

Purpose: In this problem set, you will recall and explore the properties and types of linear functions. We will work with distance and average rate of change.

RELATIONSHIPS BETWEEN LINES

Definitions

- Two lines are **parallel** if they have the same rate of change.

Notes:

- Two lines are **perpendicular** if the lines form a right angle.

Notes:

- The **vertical intercept** of a function is

- The **horizontal intercepts** of a function are

- A line is **vertical** if

- A line is **horizontal** if

1. Find the equation of a line parallel to $y = 6 + 3x$ through the point $(3, 0)$.

2. Find the slope of the line perpendicular to the line $y = -4x + 5$.

3. In 2013, a towns population was 1431. By 2017 the population had grown to 2134. Assume the population is changing linearly.

(a) How much did the population grow between the year 2013 and 2017?

(b) How long did it take the population to grow from 1431 people to 2134? Include units.

(c) What was the average population growth rate per year? Include units.

(d) Estimate the town's population in the year 2010? Include units.

(e) Give an equation for the towns population, P , in terms of years after 2013, t . Include units.

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4. Find the area of a triangle bounded by the y -axis, the line $f(x) = 9 - \frac{6}{7}x$, and the line perpendicular to $f(x)$ which passes through the origin. Include units.

5. Find the value of m so the lines $f(x) = mx + 5$ and $g(x) = x$ and the y -axis form a triangle with an area of 10 units squared.

THE PROBLEM SOLVING PROCESS:

1. Identify changing quantities, and then carefully and clearly define descriptive variables to represent those quantities. When appropriate, sketch a picture or define a coordinate system.
2. Carefully read the problem to identify important information. Look for information giving values for the variables, or values for parts of the functional model, like slope and initial value.
3. Carefully read the problem to identify what we are trying to find, identify, solve, or interpret.
4. Identify a solution pathway from the provided information to what we are trying to find. Often this will involve checking and tracking units, building a table or even finding a formula for the function being used to model the problem.
5. When needed, find a formula for the function.
6. Solve or evaluate using the formula you found for the desired quantities.
7. Reflect on whether your answer is reasonable for the given situation and whether it makes sense mathematically.
8. Clearly convey your result using appropriate units, and answer in full sentences when appropriate.