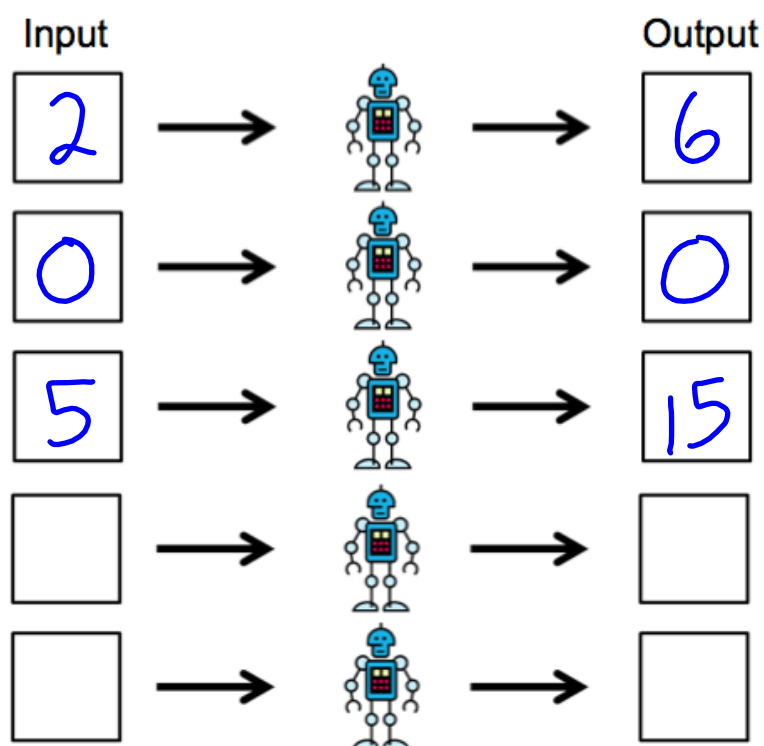


Using Patterns to Start Learning About Algebra

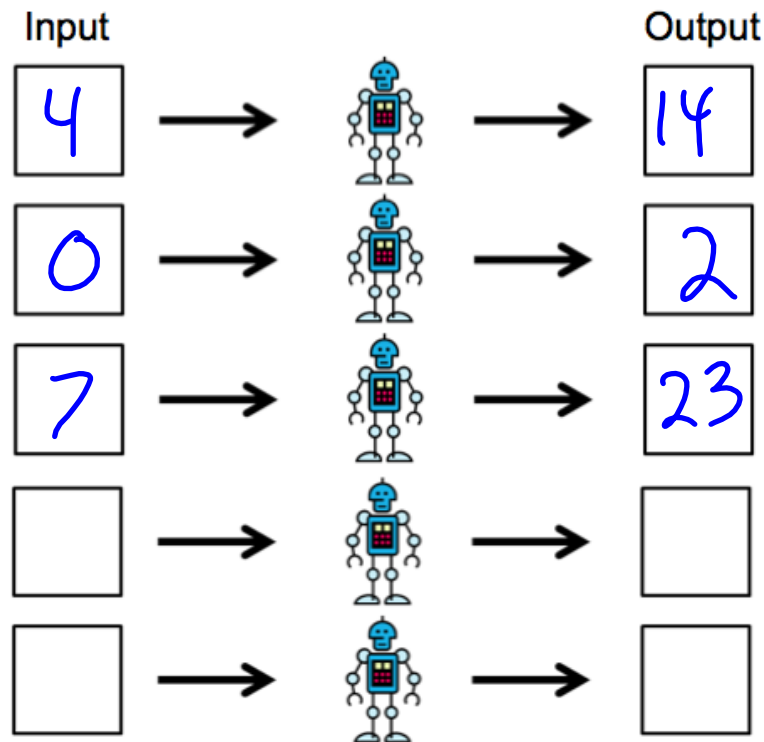
Lesson 3 - Robot Tables, Multiplier & Constants

Robot Tables . . . Part 2



The rule is:

$$\text{Output} = \text{Input} \times 3$$



The rule is:

$$O = I \times 3 + 2$$

Definitions:

A constant is: The part that stays the same. (the "+ 2" part)

A direct variation is: when the constant is zero (No constant)

A partial variation is: when there is a constant value.

(a)

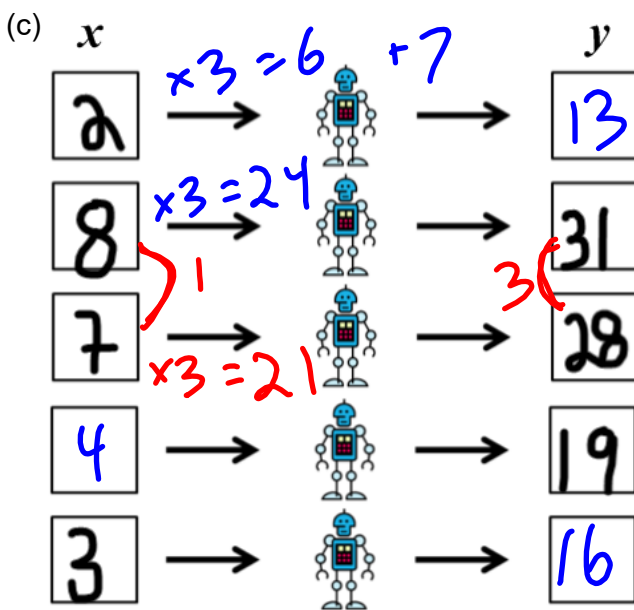
1	→		→	6
2	→		→	11
3	→		→	16
4	→		→	21
5	→		→	26

$O = 5 \times I + 1$

(b)

2	→		→	24
4	→		→	38
6	→		→	52
8	→		→	66
10	→		→	80

$O = 7 \times I + 10$



(i) Determine the value of y when x is 13.

$$y = 3(13) + 7$$

$$= 39 + 7$$

$$= 46$$

(ii) Determine the value of x when y is 25.

$$25 = 3x + 7$$

$$18 = 3x$$

$$6 = x$$

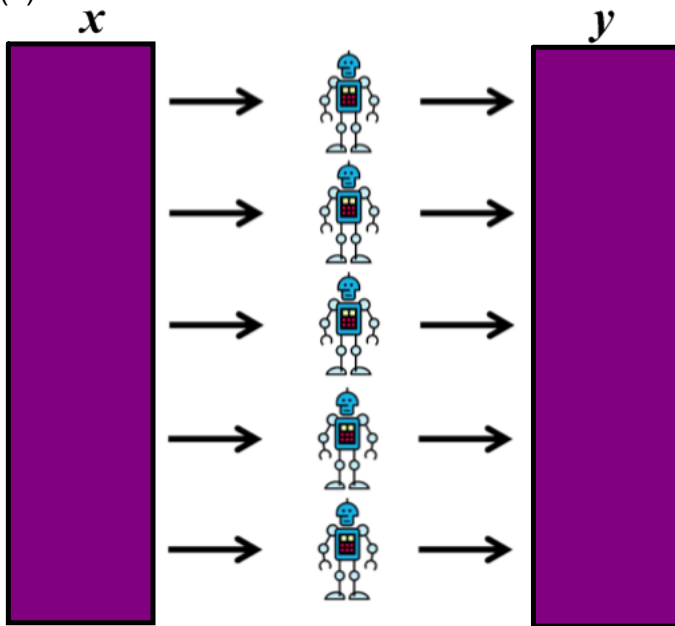
The rule is:

$$O = 3 \times I + 7$$

$$y = 3x + 7$$



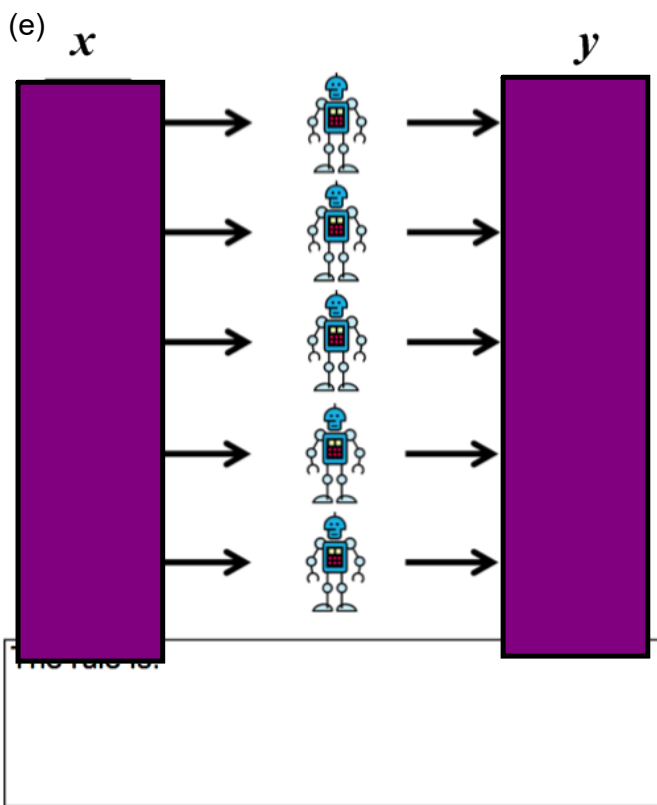
(d)



(i) Determine the value of y when x is 11.

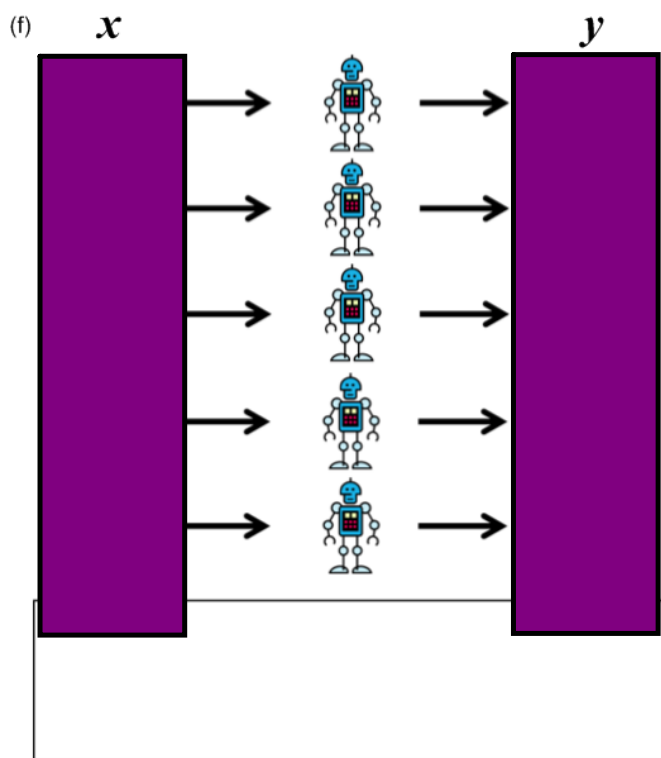
(ii) Determine the value of x when y is 40.

The rule is:



(i) Determine the value of y when x is 9.

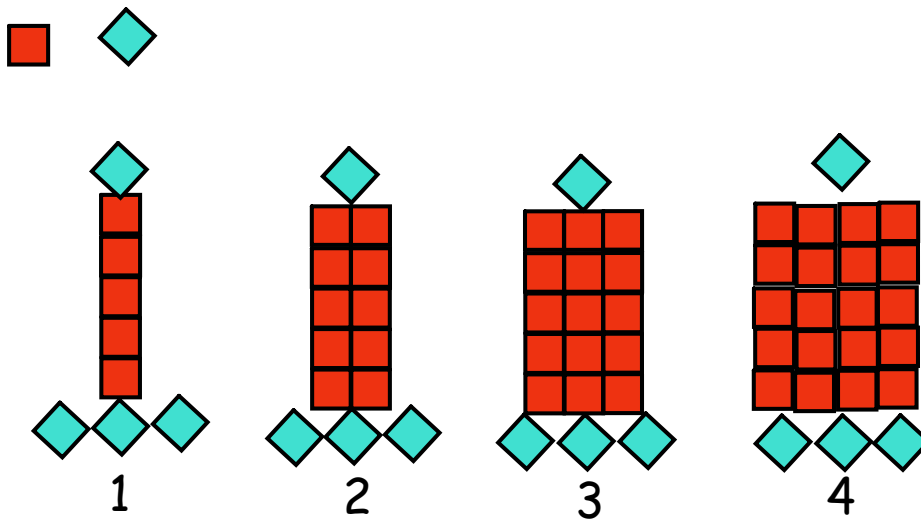
(ii) Determine the value of x when y is 188.



(i) Determine the value of y when x is 20.

(ii) Determine the value of x when y is 20.

Building Patterns with Tiles



Position #			Total # of Tiles
1	5	4	9
2	10	4	14
3	15	4	19
4	20	4	24
5	25	4	29

The rule is:

$$y = 5x + 4$$

Think about . . .

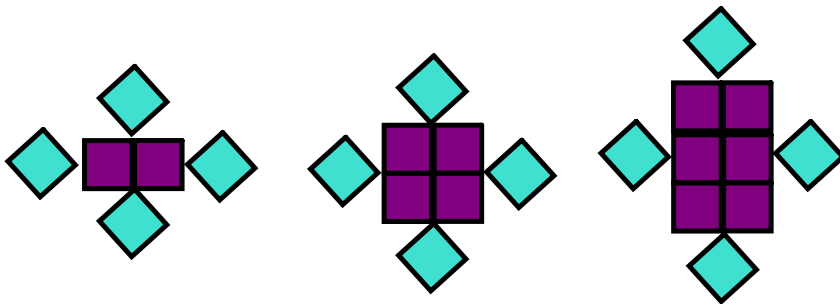
i) What is the rule? $y = 5x + 4$

ii) How many tiles do you need to build the 10th position?
 54

iii) How many tiles do you need to build the 100th position? How do you know this?
 504

iv) What part of the rule is represented by the red tiles? *multiplier*
 What part of the rule is represented by the blue tiles? *constant*
 How do you know this?

Example 2



1

2

3

4

x

y

Position Number	Number of Tiles

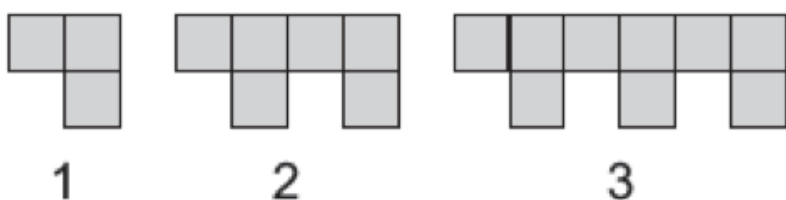
Think about . . .

i) What is the rule?

ii) How do you know which tiles represent the constant?

iii) How do you know which tiles represent the multiplicative part?

Example 3



1

2

3

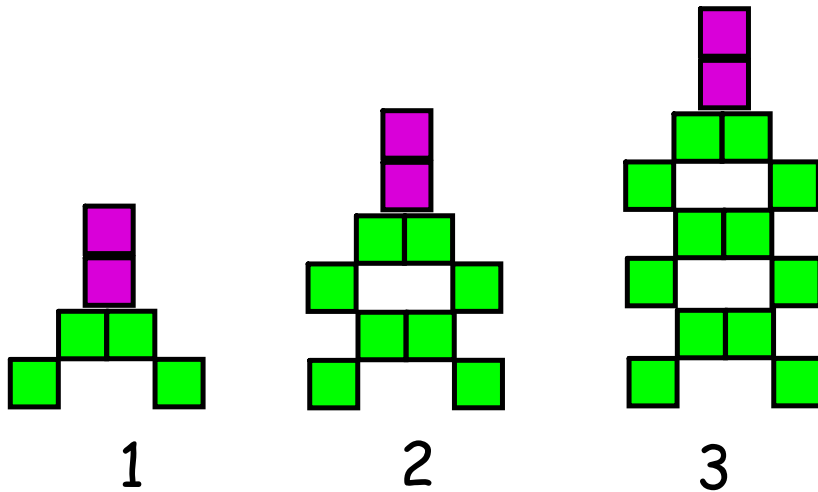
x

y

<u>Position Number</u>	<u>Number of Tiles</u>

The rule is: _____

Example 4



4

x	y
<u>Position Number</u>	<u>Number of Tiles</u>

Think about . . .

i) What is the rule?

ii) How do you know which tiles represent the constant?

iii) How do you know which tiles represent the multiplicative part?

Summary

How to determine a rule from a table of values.

1. See if it's a "multiplier only" rule first.
This is called a direct variation.

Input	Output
2	12
5	30
1	6
9	54

Handwritten annotations: A blue '1' with a curved arrow pointing to the input column. A blue '6' with a curved arrow pointing to the output column.

look at consecutive values

2. If multiplying doesn't work, then it's a **composite rule** - it has two parts: a multiplication part and a constant part.

This is called a partial variation.

Input	Output
2	11
5	23
9	39
6	27
0	3

Handwritten annotations: A blue '4' with a curved arrow pointing to the output column. A red '3' with a curved arrow pointing to the output column.

mult. = 4
const. = 3

rule \rightarrow
 $y = 4x + 3$

For a composite rule, why is it helpful to have two consecutive input values?

because the difference in output values is the multiplier.

How might knowing the output value for an input of 0 be helpful in determining the rule?

the output is the constant.