

# Unit 1

## Slope and Rate of Change

Section 1.1

# **RISE OVER RUN**

# Ratio

- A ratio is the ability to compare two numbers
- Examples
  - $\frac{1}{2}$
  - 1:2
  - If we need 1 litre of oil for every 10 litre of gas the ratio is
  - 1:10 or  $\frac{1}{10}$

# Proportion

- This a comparison between ratios
- This means that you take the initial ratio and compare it to the information given
- Example:
- If we have a ratio of  $\frac{1}{2}$  where 1 is the amount of salt in cups and 2 is the amount of water litres. What happens if the amount of water is increased to 6 litres? How much salt do we need in cups?

# Slope

- Other terms for slope
  - Pitch
  - Slant
  - Steepness
- Slope is a type of ratio
- Slope compares vertical distance (rise) over horizontal distance (run)

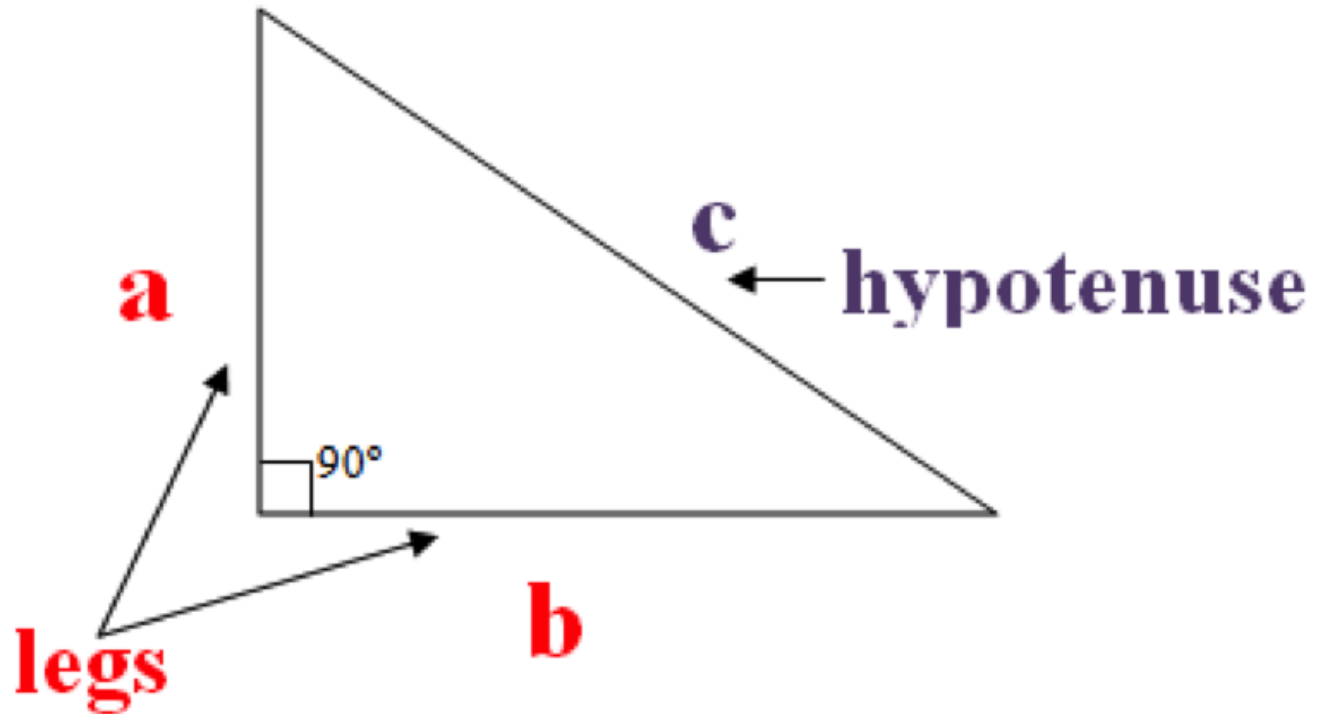
# Slope Continued

- Slope can be written with an  $m$
- $m = \frac{\textit{rise}}{\textit{run}}$
- $m = \frac{R}{r}$

Section 1.2

# **GRADE, ANGLE OR ELEVATION AND DISTANCE**

# Pythagorean theorem

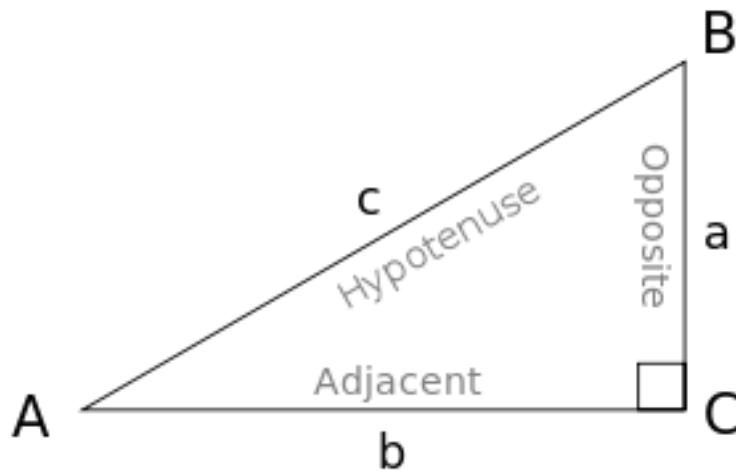


$$a^2 + b^2 = c^2$$



# The Tangent Ratio

- Tangent ratio = the ratio of the length of the side opposite an angle to the side adjacent to an angle

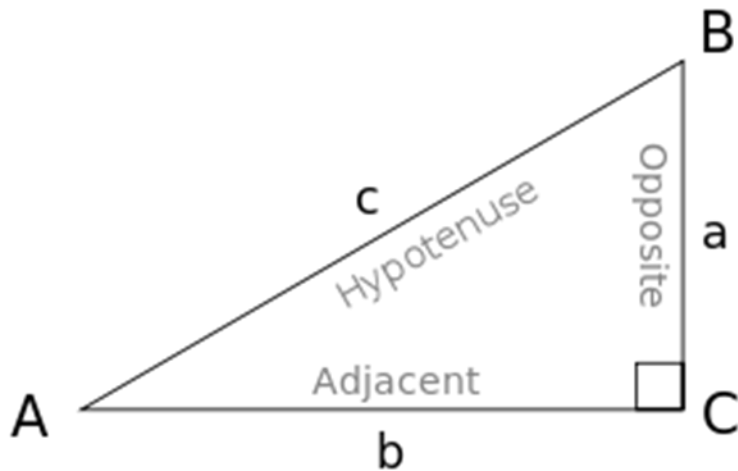


$$\tan\theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan A = \frac{BC}{AC}$$

# Slope and Tangent Ratio

- $m = \frac{a}{b}$
- $\tan A = \frac{a}{b}$



# Types of Angles

- Angle of depression is like looking down (example looking down at a fish in a pond)
- Angle of elevation is like looking up (example looking up at a telephone pole)

# Grade

- Slope of a road is call grade

$$\text{percent grade} = \frac{\text{rise}}{\text{run}} \times 100$$

$$\text{percent grade} = m \times 100$$

# Pitch

- When considering the slope of a roof the term pitch is often used to describe it
- Have to consider create right angle triangles to determine the slope.

Section 1.3

# **RATE OF CHANGE**

# Slope of a line on a graph

- Slope on a line graph is important
- It indicates the rate of change between two sets of values
  - Those on the x-axis (horizontal)
  - And those on the y-axis (vertical)

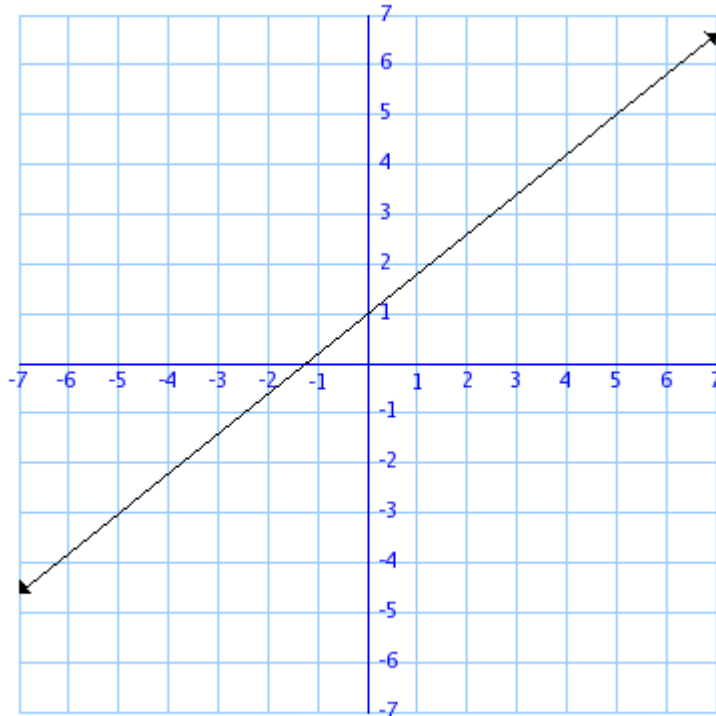
# Slope of a line on a graph

- To get the slope of the line you need to select 2 points  $(x_1, y_1)$  and  $(x_2, y_2)$
- The formula using those two points is as follows:
  - $m = \frac{y_2 - y_1}{x_2 - x_1}$



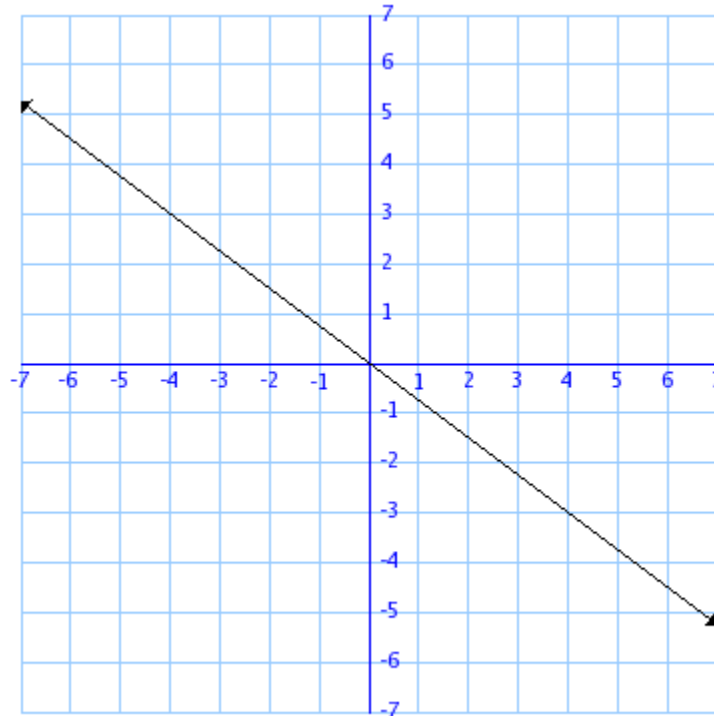
# Positive slope

- In positive slope the line is going **up** from left to right

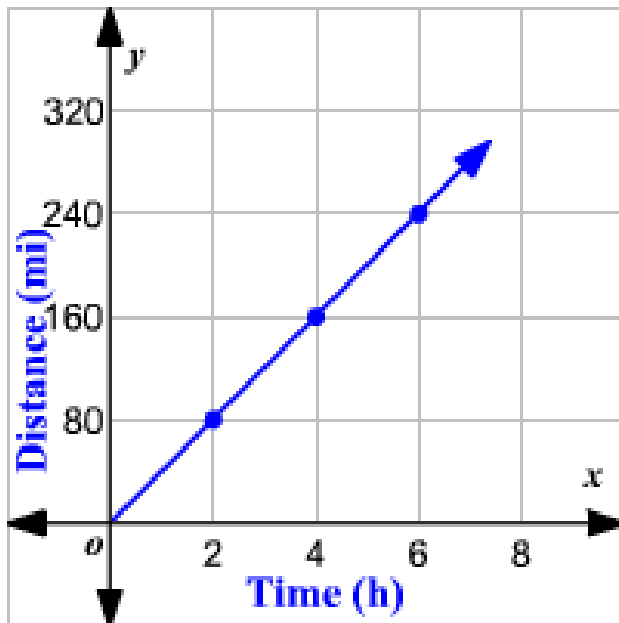


# Negative Slope

- This type of slope occurs when the graph goes **down** from left to right



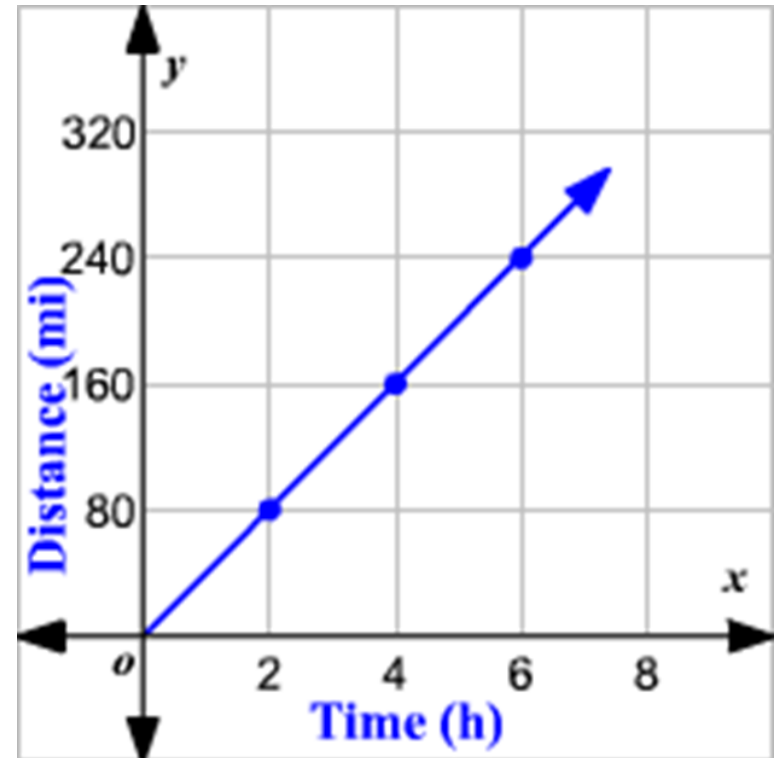
# Rate of Change



- Rate of change compares one variable to another and relates how they change in comparison to each other
- The rate of change in this graph is distance to time
- Independent Variable = time
- Dependent Variable = distance

# Types of Variables

- Independent variables can be selected freely for they do not rely on other values
- Dependent variables rely on the value of another variable



# How to determine the general formula

- From the graph every point will simplify to  $40/1$  which is 40 mi/h
- The value was determined by taking the value 80 and dividing by 2 (the first point on the graph)
- To determine distance the general formula will be
  - $d_1=40t$
  - $d_1=40(1)$
  - $d_1=40$

