

GEOMETRY 10b Lesson B Week Three
Mr. Dinallo

There are two lessons for class 10b. You are to do lesson B if your name is listed below.

If your name is not listed below you are to do lesson A.

The following students are to complete this: lesson A.
Aharonbayev, Akilov, Babev, Fleischmann, Rosenbaum

Coordinate geometry lesson B

Learning intention: equation of a line, and transformations

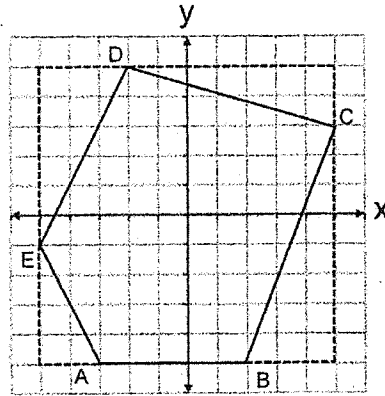
Materials: for this lesson students graph paper and ruler

Assignment: in the Barron's or see attachment below, read pages: 101 equation of lines, 102 and 103 rotations.

Do problems: page 105: 1-4 *show your work.*

Example:

Find the area of polygon $ABCDE$, with vertices $A(-3, -5)$, $B(2, -5)$, $C(5, 3)$, $D(-2, 5)$, and $E(-5, -1)$.

**Solution:**

Sketch the bounding rectangle in around $ABCDE$.

The length is 10 and the width is 10, giving an area of 100.

The triangles have areas:

$$\text{upper left triangle} = \frac{1}{2}(3 \cdot 6) = 9$$

$$\text{upper right triangle} = \frac{1}{2}(7 \cdot 2) = 7$$

$$\text{lower left triangle} = \frac{1}{2}(4 \cdot 2) = 4$$

$$\text{lower right triangle} = \frac{1}{2}(3 \cdot 8) = 12$$

$$\text{The area of } ABCDE = 100 - 9 - 7 - 4 - 12 = 68$$

COLLINEARITY

Three points are **collinear** if the slopes between any two pairs are equal. For example, points A , B , and C are collinear if the slope of \overline{AB} equals the slope of \overline{BC} .

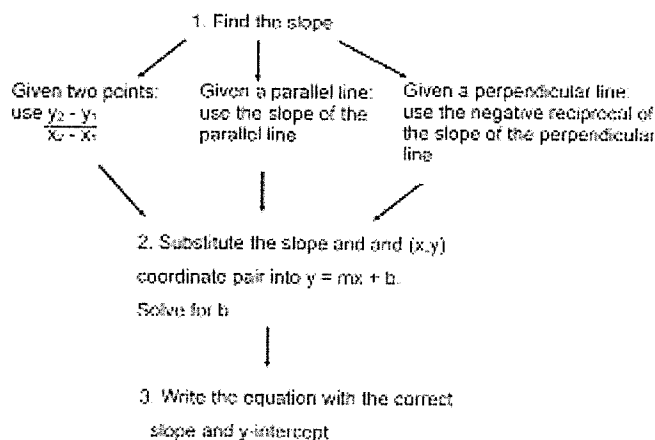
EQUATIONS OF LINES

- The slopes of parallel lines are equal.
- The slopes of perpendicular lines are negative reciprocals. (If the slope of line m is $\frac{2}{3}$, then the slope of any line perpendicular to m is $-\frac{3}{2}$.)

102 A Brief Review of Key Geometry Facts and Skills

- The equation of a line in slope-intercept form is $y = mx + b$ where m is the slope and b is the y -intercept. To graph the line, plot a point on the y -axis at the y -intercept. From that point, plot additional points using the rise and run from the slope.
- The equation of a line in point-slope form is $y - y_1 = m(x - x_1)$ where m is the slope and (x_1, y_1) are the coordinates of any point on the line. To graph the line, plot the first point at (x_1, y_1) . From that point, plot additional points using the rise and run from the slope.

Strategy for writing the equation of a line in slope-intercept form:



TRANSFORMATIONS AND LINES

Translations and Dilations

Translations and dilations preserve slope, so the slope of the image will be the same as the slope of the pre-image.

To translate or dilate a line given its equation,

1. Choose any point on the line (the y -intercept is often an easy choice).
2. Apply the translation or dilation to that point.
3. Find the equation of the line that has the same slope as the original line and passes through the transformed point.

Rotations

Rotations of 90° will result in a line perpendicular to the original, so the slope will be the negative reciprocal. To write the equation of a line after a 90° rotation, use the same procedure for translations and dilations, except use the negative reciprocal of the slope.

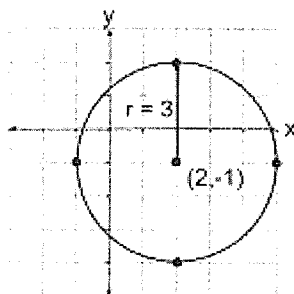
EQUATION OF THE CIRCLE**Center Radius Form of the Equation of a Circle**

$(x - h)^2 + (y - k)^2 = r^2$ where the center has coordinates (h, k) and radius has length r .

- To graph a circle, first identify the center and radius from the equation. Plot a point at the center. Then plot points up, down, left, and right a distance r from the center.

Example:

Graph the equation $(x - 2)^2 + (y + 1)^2 = 9$.



The center is located at $(2, -1)$, and $r^2 = 9$, so $r = 3$. We plot the center point at $(2, -1)$; then plot points up, down, right, and left 3 units from the center. Use these four points as a guide to complete the circle.

Practice Exercises

- Points $A(2, -1)$ and $B(8, -3)$ lie on line m . After a rotation of 90° about the origin, the images of A and B are A' and B' . If A' and B' lie on line n , what is the equation of line n ?
 - $y = -3x + 2$
 - $y = -\frac{1}{3}x - \frac{1}{3}$
 - $y = 3x - 1$
 - $y = \frac{1}{3}x + 6$
- What is the equation of the line $6x + 2y = 12$ after a dilation by a scale factor of 5?
 - $y = -3x + 30$
 - $y = -3x + 6$
 - $y = -15x + 30$
 - $y = -15x + 6$
- Which of the following lines is perpendicular to the line $x + 4y = 8$?
 - $y = -\frac{1}{4}x + 2$
 - $y = 4x + 3$
 - $y = \frac{1}{4}x + 2$
 - $y = -4x + 3$
- Which of the following is the equation of a line parallel to $2x + 3y + 6 = 0$ and passes through the point $(6, 1)$?
 - $y = -\frac{2}{3}x + 5$
 - $y = 2x - 11$
 - $y = -2x + 13$
 - $y = -\frac{2}{3}x + 3$