3 Linear Coordinate Geometry Feb 2019 (No Calculators)

3 pts 1. Line *p* has an x-intercept of 13 and is perpendicular to the line $y = 2x - 1$. At what point do the lines intersect?

Ans. ____________________

4 pts 2. A line with slope 2 intersects a line with slope 6 at the point (40, 30). What is the distance between the x-intercepts of the two lines?

Ans. ____________________

5 pts 3. Lines *p* and *q* are 4 units away from the line $3x - 4y = 8$. Lines *p* and *q* intersect the line $2x - y = -3$ at points *R* and *T*. Find the distance *RT*.

Ans. ____________________

Linear Coordinate Geometry

1. Line *p* has a slope of -1/2. Since its x-intercept is 13, then its y-intercept is 6 1/2, using slope. Thus p has equation $y = -\frac{1}{2}x + 6\frac{1}{2}$. Using substitution to solve the sim. eq.:

$-\frac{1}{2}x + 6\frac{1}{2} = 2x - 1 \rightarrow 7\frac{1}{2} = 2\frac{1}{2}x$, so $x = 3$. In $y = 2x - 1$, $y = 2(3) - 1$, $y = 5$. **Ans. (3, 5)**

2. (40, 30). Equation with slope 2: $y = 2x + b$, $30 = 2(40) + b$, $-50 = b$. So (1) $y = 2x - 50$. Equation with slope 6: $30 = 6(40) + b$, $-210 = b$. So (2) $y = 6x - 210$. The x-intercept for either (1) or (2), set $y = 0$ and solve. For (1) $x = 25$, for (2) $x = 35$. Difference is 10. **Ans. 10**

3. Since $3x - 4y = 8$, the unit distance between parallel lines is ± 5 according to the constant 8 and the 3-4-5 right triangle from the coefficients of x and y. So one of the parallel lines is

$3x - 4y = 8 + 4(5) \rightarrow$ (1) $3x - 4y = 28$, and the other is $3x - 4y = 8 - 4(5) \rightarrow$ (2) $3x - 4y = -12$.

Where these lines intersect (3) $2x - y = -3$, -4(3) + (1): $-8x + 3x = 12 + 28$, so $x = -8$. In (3):

$-16 - y = -3$, $y = -13$. Thus (-8, -13). -4(3) + (2): $-8x + 3x = 12 - 12$, so $x = 0$. Thus (0, 3).

The distance between the points: $\sqrt{(-8-0)^2 + (-13-3)^2} = \sqrt{8^2 + 16^2} = 8\sqrt{5}$. **Ans. $8\sqrt{5}$**

3 Linear Coordinate Geometry Feb 2018 (No Calculators)

3 pts 1. A line contains the points (3, -7) and (5, 9). Find the equation of the line perpendicular to this line with a y-intercept of 6. Express answer in y = mx + b form.

Ans. ____________________

4 pts 2. Calculate the distance between the x-intercept and y-intercept of the line

$8x + 15y = 30$

Ans. ____________________

5 pts 3. Three of the vertices of a rectangle are (5, -2), (14, 1) and (7, -8). Find the coordinates of fourth point.

Ans. ____________________

Linear Coordinate Geometry

1. Slope of line $= \frac{9+7}{5-3} = 8$. Slope of line perpendicular $= -\frac{1}{8}$. Its equation is **Ans.** $\mathbf{y = -\frac{1}{8}x + 6}$

2. The x-intercept is 15/4. The y-intercept is 2. $\sqrt{\left(\frac{15}{4}\right)^2 + 2^2} = \sqrt{\frac{225}{16} + \frac{64}{16}} = \sqrt{\frac{189}{16}} = \frac{17}{4}$. **Ans.** $\frac{17}{4}$

3. Points are A(5,-2), B(14,1), C(7,-8). Slope of $\overline{AB} = \frac{1+2}{14-5} = \frac{1}{3}$. Slope of $\overline{BC} = \frac{1+8}{14-7} = \frac{9}{7}$. Slope of $\overline{AC} = \frac{-2+8}{5-7} = -3$. So the right angle is at A. Side BD is parallel to AC: y = -3x form, 3x + y = c passing through B: 3(14) + (1) = 43, thus [1]: 3x + y = 43. Side CD is parallel to AB: $y = \frac{1}{3}x$ form, x – 3y = c passing through C: (7) – 3(-8) = 31, thus [2] x – 3y = 31.

3[1] + [2]: 10x = 129 + 31 = 160, so x = 16. In [1]: 3(16) + y = 43, y = -5. Alternate solution: If a student can graph well and uses the slope from A to B which is (right 9, up 3), then from C: (7 right 9, -8 up 3) ➔ (16, -5).

Ans. (16, -5)

3 Linear Coordinate Geometry Feb 2016-17 (No Calculators)

3 pts 1. For what value of A will the line $Ax - 2y = 7$ be perpendicular to the line $2x + 5y = 13$?

Ans. ______________

4 pts 2. Line L has an x-intercept of (13, 0) and line M has an x-intercept of (11, 0). The slope of line L is 4/35 greater than the slope of line M. If the two lines intersect at $(a, 2)$, where $a < 11$, find a.

Ans. ______________

5 pts 3. Isosceles ΔABC has base $\overline{AB}$, where A(23, 15) and B(5, 3). Vertex C is on the line $7x + y = -3$. Find C in (x, y) form.

Ans. ______________

Linear coordinate Geometry

1. In standard form, the coefficients of x and y switch and the sign changes, so A = 5. **Ans. 5**

2. L: x-i (13, 0); M: x-i (11, 0). Slopes: $L = M + \frac{4}{35}$, using point (a, 2), ➔ $\frac{-2}{13-a} = \frac{-2}{11-a} + \frac{4}{35}$ ➔ $\frac{-2(11-a)+2(13-a)}{(13-a)(11-a)} = \frac{4}{(13-a)(11-a)} = \frac{4}{35}$. $(13 - a)(11 - a) = 35$ ➔ $143 - 24a + a^2 = 35$ ➔ $a^2 - 24a + 108 = 0$ ➔ $(a - 6)(a - 18) = 0$. Since $a < 11$, then $a = 6$. **Ans. 6**

3. Midpoint of $\overline{AB}$: $\left(\frac{23+5}{2}, \frac{15+3}{2}\right) = (14, 9)$. Slope of $\overline{AB}$: $\frac{15-3}{23-5} = \frac{2}{3}$. The slope of the perpendicular bisector is $-\frac{3}{2}$, thus $y = -\frac{3}{2}x$ ➔ $3x + 2y = 3(14) + 2(9) = 60$. We need to find out where this line (1) $3x + 2y = 60$ intersects the line (2) $7x + y = -3$. $-2(2) = -14x - 2y = 6$. Adding to (1): $-11x = 66$, so $x = -6$. In (2): $7(-6) + y = -3$ ➔ $y = 39$. **Ans. (-6, 39)**

3 pts 1. Line *m* is parallel to the line $y = \frac{3}{5}x + 7$ and passes through the point (8, -5). What is the y-intercept of *m*?

Ans. ______________

4 pts 2. The coordinates of A and B of right triangle ABC are (4, 1) and (9, 8) respectively. If angle B is the right angle, and point C has coordinates (*a*, -2), find *a*.

Ans. ______________

5 pts 3. (10, -2) and (6, -4) are the vertices of the base of an isosceles triangle. The third vertex of the triangle is 10 units from the base of the triangle and is in the first quadrant. Find the coordinates of the third vertex.

Ans. ____________________

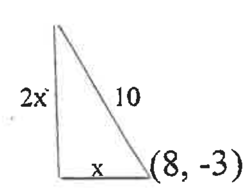
Linear Coordinate Geometry

1. m takes same slope, so $y = \frac{3}{5}x + b$ ➔ $-5 = \frac{3}{5}(8) + b$ ➔ $-5 - 4\frac{4}{5} = b$. **Ans.** $-9\frac{4}{5}$

2. The slope of $\overline{AB} = \frac{8-1}{9-4} = \frac{7}{5}$. The slope of $\overline{BC}$ is $-\frac{5}{7}$, thus taking the form $y = -\frac{5}{7}x$ or $5x + 7y = c$. Plugging in B(9,8): $5(9) + 7(8) = 45 + 56 = 101$, thus line BC is $5x + 7y = 101$. Plugging in the point C(a, -2): $5a + -14 = 101$ ➔ $5a = 115$, so $a = 23$. **Ans. 23**

3. The slope of the base is: $\frac{-4+2}{6-10} = \frac{1}{2}$. The midpoint of the base is: $\left(\frac{10+6}{2}, \frac{-2-4}{2}\right) = (8, -3)$.

So the slope of the perpendicular bisector of the base is -2. Using the right triangle at right to find the coordinates of the vertex angle: $(2x)^2 + x^2 = 10^2$. $5x^2 = 100$, so $x = 2\sqrt{5}$. The x coordinate is $8 - 2\sqrt{5}$ and the y coordinate is $-3 + 4\sqrt{5}$. Thus $(8 - 2\sqrt{5}, -3 + 4\sqrt{5})$.



Ans. $(8 - 2\sqrt{5}, -3 + 4\sqrt{5})$

3 **Linear Coordinate Geometry Feb 2015 (No Calculators)**

3 pts 1. If (6, 9) and (10, 3) are the coordinates of two opposite vertices of a square, what is the equation of the line that contains the other diagonal? State your answer in the form $y = mx + b$.

Ans. ____________________

4 pts 2. Consider line L which contains the points (-3,8) and (6, -4). What is the length of the hypotenuse of the right triangle formed by L, the x-axis and the y-axis?

Ans. ____________

5 pts 3. A(0, 0), B(2, 6) and C(4, -2) are the coordinates of Triangle ABC. Find the point (x, y) which is the intersection of the median to side AB and perpendicular bisector of side BC.

Ans. ____________

Linear Coordinate Geometry

1. The midpoint of (6, 9) and (10, 3) = (8, 6). The slope of the line through (6, 9) and (10, 3) is $\frac{9-3}{6-10} = -\frac{3}{2}$. So the other diagonal has slope $\frac{2}{3}$. $y = \frac{2}{3}x + b$ ➔ $6 = \frac{2}{3}(8) + b$ ➔ $6 = 5\frac{1}{3} + b$ ➔ $b = \frac{2}{3}$. **Ans.** $y = \frac{2}{3}x + \frac{2}{3}$

2. Slope of L: $\frac{8-(-4)}{-3-6} = -\frac{4}{3}$. Line L is: $8 = -\frac{4}{3}(-3) + b$ ➔ $8 = 4 + b$, $b = 4$. $y = -\frac{4}{3}x + 4$. In standard form, $4x + 3y = 12$. x-i = 3 and y-i = 4. A basic 3-4-5 Δ. **Ans. 5**

3. Median to $\overline{AB}$: mdpt of $\overline{AB}$: (1,3) through C(4, -2): $y = \frac{5}{-3}x$ ➔ $5x + 3y = 14$ (1)

$\perp$ bis. of $\overline{BC}$: mdpt of $\overline{BC}$: (3, 2); slope of $\overline{BC}$: $\frac{8}{-2}$; $y = \frac{1}{4}x$ ➔ $x - 4y = -5$ (2)

5(2) – (1): $-23y = -39$, so $y = \frac{39}{23}$. 3(2) + 4(1): $23x = 41$, so $x = \frac{41}{23}$. **Ans.** $\left(\frac{41}{23}, \frac{39}{23}\right)$

3 Linear Coordinate Geometry Feb 2014 (No Calculators)

3 pts 1. Find the y-intercept in (x, y) form of the line passing through (-3, 6) and (5, 10).

Ans. ____________________

4 pts 2. Find the next highest point (x, y) on the line $5x - 12y = -6$, which is beyond the point (6, 3) that also has integral values for both x and y.

Ans. ____________________

5 pts 3. Line m passing through the point (–3, 15) is perpendicular to line *p*, whose equation is $3x - 4y = -27$. How far is the y-intercept of m from line *p*?

Ans. ____________________

Linear Coordinate Geometry

1. $m = \frac{6-10}{-3-5} = 1/2$. $y = \frac{1}{2}x + b \Rightarrow 10 = \frac{1}{2}(5) + b \Rightarrow b = 7\frac{1}{2}$. **Ans. (0, 7½)**

2. The slope is 5/12, so the next higher integral values above (6, 3) are (6 + 12, 3 + 5) = (18, 8). **Ans. (18, 8)**

3. The line perpendicular to $3x - 4y = -27$ has the form $4x + 3y =$, plugging in the point (-3, 15) makes $4x + 3y = 4(-3) + 3(15) = 33$. The y-intercept of this line is (0, 11). The line parallel to $3x - 4y = -27$ passing through (0, 11) is $3x + 4y = -44$. The distance between these two parallel lines is $\frac{|-44-(-27)|}{5} = \frac{17}{5} = 3\frac{2}{5} = 3.4$. **Ans.** $\mathbf{3\frac{2}{5}}$ **or 3.4**

3 Linear Coordinate Geometry Feb 2013 (No Calculators)

3 pts 1. Two lines pass through the point (-4, -7) in the xy-coordinate plane. One line has slope m_1 and a y-intercept at (0, 9). The other line has slope m_2 and a y-intercept at (0, 10). Find the value of $m_2 - m_1$.

Ans. ____________

4 pts 2. Line segment L has endpoints at $(a, 2a)$ and $(5a, 4a)$ for some $a \neq 0$. In terms of a, find the point at which the perpendicular bisector of L has its y-intercept.

Ans. ____________

5 pts 3. The coordinates of $\triangle ABC$ are A(6, 11), B(-2, 1) and C(10. -1). $\overline{AD}$ is the median from A to side BC. Point E on line AD has x-coordinate of 8. Find the x-intercept of the line through E perpendicular to line AD.

Ans. ____________

Linear Coordinate Geometry

1. $m_2 = \frac{10-(-7)}{0-(-4)} = \frac{17}{4}$. $m_1 = \frac{9-(-7)}{0-(-4)} = \frac{16}{4}$. $m_2 - m_1 = \frac{1}{4}$. **Ans. ¼**

2. Slope of L = $\frac{4a-2a}{5a-a} = \frac{1}{2}$. Slope of Perpendicular line -2. Midpoint: $\left(\frac{5a+a}{2}, \frac{4a+2a}{2}\right)$ = (3a, 3a). Perpendicular bisecting equation: y = -2x + b ➔ 2x + y = b. 2(3a) + 3a = b, thus b = 9a.
Ans. 9a or **(0, 9a)**

3. A(6, 11), B(-2, 1) and C(10. -1). Mdpt. D = (4, 0). Line AD: $y = \frac{11-0}{6-4}x = \frac{11}{2}x$ form, so 11x – 2y = 11(6) – 2(11) = 44 ➔ 11x – 2y = 44. For x coordinate 8: 11(8) - 2y = 44 ➔ the y-coordinate is 22. The line perpendicular to line AD has the form 2x + 11y = C. Passing through E, the equation is: 2(8) + 11(22) = C ➔ 16 + 242 = C, 2x + 11y = 258. The x intercept of this line is: 2x + 11(0) = 258 ➔ x = 129.
Ans. 129

3 Linear Coordinate Geometry Jan 2012 (No Calculators)

3 pts 1. Find the value of the slope of the line: $2x - y = 3y - x + 2$.

Ans. ___________

4 pts 2. $\frac{2}{3}x + \frac{1}{4}y = \frac{1}{2}$ is reflected across the main diagonal $x = y$ to form a line with equation $Ax + By = C$, where A, B and C are relatively prime integers and $A > 0$. Find the sum $A + B + C$.

Ans. ___________

5 pts 3. Find the equations of the lines A and B in slope-intercept form such that:

- the sum of the values of their slopes is 4.
- the y-intercept of line A subtracted from the y-intercept of line B equals 2.
- line A intersects line B at (-1, 3).

Ans. ___________________________

Linear Coordinate Geometry

1. $2x - y = 3y - x + 2$ ➔ $-4y = -3x + 2$ ➔ $y = \frac{3}{4}x - 1/2$. Thus ¾ is slope. **Ans. 3/4**

2. The inverse of $\frac{2}{3}x + \frac{1}{4}y = \frac{1}{2}$ is $\frac{1}{4}x + \frac{2}{3}y = \frac{1}{2}$ (x and y switch). Multiplying by 12: $3x + 8y = 6$. $8 + 3 + 6 = 17$. **Ans. 17**

3. Let line A be $y = mx + b$ and let line B be $y = nx + a$. (1) $m + n = 4$ and (2) $a - b = 2$. Plugging the point of intersection into A and B: A produces $3 = -m + b$ or (3) $b - m = 3$; B produces $3 = -n + a$ or (4) $a - n = 3$. Adding (1), (2), (3), and (4): $2a = 12$ or $a = 6$. Plugging back through: (2): $6 - b = 2$, $b = 4$; (3): $4 - m = 3$, $m = 1$; (1) $1 + n = 4$, $n = 3$. So A is $y = x + 4$, and B is $y = 3x + 6$. **Ans. line A: $y = x + 4$, line B: $y = 3x + 6$**

3 Linear Coordinate Geometry Feb 2011 (No Calculators)

3 pts 1. Find the equation of the line in standard form ($Ax + By = C$, where A, B, and C are relatively prime integers and $A > 0$) passing through (-2, 5) and parallel to the line $3y + 2x = 5$.

Ans. ____________________

4 pts 2. Find the equation in standard form in terms of a and b for the line which is the perpendicular bisector of the line segment joining (2a, 0) and (0, 2b).

Ans. ____________________

5 pts 3. Determine k so that the line with equation $3x - 4y = k$ is 6/5 units away from the point (2, 3).

Ans. ____________________

Linear Coordinate Geometry

1. Equation of line same form: $2x + 3y = : 2(-2) + 3(5) = 11$. **Ans. $2x + 3y = 11$**

2. Midpoint = (a, b). Slope of line segment: $\frac{2b-0}{0-2a} = -\frac{b}{a}$ so slope of perpendicular line is $\frac{a}{b}$. Line is $y - b = \frac{a}{b}(x - a)$ ➔ $by - b^2 = ax - a^2$. **Ans. $ax - by = a^2 - b^2$**

3. The distance between two parallel lines: $d = \frac{|Ax + By + C|}{\sqrt{A^2 + B^2}}$, so $\frac{6}{5} = \frac{|3(2) - 4(3) - k|}{\sqrt{9+16}}$ ➔ $\frac{6}{5} = \frac{|-6-k|}{5}$, $6 = |-6-k|$ ➔ (1): $6 = -6 - k$ or (2): $6 = 6 + k$. In (1) $k = -12$ and in (2): $k = 0$. **Ans: $k = 0$ or $k = -12$**

3 Linear Coordinate Geometry Feb 2010 (No Calculators)

3 pts 1. (3, 6), (-2, 3) and (13, *k*) are collinear. Find *k*.

Ans. ________________

4 pts 2. Line segment AB has endpoints A (3, -1) and B (13, -5). Find the point of intersection of the line 3x – 4y = 8 and the perpendicular bisector of segment AB.

Ans. ________________

5 pts 3. Triangle ABC has vertices A (1, 2), B (7, 8) and C 11, -6). Find the coordinates of the centroid, which is the point of concurrency of the medians of the triangle.

Ans. ________________

Linear Coordinate Geometry

1. The slopes between pairs of points is the same: $\frac{6-3}{3-(-2)} = \frac{k-6}{13-3}$ ➔ $\frac{3}{5} = \frac{k-6}{10}$ ➔ 30 = 5k – 30 ➔ 60 = 5k, thus k = 12. **Ans. 12**

2. The midpoint of $\overline{AB} = \left(\frac{13+3}{2}, \frac{-5+-1}{2}\right)$ = (8, -3). Slope of $\overline{AB} = \frac{-1--5}{3-13} = -\frac{2}{5}$. The slope of the perpendicular bisector is $\frac{5}{2}$. Equation form: $y = \frac{5}{2}x$ or 5x – 2y = c. Plugging in (8, -3): 5(8) – 2(-3) = 46. Thus the equation: (1) 5x – 2y = 46. Where does this line intersect (2) 3x – 4y = 8. -2(1) + (2): -10x + 4y = -92 (+) 3x – 4y = 8 ➔ -7x = -84, thus x = 12. In (2): 3(12) – 4y = 8 ➔ 28 = 4y so y = 7. **Ans. (12, 7)**

3. A (1, 2), B (7, 8), C 11, -6). The midpoint of $\overline{AB}$ is (4, 5). The median equation from C to $\overline{AB}$: slope $\frac{-6-5}{11-4} = -\frac{11}{7}$; equation: (1) 11x + 7y = 79. The midpoint of $\overline{BC}$ is (9, 1). The median equation from A to $\overline{BC}$: slope $\frac{1-2}{9-1} = -\frac{1}{8}$; equation (2) x + 8y = 17. Solving these simultaneously: -11(2) + (1) ➔ - 11x - 88y = -187 (+) 11x + 7y = 79 ➔ - 81y = -108 y = 4/3. Plugging in to (2): x + 8(4/3) = 17 ➔ x + 10⅔ = 17. Thus x = 6⅓.

Ans. (6⅓, 1⅓) or (19/3, 4/3)