

Day 03: 3-3 Slopes of Lines

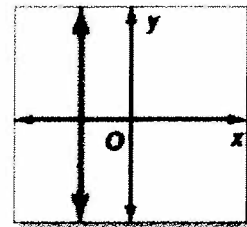
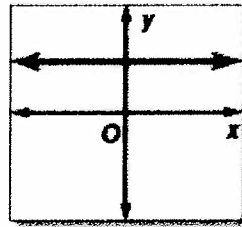
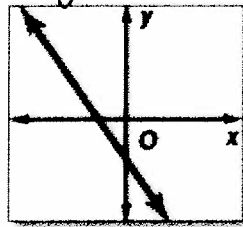
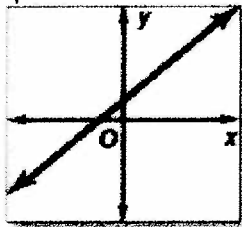
3-3 Learning Target: Students will be able to find the slope of a line given a graph or 2 points and they will be able to determine if two lines are parallel or perpendicular by comparing the slopes.

Slope – the ratio of the vertical change to the horizontal change between any two points on the line. It is also called the “rate of change.”

Memorize this Formula:
$$\text{Slope (m)} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

1. **Classifying Slopes:** looking at the graph can give you insight about the type of slope you have.

- a. positive
- b. negative
- c. zero
- d. undefined



2. Find the slope of the line going through the following points.

- a. A(-2,3) and B(3,-5)

$$\frac{-5-3}{3-(-2)} = \frac{-8}{5}$$

- b. R(3,7) and S(5,7)

$$\frac{7-7}{5-3} = \frac{0}{2} = 0$$

3. Use the graph on the right to find the slope of each line.

a. \overline{AB} $\frac{6}{2} = 3$

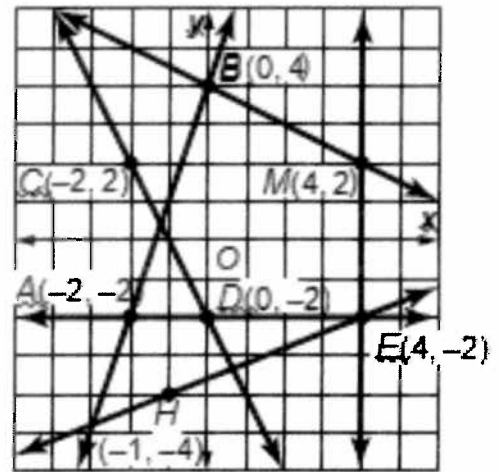
b. \overline{CD} $\frac{-4}{2} = -2$

c. \overline{EM} $\frac{4}{0} = \text{Undefined}$

d. \overline{AE} $\frac{0}{2} = 0$

e. \overline{EH} $\frac{2}{5}$

f. \overline{BM} $\frac{-2}{4} = -\frac{1}{2}$



Slopes of Parallel Lines: Two nonvertical lines have the same slope if and only if they are parallel. **Example:** $y = 2x + 5$ is parallel to $y = 2x - 3$ because both of them have a slope of 2

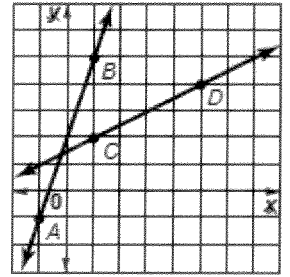
Slopes of Perpendicular Lines: Two nonvertical lines are Perpendicular if and only if the product of their slopes is -1 (their slopes are opposite reciprocals).

Example: $y = 2x + 5$ is perpendicular to $y = -\frac{1}{2}x + 1$ because the product of their slopes is negative 1.

DETERMINING THE RELATIONSHIP BETWEEN LINES FULLY EXPLAINED:

Determine whether \overline{AB} and \overline{CD} are parallel, perpendicular, or neither for $A(-1, -1)$, $B(1, 5)$, $C(1, 2)$, $D(5, 4)$.

Graph each line to verify your answer.



a. Find the slope of each line:

$$\text{slope of } \overline{AB} = \frac{5 - (-1)}{1 - (-1)} = \frac{6}{2} \text{ or } 3 \qquad \text{slope of } \overline{CD} = \frac{4 - 2}{5 - 1} = \frac{2}{4} = \frac{1}{2}$$

b. The two lines do not have the same slope, so they are not parallel.

c. To determine if the lines are perpendicular, find the product of their slopes: $3 \left(\frac{1}{2} \right) = \frac{3}{2} = 1.5$

d. Since the product of their slopes is not -1 , the two lines are not perpendicular.

Therefore, there is no relationship between \overline{AB} and \overline{CD} .

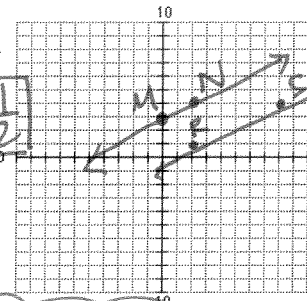
e. When graphed, the two lines intersect but not at a right angle.

Determine whether \overline{MN} and \overline{RS} are parallel, perpendicular, or neither. Graph each line to verify your answer.

1. $M(0, 3)$, $N(2, 4)$, $R(2, 1)$, $S(8, 4)$

$$m_{\overline{MN}} = \frac{4 - 3}{2 - 0} = \frac{1}{2}$$

$$m_{\overline{RS}} = \frac{4 - 1}{8 - 2} = \frac{3}{6} = \frac{1}{2}$$

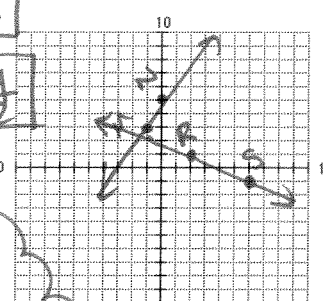


$\overline{MN} \parallel \overline{RS}$
because their slopes are the same!

2. $M(-1, 3)$, $N(0, 5)$, $R(2, 1)$, $S(6, -1)$

$$m_{\overline{MN}} = \frac{5 - 3}{0 - (-1)} = \frac{2}{1} = 2$$

$$m_{\overline{RS}} = \frac{-1 - 1}{6 - 2} = \frac{-2}{4} = -\frac{1}{2}$$



$\overline{MN} \perp \overline{RS}$
because 2 and $-\frac{1}{2}$ are opposite reciprocals and $2 \cdot -\frac{1}{2} = -1$

3-4: Use the given equation of a line to find the value of each.

3. $y = 4x - 10$

a. What is the slope of a line parallel to the line?

$$\boxed{4}$$

b. What is the slope of a line perpendicular to the line?

$$\boxed{-\frac{1}{4}}$$

4. $3x - 4y = 12$

a. What is the slope of a line parallel to the line?

$$\begin{aligned} -4y &= -3x + 12 \\ \frac{-4y}{-4} &= \frac{-3x + 12}{-4 - 4} \\ y &= \frac{3}{4}x - 3 \end{aligned}$$

$$\boxed{\frac{3}{4}}$$

b. What is the slope of a line perpendicular to the line?

$$\boxed{-\frac{4}{3}}$$