PROPORTIONALITY

A WHAT IS PROPORTIONALITY?

Definition Proportional

Two variables x and y are **proportional** if the ratio $\frac{y}{x}$ is constant, equal to a value k called the **coefficient of proportionality**:

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

Equivalently, y is **proportional** to x if, for the same constant k,

$$y = k \times x.$$

Ex: Does this table represent a proportional relationship?

x	1	2	3
y	15	30	45

Answer: Yes. The table represents a proportional relationship because each ratio is equal:

$$\frac{15}{1} = \frac{30}{2} = \frac{45}{3} = 15.$$

B CALCULATING A FOURTH PROPORTIONAL

Method Calculating a Fourth Proportional

If 4 tickets cost \$28, how much do 6 tickets cost if each ticket costs the same?

- **Method 1: Using the Coefficient of Proportionality**
  Find the unit price (price for 1 ticket):
  $$\text{Unit price} = \frac{28}{4} = 7.$$
  Now multiply by 6 for 6 tickets:
  $$\text{Total for 6 tickets} = 7 \times 6 = 42.$$

- **Method 2: Proportion Equation**
  $$\frac{28}{4} = \frac{x}{6}$$
  $$4 \times x = 28 \times 6 \quad \text{(cross-multiplication)}$$
  $$x = \frac{28 \times 6}{4}$$
  $$x = 42$$

- **Method 3: Unit Rate with Equivalent Ratios**
  $$\frac{28}{4} \overset{\div 4}{=} \frac{7}{1} \overset{\times 6}{=} \frac{42}{6}$$

- **Method 4: Cross-multiplication (Product in Cross)**

Number of Tickets	4 ÷ / 6 ×	6
Price	28	$6 \times 28 \div 4 = 42$

So, 6 tickets cost 42 dollars.