International Competitions and Assessments for Schools

DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED.

STUDENT’S NAME:

Read the instructions on the ANSWER SHEET and fill in your NAME, SCHOOL and OTHER INFORMATION.
Use a 2B or B pencil.
Do NOT use a pen.
Rub out any mistakes completely.

You MUST record your answers on the ANSWER SHEET.

MATHEMATICS

Mark only ONE answer for each question.
Your score will be the number of correct answers.
Marks are NOT deducted for incorrect answers.

MULTIPLE-CHOICE QUESTIONS:
Use the information provided to choose the BEST answer from the four possible options.
On your ANSWER SHEET fill in the oval that matches your answer.

FREE-RESPONSE QUESTIONS:
Write your answer in the boxes provided on the ANSWER SHEET and fill in the oval that matches your answer.

You may use a ruler and spare paper.
A CALCULATOR is required.
1. In which picture does the slice match the missing part of the cake?

(A)  
(B)  
(C)  
(D)  

2. This is a diagram of a triangle.

Which of these cannot be values for \(x\) and \(y\) ?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>70</td>
</tr>
<tr>
<td>(B)</td>
<td>50</td>
</tr>
<tr>
<td>(C)</td>
<td>70</td>
</tr>
<tr>
<td>(D)</td>
<td>50</td>
</tr>
</tbody>
</table>

3. This is a sector graph (pie graph).

Vehicles Passing the School

Key
- cars
- trucks
- motorbikes
- bicycles

What is the angle at the centre for the number of cars passing this school?

(A) 296°  
(B) 284°  
(C) 257°  
(D) 240°

4. In the toy car shown, the diameters of the back wheels are one-and-a-half times the diameters of the front wheels.

When the car travels one metre, the back wheels go around 6 times.

How many times do the front wheels go around when the car travels one metre?

(A) 4  
(B) 6  
(C) 9  
(D) 12
5. Katya has a set of Russian dolls. The heights of her dolls are shown. They increase by a fixed ratio.

The smallest doll fits in the next larger doll. They both fit inside the next doll. The largest doll shown fits all four of the other dolls inside it.

Katya calculates the height of the doll that can fit exactly 700 dolls inside it, including the dolls shown.

She writes the answer as:

\[ 1.1603 \times 10^x \text{ mm} \]

What is the value of \( x \)?
The following year levels should sit THIS Paper:

<table>
<thead>
<tr>
<th>Country</th>
<th>Year/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Year 10</td>
</tr>
<tr>
<td>Brunei</td>
<td>Form 5</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Form 4</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Year 11</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Form 4</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Year 11</td>
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<tr>
<td>Pacific</td>
<td>Year 10</td>
</tr>
<tr>
<td>Singapore</td>
<td>Secondary 3</td>
</tr>
<tr>
<td>South Africa</td>
<td>Grade 10</td>
</tr>
</tbody>
</table>
HOW TO FILL OUT THIS SHEET:

- Rub out all mistakes completely.
- Print your details clearly in the boxes provided.
- Make sure you fill in only one oval in each column.

**FIRST NAME** to appear on certificate

**LAST NAME** to appear on certificate

**DATE OF BIRTH**

- Day
- Month
- Year

**CLASS** (optional)

Are you male or female?
- Male
- Female

Does anyone in your home usually speak a language other than English?
- Yes
- No
TO ANSWER THE QUESTIONS

MULTIPLE CHOICE

Example: $6 + 4 =$

(A) 2
(B) 9
(C) 10
(D) 24

START

The answer is 10, so fill in the oval $\bigcirc$, as shown.

FREE RESPONSE

Example: $6 + 6 =$

• The answer is 12, so WRITE your answer in the boxes.
• Write only ONE digit in each box, as shown, and fill in the correct oval, as shown.

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<table>
<thead>
<tr>
<th>QUESTION</th>
<th>KEY</th>
<th>SOLUTION</th>
<th>STRAND</th>
<th>LEVEL OF DIFFICULTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C</td>
<td>The missing part in C is one third which matches the slice (one third); altogether they complete one whole.</td>
<td>Space and Geometry</td>
<td>Easy</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>The sum of (x) and (y) adds to 190° which is more than the angle sum of a triangle (180°).</td>
<td>Space and Geometry</td>
<td>Easy</td>
</tr>
</tbody>
</table>
| 3        | D   | The total number of vehicles = 135
The angle at the centre for cars = \(\frac{90}{135} \times 360° = 240°\) | Chance and Data    | Medium             |
| 4        | C   | Let \(D\) be the diameter of the big wheel (back wheel).
Let \(d\) be the diameter of the small wheel (front wheel).
According to the question information,
\(D = \frac{3}{2} \times d\).

When the car travels 1 m, the big wheel makes 6 turns. Therefore, \(6 \times \text{circumference of the big wheel} = 1\)
Circumference of the big wheel is \(\pi D\), therefore the equation can be presented as:
\(6 \times \pi D = 1\) ...(Equation 1).

Let \(x\) be the number of turns the small wheel makes when the car travels 1m.
Using the same logic, we can form the equation \(x \times \pi d = 1\) .... (Equation 2)

Dividing Equation 1 by Equation 2:
\(\frac{6D}{xd} = 1\), make \(x\) the subject of the equation:
\(x = \frac{6D}{d}\)
Substitute \(D = \frac{3}{2} d\)
\(x = \frac{6 \times \frac{3}{2}}{2} = 9\). | Measurement | Medium               |
Height of smallest doll is 40.5mm. Rate of increase in height of successive dolls is \( \frac{128}{96} \).

Height of doll with 700 dolls inside

\[
= 40.5 \times \left( \frac{128}{96} \right)^{700}
\]

\[= 1.1603 \times 10^{89} \text{ mm}\]

Therefore, the value of \( x \) is 89.

<table>
<thead>
<tr>
<th>Level of difficulty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>more than 70% of candidates will choose the correct option</td>
</tr>
<tr>
<td>Medium</td>
<td>about 50–70% of candidates will choose the correct option</td>
</tr>
<tr>
<td>Medium/Hard</td>
<td>about 30–50% of candidates will choose the correct option</td>
</tr>
<tr>
<td>Hard</td>
<td>less than 30% of candidates will choose the correct option</td>
</tr>
</tbody>
</table>