

Linear Equations

$$2x + \sqrt{5}y = 3$$

$$\frac{2}{x} + \sqrt{5}\sqrt{y} = 3$$

$$\sqrt[3]{2x+1} - 5 + 2\sqrt[3]{2x+1} = -14$$

$$\sqrt[3]{2x+1} = y$$

$$y - 5 + 2y = -14$$

$$3y = -9$$

$$y = -3$$

$$\sqrt[3]{2x+1} = -3$$

$$2x+1 = -27$$

\Rightarrow

$$x = -14$$

$$2x + 2y = 6$$

$$x - y = 5$$

$$x = 5 + y$$

$$2x - 2y = 10$$

$$4x = 16$$

$$\sqrt{x} + 2\sqrt{y} = 3$$

$$2\sqrt{x} - \sqrt{y} = 0$$

$$a = \sqrt{x} \quad b = \sqrt{y}$$

$$\frac{2}{3} = \sqrt{x} \quad \frac{6}{3} = \sqrt{y}$$

$$\Rightarrow \begin{cases} x = \frac{4}{25} \\ y = \frac{36}{25} \end{cases}$$

$$a + 2b = 3 \quad 2a + 4b = 6$$

$$2a - b = 0$$

$$\Rightarrow 5b = 6 \quad b = \frac{6}{5}, a = \frac{3}{5}$$

Word Problems

Ex: Kevin drives 80 mph to school and 20 mph on the way back. Find his average speed for the round trip.



$$\frac{80 + 20}{2}$$

$$\frac{160 \text{ mi}}{5 \text{ hr}} = 32 \text{ mph}$$

$$\frac{2 \cdot d}{\frac{d}{80} + \frac{d}{20}} = \frac{2}{\frac{1}{80} + \frac{1}{20}}$$

$$= \frac{2}{\frac{1}{40}} = \frac{2 \cdot 40}{1} = 80$$

Proportions

Direct proportions

1 apple \$2

2 apples \$4

3 apples \$6

⋮

x apples 2x

x y

$$y = 2x$$

$$y = kx$$

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

$$= \frac{2}{\frac{1}{40}} = 80$$

Inverse proportion:

\$ 2	10	Budget: \$20
\$ 5	4	
\$ 10	2	$y = \frac{20}{x}$
x	$\frac{20}{x}$	$y = \frac{k}{x}$
x	y	$xy = k$

Joint proportions

3 days	4 people	5 houses
? days	2 people	6 houses

$$h = rpd \quad \frac{h}{pd} = r$$

$$\frac{h}{pd} = \frac{x}{x^2} = k$$

$$\frac{5}{3 \cdot 4} = \frac{6}{2 \cdot x}$$

$$10x = 72$$

$$x = \frac{36}{5}$$

Manipulating proportions

$$\frac{a}{b} = \frac{c}{d} = k$$

$$\boxed{\begin{aligned} a &= bk \\ c &= dk \end{aligned}}$$

$$\frac{a+c}{b+d} = \frac{bk+dk}{b+d} = \frac{k(b+d)}{b+d} = k$$

$$\frac{a-c}{b-d} = k = \frac{ma+nc}{mb+nd} = k$$