $x$, the geometric mean is 30

What is the value of $x$?

$x = \underline{\hspace{0.5cm}}$

1 mark

(b) Reena says:

‘For the two numbers –2 and 8, it is **impossible** to find the geometric mean.’

Is Reena correct?

[ ] Yes [ ] No

Explain your answer.

1 mark
20. (a) **Draw lines** to match each \( n \)th term rule to its number sequence.

<table>
<thead>
<tr>
<th>( n )th term</th>
<th>Number sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 4n )</td>
<td>4, 7, 12, 19, ...</td>
</tr>
<tr>
<td>((n + 1)^2)</td>
<td>4, 8, 12, 16, ...</td>
</tr>
<tr>
<td>( n^2 + 3 )</td>
<td>4, 9, 16, 25, ...</td>
</tr>
<tr>
<td>( n(n + 3) )</td>
<td>4, 10, 18, 28, ...</td>
</tr>
</tbody>
</table>

(b) **Write the first four** terms of the number sequence using the \( n \)th term rule below.

<table>
<thead>
<tr>
<th>( n^3 + 3 )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 marks
21. The diagram shows a rhombus. The midpoints of two of its sides are joined with a straight line.

What is the size of angle $p$?

$p = \ldots\degree$

2 marks
22. A bag contains counters that are red, black, or green.

\[
\frac{1}{3} \text{ of the counters are red}
\]

\[
\frac{1}{6} \text{ of the counters are black}
\]

There are 15 green counters in the bag.

How many black counters are in the bag?
23. Here is a plan of some land.

There will be a fence that is always the **same distance** from tree A as from tree B, going all the way from one road to the other road.

Use compasses and a straight edge to show accurately on the plan where the fence will go.

You **must** leave in your construction lines.
24. Work out the values of \( m \) and \( n \)

\[
5^8 \times 5^4 = 5^m
\]

\[
\frac{5^8}{5^4} = 5^n
\]

\[m = \underline{\phantom{00000}}\]

\[n = \underline{\phantom{00000}}\]
25. A square of area $64\text{cm}^2$ is cut to make two rectangles, A and B.

The ratio of area A to area B is $3 : 1$

Work out the dimensions of rectangles A and B.

Rectangle A: $\underline{\phantom{100}}$ cm by $\underline{\phantom{100}}$ cm

Rectangle B: $\underline{\phantom{100}}$ cm by $\underline{\phantom{100}}$ cm

2 marks
26. A teacher has some coins in his pocket.
He is going to take one of the coins at random.
He says:

There are **more than four** coins in my pocket.
The total value of the coins is **25p**.
The probability that I will take a **1p** coin is $\frac{1}{4}$

List all the **coins** that must be in his pocket.
END OF TEST
END OF TEST