Direct Variation

xplore-Classwork

Name______________________ 6th

Date ________________ Period 6

If you are like the average American, you have enough time to sing several songs while taking a shower. The national average for time spent in the shower is 12.2 minutes. That means you use 73.2 gallons of water for each shower you take. Taking one shower per day for one year would use 26,718 gallons of water!

Gal ÷ min — unit rate

1. How many gallons of water are used each minute?

   73.2 ÷ 12.2 = 6 gallons per minute

2. Complete the table that shows the relationship between the time spent showering and the amount of water used.

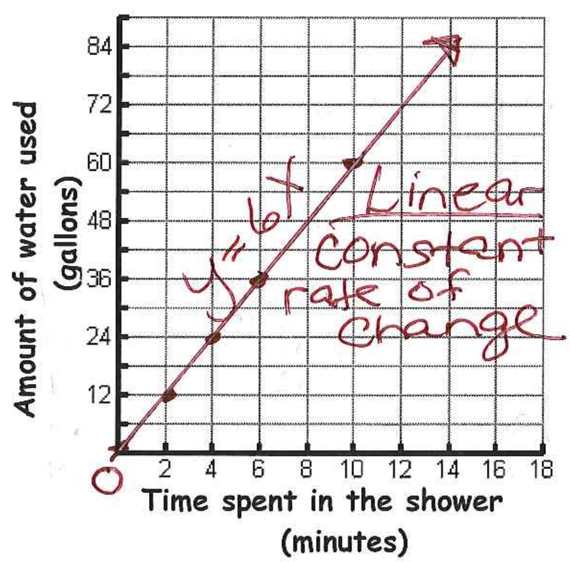
x (minutes) 0	3	6	7.5	12	20.5
y (gallons) 0	18	36	45	72	123

3. Write the equation that would represent the number of gallons, y, used for a given number of minutes, x.

   $\boxed{y = 6x}$

4. Graph the line.

Shower Statistics



5. What does the 6 represent?

   Gallons per minute (Slope)

6. What is the y-intercept?

   (0, 0) → origin

The number of gallons of water used depends directly on the amount of time spent in the shower. This means that this situation is an example of **direct variation**. The relationship between x and y is constant. As one variable increases, the other variable increases proportionally.

7. What will happen to the amount of water used if you double the amount of time you spend in the shower? You will use double the water used.

   → varies directly

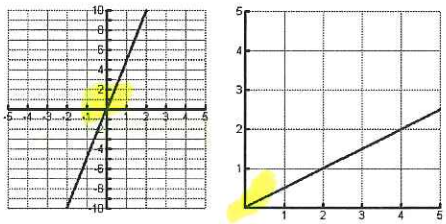
What will happen to the amount of water used if you spend half the amount of time in the shower?

you will use ½ as much water

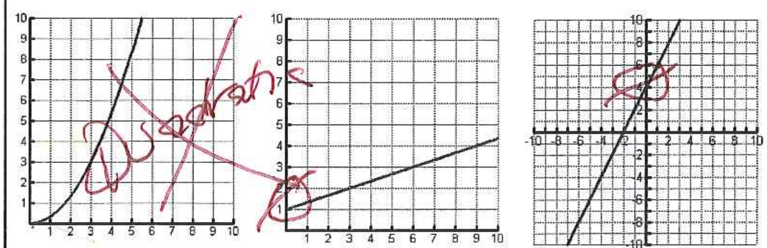
→ varies directly

Direct Variation Equation: $y = kx$ ($k \to m$)   Constant of variation: $k = \frac{y}{x}$

Examples of Direct Variation Graphs



Non Examples of Direct Variation Graphs



9. What do you notice about the Direct Variation graphs?

① must go through the origin (0,0)
② must be Linear (constant rate of change)

Examples of Direct Variation Equations

$y = mx$

$y = 2x \qquad y = \frac{1}{2}x \qquad y = 4x \qquad y = x$

Non Examples of Direct Variation Equations

$y = 2x \cancel{+1} \qquad y = \frac{1}{2}x \cancel{+4} \qquad y = 4x \cancel{-2} \qquad y = x \cancel{+3}$

10. What do you notice about the proportional equations? $y = mx \cancel{+b}$

can't have a 'b' → y-intercept must = 0

Examples of Direct Variation Tables

①

x	y
0	0
2 x3	6
3 x3	9
6 x3	18
10 x3	30
n	

②

x	y
5 x2	10
10 x2	20
15 x2	30
30 x2	60
50 x2	100
n	

③

x	y
-2 x4	-8
-1 x4	-4
0 x4	0
1 x4	4
2 x4	8
n	

Non Examples of Direct Variation Tables

x	y
0	3
1	6
2	9
3	12
4	15

(+1 ... +3)

0, 20

x	y
5	30
10	40
15	50
20	60
25	70

x	y
-2	0
-1	-1
0	-2
1	-3
2	-4

11. Choose one of the direct variation tables. Divide each y value by the x value. What do you notice?

$\frac{6}{2} = 3 \quad \frac{9}{3} = 3 \quad \frac{18}{6} = 3 \quad \frac{30}{10} = 3$

There is a constant relationship between the x and the y → they are proportional

12. Write the equation for each direct variation table.

① $\boxed{y = 3x}$ ② $\boxed{y = 2x}$ ③ $\boxed{y = 4x}$

In each of the following problems, the value of y varies directly with x. Write the direct variation equation. $y = kx \qquad k = \frac{y}{x}$

1. y = 15, x = 3 $\qquad k = \frac{15}{3} = 5 \quad \boxed{y = 5x}$

6. y = -8, x -1 $\qquad k = \frac{-8}{-1} = 8 \quad \boxed{y = 8x}$

7. y = 6, x = 12 $\qquad k = \frac{6}{12} = \frac{1}{2} \quad \boxed{y = \frac{1}{2}x}$

8. y = 9, x = 12 $\qquad k = \frac{9}{12} = \frac{3}{4} \quad \boxed{y = \frac{3}{4}x}$

9. y = 14, x = 9 $\qquad k = \frac{14}{9} \quad \boxed{y = \frac{14}{9}x}$

10. y = $\frac{18}{5}$, x = 20 $\qquad k = \frac{\frac{18}{5}}{20} \quad \boxed{y = \frac{9}{50}x}$

$\frac{18}{5} \cdot \frac{1}{20} = \frac{18}{100} = \frac{9}{50}$