2.5 - Variation

- y varies directly as \( x \Rightarrow y = kx \)
- y varies inversely as \( x \Rightarrow y = \frac{k}{x} \)
- y varies jointly as \( x \) and \( z \Rightarrow y = k \cdot x \cdot z \)

Making a model, and then using it to project or predict things.

\[ \text{Procedure} \]

1. Set up the equation with constant \( k \).
2. Use appropriate data to find \( k \) (initial condition).
3. Rewrite the equation, replacing \( k \) with its new value.
4. Find the requested information. \{Try making your own procedure so as \( \text{not to miss any steps!} \) \}

4. \( V \) varies directly with \( t \). \( V = 16 \) when \( t = 2 \).

\[ \Rightarrow y = kx \Rightarrow V = kt \] \( \text{we need to find } k \text{ so what do we need? In this case, } V \text{ and } t, \text{ so I can solve} \)

\[ 16 = k(2) \Rightarrow 8 = k \] \( \text{for the last missing thing!} \)

\[ V = 8t \]
8) \( y \) varies inversely with \( \sqrt{x} \). \( y = 11 \) when \( x = 9 \).
\[ y = \frac{k}{x} \quad \rightarrow \quad y = \frac{k}{\sqrt{x}} \]
\[ 4 = \frac{k}{4} \quad \rightarrow \quad 4 = \frac{k}{3} \quad \rightarrow \quad 12 = k \]
\[ \text{Rewrite: } y = \frac{12}{\sqrt{x}} \]

10) \( T \) varies jointly as \( \sqrt{x} \) and \( d^2 \).
\[ T = 18 \quad \text{when} \quad x = 8 \quad \text{and} \quad d = 3. \]
\[ y = k \cdot x \cdot d^2 \quad \rightarrow \quad T = k \cdot \sqrt{x} \cdot d^2 \]
\[ 18 = k \cdot 3 \cdot 3 \quad \Rightarrow \quad 18 = k \cdot 18 \quad \Rightarrow \quad k = 1 \]
\[ T = 3 \sqrt{x} \cdot d^2 \]


Information:
- Current = \( i \) amperes
- Resistance = \( Z \) ohms
\[ y = \frac{k}{x} \]
- Current is inversely proportional to resistance
\[ i = \frac{k}{z} \quad ; \quad i = 30 \quad ; \quad z = 8 \]
\[ 30 = \frac{k}{8} \quad \Rightarrow \quad 240 = k \]
\[ i = \frac{240}{z} \quad \Rightarrow \quad i = \frac{240}{10} = 24 \text{ amperes} \]