

Chapter 2.5 Notes
Variations

Direct variation: $y = kx$

k = the constant

Inverse variation: $y = \frac{k}{x}$

when varies both directly + inversely: $y = \frac{kx}{z}$

1. Write a general formula to describe the variation.

y varies directly with x $y = 8$ when $x = 24$

$y = kx$ ← Step 1: write down direct variation formula

$8 = k \cdot 24$ ← Step 2: replace x + y with your numbers

$\frac{8}{24} = k \cdot \frac{24}{24}$ ← Step 3: divide both sides by the # of the right side.

$\frac{1}{3} = k$ ← Step 4: simplify

$y = \boxed{\frac{1}{3}x}$ ← Step 5: Replace k in the original equation with the number you just found.

2. Write a general formula to describe the variation.

A varies directly with x^2 ; $A = 48\pi$ when $x = 4$

$$y = kx \quad \leftarrow \text{Step 1: write down direct variation formula}$$

your formula \rightarrow $A = kx^2$ \leftarrow Step 2: Replace y with the 1st letter and x with the 2nd letter.

$$48\pi = k \cdot 4^2 \quad \leftarrow \text{Step 3: Replace the letters with the numbers you were given.}$$

$$48\pi = k \cdot 16 \quad \leftarrow \text{Step 4: Square the number, if applicable}$$

$$\frac{48\pi}{16} = k \cdot \frac{16}{16} \quad \leftarrow \text{Step 5: divide both sides by the number on right side}$$

$$3\pi = k \quad \leftarrow \text{Step 6: Simplify}$$

$$A = \boxed{3\pi x^2} \quad \leftarrow \text{Step 7: Replace } k \text{ in "your formula" with the number you found.}$$

3. Write a general formula to describe the variation.

y varies inversely with \sqrt{x} ; $y = 3$ when $x = 16$

$$y = \frac{k}{x} \quad \leftarrow \text{Step 1: write down inverse variation formula}$$

your formula \rightarrow $y = \frac{k}{\sqrt{x}}$ \leftarrow Step 2: Replace y with the 1st letter and x with the 2nd letter.

$$3 = \frac{k}{\sqrt{16}} \quad \leftarrow \text{Step 3: Replace the letters with the numbers you were given.}$$

$$3 = \frac{k}{4} \quad \leftarrow \text{Step 4: Take the } \sqrt{\text{ of the number if applicable.}}$$

$$3 = \frac{k}{4} \quad \leftarrow \text{Step 5: cross multiply}$$

$$12 = k$$

$$y = \boxed{\frac{12}{\sqrt{x}}} \quad \leftarrow \text{Step 6: Replace } k \text{ in "your formula" with the number you found.}$$

4. Write a general formula to describe the variation.

F varies inversely with d^2 ; $F = 35$ when $d = 5$

$$y = \frac{k}{x}$$

← step 1: write down the inverse formula

your
formula →

$$F = \frac{k}{d^2}$$

← step 2: Replace y with the 1st letter and x with the 2nd letter.

$$35 = \frac{k}{5^2}$$

← step 3: Replace the letters with the numbers you were given.

$$35 = \frac{k}{25}$$

← step 4: square any numbers, if applicable

$$\frac{35}{1} = \frac{k}{25}$$

← step 5 = cross multiply.

$$875 = k$$

$$F = \boxed{\frac{875}{d^2}}$$

← step 6: Replace k in "your formula" with the number you found.

5. Write a general formula to describe the variation.

m varies directly with the square of d and inversely with the square root of x.

m = 12 when d = 3 and x = 16

$$y = \frac{kx}{z} \quad \leftarrow \text{Step 1: Write down formula.}$$

your formula → $m = \frac{k d^2}{\sqrt{x}}$ ← Step 2: Replace y with 1st letter, x with 2nd letter, and z with 3rd letter.

$$12 = \frac{k \cdot 3^2}{\sqrt{16}} \quad \leftarrow \text{Step 3: Replace letters with the numbers you were given.}$$

$$12 = \frac{k \cdot 9}{4} \quad \leftarrow \text{Step 4: Take the } \sqrt{\quad} \text{ and square any number}$$

$$\frac{12}{1} \cdot \frac{4}{9} = \frac{k \cdot 9}{4} \quad \leftarrow \text{Step 5: Cross multiply}$$

$$k \cdot 9 = 48$$

$$\frac{k \cdot \cancel{9}}{\cancel{9}} = \frac{48}{9} \quad \leftarrow \text{Step 6: divide both sides by number by k}$$

$$k = \frac{16}{3} \quad \leftarrow \text{Step 7: Simplify}$$

$$m = \boxed{\frac{16 d^2}{3 \sqrt{x}}} \quad \leftarrow \text{Step 8: replace k in "your formula" with the number you found.}$$

6. Write a general formula to describe the variation.

The square of T varies directly with the cube of a and inversely with square of d.

$$T = 4 \text{ when } a = 2 \text{ and } d = 2$$

$$y = \frac{kx}{z} \quad \leftarrow \text{Step 1: Write down formula}$$

your formula $\rightarrow T^2 = \frac{k \cdot a^3}{d^2}$ \leftarrow Step 2: Replace y with the 1st letter, x with the 2nd letter, and z with the 3rd letter.

$$4^2 = \frac{k \cdot 2^3}{2^2} \quad \leftarrow \text{Step 3: Replace each letter with the numbers you were given}$$

$$16 = \frac{k \cdot 8}{4} \quad \leftarrow \text{Step 4: Take care of the exponents}$$

$$16 = \frac{k \cdot 8}{4} \quad \leftarrow \text{Step 5: Cross multiply}$$

$$64 = k \cdot 8$$

$$\frac{64}{8} = \frac{k \cdot 8}{8} \quad \leftarrow \text{Step 6: Divide both sides by the number next to k.}$$

$$8 = k \quad \leftarrow \text{Step 7: Simplify}$$

$$T^2 = \frac{8a^3}{d^2} \quad \leftarrow \text{Replace k in "your formula" with the number you found}$$