Modeling Direct Variation
Examples using proportions

1) Find the cost of 10 apples if 4 apples cost $1

Step 1 Establish two pairs of related data

Known Facts 4 apples cost $1

Unknown Facts 10 apples cost X dollars

Steps 2, 3, 4, 5+

$$\frac{4 \text{ apples}}{10 \text{ apples}} = \frac{\$1}{\$x}$$

Solve $4x = 10$

$$\frac{4x}{4} = \frac{10}{4}$$

$$x = 2.5$$

So, 10 apples cost $2.50

Estimation

8 apples cost $2.00

12 apples cost $3.00

Modeling Direct Variation

2) A truck travels 102 mi on 6 gal of gasoline. How far will it travel on 30 gal of gasoline

Known Facts: 102 mi uses 6 gal of gas

Unknown Facts: X mi uses 30 gal of gas

Estimation / Observation: We are using 5 times as much gas, so $5 \cdot 100 = 500$ miles
The answer should be around 500 mi

$$\frac{102 \text{ mi}}{X \text{ mi}} = \frac{6 \text{ gal}}{30 \text{ gal}}$$

$$6x = 3060$$

$$\frac{6x}{6} = \frac{3060}{6}$$

$$x = 510 \text{ mi}$$

Conclusion: The truck travels 510 mi on 30 gal of gas.

Modeling Inverse Variation

1) If 5 machines take 12 days to complete a job, how long will it take for 8 machines to do the job?

Step 1

5 machine takes 12 days

8 machines take x days

Estimation/Observation

10 machine should take 6 days

8 machines should be between 6 and 12 days

$$\frac{5 \text{ machines}}{8 \text{ machines}} = \frac{x \text{ days}}{12 \text{ days}}$$

$$\frac{5}{8} = \frac{x}{12}$$

$$8x = 60$$

$$x = \frac{15}{2} \text{ or } 7\frac{1}{2} \text{ days}$$

Conclusion: 8 machines will take $7\frac{1}{2}$ days to complete job

Model Inverse Variation

a) A 10 in diameter gear is in mesh with a 5 in diameter gear. If the larger gear has a speed of 25 rpm, at how many rpm does the smaller gear turn?

10 in gear turns at 25 rpm

5 in gear turns at X rpm

Estimation / Observation: the 5 in gear should turn twice as fast so 50 rpm

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$$\frac{10\text{ in}}{5\text{ in}} = \frac{X\text{ rpm}}{25\text{ rpm}}$$

$$\frac{10}{5} = \frac{X}{25}$$

$$5X = 250$$

$$X = 50 \text{ rpm}$$

Conclusion: The 5 in gear turns at 50 rpm.

"Smaller gear turns faster"