1.4 Using Variables to Describe Patterns

Vocabulary:

Variable: a letter that can be replaced by the value of any number

Remember how to find the expression used based on an Input/Output table?

1. Find out the pattern rule for output.
2. If the same amount is added each time this means multiplication took place. Test your number on the second input.
3. See how many you need to add or subtract based on your calculation so far to get to the number you see in the table.
4. Test your overall pattern rule (comparing input to output) on the next input number.

New: you can turn this pattern rule into an expression using a variable *(eg. n, t, s, p—Note- these can represent any number; your input)*

Eg.

Input	Output
1	7
2	11
3	15
4	19
5	23

1. **Find the pattern rule for output:**
   -start at 7. Add 4 each time.

2. **If the same amount is added each time this means multiplication took place. Test your number on the second input.**

   -4 was added each time; therefore, the input must be multiplied by 4
   -Test 4 x 2=8

3. **See how many you need to add or subtract based on your calculation so far**.

   -add 3 to 8 to get to 11; therefore, you need to add 3 after multiplying
   Pattern rule: Multiply the input by 4. Then add 3.

Note: When you use variables in expressions, be sure not to use an "x" to represent multiplication. Instead put the two numbers beside each other in brackets, or put a dot between.

Eg. 3 x 4 = 3(4) = 3 ● 4

4. **Test:**
(4 x 3) + 3 = 12 + 3 = 15 ☺

New: replace your input number in this equation by a variable.
eg. 4n + 3
-        You can now test any number from your input by replacing the n with your input value.

How to use patterns to solve a problem:

Example: Cindy works at a fishing camp in the Yukon. She earns $25 a day, plus $8 for each fishing net she repairs. On Saturday, Cindy repaired 9 nets. How much money did she earn?

Strategy 1: Make a table of values

Input: Number of Fishing Nets	Output: Amount Earned
0	25
1	33
2	41
3	49
4	57
5	65
6	73
7	81
8	89
9	97

- Use the patterns in the columns. When we add 1 to the number of nets, we add 8 to the amount earned.
- The pattern in the number of nets is:
  Start at 0. Add 1 each time.

- The pattern in the amount earned is:
  Start at 25. Add 8 each time.

- We can use these patterns to extend the table.
  Cindy earned $97 for repairing 9 nets.

Strategy 2: Use a variable in an expression.

For or 0 nets, she earns: 8 x 0 + 25 = 25

For 1 net, she earns: 8 x 1 + 25 = 33

For 2 nets, she earns: 8 x 2 + 25 = 41

For 3 nets, she earns: 8 x 3 + 25= 49

Cindy earned $25 even when there are no nets to repair. For each net Cindy repairs, she earns $8.

We can use the letter n to represent any number of nets. Then, the amount earned in dollars for repairing n nets is:

8 x n + 25 or 8n + 25

Check the expression by substituting n for any of the table values.

$$8n + 25 = 8 (3) + 25$$
$$= 49 ☺$$

To find the amount earned for 9, substitute 9 in for n.

8(9) + 25= 72 + 25= 97

Cindy earned $97 for repairing 9 nets.

Homework: p. 22 # 1,2,3,4 Bonus 5, 6