MARCH 16, 2018

UNIT 6: LINEAR RELATIONS

4.2: LINEAR RELATIONS

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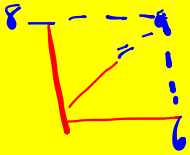
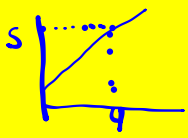
MATH 9

WHAT'S THE POINT OF TODAY'S LESSON?

We will begin working on the Math 9 Specific Curriculum Outcome (SCO) "Patterns and Relations 2" OR "PR2" which states:

"Graph linear relations, analyze the graph and interpolate or extrapolate to solve problems."





SECTION 4.2: LINEAR RELATIONS

For this section of the unit, we need to be familiar with some more *VOCABULARY*:

1. **DISCRETE DATA: Data that does NOT have an infinite number of values between whole numbers; in graphs containing discrete data, points are NOT joined together to signify this. (Think NO fractions and NO decimals.)**
   examples: number of people, number of squares

2. **CONTINUOUS DATA: Data that has an infinite number of values between whole numbers; in graphs containing continuous data, points are joined together to signify this. (Think fractions and decimals.)**
   examples: heights, distances, times, temperature, speed

VOCABULARY:

3. **DEPENDENT VARIABLE: A variable whose value depends on the value of another (the *independent* variable). It is plotted on the y-axis of a graph.**

4. **INDEPENDENT VARIABLE: A variable whose value is NOT dependent on the value of another; it controls the relationship and determines the value of the other variable (the *dependent* variable). It is plotted on the x-axis of a graph.**

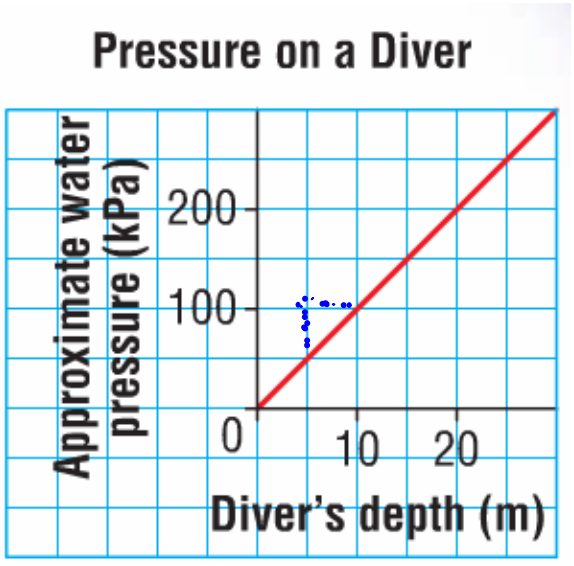
5. **RELATION:** A rule that relates two quantities. When two variables are related, we have a relation.

6. **LINEAR RELATION:** A relation whose graph contains a straight line. In a linear relation, a constant change in one variable produces a constant change in the other.

Example: Please turn to page 164 in *MMS9*.

When a scuba diver goes under water, the weight of the water exerts pressure on the diver.

Diver's Depth (m)	Approximate Water Pressure (kiloPascals)
0	0
5	50
10	100
15	150
20	200



What pattern do you see in the table?
As the diver's depth increases by 5 m, the water pressure increases by 50 kPa.

What pattern do you see in the graph?
The same pattern as in the table.

"Investigate", page 164 in *MMS9*:

Working with your assigned group, represent the relation between the total cost and the number of text messages sent in as many different ways as possible. Be prepared to share and discuss your findings.

REMINDER: "Discuss the Ideas", page 158:

"1. What different ways can you represent a between two quantities?"
diagrams, words, tables of values, expressions, equations;
new way: graph

***In words*:** **The total cost of the cell phone plan per month is equal to the number of text messages sent in one month multiplied by $0.10 plus the fixed cost of $20.**

$C = 0.10x + 20$

m (slope) $\quad$ y-int

***In a table of values*:** $y = 0.10x + 20$

Number of Text Messages Sent (n)	Total Cost (C)
0	20
10	21
20	22

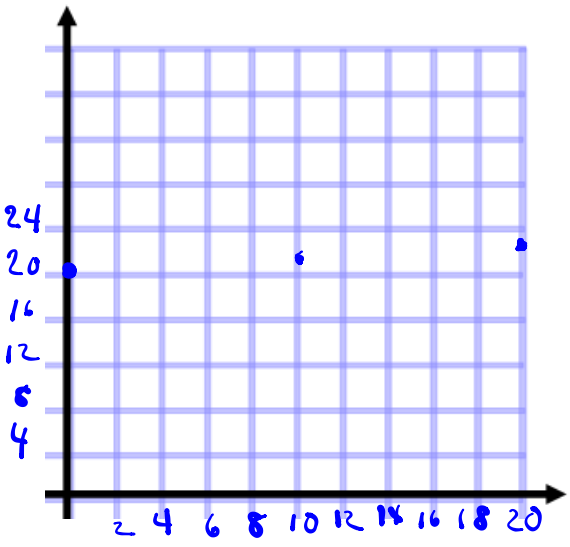
In a table of values:

$y = 0.10x + 20$

Number of Text Messages Sent (n)	Total Cost (C)
0	20
20	22
40	24

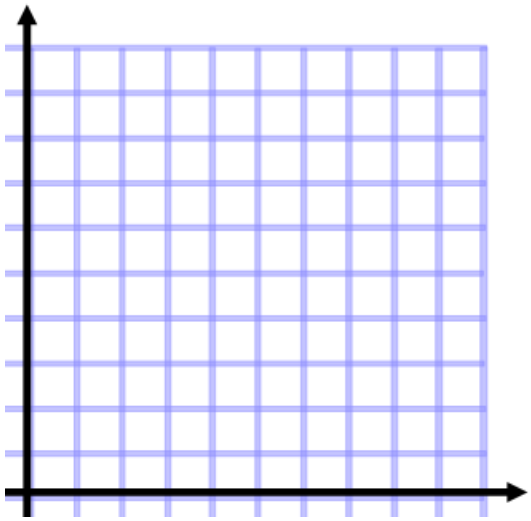
In a graph:

Number of Text Messages Sent (n)	Total Cost (C)
0	20
10	21
20	22



In a graph:

Number of Text Messages Sent (n)	Total Cost (C)
0	20
20	22
40	24



Using an expression:

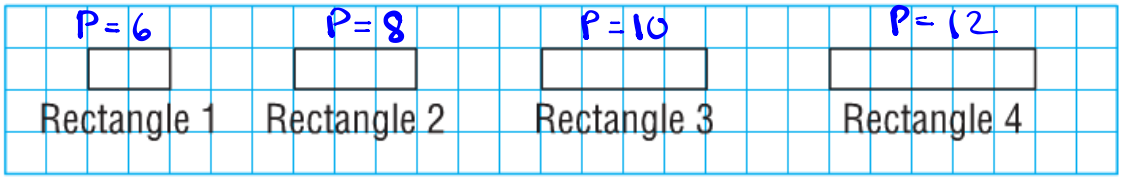
0.10n + 20

Using an equation:

C = 0.10n + 20

PLEASE CLOSE YOUR TEXTBOOKS!

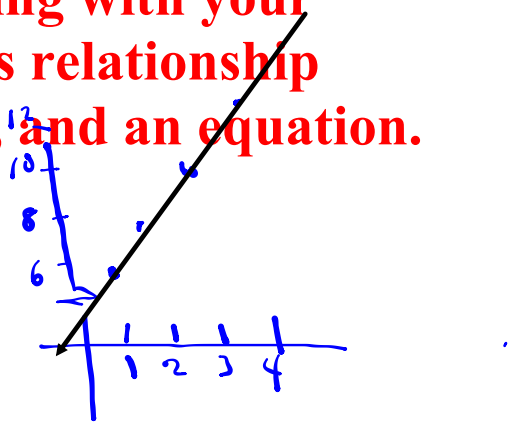
The first 4 rectangles in a pattern are shown below. The pattern continues. Each small square has a side length of 1 cm.



The perimeter (P) of a rectangle is related to the rectangle number (n). Working with your assigned group, represent this relationship using words, a table, a graph, and an equation.

1	6
2	8
3	10
4	12

$P = 2n + 4$



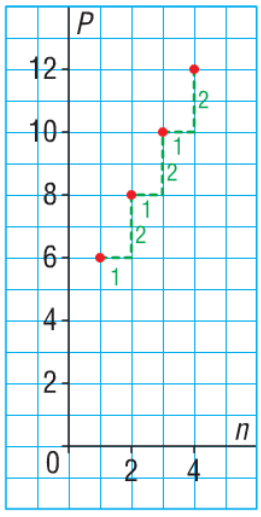
Please turn to pages 165 and 166 in *MMS9* to check your group's work.

In a Table

Rectangle Number, n	Perimeter, P (cm)
1	$6 = 2(1) + 4$
2	$8 = 2(2) + 4$
3	$10 = 2(3) + 4$
4	$12 = 2(4) + 4$

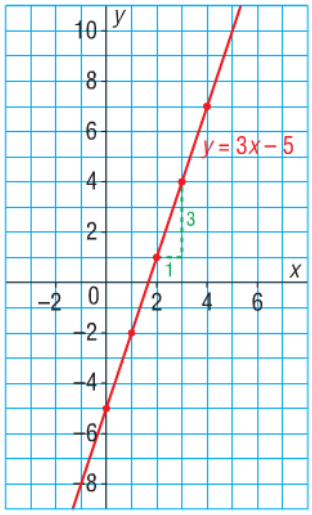
+1, +1, +1 (rectangle number) +2, +2, +2 (perimeter)

Graph of P against n



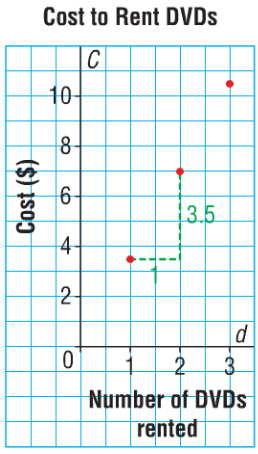
Please look at the example on page 166 of *MMS9*.

x	y	
0	−5	
		+1
1	−2	+3
		+1
2	1	+3
		+1
3	4	+3
		+1
4	7	+3



Please look at "Example 1" on page 167 of *MMS9* (graphing a linear relation from a table of values):

Number of DVDs Rented, *d*	Cost, *C* ($)
1	3.50
2	7.00
3	10.50
4	14.00
5	17.50

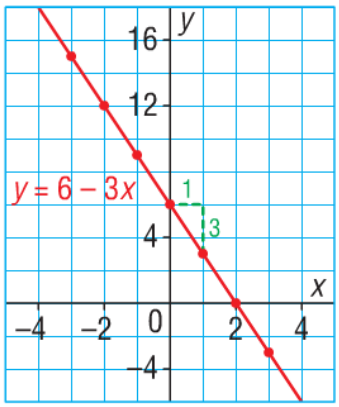


Please look at "Example 2" on pages 167 and 168 of *MMS9* (graphing a linear relation from an equation):

$y = 6 - 3x$

x	y
−3	15
−2	12
−1	9
0	6
1	3
2	0
3	−3

+1, +1, +1 → −3, −3, −3

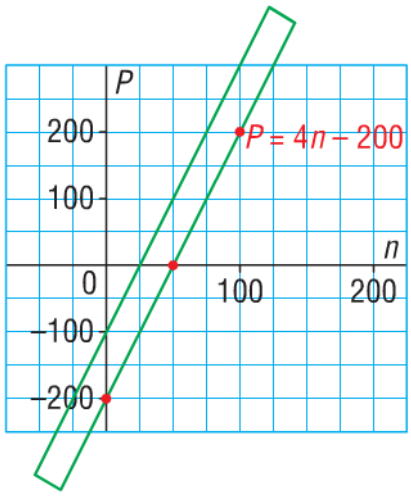


Please look at "Example 3" on page 169 of *MMS9* (solving problems using a linear relation):

Equation: $\boxed{P = 4n - 200}$

(P = Profit; n = number of students)

n	P
0	−200
50	0
100	200



PLEASE TURN TO PAGE 170 IN *MMS9.*

"Discuss the Ideas":

1. a) Its point lie on a straight line.

   b) If a constant change in one quantity produces a constant change in the other, the relation is linear.

2. a) 2

   b) This produces a more accurate graph which is easier to extend when necessary.

3. If the data represented in the graph is continuous, which means fractions and decimals are allowed, we connect the points; if the data represented in the graph is discrete, which means fractions and decimals are NOT allowed, we do NOT connect the points.

CONCEPT REINFORCEMENT:

MMS9:

PAGE 170: ALL! (#4 and #5)
PAGE 171: ALL! (#6 to #11)
PAGE 172: ALL! (#12 to #15)
PAGE 173: #16
PAGE 181: #3 TO #5
PAGE 201: #4 TO #6

5. a)

x	y
1	4
2	13
3	22
4	31
5	40

+1 +9, +1 +9, +1 +9, +1 +9

$m = \frac{9}{1}$ Linear