

Unit 4: Linear Functions

Section 4.1: Writing Equations to describe patterns

Patterns: 2, 4, 6, 8, 10, ...

* Numbers are increasing by 2

-3, -7, -11, -15, -19, ...

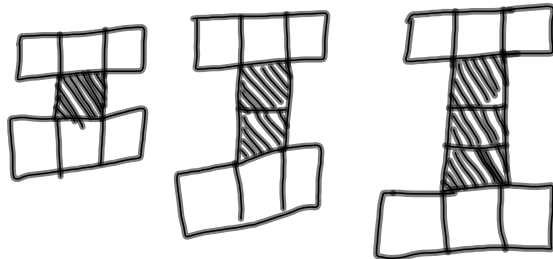
* Numbers are decreasing by 4

$\frac{1}{2}, 0, -\frac{1}{2}, -1, -\frac{3}{2}, -2, \dots$

* Numbers are decreasing by $\frac{1}{2}$

Example #1: The following is a pattern based on square blocks

Diagram:

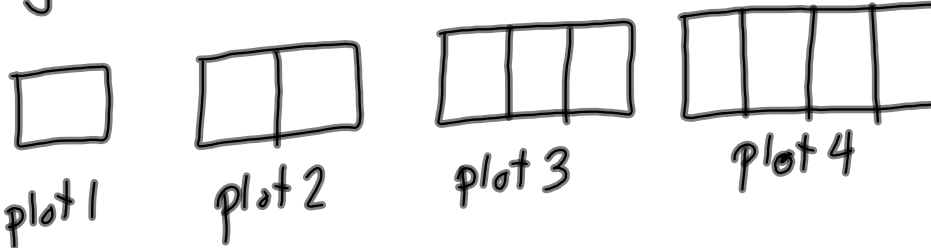


Question: Construct a table including the diagram number, number of shaded & unshaded blocks.

Diagram #	Unshaded Blocks	Shaded Blocks
1	6	1
2	6	2
3	6	3
4	6	4
5	6	5
6	6	6
N	6	N

Example 2: A landscaper uses wooden boards as edging for the plots in a garden.

Diagram:



* Create a table showing the plot number & the # of boards used.

Plot Number	Number of Boards
1	4
2	7
3	10
4	13

$\begin{matrix} \text{>} +3 \\ \text{>} +3 \\ \text{>} +3 \end{matrix}$

pattern: # of boards = Three times the plot number increased by 1

Variables: Let n = plot number
 b = # of boards

Rule: $b = 3n + 1$

Questions: $b?$

(1) How many boards does Farmer Jack need if he wants to have 25 plots?

Ans) $b = 3n + 1$
 $b = 3(25) + 1$
 $b = 75 + 1$
 $b = 76$

∴ Jack needs 76 boards.

.....
 (2) Farmer Jill has 34 pieces of board.
 How many plots can she make?

Ans) $b = 3n + 1$

$$34 = 3n + 1$$

$$34 - 1 = 3n + 1 - 1$$

$$\frac{33}{3} = \frac{3n}{3}$$

$$11 = n$$

∴ Farmer Jill will have a plot # of 11.

Example #3: A local taxi service charges the following:

* Fixed Cost = \$3.60

* Per km = \$1.50

(A) Write an equation for the cost of a taxi based on distance travelled.

Ans) $d + C = \text{cost of taxi ride}$
 $d = \text{distance travelled}$.

$$C = 1.50d + 3.60$$

(B) What is the cost of an 11 km taxi ride?

Ans) $C = 1.5d + 3.6$

$$C = 1.5(11) + 3.6$$

$$C = 16.5 + 3.6$$

$$C = \$20.10$$

(C) How far could you travel if the taxi ride is \$33.60?

Ans) $C = 1.5d + 3.6$

$$33.6 = 1.5d + 3.6$$

$$33.6 - 3.6 = 1.5d + 3.6 - 3.6$$

$$30 = 1.5d$$

$$\frac{30}{1.5} = \frac{1.5d}{1.5}$$

$$20 = d$$

oo You could travel 20 km.

Homework:

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#5, 7, 8, 9, 11 (iii)

12A-D, 15-17

14. The cost to print brochures is the sum of a fixed cost of \$250, plus \$1.25 per brochure.
- Write an equation that relates the total cost, C dollars, to the number of brochures, n .
 - What is the cost of printing 2500 brochures?
 - How many brochures can be printed for \$625?

$$\text{Fixed Cost} = \$250$$

$$\text{per brochure} = \$1.25$$

$$C = \text{Total Cost}$$

$$n = \# \text{ of brochures.}$$

$$(A) C = 1.25n + 250$$

$$(B) C = 1.25n + 250$$

$$C = 1.25(2500) + 250$$

$$C = 3125 + 250$$

$$C = \$3375$$

\therefore It would cost \$3375 to make 2500 brochures.

$$(C) C = 1.25n + 250$$

$$625 = 1.25n + 250$$

$$625 - 250 = 1.25n + 250 - 250$$

$$\frac{375}{1.25} = \frac{1.25n}{1.25}$$

$$300 = n$$

\therefore 300 brochures can be printed for \$625.

16. Clint has a window cleaning service. He charges a fixed cost of \$12, plus \$1.50 per window.
- Write an equation that relates the total cost to the number of windows cleaned. How do you know that your equation is correct?
 - Clint charged \$28.50 for a job. How many windows did he clean?

Fixed Cost = \$12
 per window = \$1.50
 $C = \text{total cost}$
 $w = \# \text{ of windows cleaned.}$

$$(A) C = 1.50w + 12$$

$$(B) C = 1.50w + 12$$

$$28.50 = 1.50w + 12$$

$$28.50 - 12 = 1.50w + 12 - 12$$

$$\frac{16.50}{1.50} = \frac{1.50w}{1.50}$$

$$11 = w$$

∴ For \$28.50 Clint can wash 11 windows

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 #15, 17

Homework:

15. A pizza with tomato sauce and cheese costs \$9.00.

Each additional topping costs \$0.75.

- (A)
- Create a table that shows the costs of a pizza for up to 5 toppings.
 - Write an equation that relates the cost, C dollars, to the number of toppings, n . Verify your equation by substituting values of n from the table.
 - Suppose a pizza costs \$15.00. How many toppings were ordered? What strategy did you use? Try a different strategy to check your answer.

Fixed cost: \$9
each topping: \$0.75

Number of Toppings n	Pizza Cost (\$) C
1	9.75
2	10.50
3	11.25
4	12.00
5	12.75

$$(B) C = 0.75n + 9$$

$$(C) C = 0.75n + 9$$

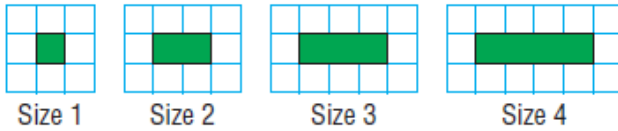
$$15 = 0.75n + 9$$

$$15 - 9 = 0.75n + 9 - 9$$

$$\frac{6}{0.75} = \frac{0.75n}{0.75}$$

$$\therefore n = 8 \text{ toppings}$$

17. A landscaper uses square patio stones as a border around a rectangular garden.
 The number of patio stones needed depends on the size of the garden.
 This pattern continues.



- * Create a table
- * Find a rule or equation
- * Answer question.

The landscaper uses 152 stones. What size of garden does she make?

(A)

SHADED	h	UNSHADED	U
1		8	
2		10	
3		12	
4		14	

$\nearrow +2$
 $\nearrow +2$
 $\nearrow +2$

Pattern: multiply by 2 and add 6.

Equation: $U = 2h + 6$ * $U = 152 + h = ?$

$$152 = 2h + 6$$

$$152 - 6 = 2h + 6 - 6$$

$$\frac{146}{2} = \frac{2h}{2}$$

$$73 = h$$

oo Garden size = 73

Homework:
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 #19, 20