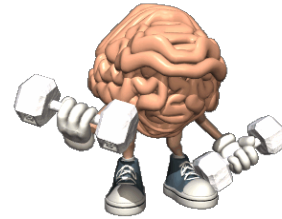
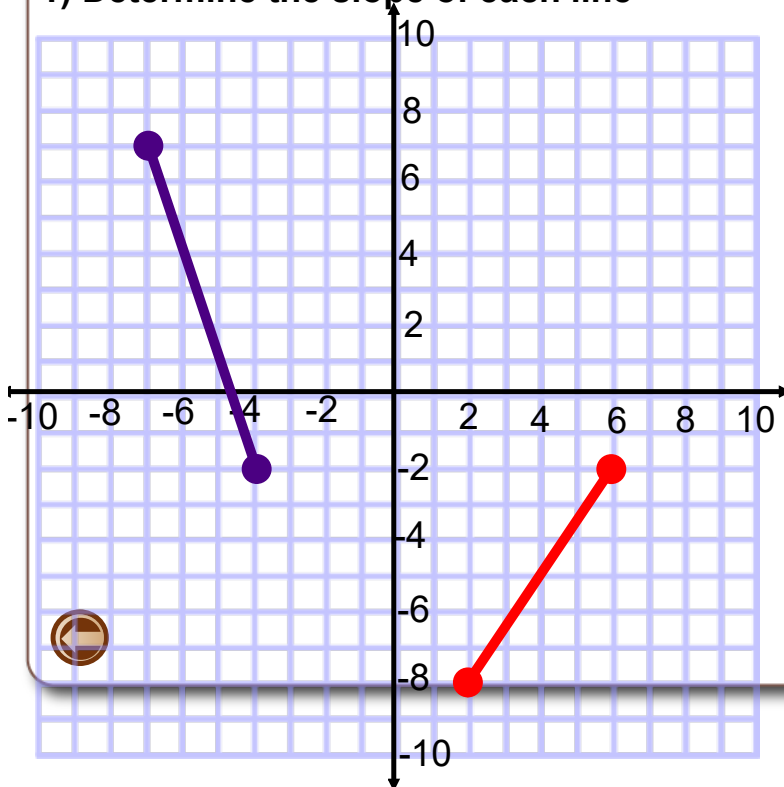


Warm Up



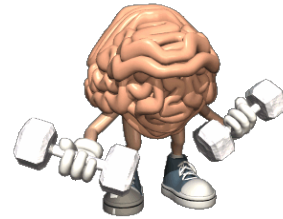
1) Determine the slope of each line



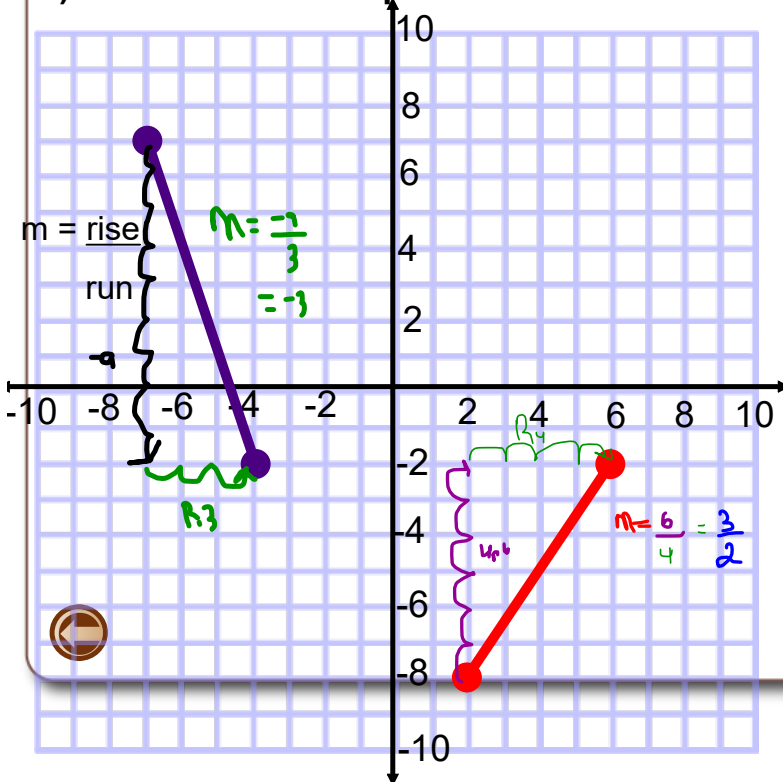
2) What is the slope of a line with points $(-3, 4)$ and $(11, -1)$?

Solutions to Warm Up

Warm Up



1) Determine the slope of each line



2) What is the slope of a line with points $(-3, 4)$ and $(11, -1)$?

$$\begin{aligned}
 m &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{-1 - 4}{11 - -3} \quad \text{watch signs} \\
 &= \frac{-5}{11 + 3} \\
 &= \frac{-5}{14}
 \end{aligned}$$



Parallel & Perpendicular Lines & Collinear Points

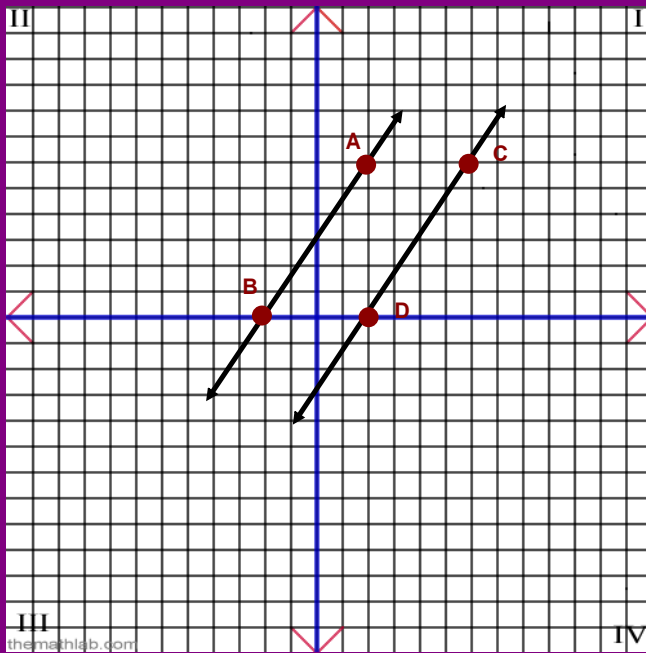




Parallel Lines

Parallel Lines are two lines that are always the same distance apart, and that never intersect.

Parallel Lines



Calculate the slope of
AB & DC

<i>1st</i>	<i>x₁</i>	<i>2nd</i>	<i>x₂</i>	<i>1st</i>	<i>x₁</i>	<i>2nd</i>	<i>x₂</i>
	<i>y₁</i>		<i>y₂</i>		<i>y₁</i>		<i>y₂</i>

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} \quad m_{DC} = \frac{y_2 - y_1}{x_2 - x_1}$$

Do on next page

What Do You Notice?

What Do You Notice?

$$\begin{array}{cc} \text{1st} & \text{2nd} \\ x_1 & y_1 & x_2 & y_2 \\ (-2, 0) & (2, 6) \end{array}$$

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{6 - 0}{2 - (-2)}$$

$$= \frac{6 - 0}{2 + 2}$$

$$= \frac{6}{4}$$

$$m_{AB} = \frac{3}{2}$$

$$\begin{array}{cc} \text{1st} & \text{2nd} \\ x_1 & y_1 & x_2 & y_2 \\ (2, 0) & (6, 6) \end{array}$$

$$m_{DC} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{6 - 0}{6 - 2}$$

$$= \frac{6}{4}$$

$$m_{DC} = \frac{3}{2}$$

Same

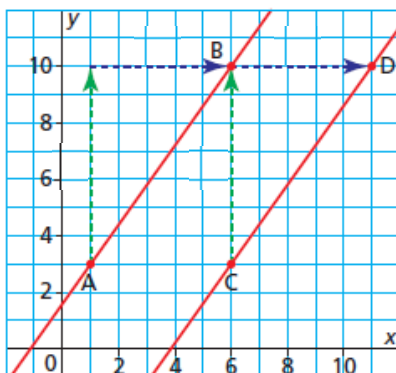


When two lines have the same slope, congruent triangles can be drawn to show the rise and the run.

Lines that have the same slope are parallel.

Slope of AB = ?

Slope of CD = ?



Recall:

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

?



Study

Slopes of parallel lines are equal

When given an equation $y = mx + b$

Two lines that are parallel will have the same "m"

Example: $y = \overset{m=3}{\downarrow} 3x + 7$ & $y = \overset{m=3}{\downarrow} 3x + 144$

1) What is the slope of a line parallel to $y = 5x - 6$?

$$m = 5$$

$$m_{//} = 5$$

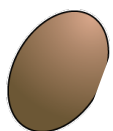
2) What is the slope of a line parallel to $y = \frac{-6}{7}x - 10$?

$$m = -\frac{6}{7}$$

$$m_{//} = -\frac{6}{7}$$

1

What is the slope of a line parallel to AB?



-2



$\frac{1}{2}$



2

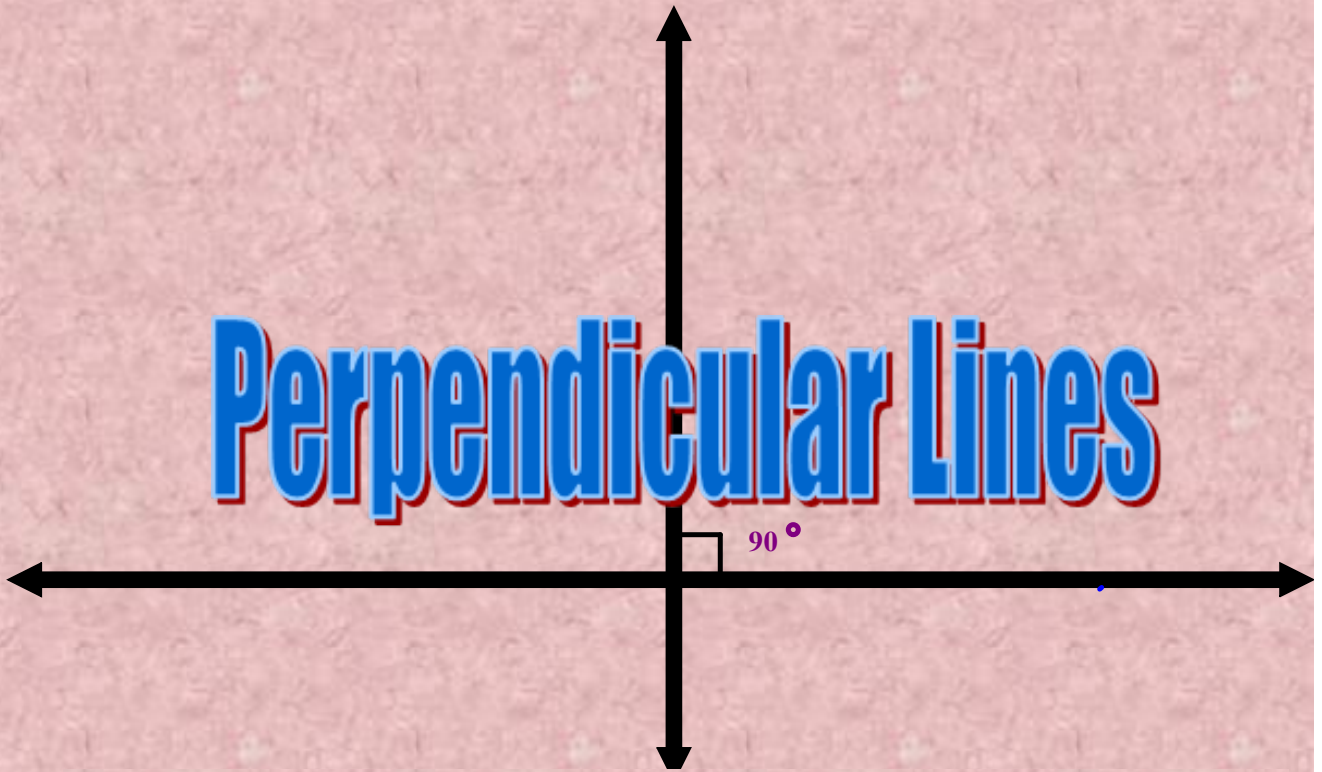
$$m_{AB} = 2$$

$$m_{\parallel AB} = 2$$

Slope of AB = 2



Perpendicular Lines

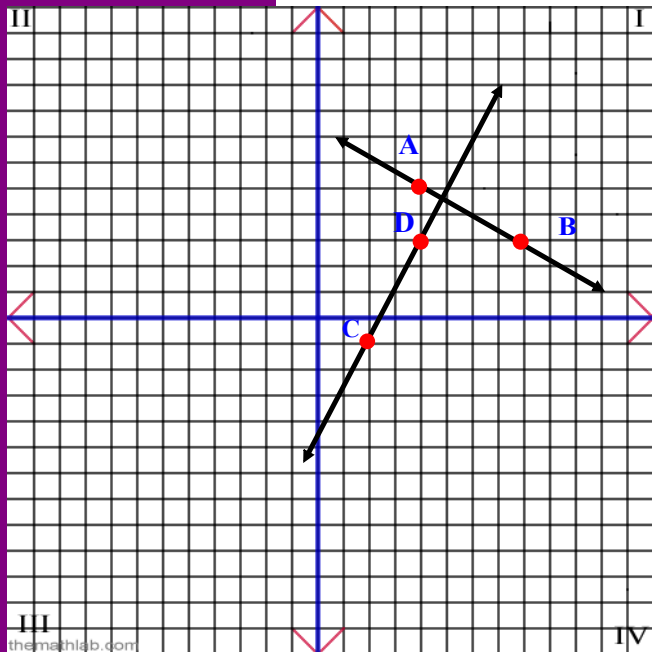


Perpendicular Lines are two lines that intersect to form a 90° angle. (Right Angle)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Parallel Lines

Calculate the slope of
AB & DC



AB 1st (4, 5) 2nd (8, 3)

CD 1st (2, -1) 2nd (4, 3)

What Do You Notice?

Calculate the slope of
AB & DC

AB 1st (4, 5) 2nd (8, 3)

CD 1st (2, -1) 2nd (4, 3)

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_{CD} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_{AB} = \frac{3 - 5}{8 - 4}$$

$$m_{CD} = \frac{3 - (-1)}{4 - 2}$$

$$m_{AB} = \frac{-2}{4}$$

$$m_{CD} = \frac{4}{2}$$

$$m_{AB} = \frac{-1}{2}$$

← opposite sign
fraction flipped

$$m_{CD} = \frac{2}{1}$$

What Do You Notice?

Study

Therefore if the slopes of two lines are

OPPOSITE RECIPROCAL

we can say the lines are perpendicular

Therefore AB is perpendicular to DC

$m = -3$ perpendicular to m

2 What is the slope of a line perpendicular to AB?

$m_{\perp AB}$



A $\frac{3}{4}$

$\frac{4}{3}$

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



Slope of AB = $-\frac{3}{4}$

$$m_{AB} = -\frac{3}{4}$$

$$m_{\perp AB} = +\frac{4}{3}$$

When given an equation $y = mx + b$

Two lines that are perpendicular when their slope are negative reciprocals "m" and $(-1/m)$

Example: $y = 3x + 7$ & $y = \frac{-1}{3}x + 144$

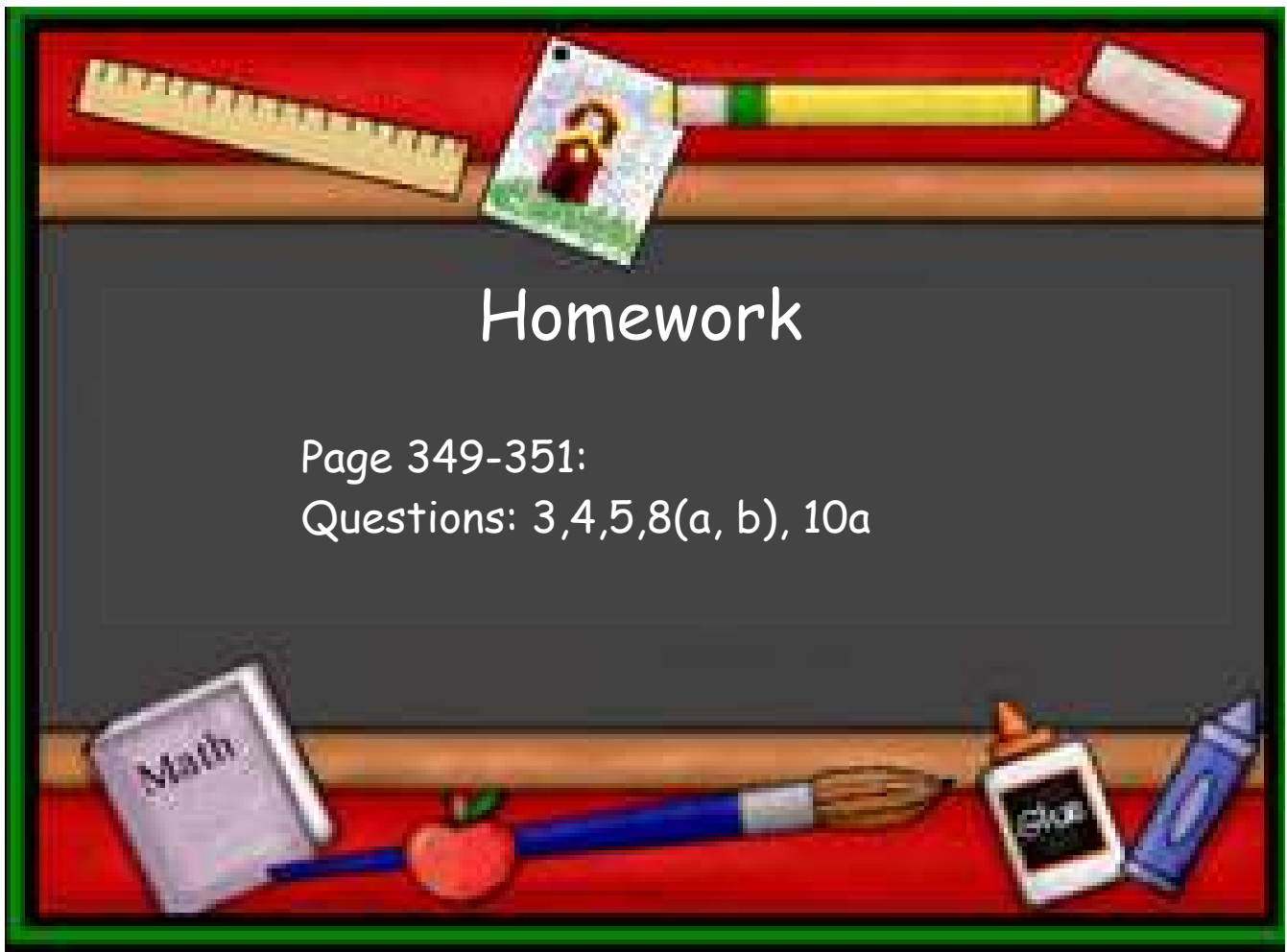
\downarrow
 $m = \frac{3}{1}$ $m_{\perp} = -\frac{1}{3}$

1) What is the slope of a line Perpendicular to $y = 5x - 6$?

$m = \frac{5}{1}$ $m_{\perp} = -\frac{1}{5}$

2) What is the slope of a line perpendicular to $y = \frac{-6}{7}x - 10$?

$m = -\frac{6}{7}$ $m_{\perp} = \frac{7}{6}$



3. The slopes of lines are given below. For each line, what is the slope of a parallel line?

$m //$

a) $\frac{4}{5}$

b) $-\frac{4}{3}$

c) 3

d) 0

4. The slopes of lines are given below. For each line, what is the slope of a perpendicular line

$m \perp$

a) $\frac{7}{6}$

b) $-\frac{5}{8}$

c) 9

d) -5

5. The slopes of two lines are given. Are the two lines parallel, perpendicular, or neither?

a) 4, 4

b) $\frac{1}{6}$, 6

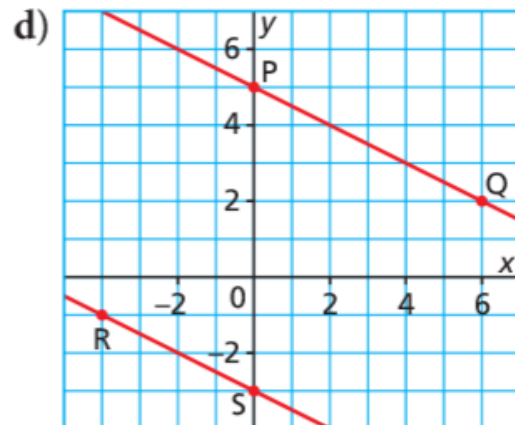
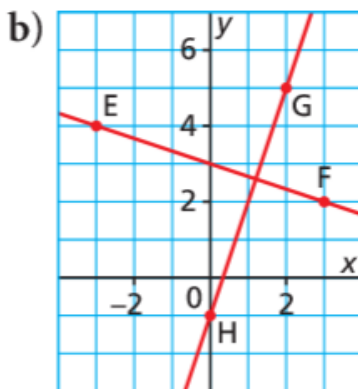
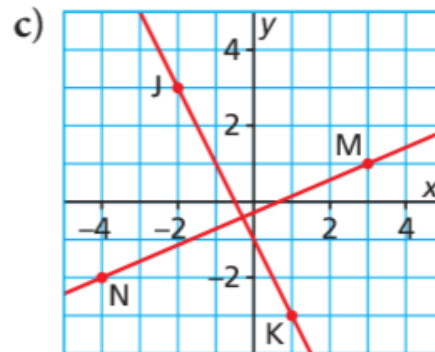
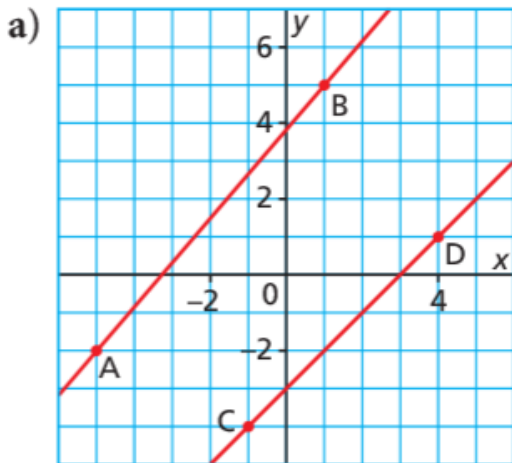
c) $\frac{7}{8}$, $-\frac{7}{8}$

d) $\frac{1}{10}$, -10

8. For each grid below:

i) Write the coordinates of the 2 labelled points on each line.

ii) Are the two lines parallel, perpendicular, or neither? Justify your answer.



10. How are the lines in each pair related? Justify your answer.

a) DE has an x -intercept of 4 and a y -intercept of -6 .

FG has an x -intercept of -6 and a y -intercept of 4.

b) HJ has an x -intercept of -2 and a y -intercept of 3.

KM has an x -intercept of -9 and a y -intercept of 6.

$(4, 0)$

$$m_{DE} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_{FG} = \frac{y_2 - y_1}{x_2 - x_1}$$

Solutions to Page 349-351: Questions: 3,4,5,8(a,b), 10a



3. The slopes of lines are given below. For each line, what is the slope of a parallel line?

parallel

a) $\frac{4}{5}$

$m_{//} = \frac{4}{5}$

b) $-\frac{4}{3}$

$m_{//} = -\frac{4}{3}$



c) 3 $m_{//} = 3$

d) 0 $m_{//} = 0$

4. The slopes of lines are given below. For each line, what is the slope of a perpendicular line

perpendicular Lines

a) $\frac{7}{6}$

$m_{\perp} = -\frac{6}{7}$

b) $-\frac{5}{8}$

$m_{\perp} = \frac{8}{5}$

c) $\frac{9}{1}$

$m_{\perp} = -\frac{1}{9}$

d) $-\frac{5}{1}$

$m_{\perp} = \frac{1}{5}$

Solutions to Page 349-351: Questions: 3,4,5,8(a,b), 10a



5. The slopes of two lines are given. Are the two lines parallel, perpendicular, or neither?

a) 4, 4

same
parallel

b) $\frac{1}{6}, 6$

reciprocal
but
not
opposit
so neither



parallel

perpendicular

c) $\frac{7}{8}, -\frac{7}{8}$

opposite in sign
but not reciprocal
neither

d) $\frac{1}{10}, -10$

opp recip
Perpendicular

Solutions to Page 349-351: Questions: 3,4,5,8(a,b), 10a

$$8a) \text{ i) } A(\overset{x_1}{-5}, \overset{y_1}{-2}) \quad B(\overset{x_2}{1}, \overset{y_2}{5})$$

$$C(4, -4) \quad D(4, 1)$$

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{5 - (-2)}{1 - (-5)}$$

$$= \frac{5 + 2}{1 + 5}$$

$$= \frac{7}{6}$$

=

neither

$$m_{CD} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{1 - (-4)}{4 - (-1)}$$

$$= \frac{1 + 4}{4 + 1}$$

$$= \frac{5}{5}$$

$$= +1$$

Solutions to Page 349-351: Questions: 3,4,5,8(a,b), 10a

8b) $E(-3, 4)$ $F(3, 2)$
 $G(2, 5)$ $H(6, -1)$

$$m_{EF} = \frac{y_2 - y_1}{x_2 - x_1}$$

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

add opp

$$= \frac{2 - 4}{3 + 3}$$

$$= \frac{-2}{6}$$

Reduce

$$= \frac{-1}{3}$$

$$m_{GH} = \frac{y_2 - y_1}{x_2 - x_1}$$

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

$$= \frac{-6}{4}$$

$$= \frac{-3}{2}$$

$EF \perp GH$

*opposite
reciprocals
so
perpendicular*

Solutions to Page 349-351: Questions: 3,4,5,8(a,b), 10a

10. How are the lines in each pair related? Justify your answer.

a) DE has an x -intercept of 4 and a y -intercept of -6 .

FG has an x -intercept of -6 and a y -intercept of 4.

b) HJ has an x -intercept of -2 and a y -intercept of 3.

KM has an x -intercept of -9 and a y -intercept of 6.

a) x -inter (4,0) $m_{AB} = \frac{-6-0}{0-4}$
 y -int (0,-6) $= \frac{-6}{-4}$
 $= \frac{3}{2}$

F (-6,0) G (0,4)
 $m = \frac{4-0}{0-(-6)}$
 $= \frac{4}{6}$
 $= \frac{2}{3}$

Not the same
 and
 not opposite
 Reciprocal

Neither

Attachments

Parallel.doc

Perpendicular and Parallel lines.docx