Geometry H
3.4 Comparing Slopes Notes

Name : Key
Date : _____ Period : _____

Comparing slopes:

- **When two lines intersect in a coordinate plane, the steeper line has the slope with the larger absolute value.**

Example 1: If line 1 has a slope of 3/5 and line 2 has a slope of -2/3, line 2 is steeper because $\left|-\frac{2}{3}\right| > \left|\frac{3}{5}\right|$

TRY THESE!

Tell which line through the given points is steeper. You will need to find the slope of each line first!

1. Line 1 : $(-2,3)$, $(3,5)$
Line 2 : $(3,1)$, $(6,5)$

Line 1 : $\frac{5-3}{3+2} = \frac{2}{5}$

Line 2 : $\frac{5-1}{6-3} = \frac{4}{3}$

Line 2 is steeper since $\left|\frac{4}{3}\right| > \left|\frac{2}{5}\right|$

2. Line 3 : $(-2,-1)$, $(1,-2)$
Line 4 : $(-5,-3)$, $(-1,-4)$

Line 3 : $\frac{-2+1}{1+2} = \frac{-1}{3}$

Line 4 : $\frac{-4+3}{-1+5} = \frac{-1}{4}$

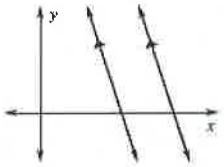
Line 3 is steeper since $\left|-\frac{1}{3}\right| > \left|-\frac{1}{4}\right|$

- You can also compare slopes to tell whether two or more lines are parallel or perpendicular.

POSTULATE 17 SLOPES OF PARALLEL LINES

In a coordinate plane, two nonvertical lines are parallel if and only if they have the same **slope**.

Any two **vertical** lines are parallel.

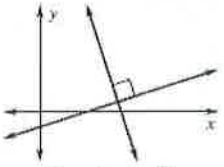


$m_1 = m_2$

POSTULATE 18 SLOPES OF PERPENDICULAR LINES

In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is **-1**.

Horizontal lines are **perpendicular** to vertical lines.



$m_1 \cdot m_2 = -1$

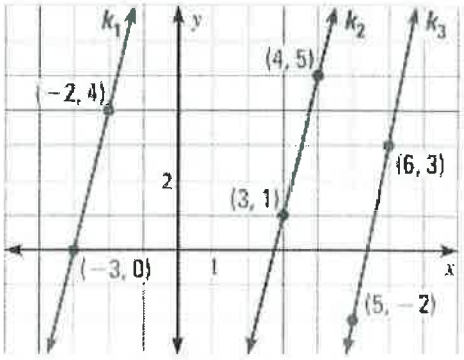
If the product of two numbers is -1, then the numbers are called *negative reciprocals*.

Deciding Whether Lines are Parallel, Perpendicular, or Neither

Example 2: Find the slope of each line. Which lines are parallel?

a. Find the slope of k_1 through $(-2,4)$ and $(-3,0)$:

$$m_1 = \frac{0-4}{-3-(-2)} = \frac{-4}{-4} = 4$$



b. Find the slope of k_2 through $(4,5)$ and $(3,1)$:

$$m_2 = \frac{1-5}{3-4} = \frac{-4}{-1} = 4$$

c. Find the slope of k_3 through $(6,3)$ and $(5,-2)$:

$$m_3 = \frac{-2-3}{5-6} = \frac{-5}{-1} = 5$$

→ Compare the slopes. Because k_1 and k_2 have the same slope, they are parallel. The slope of k_3 is different so k_3 is not parallel to the other lines.

TRY THESE!

Tell whether the lines through the given points are *parallel*, *perpendicular*, or *neither*. You will need to find the slopes of each line first!

3. Line 1 : $(1,0)$, $(7,4)$
Line 2 : $(7,0)$, $(3,6)$

Line 1: $\frac{4-0}{7-1} = \frac{4}{6} = \frac{2}{3}$

Line 2: $\frac{6-0}{3-7} = \frac{6}{-4} = -\frac{3}{2}$

Perpendicular

4. Line 3 : $(-3,1)$, $(-7,-2)$
Line 4 : $(2,-1)$, $(8,4)$

Line 3: $\frac{-2-1}{-7+3} = \frac{-3}{-4} = \frac{3}{4}$

Line 4: $\frac{4+1}{8-2} = \frac{5}{6}$

Neither

5. Line 5 : $(-9,3)$, $(-5,7)$
Line 6 : $(-11,6)$, $(-7,2)$

Line 5: $\frac{7-3}{-5+9} = \frac{4}{4} = 1$

Line 6: $\frac{2-6}{-7+11} = \frac{-4}{4} = -1$

Perpendicular

Answers to Try These!

1. Line 2 2. Line 3 3. Perpendicular, because $\left(\frac{2}{3}\right)\left(-\frac{3}{2}\right) = -1$

4. Neither 5. Perpendicular, because $(1)(-1) = -1$