

Math 9

5.1 Notes

Name:

Describing Relations Algebraically

Goal: Use symbols to describe a pattern that changes at a constant rate.

Relation: (def) comparison between two different "quantities"
ie) Dallas earns \$10/h → relation between hours worked and total wages

Eg 1: A cell phone plan has a connection fee of \$15 plus \$2 per minute charge.
A relation exists between the number of minutes and the total charges.
This relation can be shown using symbols.

Total charges for 1 minute

$$\begin{array}{c} \boxed{\$10} \quad \boxed{\$5} \\ \boxed{15} \end{array} + \textcircled{2} = \$15 + \$2 = \$17$$

Total charges for 2 minutes

$$\begin{array}{c} \boxed{\$10} \quad \boxed{\$5} \\ \boxed{15} \end{array} + \textcircled{2} + \textcircled{2} = \$15 + \$2 + \$2 = \$19$$

Total charges for 3 minutes

$$\begin{array}{c} \boxed{\$10} \quad \boxed{\$5} \\ \boxed{15} \end{array} + \textcircled{2} + \textcircled{2} + \textcircled{2} = \$15 + \$2 + \$2 + \$2 = \$21$$

RATE OF CHANGE --- the amount that changes with time. For example, the price increase per minute would represent the rate of change here.

What is the rate of change of the cell phone plan?

$$\text{Rate of change} = \frac{\text{Increase in Fee}}{\text{Increase in minutes}} = \frac{\$2}{1 \text{ min}}$$

Rate of change is \$2/min

rate of change

$$\text{Total Cost} = \text{connection fee} + (2 \times \# \text{ minutes})$$

We can show the cell phone plan as an equation. Let C be the total cost and n be the number of minutes.

$$C = 15 + 2n$$

Using the equation, determine the total cost after 30 minutes

Step 1: Let $n = 30$

Step 2: replace "n" with 30

step 3: simplify

$$C = 15 + 2(30)$$

$$C = 15 + 60$$

$$= \underline{\underline{\$75}}$$

How many minutes would have to have been used for a cost of \$107?

Step 1: Let $C = 107$

Step 2: replace C with 107

Step 3: Solve for n

$$C = 15 + 2n$$

$$107 = 15 + 2n$$

$$107 = 15 + 2n$$

$$-15 \quad -15$$

$$\frac{92}{2} = \frac{2n}{2}$$

$$\boxed{n = 46 \text{ minutes}}$$

Make a table of values from the equation: $C = 15 + 2n$

n	C
0	15
1	17
2	19
3	21

starting number
(when $n=0$)

↑
st#

↑
r/c

• RATE OF CHANGE

x	y
n	C
+1	0 15
+1	1 17
+1	2 19
+1	3 21

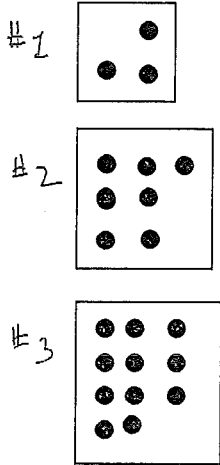
$$\text{FORMULA} = \frac{\text{change in } y\text{'s}}{\text{change in } x\text{'s}}$$

$$R/C = \frac{2}{1} = \underline{\underline{2}}$$

Use the table to find the rate of change.

Eg. Patterns can be shown several ways:

a) Picture



b) Table

Fig #	# dots
1	3
2	7
3	11

• Starting number

F	D	← st #
0	-1	
+1 < 1	3	> +4
+1 < 2	7	> +4
+1 < 3	11	

• Rate of change

$$= \frac{\text{change in "dots"}}{\text{change in fig \#}} = \frac{4}{1} = 4$$

Dots

c) Equation

$$D = \text{starting} + r/c \times F$$

$$D = -1 + 4F$$

or

$$D = 4F - 1$$

• How many dots in Figure # 35 ??

• let $F = 35$ • $F = -1 + 4(35)$

$$= -1 + 140$$

$$= \underline{\underline{139 \text{ dots}}}$$

Practice: Determine the rate of change and starting number for the following and write an equation

a) $st \# = 5$

X	Y
0	5
1	12
2	19
3	26

+1 < } +7
+1 < } +7
+1 < } +7

b) $st \# = 25$
 $r/c = -5$

X	Y
0	25
1	20
2	15
3	10

+1 < } -5
+1 < } -5

c) $st \# = 6$; $r/c = 1/2$

x	y
0	6
2	7
4	8
6	9

+2 < } +1

$r/c = \frac{7}{1} = 7$
 $y = 5 + 7x$

$y = 25 - 5x$

$y = 6 + \frac{1}{2}x$

$st \# = 7$ Determine the rate of change and the starting number

d) $y = -2x + 7$
 $y = 7 - 2x$
 $r/c = -2$

e) $y = 5x - 3$
 $y = -3 + 5x$
 $st \# = -3$
 $r/c = 5$

Practice: Complete the tables below

a) $y = 4x + 1$

x	y
-1	-3
0	1
1	5
2	9

> 4
> 4

b) $y = \frac{1}{2}x + 3$

x	y
-2	2
0	3
4	4
6	5

> 1
> 1