Island Numeracy Assessment
Grade 5+: Patterning

Assessment Question	Answer Key
1. Write the missing term: 5, 25, 15, 35, ____, 45, 35	**Answer** 25
2. Write the next two terms in this pattern: 5.7, 5.8, 5.9, ____, ____,	**Answer** 6.0, 6.1 or 6, 6.1 **Note:** Teacher would also look to see if the student understands place value: Do they answer 6.10
3. Following this pattern, how many dots will be in Figure E? _____ A B C D E	**Answer** 15
4. The first term of a pattern is 8. The pattern **alternates** adding 3 and subtracting 2. What is the seventh term? ____, ____, ____, ____, ____, ____, ____,	**Answer** 11 (8, 11, 9. 12, 10, 13, 11)

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. $81 - n$

6. Here is a pattern of linking cubes.
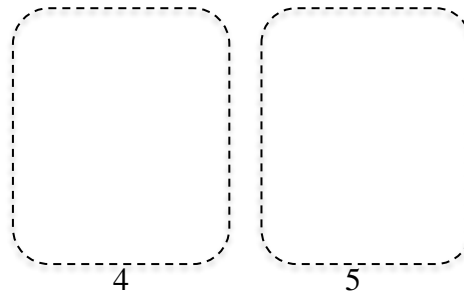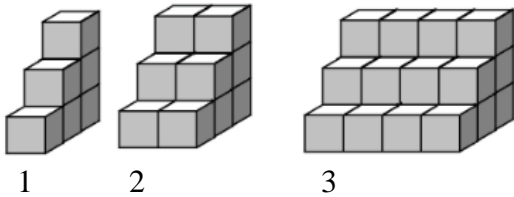
1   2   3   4   5

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. | **Answer:** 13 tickets |
| | |

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

TTT+1
+ TTT+1
+ TTT+1 + T

= 13

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

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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

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.

×	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

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 …

×	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

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.

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.

1. 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

2. 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

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