Island Numeracy Assessment
Grade 7+: Linear Relations
Collaborative Task

Part A: Sort the twelve equations into three categories: *Always True, Sometimes True and Never True.* Be sure to discuss your thoughts and reasoning with your group before choosing a category.

2n + 3 = 3 + 2n	n + 5 is less than 20	2t − 3 = 3 − 2t
5q = 5	2x = 2x	4p is greater than 9 + p
2 x 3 + s = 6 + s	k + 12 = g + 12	d + 3 = d ÷ 3
2x = 4	q + 2 = q + 16	n + 5 = 11

Always True	$2n + 3 = 3 + 2n$ $2x = 2x$ $2 \times 3 + 5 = 6 + 5$
Sometimes True	$5q = 5$ $2x = 4$ $n + 5\ is\ less\ than\ 20$ $k + 12 = g + 12$ $2t - 3 = 3 - 2t$ $4p\ is\ greater\ than\ 9 + p$ $d + 3 = d \div 3$ $n + 5 = 11$
Never True	$q + 2 = q + 16$

Part B: Choose *one* equation from each category. Write your group's reasoning and provide examples to justify your category choice.

Always True Equation:	Reasoning:
	$2n + 3 = 3 + 2n$
	If you add something, it's the same each way; it's a reversible equation.
	$2x = 2x$
	If it's two of the same thing, it must be the same.
	$2x = 2x$
	It's the same thing because $2 \times 3 = 6$
Sometimes True Equation:	**Reasoning:**
	$5q = 5$; if q = 1
	$2x = 4$; if q = 2
	$n + 5 \ is \ less \ than \ 20$; if n is less than 15
	$k + 12 = g + 12$; if $k = g$
	$2t - 3 = 3 - 2t$; if $t = \frac{2}{3}$
	Note: students might think this is never true if they are thinking only in terms of integers, and may give this as an explanation:
	When you are subtracting a big number from a smaller number, you get a negative, and when you subtract a small number from a big number you get a positive, but a positive number and a negative number are not the same thing.
	$4p \ is \ greater \ than \ 9 + p$; this is true when p is bigger than 4 and not true if p is less than 4
	$d + 3 = d \div 3$; this is true when d = –4.5
	Note: Students might think this is never true if they are thinking only in whole numbers, and may give this as an explanation:
	You can't have the same answer when adding and dividing because you are going in different directions.
	$n + 5 = 11$; true when $n = 6$
Never True Equation:	**Reasoning:**
	$q + 2 = q + 16$
	q and q are the same thing, and if one number is the same and the other number is different, you can't get the same thing

Source: Teaching Through Problems Worth Solving, Burdess, Student, Lafleur et al.

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Item	Assessment Question	Answer Key
1	Ms. Gill's class is making school flags. 	10 metres 2 m = 5 flags 5 flags x 5 = 25 2 m x 5 = 10 4 m = 10 flags 5 m = 12.5 flags 12.5 x 2 = 25 5 m x 2 = 10

Item 1 table:

Metres of fabric	1	2	3	…	?
Number of flags	2 1/2	5	7 1/2	…	25

How many metres of fabric will Ms. Gill need to buy to make 25 flags?

Item	Assessment Question	Answer Key
2	A student earns $12 per hour at a local restaurant and $35 in tips for her shift. Write an expression to describe the amount she earned during the shift?	12h + 35
3	Find the value of 4m+5k if m=3 and k = (-2)	$4(3) + 5(-2)$ $= 12 + (-10)$ $= 2$ $4 \times m = 12$ $5 \times k = -10$ $12 + (-10) = 2$
4	If *x* represents the term number, choose an expression that represents this relationship:	$C. x + 14$

Item 4 table:

Term Number	10	11	12	13	14	15
Term	24	25	26	27	28	29

A. 14x
B. x+10
C. x+14
D. x+24

5	Write the equation to match the steps shown by the algebra tiles:	
	$\dfrac{2n}{2} = \dfrac{8}{2}$	
	n = 4	
	2n + 3 - 3 = 11 - 3	
	2n = 8	
	2n +3 = 11	

The table continues with algebra tile diagrams matched to answer boxes:
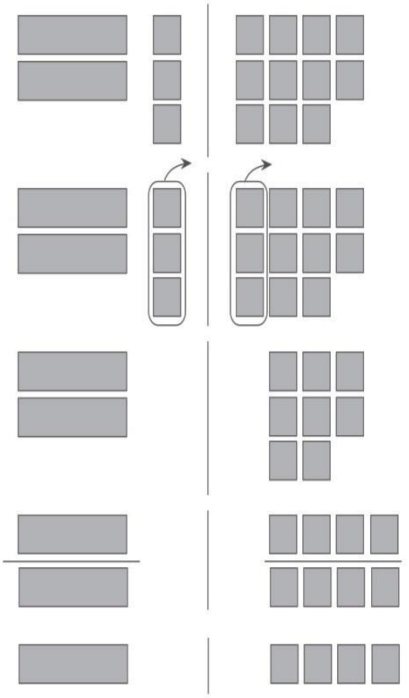
Algebra tiles	Answer box	Label
(tiles)	☐	2n +3 = 11
(tiles with arrows)	☐	2n + 3 - 3 = 11 - 3
(tiles)	☐	2n = 8
(tiles with division line)	☐	$\dfrac{2n}{2} = \dfrac{8}{2}$
(tiles)	☐	n = 4

6	Write the coordinates of the point that completes the rectangle. (_____ , _____)	$(-3,4)$ *Students may have trouble remembering which order to write the coordinates in.*
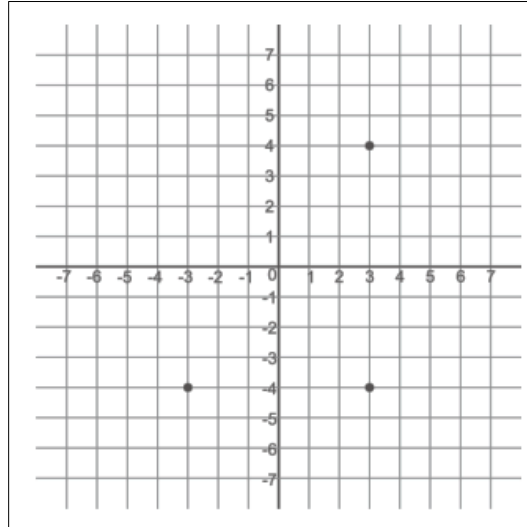
7	Write an expression to represent the following: **"Fifteen less than a number, multiplied by 3"** *If students are having trouble with the generalization, they may pick a number bigger than 15 to get started. I.e. 18 – 15 = 3; 3 x 3 = 9*	$3(n-15)$ *Students may get confused about the order of what to do here and multiply the number by 3 first, and then subtract 15.*

8	The school's environmental club is having a lunch. The club is charged $140 for the speaker, plus $16 for each lunch served. The expression for this situation is 16n + 140 Complete the table of values for the number of participants:	*Students may include the following calculations:* *16 + 140 = 256* *160 + 140 = 300* *400 + 140 = 540* *800 + 140 = 940* *1000 + 140 = 1740*

Number of Participants	Total
1	$156
10	$300
25	$540
50	$940
100	$1740

9	Solve the following equation and show your work: **3*n* - 104 = 226**	$3n - 104 + 104$ $= 226 + 104$ $3n = 330$ $\dfrac{3n}{3} = \dfrac{330}{3}$ $n = 110$ *Students may organize their thinking differently:* 226 + 104 = 330 330 ÷ 3 = 110 *Check to see if students are checking their work:* 110 x 3 = 330; 330 − 104 = 226
10	In the school cafeteria, four people can sit together at one table. If two tables are placed together, then six people can sit together. How many tables must be placed together to seat 10 people? Using the pattern, how many tables would be needed for 50 people. *Students might explain in words:* *Two tables in the middle will hold four people. Add the two end tables for six more people. Altogether, four tables are needed.* *Or,* *There has to be eight people between the two people on the ends, so there needs to be four tables altogether.* 50 People: *The end tables hold six people, so 44 more people need to be seated. Half of 44 is 22, and there needs to be two end tables, so 24 tables are needed.* *Or,* *Two people are seated at the ends, so there are 48 people to be seated in the middles. Half of 48 is 24, so 24 tables are needed.*	*10 people:* $3 + 3 + 2 + 2 = 10$ *four tables are needed* *50 people:* $6 + 2(n - 2) = 50$ $2(n - 2) = 44$ $n - 2 = 22$ $n = 24$ *24 tables are needed*
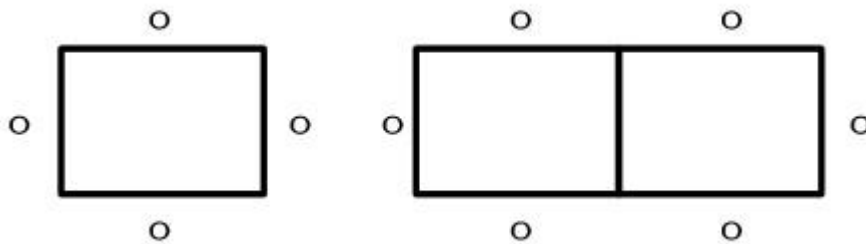
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Performance Task

The community gives grade seven students of money to plant 100 seedlings each year to help reforest their local mountain.

They receive a total of $4500.00 to spend

The first year, the seedlings cost $3.00 each. Their supplies cost $250.00 each year.

The cost of a seedling increases by $1.00 each year

1. For how many years will they be able to continue this reforestation project?

2. How many seedlings would they plant in the last year to use all their money?

Year	Seedling Cost	Cost of Seedlings	Total Cost
1	3	300	550
2	4	400	650
3	5	500	750
4	6	600	850
5	7	700	950
6	8	800	1050
7	9	900	1150

550 + 650 = 1200 (at the end of year 2)
1200 + 750 = 1950 (at the end of year 3)
1950 + 850 = 2800 (at the end of year 4)
2800 + 950 = 3750 (at the end of year 5)
3750 + 1050 = 4800 (at the end of year 6)

They can continue the project for six years.

4500 – 3750 = 750
750 – 250 = 500

They have $500 to spend on seedlings and each seedling costs $8 in year 6.
500 ÷ 8 = 62.5
They can plant 62 seedlings in year 6.