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. Terry is in Station Rd and is going to a party in West St, which runs parallel to Station Rd. The angles between some of the streets are shown.

Which of these statements must be true?

(A) \( w = y \)
(B) \( x = w \)
(C) \( y = x \)
(D) \( z = y \)

2. A company uses this formula to predict total profit \( P \) based on the number of products \( n \) sold.

\[ P = n^2 + 60n - 4000 \]

How many products are sold if there is zero profit?

(A) 0
(B) 40
(C) 100
(D) 4000

3. \( 7.101 \div (3.019 - 0.798) \)

What is the value of this expression correct to three significant figures?

(A) 3.19
(B) 3.197
(C) 3.20
(D) 3.200

4. This scatter diagram shows the relationship between the air temperature \( T \) and the number of people \( P \) visiting a beachside shopping centre.

Which formula could describe the relationship between the air temperature and the number of people?

(A) \( P = 5T^2 \)
(B) \( P = -5T \)
(C) \( P = -\frac{T}{5} \)
(D) \( P = \frac{5}{T} \)
5. Mario knows that a number is divisible by nine if the sum of its digits is divisible by nine.

He has eight cards with the digits 1 to 8 written on them as shown.

 Mario selects three of these cards to make a three-digit number that is divisible by nine. He then replaces these three cards and repeats this selection procedure to select different three-digit numbers divisible by nine.

How many even three-digit numbers is it possible for him to find in this way?
The following year levels should sit THIS Paper:

- Australia: Year 11
- Brunei: Pre-University 1
- Indonesia: Year 12
- Malaysia: Form 5 & Lower 6
- New Zealand: Year 12
- Pacific: Year 11
- Singapore: Secondary 4 & 5
- South Africa: Grade 11

Acknowledgment

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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.

**EXAMPLE 1:** Debbie Bach

<table>
<thead>
<tr>
<th>FIRST NAME</th>
<th>LAST NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEBBIE</td>
<td>BACH</td>
</tr>
</tbody>
</table>

**EXAMPLE 2:** Chan Ai Beng

<table>
<thead>
<tr>
<th>FIRST NAME</th>
<th>LAST NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAN</td>
<td>AI BENG</td>
</tr>
</tbody>
</table>

**EXAMPLE 3:** Jamal bin Abas

<table>
<thead>
<tr>
<th>FIRST NAME</th>
<th>LAST NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZAMAL</td>
<td>BIN ABAS</td>
</tr>
</tbody>
</table>

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**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

**School name:**

---

**Town / suburb:**

---

**Today's date:**

---

**Postcode:**

---
Your privacy is assured as EAA fully complies with appropriate Australian privacy legislation. Visit www.eaa.unsw.edu.au for more details.
<table>
<thead>
<tr>
<th>QUESTION</th>
<th>KEY</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td><img src="https://via.placeholder.com/150" alt="Diagram" /> <strong>Smith Rd</strong> <strong>West St</strong> <strong>Station Rd</strong> <strong>y°</strong> <strong>w°</strong> <strong>Station Rd</strong> and <strong>West St</strong> are parallel, while <strong>Smith Rd</strong> crosses them. This results in angle <strong>y</strong> and angle <strong>w</strong>, that are alternate, being equal. Therefore, statement <strong>A</strong> is the correct statement.</td>
</tr>
</tbody>
</table>
| 2 | B | This is a quadratic equation. It factorises to 
\[(n + 100)(n - 40) = 0\] 
The solutions for this equation are **n = −100** and **n = 40**. 
As **n** is the number of products, it cannot be negative. Hence, **n = 40** is the correct solution. 
Alternatively, substituting the options will show that **n = 40** gives **P = 0**. |
| 3 | C | The result of the calculation is 3.197208465. This number rounded to three significant figures is 3.20. |
| 4 | D | The diagram shows an inverse relation between the air temperature, **T**, and the number of people, **P**. As **T** increases, **P** decreases. Note that the relation is not linear. 
Option **A** is a quadratic equation that gives a parabola when graphed, where the relation is positive (considering positive values of **T**). This does not describe the given data. 
Options **B** and **C** are both linear equations that give straight lines sloping downwards when graphed. Again, these do not describe the given data. 
Option **D** is an equation that gives a hyperbola when graphed. For small values of **T**, **P** has a large value. As the values of **T** increase, the values of **P** decrease. This correctly describes the given data. |
Numbers to be considered are numbers with a digit sum that is divisible by 9. So the sum of the digits must be multiples of 9: 9, 18, 27...
The highest digit sum that can be obtained from the numbers 1 to 8 is \(8 + 7 + 6 = 21\). So only numbers whose digits sum to 9 or 18 need to be considered.

The numbers must be even, so they must be of the form: _ _ 2, _ _ 4, _ _ 6 and _ _ 8.

Take for example _ _ 2. To make this number’s digits sum to 9, the first two digits must sum to 7. We can therefore have 342, or 432. We cannot have 252 or 522 as the number 2 cannot be used twice.

This table summarises the solutions.

<table>
<thead>
<tr>
<th>Possible numbers</th>
<th>Sum to 9</th>
<th>Solutions</th>
<th>Sum to 18</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First two digits sum to:</td>
<td></td>
<td>First two digits sum to:</td>
<td></td>
</tr>
<tr>
<td>_ _ 2</td>
<td>7</td>
<td>432</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>342</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>162</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ _ 4</td>
<td>5</td>
<td>234</td>
<td>14</td>
<td>684</td>
</tr>
<tr>
<td></td>
<td></td>
<td>324</td>
<td></td>
<td>864</td>
</tr>
<tr>
<td>_ _ 6</td>
<td>3</td>
<td>126</td>
<td>12</td>
<td>486</td>
</tr>
<tr>
<td></td>
<td></td>
<td>846</td>
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<td>756</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>576</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ _ 8</td>
<td>1</td>
<td>-</td>
<td>10</td>
<td>468</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>648</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>378</td>
</tr>
</tbody>
</table>

Therefore there are 18 possible numbers that Mario can find.
Note: This is one possible method. The question can be solved using other methods.

**Level of difficulty** refers to the expected level of difficulty for the question.

**Easy**
more than 70% of candidates will choose the correct option

**Medium**
about 50–70% of candidates will choose the correct option

**Medium/Hard**
about 30–50% of candidates will choose the correct option

**Hard**
less than 30% of candidates will choose the correct option