

# Island Numeracy Assessment

## Grade 5+: Patterning

### Collaborative Task

Find and describe 3 different increasing patterns in the multiplication table. Explain each pattern.

Consider patterns which are horizontal, vertical, diagonal or in a square.

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

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1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

Sample responses:

One pattern is in the row starting with 4. The numbers go up by 4 each time. This makes sense because if you make groups of a number each time you make a new group the count goes up by 4.

Another pattern is when you go diagonally from the 2 in both places on the multiplication table; the numbers are all even and the pattern grows by 4, 6, 8, 10, 12, 14 ...

In the column starting with 6, the numbers go up by 1 group of 6 and you have one more group of 6 so the pattern grows by 6.

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### Collaborative Task:

Your team of archeologists has just uncovered a tablet with a message believed to be from Julius Caesar to his people from nearly 2000 years ago.

Julius Caesar used a pattern rule, called a cipher, to communicate secret messages without revealing his plans to his enemies.

- Only part of the message was decoded below. *This all seems very clever, but so far it's all been letters and no numbers. So where is the math?*  
As a team find the pattern rule in his cipher. *The math comes if you think of the letters as numbers from 0-25 with A being 0, B being 1, C being 2 etc. Then encoding, shifting the alphabet forward three places, is the same as adding three to your starting number.*

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

- Complete the table to reveal the rest of this famous quote.






Caesar's Message	E	X	P	E	R	I	E	N	C	E	I	S
Coded Message	H	A	S	H	U	L	H	Q	F	H	L	V

Caesar's Message											
Coded Message	W	K	H	W	H	D	F	K	H	U	

Caesar's Message											
Coded Message	R	I	D	O	O	W	K	L	Q	J	V

- Using your own pattern rule, create your own cipher.  
Use your cipher to create a secret message for your classmates.

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Assessment Question	Answer Key
<p>1. Write the missing term:</p> <p style="text-align: center;">5, 25, 15, 35, _____, 45, 35</p>	<p><b>Answer</b> 25</p>
<p>2. Write the next two terms in this pattern:</p> <p style="text-align: center;">5.7, 5.8, 5.9, _____, _____,</p>	<p><b>Answer</b> 6.0, 6.1 or 6, 6.1 <b>Note:</b> Teacher would also look to see if the student understands place value: Do they answer 6.10</p>
<p>3. Following this pattern, how many dots will be in Figure E? _____</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  A         </div> <div style="text-align: center;">  B         </div> <div style="text-align: center;">  C         </div> <div style="text-align: center;">  D         </div> <div style="text-align: center;">  E         </div> </div>	<p><b>Answer</b> 15</p>
<p>4. The first term of a pattern is 8. The pattern <b>alternates</b> adding 3 and subtracting 2. What is the seventh term?</p> <p style="text-align: center;">_____, _____, _____, _____, _____, _____, _____,</p>	<p><b>Answer</b> 11  (8, 11, 9, 12, 10, 13, 11)</p>

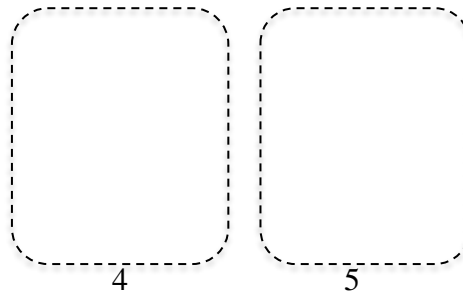
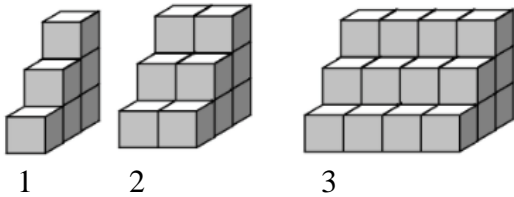
5. Which expression represents the pattern rule?

Figure Number (n)	Number of Dots
1	81
2	80
3	79
4	78
5	77

- A.  $n + 80$
- B.  $82 - n$
- C.  $n - 1$
- D.  $81 - n$

**Answer:**  
B  $82 - n$

6. Here is a pattern of linking cubes.



**Answer:**

24, 48, 96

or

24, 42, 66

The pattern continues. Complete this table for Figures 4 and 5.

Figure	Number of Cubes
1	6
2	12
3	
4	
5	

7. Fun Fair tickets are one dollar each. For every three tickets you buy, you get a fourth ticket free.

What is the greatest number of tickets you can get for \$10.00?

Show your thinking.



**Answer:**  
13 tickets

$$\begin{aligned} & TTT+1 \\ & + TTT+1 \\ & + TTT+1 + T \\ & = 13 \end{aligned}$$

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### Performance Task:

Vivienne began decorating her birthday cake for her tenth birthday party. She ran out of time!

Describe the pattern and use it to finish her birthday cake.



*I am adding one more rhombus to the next set. There is always one heart and then the rhombus increases each time.*

*Answer: This is an increasing pattern. The pattern begins as one heart, one rhombus; the rhombus increases by one with each term. HR, HRR, HRRR, HRRRR, HRRRRR, HRRRRRR*

*(Kids will often write diamonds rather than rhombus.)*

Your turn! Design your own birthday cake using your own increasing or decreasing pattern.

Describe your pattern: \_\_\_\_\_

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### Performance Task:

On the whiteboard, Keelan and Rebecka see:

2, 4, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, ...

They each create a different **increasing** pattern.

Keelan's increasing pattern	Rebecka's increasing pattern
Pattern: 2, 4, _____, _____, _____, _____	Pattern: 2, 4, _____, _____, _____, _____
Pattern Rule	Pattern Rule:
Draw a model of Keelan's pattern.	Draw a model of Rebecka's pattern.

**Answers:** Answers will vary

Any pattern can be described in more than one way. For example, the pattern 2, 4, 6, 8, 10, ... can be described with these pattern rules:

2, 4, 6, 8, 10, 12, .... Start at 2 and keep adding 2

2, 4, 8, 16, 32, 64 .... Multiply the position number by 2 to determine the term value

$x^2$  is a possible pattern rule but the pattern number will grow quickly