“Do I get partial credit for simply having the courage to get out of bed and face the world again today?”

Name ____________________________________________

Period ____________________________________________
# Homework

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<td>Answers: 1c; ( \frac{1}{2} ) and (-\sqrt{3}), 2d; ( y = \frac{1}{2}x + \frac{1}{4} ) slope: ( \frac{1}{2} ) and y-intercept: ( \frac{1}{4} ); 3; ( y = -6 ) 4; ( x = 8 ) 6a. ( y = 4x + 2 ) b. ( y = 5x - 2 ) c. ( y = 10x + 1 ) d. ( y = -2x - 5 ) e. ( y = -x + 2 ) 8a. ( y - 1 = 3(x - 2) ) b. ( y - 3 = -1/2(x + 6) ) c. ( y - 5 = 0 ) d. ( y = 7(x - 2) ) e. ( y = -4(x - 3) ) f. ( x = -3 ) g. ( y = \frac{3}{2}x - \frac{3}{8} ) 9; ( \frac{3}{4} ) 10; ( y = 3/2 x + 5/2 ) 22; ( y = x\sqrt{3} + 2 ) and ( y = -x\sqrt{3} + 2 ) Pages: #1 – 6 HW: Pages #7 – 9</td>
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<td><strong>Day 2 - Writing Equations of Altitudes, Medians and Perpendicular Bisectors</strong></td>
<td>Answers: 13. ( y - 12 = 1/7 ) (x -4) 14. ( y = -7x + 65 ) 15. ( y = -7x + 40 ) 16. ( y = -2x + 20 ) 17. ( 1/7 ) 18. a. ( y = 2 ) b. ( x = -3 ) 19. ( y - 7 = -1/2 ) (x + 1) 24. equations of medians: ( x = 2 ), ( y = x ) and ( y = -x + 4 ). They intersect at (2,2). Pages: #10 – 14 HW: Pages #15-16</td>
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<tr>
<td><strong>Day 3 - Writing Equations of a Line Using Points of Intersection</strong></td>
<td>Answers: 7. ((4, -2)) 9. ( y - 1 = 5(x - 2) ) or ( y = 5x - 9 ) 10. ( y = -2/3x = 3 ) 1/3 12. ((-8, -23)) 13. ( D = (1.1219, 5.0976) ) 14. ( \sqrt{10} ) 15. ( 4\sqrt{5}/5 ) Pages: #17 – 22 HW: Pages #23 – 26</td>
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Day 1 - Writing Equations of a Line

Warm – Up

Find the slope between each set of points

1. \((2, -8) \ (3, 10)\)

2) Write an equation of a line with the given information from below:

\[ m = \frac{1}{2}, \ b = 6 \]

Equations of Lines

When a linear equation is written in certain forms, relevant information about the line can be gathered from the equation.

<table>
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<th>Slope-Intercept Form</th>
<th>Point-Slope Form</th>
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<tbody>
<tr>
<td>( y = mx + b )</td>
<td>( y - y_1 = m(x - x_1) )</td>
<td>( Ax + By = C )</td>
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<tr>
<td>where ( m ) represents the slope, and ( b ) represents the ( y )-intercept</td>
<td>where ( m ) represents the slope, and ( x_1 ) and ( y_1 ) are the coordinates of a point on the line</td>
<td>where ( A, B, ) and ( C ) are real numbers, and ( A ) and ( B ) are not both 0</td>
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</table>
1. Write an equation of a line that is parallel to the line $2x + y = 6$ and whose $y$-intercept is the same as the line $y = x - 2$.

   - What do you know about slopes of parallel lines? _______________________

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2. Write an equation of a line perpendicular to $y = \frac{1}{3}x - 6$ and has a $y$-intercept of zero.

   - What do you know about slopes of perpendicular lines? ________________________

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You try It!

3. Write an equation of a line that passes through the point (1, 5) and is perpendicular to \(2y = x - 6\).

4. Write an equation of a line that is parallel to the line \(6x - 2y = 14\) with an x-intercept of 5.
Example 5: Write the equation of a line passing through the two points given.
(10, 20) and (20, 65)

Step 1: Calculate Slope - \[ m = \frac{Y_2 - Y_1}{X_2 - X_1} = \]

Step 2: Use your calculate Slope to help you write your equation.

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Answer: |

Practice: Write the equation of a line passing through the two points given.
(2, -5) and (-8, 5)

Answer: |
Horizontal and Vertical lines

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<td>Equation</td>
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<td>Slope</td>
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Write the equation of the horizontal line and/or vertical passing through each point.

6. (3, 7)  7. (2, -4)

Horizontal line:  Vertical Line:

8.  9.

Answer:  Answer:

10. Write an equation of a line that is parallel to the y – axis and contains the point $(-\sqrt{6}, 1)$.

Answer:

11. Write an equation of a line that is parallel to the x – axis and contains the point $(7, \frac{1}{3})$.

Answer:
SUMMARY

Given that the line is parallel to $y = 4x + 5$ and passes through the point (-2,4), write the equation of the line.

Parallel lines have equal slopes, so $m = 4$.
The point $(x_1, y_1) = (-2,4)$
Use the form: $y - y_1 = m (x - x_1)$

\[ y - 4 = 4(x - (-2)) \]
\[ y - 4 = 4(x + 2) \quad \text{ANS.} \]

---

**Memory Device for Vertical Lines**

\[ x = \]

$x = \text{“a” value of point = (a, b)}$

---

**Memory Device for Horizontal Lines**

\[ y = \]

$y = \text{“b” value of point = (a, b)}$

---

**Exit Ticket**

1) Which is an equation of the line with slope $-3$ that passes through $(2, 4)$?

A. $y - 4 = -3(x - 2)$
B. $y - 4 = -3x - 2$
C. $y + 4 = -3(x + 2)$
D. $y - 2 = -3(x - 4)$

2) Which is an equation of the line that passes through the point $(-2, 4)$ and is parallel to the line $y = 3$?

a) $x = -2$  
   b) $y = -2$  
   c) $x = 4$  
   d) $y = 4$
Day 1 – Homework

1. Find the slope and the y-intercept of the graph of each equation.

   a. \( y = 3x + 7 \)
   
   b. \( y = 4x \)
   
   c. \( y = \frac{1}{2}x - \sqrt{3} \)
   
   d. \( y = 13 - 6x \)
   
   e. \( y = -5x - 6 \)
   
   f. \( y = 7 \)

2. Rewrite each equation in y-form and find the slope and the y-intercept of its graph.

   a. \( y - 3x = 1 \)
   
   b. \( y + 5x = 2 \)
   
   c. \( 2x + 3y = 6 \)
   
   d. \( 7 - (6 - 2x) = 4y \)

3. Write an equation of a line that is 6 units below and parallel to the x-axis.

4. Write an equation of a line that is perpendicular to the x-axis and passes through \((8, 1)\).
Write (If possible, in point-slope form) an equation of the line...

a) Containing (2, 1) and (3, 4)
b) Containing (-6, 3) and (2, -1)
c) Containing (1, 5) and (-3, 5)
d) With an x-intercept of 2 and a slope of 7
e) That has an x-intercept of 3 and passes through (1, 8)
f) That passes through (-3, 6) and (-3, 10)
g) That passes through (8, 7) and is perpendicular to the graph of 3y = -2x + 24
9. The line that represents the equation $y = 8x - 1$ contains the point $(k, 5)$. Find $k$.

10. \underline{CD} is \ perpendicular to the graph of $2x + 3y = 8$. If $C = (1, 4)$, find the equation of $CD$. 
Day 2 - Writing Equations of Altitudes, Medians and Perpendicular Bisectors

A median of a triangle is a line segment drawn from the vertex of a triangle to the midpoint of the opposite side.

“How to calculate the median $\overline{AD}$ to side $\overline{BC}$ of $\triangle ABC$”

A = (4, 10), B = (12, 6), and C = (8, 2)

a. Find the midpoint, $D$, of side $\overline{BC}$.

Formula:

b. Find the slope of median $\overline{AD}$.

Formula:

c. Write the equation of median $\overline{AD}$.

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An **altitude** of a triangle is a line segment drawn from a vertex of a triangle perpendicular to the opposite side.

“**How to calculate the altitude** $\overline{AD}$ **to side** $\overline{BC}$ **of** $\Delta ABC$”

A = (4, 10), B = (12, 6), and C = (8, 2)

a. Find the slope of side $\overline{BC}$.
   
   Formula:

b. Find the slope of altitude to $\overline{BC}$

   Formula:

c. Write the equation of altitude $\overline{AD}$.

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A Perpendicular bisector of a line segment is a line (or line segment) that is perpendicular to the segment at its midpoint.

“How to calculate the ⊥ bisector \( \overline{AD} \) to side \( \overline{BC} \) of \( \triangle ABC \)”

A = (4, 10), B = (12, 6), and C = (8, 2)

a. Find the midpoint, \( D \), of side \( \overline{BC} \).

b. Find the slope of side \( \overline{BC} \).

c. Find the slope of perpendicular to \( \overline{BC} \).

d. Write the equation of the perpendicular bisector through point \( D \).

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You Try It!

In triangle $ABC$, $A(-3,2)$, $B(8,4)$ and $C(5,10)$.

a) Find an equation of the median to $AB$.

b) Find an equation of the perpendicular bisector of $AB$.

c) Find an equation of the altitude to $AB$. 
SUMMARY

“How to calculate the median $\overline{AD}$ to side $\overline{BC}$ of $\Delta ABC$”

a. Find the midpoint, $D$, of side $\overline{BC}$. \( \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \)

b. Find the slope of median $\overline{AD}$. \( m = \frac{y_2 - y_1}{x_2 - x_1} \)

c. Write the equation of median $\overline{AD}$. \( y - y_1 = m(x - x_1) \)

“How to calculate the altitude $\overline{AD}$ to side $\overline{BC}$ of $\Delta ABC$”

a. Find the slope of side $\overline{BC}$. \( m = \frac{y_2 - y_1}{x_2 - x_1} \)

b. Find the slope of altitude to $\overline{BC}$ (negative reciprocal).

c. Write the equation of altitude $\overline{AD}$. \( y - y_1 = m(x - x_1) \)

“How to calculate the $\perp$ bisector $\overline{AD}$ to side $\overline{BC}$ of $\Delta ABC$”

a. Find the midpoint, $D$, of side $\overline{BC}$. \( \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \)

b. Find the slope of side $\overline{BC}$. \( m = \frac{y_2 - y_1}{x_2 - x_1} \)

c. Find the slope of perpendicular to $\overline{BC}$ (negative reciprocal).

d. Write the equation of the perpendicular bisector through point $D$. \( y - y_1 = m(x - x_1) \)

Exit Ticket

Which equation represents the perpendicular bisector of $\overline{AB}$ whose endpoints are $A(8,2)$ and $B(0,6)$?

1) \( y = 2x - 4 \)

2) \( y = -\frac{1}{2}x + 2 \)

3) \( y = -\frac{1}{2}x + 6 \)

4) \( y = 2x - 12 \)
Day 2 – Homework

In problems 13-17, use ΔABC in the diagram.

13. Write, in point-slope form, an equation of a line through C parallel to \( \overrightarrow{AB} \).

14. Write an equation of the perpendicular bisector of \( \overline{AB} \).

15. Write an equation of the altitude from C to \( \overline{AB} \).

16. Write an equation of the median form C to \( \overline{AB} \).

17. Find the slope of the line passing through the midpoints of \( \overline{AC} \) and \( \overline{BC} \).
18. A line passes through a point 3 units to the left of and 2 units above the origin. Write an equation of the line if it is parallel to

a) The x-axis  

b) The y-axis

19. If \( P = (-2, 5) \) and \( R = (0, 9) \), write, in point-slope form, an equation for the perpendicular bisector of \( \overline{PR} \).
Day 3 - Writing Equations of a Line Using Points of Intersection

1. Write the equation of a line that contains the point of intersection of the graphs $x = 4$ and $y = 2x + 8$ and is parallel to the line whose equation is $y = -2x + 5$.

Step 1: Solve the system of equations to determine the point of intersection.

Step 2: Write the equation of your line using the point of intersection from above.

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2. Write the equation of a line that contains the point of intersection of the graphs $8x - 3y = 7$ and $10x + 4y = -1$ and is perpendicular to the line $y = -\frac{1}{3}x - 7$.

Step 1: Solve the system of equations to determine the point of intersection.

Step 2: Write the equation of your line using the point of intersection from above.

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Using Equations of Lines to Find the Coordinates of an Altitude

3. In ΔABC with coordinates A(-3,4), B(6,-2) and C(7,6) altitude \( \overline{CD} \) is drawn. Find the coordinates of D.

Step 1: Calculate the equation of the line where the altitude intersects the side.

Step 2: Calculate the equation of the altitude.

Step 3: Solve the systems from above for D
You try!

a) In ΔABC with coordinates A(0,0), B(6,3) and C(1,5) altitude CD is drawn. Find the coordinates of D.

Ans: \( D = \left( \frac{14}{5}, \frac{7}{5} \right) \)
b) In \( \triangle ABC \) with coordinates \( A \left( -4, \frac{1}{2} \right), B \left( -4, \frac{4}{2} \right), \) and \( C \left( 4, \frac{1}{2} \right) \) altitude \( BD \) is drawn, find the coordinates of \( D \).

Ans: \( D = (-2.6849, 0.9931) \)
c) In $\triangle ABD$ with coordinates $A(-4,1)$, $B(1,5)$ and $C(6, -1)$ altitude $CD$ is drawn. Find the coordinates of $D$.

$\text{Ans: } D = (1.1219, 5.0976)$
Day 3 - Homework

7) Show that the graphs of the following 3 equations are concurrent (intersect at a single point). What are the coordinates of the point of intersections?

\[
\begin{align*}
2x + 3y &= 2 \\
y &= 2x - 10 \\
3x - y &= 14
\end{align*}
\]

9) Find, in point-slope form, an equation of the line containing (2, 1) and the point of intersection of the graphs of \(3x - y = 3\) and \(x + 2y = 15\).
10) Find an equation of the line that is parallel to the graph of $2x + 3y = 5$ and contains the point of intersection of the graphs of $y = 4x + 8$ and $y = x + 5$.

12. 

Line 1 has the equation $y = 2x + 1$. Line 2 contains $(5, 3)$ and is parallel to line 1. Line 3 contains $(5, 16)$ and has the same y-intercept as line 1. Find the intersection of lines 2 and 3.
13) In ΔABD with coordinates A(-4,1), B(1,5) and C(6, -1) altitude CD is drawn. Find the coordinates of D.
14. In \( \triangle ABC \), \( A = (5, -1) \), \( B = (1, 1) \), and \( C = (5, -11) \). Find the length of the altitude from \( A \) to \( BC \).

15) Find the distance between the parallel lines corresponding to \( y = 2x + 3 \) and \( y = 2x + 7 \).
(Hint: Start by choosing a convenient point on one of the lines.)
1. The coordinates of the midpoint of $\overline{AB}$ are (-7,6). If the coordinates of $A$ are (2, -4), what are the coordinates of $B$?

2. Given triangle $ABC$ with coordinates $A(1,1)$, $B(6,4)$ and $C(3,-5)$, find each of the following:
   a. Slope of the altitude to $\overline{AB}$.
   b. Length of the median to $\overline{AB}$.

3. If the line joining $S(2,3)$ and $P(7,9)$ is perpendicular to the line joining $Q(8,k)$ and $R(2,4)$, find the value of $k$. 
4. The vertices of triangle PQR are P(1,2), Q(-3,6) and R(4, 8).
   a. Find the coordinates of S, the midpoint of \( \overline{PQ} \).
   b. Express in radical form, the length of the median \( \overline{RS} \).
   c. Find the slope of \( \overline{PR} \).
   d. A line through point Q is parallel to \( \overline{PR} \). If the line passes through the point \((x, 14)\), find the value of \(x\).

5. Find the coordinates of the midpoint of \( \overline{CD} \): C \( \left( \frac{1+3\sqrt{2}}{2}, \frac{1}{2} \right) \), D \( \left( \frac{5-\sqrt{2}}{3}, \frac{2+\sqrt{3}}{3} \right) \)

6. Find the distance from S to T: S \((x + y, a + b)\), T \((x - y, b - a)\)

7. Simplify:
   a) \(3\sqrt{50}\)
   b) \(2\sqrt{12}\)
   c) \(3\sqrt{15} \times 7\sqrt{6}\)
8. In Δ ABD with coordinates A(-4,1), B(1,5), C(6, -1) altitude CD is drawn. Find the coordinates of D.

9. Write an equation of the perpendicular bisector of the segment that joins the points (3, -7 ) and (5,1).

10. Write an equation of a line that passes through the point B(3,1) and is perpendicular to the line 3y + 2x = 15.
11. The vertices of $\triangle ABC$ are $A(0,6)$, $B(-8,0)$, $C(0,0)$. Write an equation of the line that passes through one of the vertices of the triangle and parallel to $\overline{AC}$.

12. Write an equation of the line that contains point (-5,2) and is parallel to the y-axis.

13. Write an equation of the line that contains point (4,-1) and is perpendicular to the x-axis.

14. Write an equation of a line that contains the point (2, 2) and the intersection of the graphs $x + y = 10$ and $x - y = 2$. 
15. In \( \triangle ABC \) with coordinates \( A(-4,3) \), \( B(2,7) \) and \( C(4,-3) \).

a) Find the equation of the median to \( AC \).

b) Find the equation of the altitude to \( AB \).

c) Find the equation of the perpendicular bisector of \( AB \).
Answer Key:

1. \((-16, 16)\)
2.  
   a) \(\frac{-5}{3}\)  
   b) \(\frac{\sqrt{226}}{2}\)
3. \(k = -1\)
4.  
   a) \((-1, 4)\)  
   b) \(\sqrt{41}\)  
   c) 2  
   d) \(x = 1\)
5. \(\left(\frac{13+7\sqrt{2}}{12}, \frac{7+2\sqrt{3}}{12}\right)\)
6. \(\sqrt{4y^2 + 4a^2} = 2\sqrt{y^2 + a^2}\)
7.  
   a) \(15\sqrt{2}\)  
   b) \(4\sqrt{3}\)  
   c. \(63\sqrt{10}\)
8.  
   equation of \(\overline{AB}\):  
   \[y - 1 = \frac{4}{5}(x + 4); \quad y = \frac{4}{5}x + \frac{21}{5}\]
   
   equation of altitude:  
   \[y + 1 = -\frac{5}{4}(x - 6); \quad y = -\frac{5}{4}x + \frac{13}{2}\]
   
   coordinates of D: \(\left(\frac{46}{41}, \frac{209}{41}\right)\)
9.  
   \[y + 3 = -\frac{1}{4}(x - 4) \text{ or } y = -\frac{1}{4}x - 2\]
10.  
    \[y - 1 = \frac{3}{2}(x - 3) \text{ or } y = \frac{3}{2}x - \frac{7}{2}\]
11. \(x = -8\)
12. \(x = -5\)
13. \(x = 4\)
14.  
    \[y - 2 = \frac{1}{2}(x - 2) \text{ or } y - 4 = \frac{1}{2}(x - 6) \text{ or } y = \frac{1}{2}x + 1\]
15.  
    a) \[y - 0 = \frac{7}{2}(x - 0) \text{ or } y = \frac{7}{2}x\]
    
    b) \[y + 3 = -\frac{3}{2}(x - 4) \text{ or } y = -\frac{3}{2}x + 3\]
    
    c) \[y - 5 = -\frac{3}{2}(x + 1) \text{ or } y = -\frac{3}{2}x + \frac{7}{2}\]
Additional Questions: Honors Text Book – Pages: 644 – 647: 13, 17, 21ab, 29

13) \[
slope = \frac{7 - 3}{5 - (-2)} = \frac{4}{7} \\
y = \frac{4}{7}x + b \\
3 = \frac{4}{7}(-2) + b \\
0 = \frac{4}{7}x + \frac{20}{7} \\
\frac{20}{7} = b \\
-\frac{20}{4} = x \\
y = \frac{4}{7}x + \frac{20}{7}
\]

17) a) mdpt \( \overline{AB} = (7, 4) \)
   length of median = \( \sqrt{(9 - 7)^2 + (8 - 4)^2} = 2\sqrt{5} \)
   b) slope of median = \( \frac{8 - 4}{9 - 7} = \frac{4}{2} = 2 \)
   \( y = 2x + b \)
   \( 4 = 14 + b \)
   \( -10 = b \)
   \( y = 2x - 16 \) or \( y - 4 = 2(x - 7) \)
   c) slope of \( \overline{AB} = \frac{5 - 3}{12 - 2} = \frac{2}{10} = \frac{1}{5} \)
   slope of \( \perp \) bis = -5
   \( y - 4 = -5(x - 7) \)
   d) slope of alt = -5
   \( y - 8 = -5(x - 9) \)
   e) \( y - 8 = \frac{1}{5}(x - 9) \)

21a) \[
y = 4x - 1 \\
y = 2x + 3 \\
4x - 1 = 2x + 3 \\
2x = 4 \\
x = 2 \\
\{2, 7\}\]

21b) \[
x - 3y = 10 \\
x = 3y + 10 \\
2x + y = 13 \\
2(3y + 10) + y = 13 \\
6y + 20 + y = 13 \\
7y = -7 \\
x = 3y + 10 \\
y = -7 \\
x = 7 \\
\{7, -1\}\]