Instructions and Tips:

- You have 60 minutes to complete this worksheet
- This worksheet consists of 6 questions
- Write answers in the spaces provided
- Show all working

Student Name: _______________________________

Student ID: __________________________________

Date: _ _ / _ _ / _ _ _ _

Total Score:

Highest Score:

Tutor's Comments:

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Question 1

Consider these patterns made from squares:

(a) Draw the fourth figure in the pattern:

first figure

second figure

third figure

fourth figure

(2 marks)
(b) Complete the table below:

<table>
<thead>
<tr>
<th>Figure number (f)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of squares (N)</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

(3 marks)

(c) Write an equation in terms of figure number (f) that gives the number of squares (N) in the figure.

\[ N = f + 2 \]

(3 marks)

(d) Determine the number of squares used for the 12th figure in the pattern.

\[ N = f + 2 \]
\[ N = 12 + 2 \]
\[ N = 14 \]

For the 12th figure, 14 squares are used.

(2 marks)
**Question 2**

Consider these patterns that consists of triangles and squares:

(a) Draw the third figure in the pattern:

first figure

second figure

third figure

(3 marks)
(b) Complete the table below:

<table>
<thead>
<tr>
<th>Figure number (f)</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of shaded squares (n)</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

(2 marks)

Consider the sequence of numbers below:

0, 1, 1, 2, 3, 5, 8, 13, 21...

(c) Determine the next three terms in the sequence of numbers.

The next three terms in the sequence of numbers are 34, 55 and 89.

(3 marks)

(d) What is the name of this sequence of numbers?

This sequence of numbers is known as a Fibonacci sequence.

(2 marks)
Question 3

Consider some patterns made from rectangles and triangles:

(a) Draw the fourth figure in the pattern:

fourth figure

(2 marks)
(b) Draw the fifth figure in the pattern:

![Fifth figure diagram]

(c) Complete the table below:

<table>
<thead>
<tr>
<th>Figure number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of triangles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

(d) How many triangles will the 100th figure have?

The 100th figure will have 100 triangles.
**Question 4**

Consider the first three figures in the pattern below:

- First figure
- Second figure
- Third figure

(a) Draw the fourth figure in the pattern:

(b) From your observation and analysis of the patterns, complete the table below:

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of triangles</th>
<th>Number of circles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>(i) 4</td>
<td>(ii) 9</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>(iii) 2n + 1</td>
</tr>
<tr>
<td>(iv) 150</td>
<td>(v) 150</td>
<td>(vi) 301</td>
</tr>
</tbody>
</table>

2n + 1 = 301    2n = 301 - 1    2n = 300    n = 150

(6 marks)
**Question 5**

Consider the first three figures in the pattern below:

- First figure
- Second figure
- Third figure

(a) Draw the fourth figure in the pattern:

(b) From your observation and analysis of the patterns, complete the table below:

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of circles</th>
<th>Number of triangles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>(i) 2</td>
<td>6</td>
</tr>
<tr>
<td>n</td>
<td>2</td>
<td>(ii) n + 2</td>
</tr>
<tr>
<td>(iii) 296</td>
<td>2</td>
<td>298</td>
</tr>
</tbody>
</table>

\[ n + 2 = 298 \quad n = 298 - 2 \quad n = 296 \]

(6 marks)
**Question 6**

(a) Draw the fourth figure in the pattern:

(b) Complete the table

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of horizontal lines</th>
<th>Number of vertical lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>(i) 3</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>(ii) 3</td>
<td>3</td>
</tr>
</tbody>
</table>

(2 marks)