Perpendicular Lines (NRS)

1. What are the negative reciprocals of the numbers given below?

   a. $\frac{-2}{3}$  
      Answer: __________

   b. 8  
      Answer: __________

   c. $\frac{4}{5}$  
      Answer: __________

   d. 0.5  
      Answer: __________

   e. $-1.25$  
      Answer: __________

   f. $0.3\bar{3}$  
      Answer: __________

2. What is the slope of a line that is perpendicular to:

   $$2x - 3y - 81 = 0$$

Answer: __________________________
1. What are the negative reciprocals of the numbers given below?

a. \( \frac{-2}{3} = \frac{-2}{3} \rightarrow \frac{-3}{-2} = 1.5 \)  
   Answer: \( 1.5 \)

b. \( 8 = \frac{8}{1} \rightarrow \frac{-1}{8} = -0.125 \)  
   Answer: \( -0.125 \)

c. \( \frac{4}{5} = \frac{4}{5} \rightarrow \frac{-5}{4} = -1.25 \)  
   Answer: \( -1.25 \)

d. \( 0.5 = \frac{0.5}{1} \rightarrow \frac{-1}{0.5} = -2 \)  
   Answer: \( -2 \)

e. \( -1.25 = \frac{-1.25}{1} \rightarrow \frac{-1}{-1.25} = 0.8 \)  
   Answer: \( 0.8 \)

f. \( 0.\overline{3} = \frac{0.\overline{3}}{1} \rightarrow \frac{-1}{0.\overline{3}} = -3 \)  
   Answer: \( -3 \)

2. What is the slope of a line that is perpendicular to:

\[ 2x - 3y - 81 = 0 \]

\[ -2x + 81 \]

\[ -3y = -2x + 81 \]

\[ \frac{-3y}{-3} = \frac{-2x + 81}{-3} \]

\[ y = \frac{0.6x - 27}{1} \]

Answer: \( a = -1.5 \)
3. What is the **equation** of a line *perpendicular* to \( y = -0.4 \, x + 3 \), passing through \((13, 25)\)?

Equation: __________________________

4. What is the equation of a line travelling *perpendicular* to one defined by the rule \( 2y - 6x + 12 = 0 \), but passing through point \((-9, 8)\)?

Equation: __________________________
3. What is the equation of a line perpendicular to \( y = -0.4x + 3 \), passing through \((13, 25)\)?

Equation: \( y = 2.5x - 7.5 \)

4. What is the equation of a line travelling perpendicular to one defined by the rule \( 2y - 6x + 12 = 0 \), but passing through point \((-9, 8)\)?

Equation: \( y = -0.3x + 5 \)
5. Line 1 and Line 2 are perpendicular. What is the equation of line 2?

*(Drawing not to scale)*

**Answer:** The equation of line 2 is \( y = \) _____________
5. Line 1 and Line 2 are perpendicular. What is the equation of line 2?

*(Drawing not to scale)*

**STEP 1** Find slope of Line 1.

\[
\alpha = \frac{y_2 - y_1}{x_2 - x_1} = \frac{30 - (-14)}{5 - (-6)} = \frac{44}{11} = 4
\]

**STEP 2** Line 2 is perpendicular to Line 1.

\[\frac{4}{1} \times \frac{-1}{4} = -0.25\]

Slope for Line 2 is: \(\alpha = -0.25\)

**STEP 3** Plug-in point on Line 2 to find 'b'.

\[y = \alpha x + b\]
\[y = -0.25 x + b\]
\[12 = -0.25 (12) + b\]
\[12 = -3 + b\]
\[b = 15\]

Rule for Line 2 is:

\[y = -0.25 x + 15\]

**Answer:** The equation of line 2 is \(y = -0.25 x + 15\).
6. What are the coordinates of point D?

(Drawing not to scale)
6. What are the coordinates of point D?

Step 1: Add the \( \Delta \)s to the intercepts.

Step 2: Find the slope for line 1.

\[ a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-8)}{24 - 0} = \frac{8}{24} = \frac{1}{3} \]

Step 3: Line 1 is perpendicular to line 2... N.R.S.

\[ \frac{h}{l} = \frac{0.3}{1} \Rightarrow \frac{-1}{0.3} = \frac{-3}{1} \]

Slope for line 2 is: \( a = -3 \)

Step 4: Finish building the rule by plugging in the point.

\[ y = a \times x + b \]
\[ y = -3 \times x + b \]
\[ 27 = -3 \times (0) + b \]
\[ 27 = b \]

Rule for line 2:

\[ y = -3x + 27 \]

Step 5: Make \( y = 0 \) to find point D (which is on the x-axis).

\[ y = -3x + 27 \]
\[ 0 = -3x + 27 \]
\[ -27 = -3x \]
\[ -27 \div -3 = -3 \times \]

\( x = 9 \)

\( D(9, 0) \)
7. Are the following equations parallel, perpendicular, or something else? Justify your answer.

Line 1: \(-4x + 2y + 16 = 0\)  
Line 2: \(6y = -3x + 6\)

The two lines are
- [ ] Parallel
- [ ] Perpendicular
- [ ] Neither Parallel, nor Perpendicular

Justification:

_____________________________________________________________________________________________________________
_____________________________________________________________________________________________________________
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Justification:

Not parallel ... the slopes are different.

PERPENDICULAR & the slopes are negative reciprocals.