GEOMETRY 11 b   Lesson B   Week Three
Mr. Dinallo

There are two lessons for class 11b. 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 B.
Beckerman, Federman, Perlow, Schecter

Coordinate geometry lesson B

Learning intention: how to find equation of lines and transformations

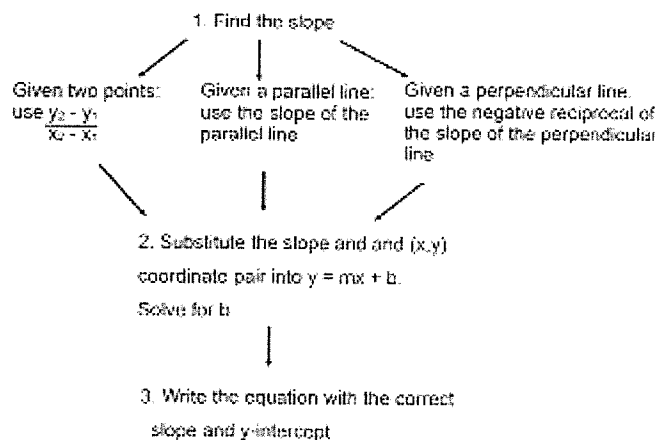**Materials:** for this lesson students graph paper and ruler

Assignment: in the Barron's or see attachment below, read pages: 99-103 rotations

Do problems: page 106: 5,7,8, and 9. show your work for credit.

- 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:

1. Find the slope

Given two points: use $\frac{y_2 - y_1}{x_2 - x_1}$

Given a parallel line: use the slope of the parallel line

Given a perpendicular line: use the negative reciprocal of the slope of the perpendicular line

2. Substitute the slope and and (x,y) coordinate pair into $y = mx + b$. Solve for b

3. Write the equation with the correct slope and y-intercept

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.
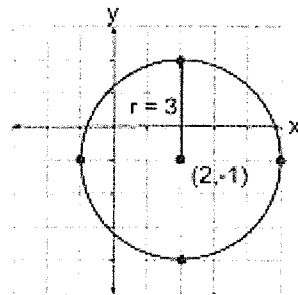
EQUATION OF THE CIRCLE

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.

5. What are the coordinates of the midpoint of a segment whose endpoints have coordinates (3, 1) and (15, −7)?
(1) (27, −15)   (3) (6, −4)
(2) (−6, 4)   (4) (9, −3)

6. The diameter of a circle has endpoints with coordinates (4, −1) and (8, 3). Which of the following is an equation of the circle?

(1) $(x - 2)^2 + (y - 1)^2 = 8$ (3) $(x - 6)^2 + (y - 1)^2 = 8$
(2) $(x - 2)^2 + (y - 1)^2 = 32$ (4) $(x - 6)^2 + (y - 1)^2 = 32$

7. Are the segments $\overline{AB}$ and $\overline{TU}$ congruent, given coordinates $A(1, 4)$, $B(-3, 6)$, $T(2, 5)$, and $U(4, 1)$? Justify your answer.

8. Find the coordinates of the point W that divides directed segment $\overline{UV}$ in a 1:5 ratio, given coordinates $U(-3, 7)$ and $V(9, 1)$.

9. Point A has coordinates (−2, 7) and point B has coordinates (6, 3). Line m has the property that every point on the line is equidistant from points A and B. Find the equation of line m.

10. A circle is described by the equation $x^2 + 6x + y^2 - 12y + 25 = 0$. Find the radius of the circle and the coordinates of its center.

11. Circle P has a center $P(4, -5)$ and a radius with length $\sqrt{65}$. Does the point $A(8, 2)$ lie on circle P? Justify your answer.

12. Parallelogram $ABCD$ has coordinates $A(2, -1)$, $B(5, 1)$, $C(a, b)$, and $D(3, 4)$. Write the equation of the line that contains side $\overline{CD}$.