6.12 Exam: Graphing, perpendicular and parallel slopes

1. Graph and label the two equations. Mark their intersection as an ordered pair.

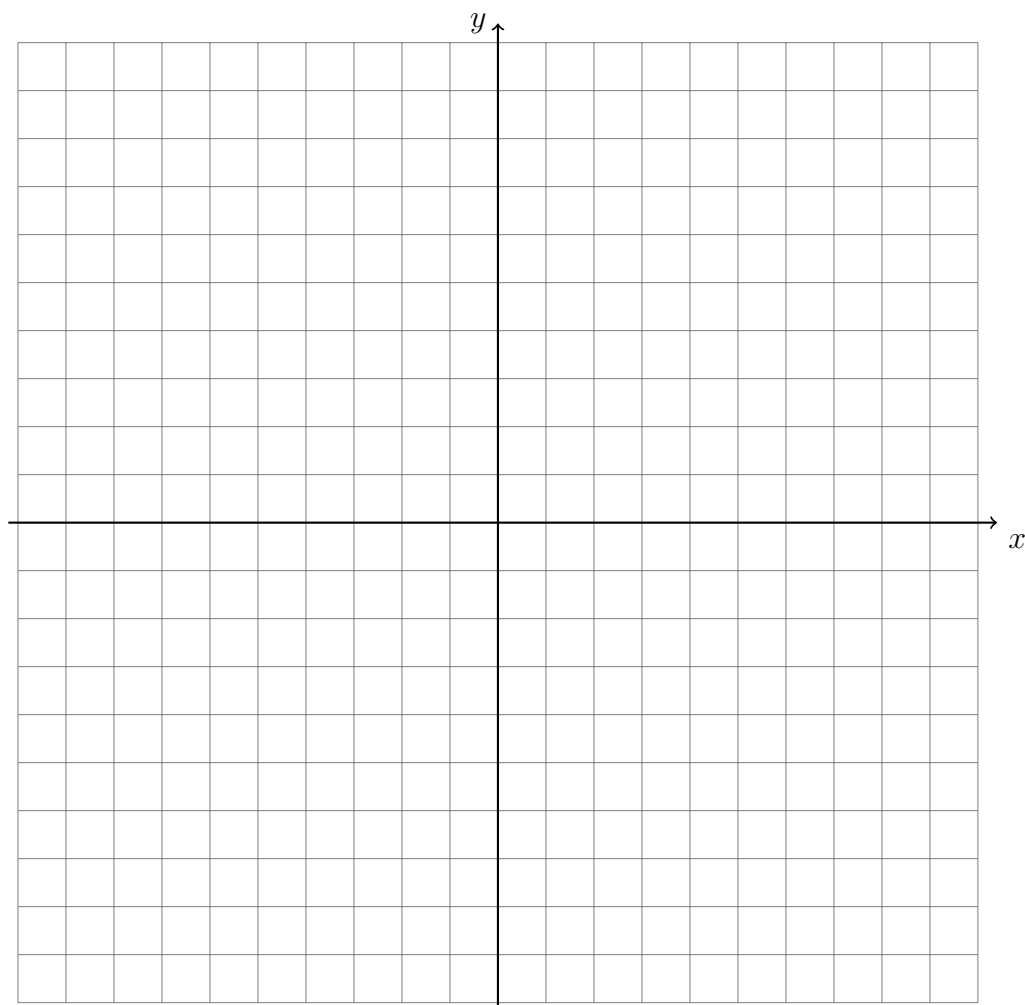$y = \frac{3}{4}x - 5$ $y = -x + 2$

Write down the slopes of the two lines.

$m_1 =$ $m_2 =$

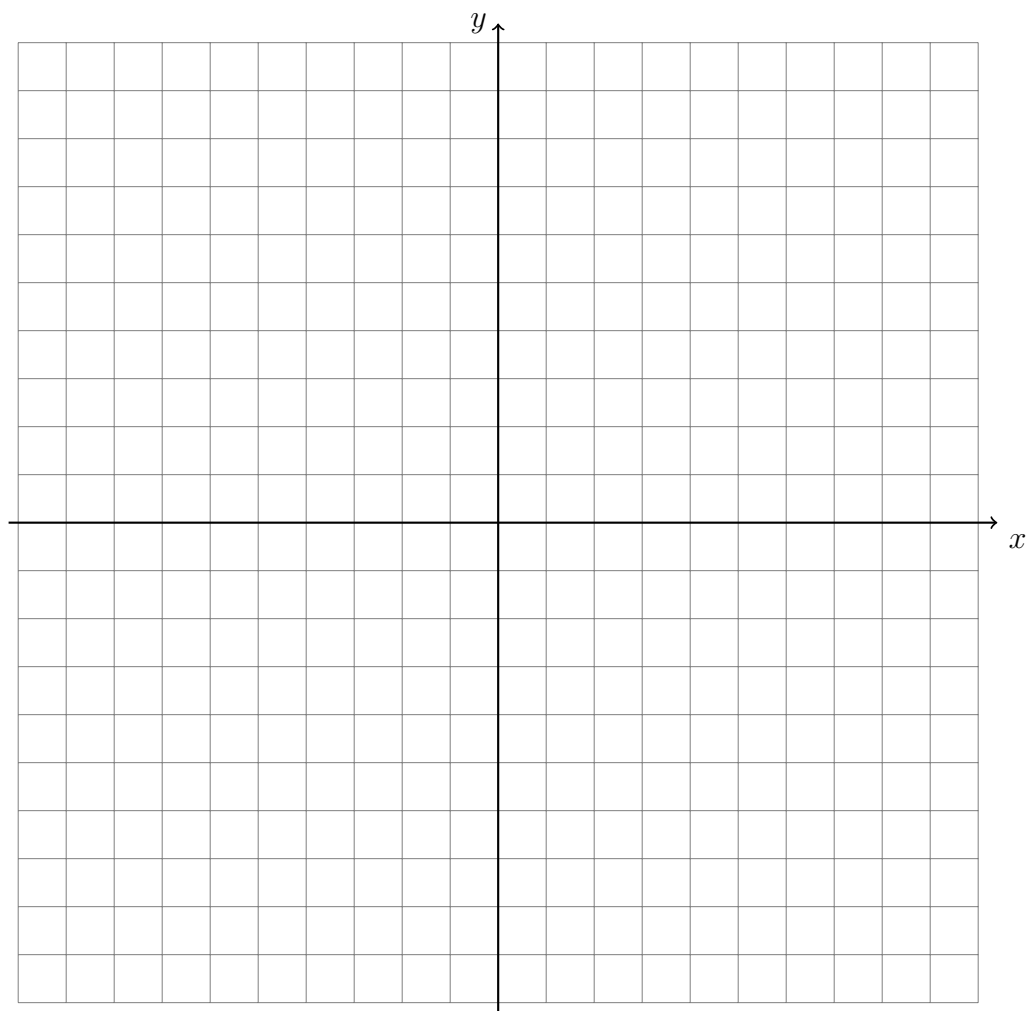Are the lines parallel, perpendicular, or neither? Justify your answer using the slopes.

2. Graph and label the two equations. Mark their intersection as an ordered pair.

$y = -\frac{1}{3}x + 4$

$3x - y = 6$

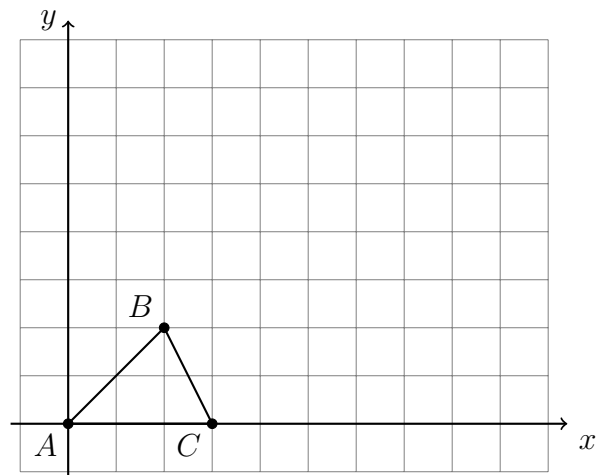Are the lines parallel, perpendicular, or neither? Justify your answer using the slopes.

3. The line l has the equation $y = -\frac{3}{5}x + 3$.

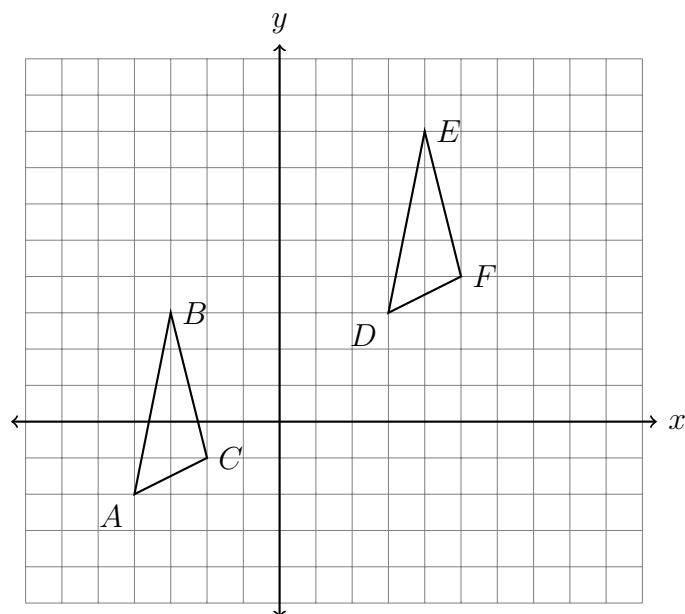(a) What is the slope of the line k, given $k \parallel l$?

(b) What is the slope of the line j, given $j \perp l$?

4. Apply a dilation mapping $\triangle ABC \rightarrow \triangle A'B'C'$ with a factor of $k = 3$ centered at the origin. Draw and label the image on the grid and make a table of the coordinates.
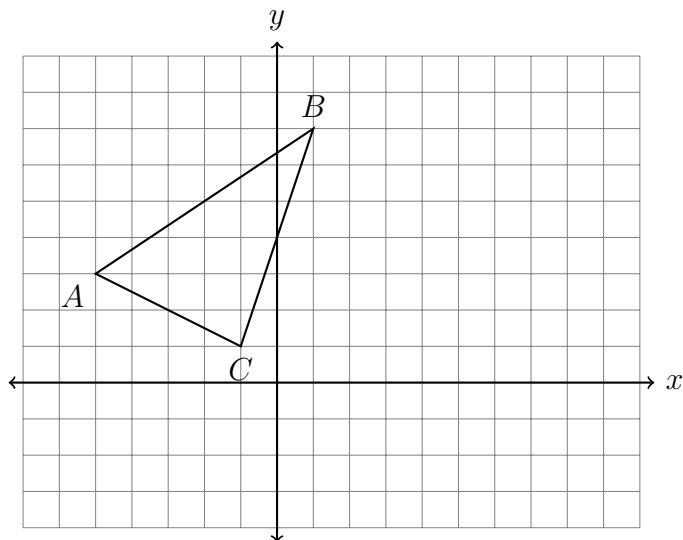

5. Find the image of $P(-2, 7)$ after the translation $(x, y) \rightarrow (x + 5, y - 2)$.
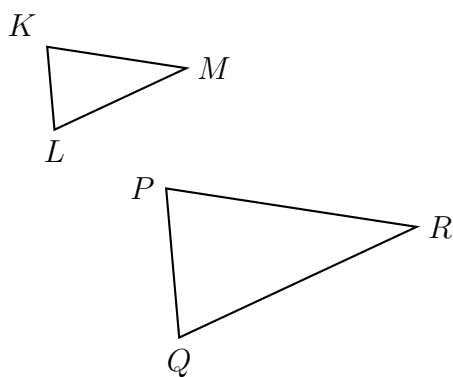
6. What transformation maps $\triangle ABC$ onto $\triangle DEF$, shown below? Fully specify the transformation.

7. Translate $\triangle ABC$ to the right six units and down two units. Make a table of the coordinates and plot and label the image on the axes.

8. A translation maps $P(-5, 3) \to P'(6, 1)$. What is the image of $Q(1, 9)$ under the same translation?

9. A dilation maps triangle KLM onto triangle PQR, with $KM = 5$, $LM = 4$, $PR = 10$.

Complete each mapping or equivalence.

(a) $L \to$ _____

(b) $\angle K \cong$ _____

(c) $QR =$ _____

10. Given $\triangle ABC \sim \triangle DEF$. $m\angle A = 33°$ and $m\angle B = 66°$. Find the measure of $\angle D$.

11. A dilation centered at A maps $\triangle ABC \rightarrow \triangle ADE$. Given the sides of the preimage, $AC = 6$, $BC = 4$, $AB = 8$, and of $DE = 10$ find the scale factor k and the lengths AD and AE. Then find CE and BD.
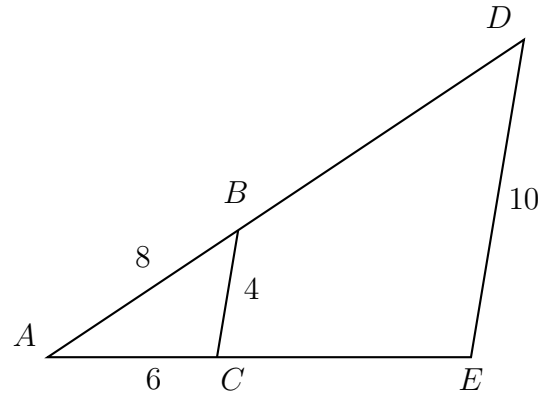
   (a) $k =$

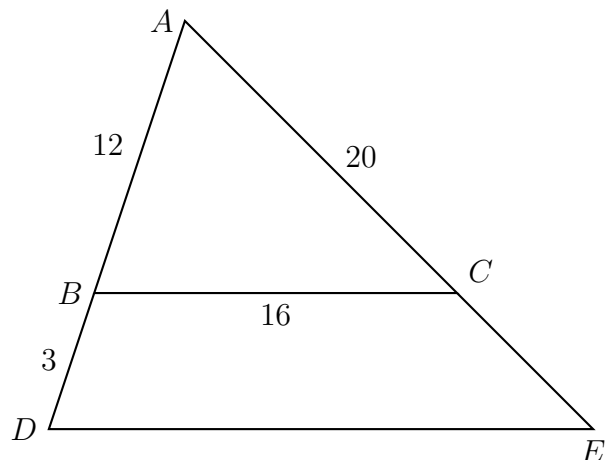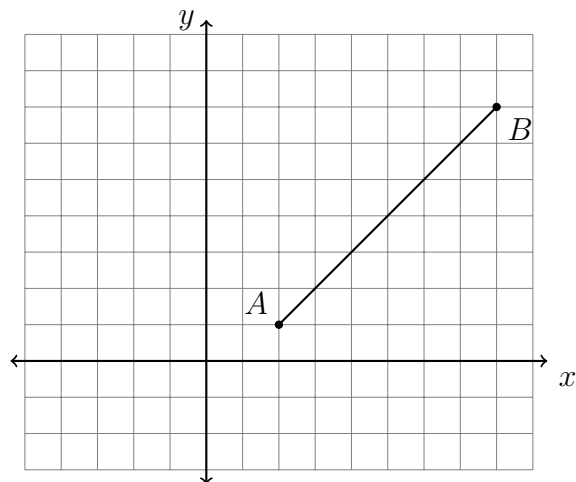   (b) $AD =$

   (c) $AE =$

   (d) $CE =$

   (e) $BD =$

12. Triangle ABC is dilated with a scale factor of k centered at A, yielding $\triangle ADE$, as shown. Given $AB = 12$, $BC = 16$, $AC = 20$, and $BD = 3$.

   Find the scale factor k and the segment lengths DE and CE.

   (the diagram is not to scale)

13. As shown, $\overline{AB}$ has endpoints with coordinates $A(2,1)$ and $B(8,7)$. Show the calculation for the coordinates of the midpoint M of $\overline{AB}$. Mark and label it on the graph.
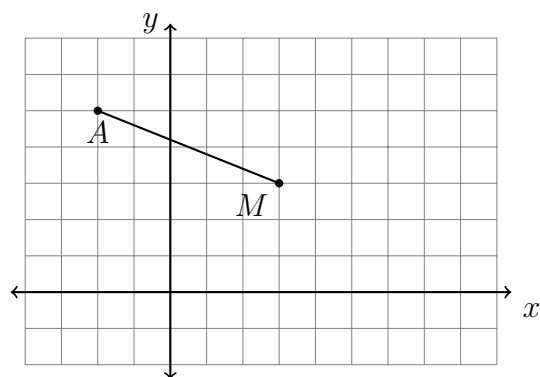
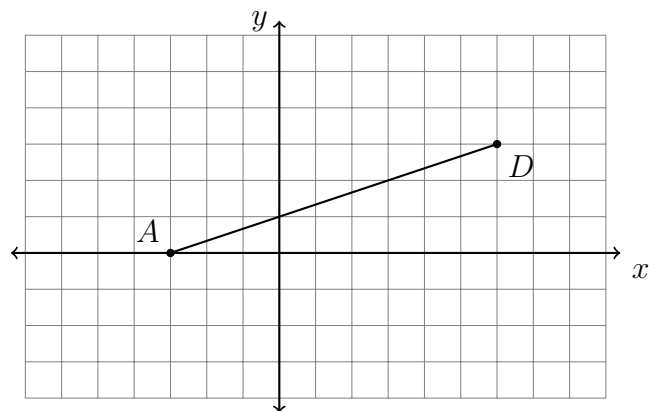14. $A(-2,5)$ is one endpoint of $\overline{AB}$. The segment's midpoint is $M(3,3)$, as shown below.

    (a) What translation maps

    $A(-2,5) \rightarrow M(3,3)$?

    (b) Find the other endpoint, B.

15. In the diagram below, $\overline{AD}$ has endpoints with coordinates $A(-3,0)$ and $D(6,3)$. What points B and C trisect $\overline{AD}$ into three congruent segments? Mark and label them on the graph. State their coordinates.

16. Given $\triangle ABC$, find the lengths of its sides. $A(1,2)$, $B(9,8)$, $C(9,2)$.
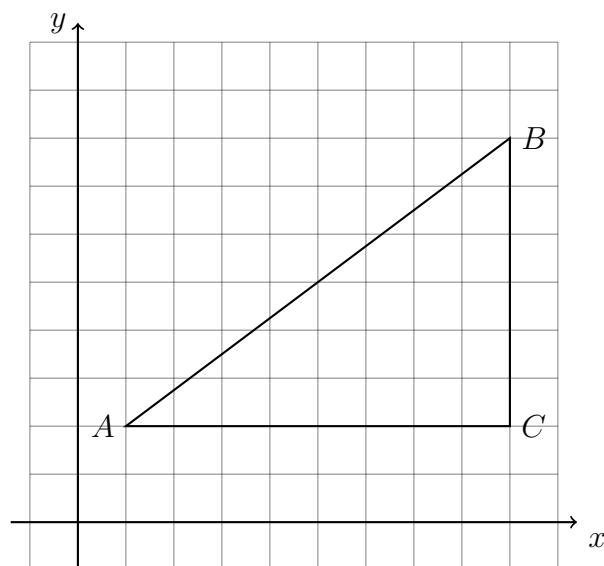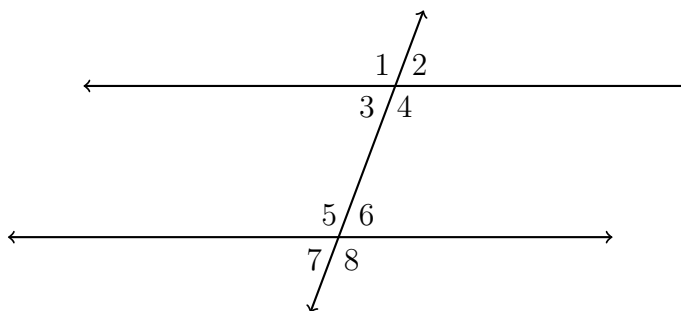
    (a) $AC =$

    (b) $BC =$

    (c) Use the formula for distance:
    $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
    $AB =$

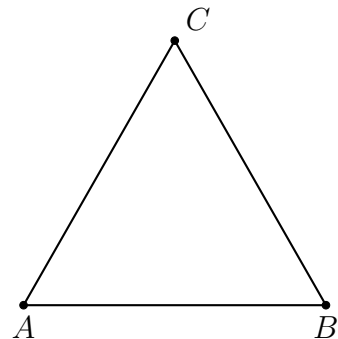17. Given two parallel lines and a transversal, as shown below. Given $m\angle 1 = 117$.

    (a) Find the measure $m\angle 2$.

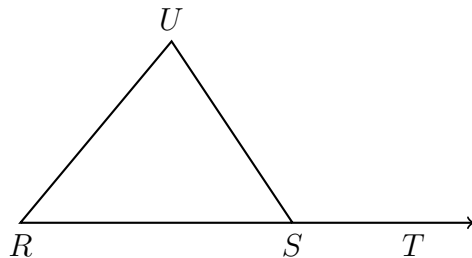   (b) Find the measure $m\angle 4$.

    (c) Find the measure $m\angle 5$.

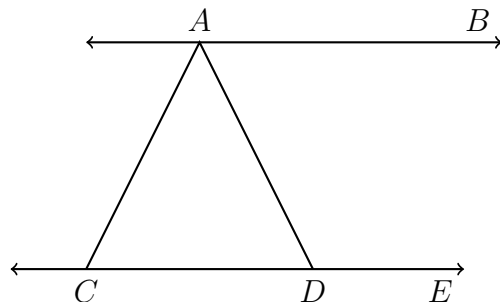   (d) Given $m\angle 8 = (5x - 8)^\circ$. Find x.

18. Given isosceles $\triangle ABC$ with $\overline{AB} \cong \overline{BC}$, $m\angle A = x$, $m\angle B = 63$, and $m\angle C = y$. Mark and label the diagram, and then find x and y. (*the diagram is not to scale*)
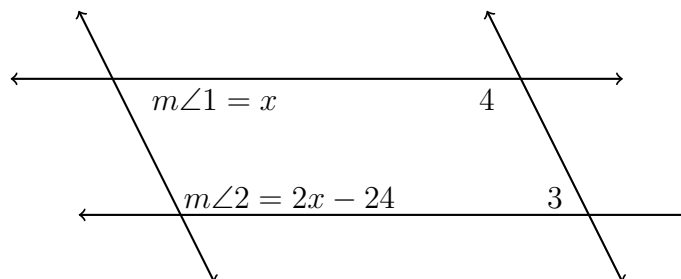

19. Given isosceles $\triangle RSU$ with $\overline{RS} \cong \overline{US}$. If $m\angle UST = 140$ find $m\angle R$. (mark and label the diagram) (*the diagram is not to scale*)
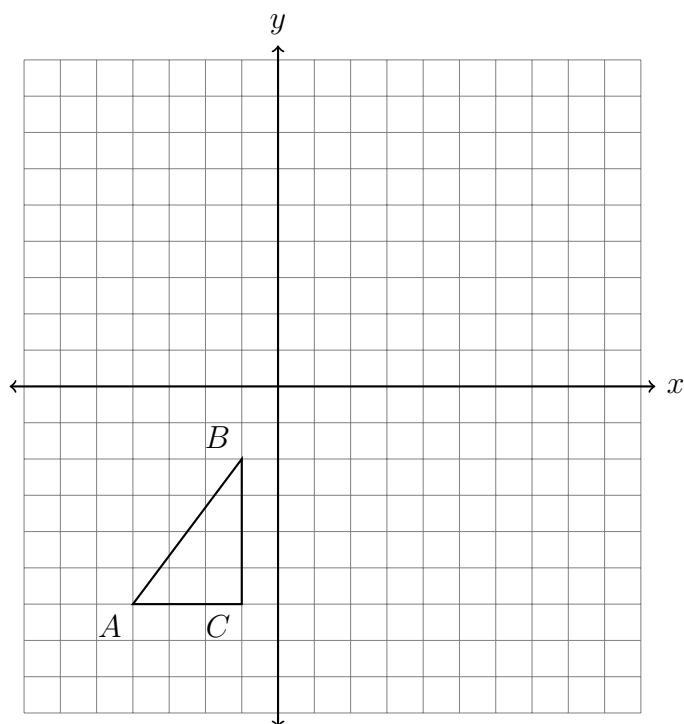

20. Given parallel lines $\overleftrightarrow{AB} \parallel \overleftrightarrow{CDE}$ with $\overline{AC} \cong \overline{CD}$. If $m\angle BAD = 55$ find $m\angle ACD$. (completely mark and label the diagram)

21. Two parallel lines intersect a second set of parallel lines. Given $m\angle 1 = x$ and $m\angle 2 = 2x - 24$, find the measure of $\angle 4$.
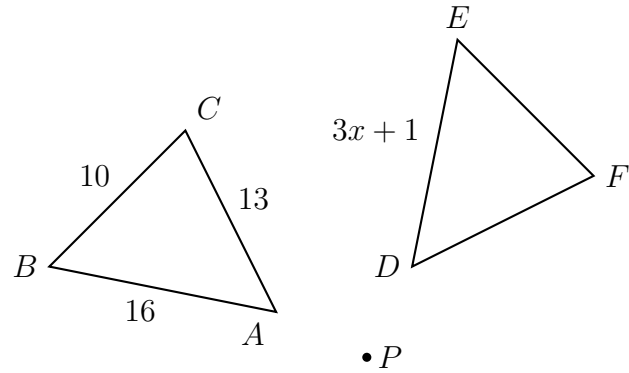
$m\angle 1 = x$ 4

$m\angle 2 = 2x - 24$ 3

22. Reflect $\triangle ABC$ over the x-axis, then translate it by $(x, y) \rightarrow (x + 9, y + 3)$. Make a table of the coordinates showing $\triangle ABC \rightarrow \triangle A'B'C' \rightarrow \triangle A''B''C''$ and plot and label the image on the axes.
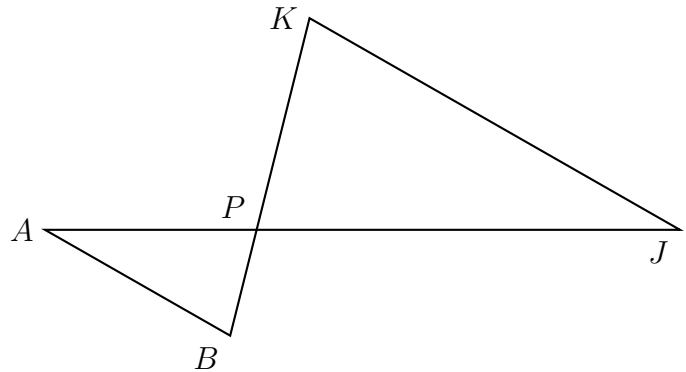
23. In the diagram below, $\triangle ABC$ with sides of 10, 13, and 16, is mapped onto $\triangle DEF$ after a clockwise rotation of $90°$ about point P.

If $DE = 3x + 1$, what is the value of x?

24. Given $\triangle ABP \sim \triangle JKP$ as shown below. $AB = 9.6$, $AP = 12.0$, $BP = 6.3$, and $JP = 27.0$. Find JK.

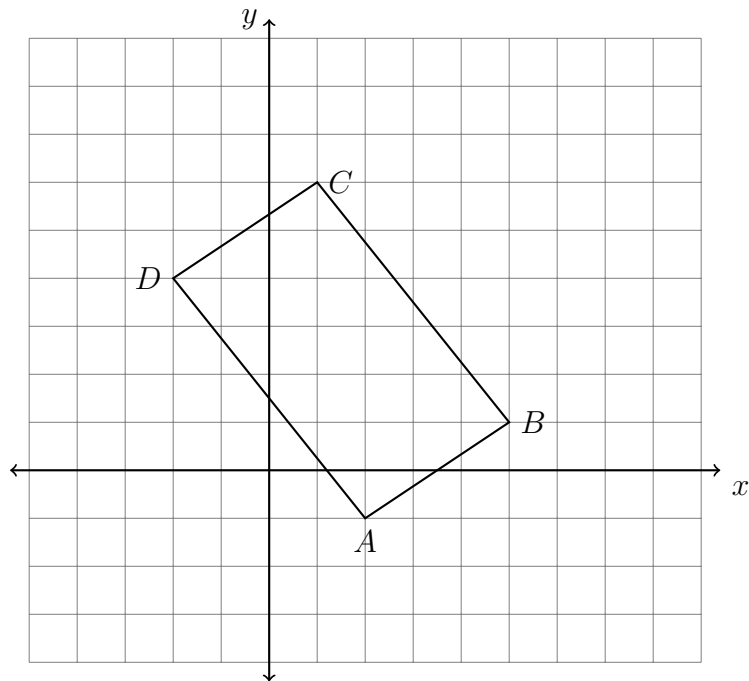**Spicy Regents problems: Using slope to prove a parallelogram**

25. In this problem use the following theorem (copy it at the bottom of the page after your calculations):

A quadrilateral is a parallelogram if and only if it's opposite sides are parallel.

Shown below is quadrilateral $ABCD$, $A(2,-1)$, $B(5,1)$, $C(1,6)$, and $D(-2,4)$.

Prove it is a parallelogram by

(a) finding the slope of each of the four sides,

(b) stating which sides are parallel,

(c) copying the theorem as your conclusion.

**Using the distance formula to prove a parallelogram**

26. In this problem use the following theorem (copy it at the bottom of the page after your calculations):

   *A quadrilateral is a parallelogram if and only if it's opposite sides are congruent.*

    Shown below is quadrilateral $ABCD$, $A(2, -1)$, $B(5, 1)$, $C(1, 6)$, and $D(-2, 4)$.

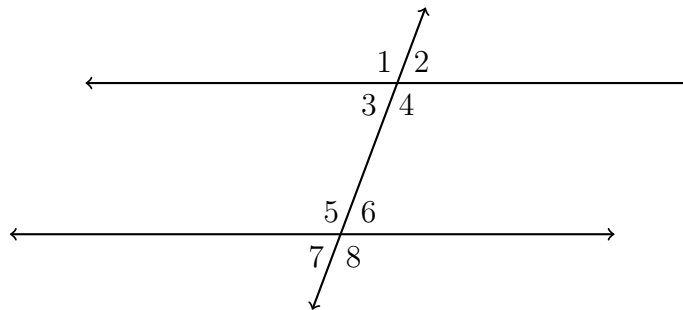   Prove it is a parallelogram by

    (a) finding the length of each of the four sides,
    (b) stating which sides are congruent,
    (c) copying the theorem as your conclusion.
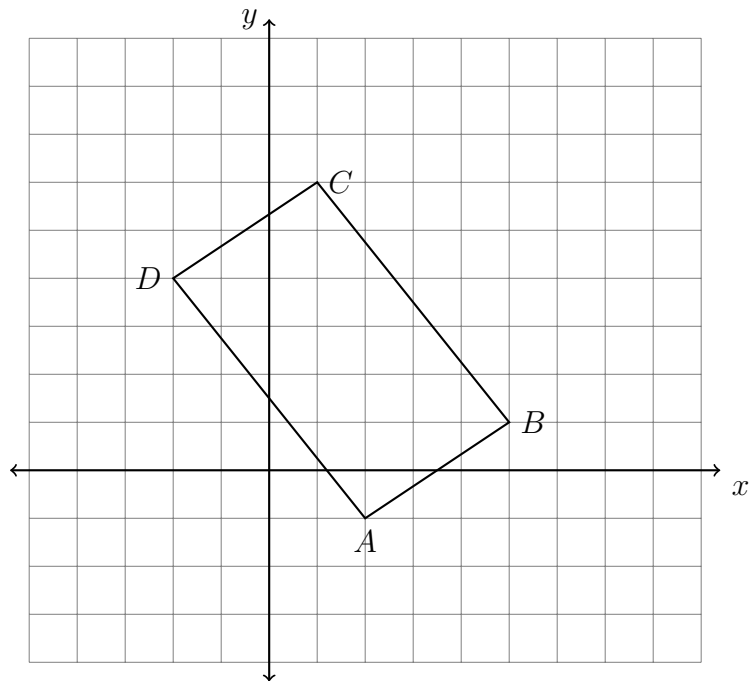
27. Given $\overleftrightarrow{AB}$ as shown on the number line, with $A = -3$ and $B = 5$. Mark and label the midpoint M between A and B?
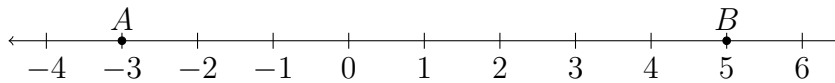
28. Given two parallel lines and a transversal, as shown below.

   (a) State the angle corresponding with $\angle 7$.

   (b) What theorem would justify $m\angle 4 + m\angle 6 = 180°$? _____

   (c) What theorem would justify $\angle 3 \cong \angle 6$? _____

   (d) What theorem would justify $\angle 5 \cong \angle 8$? _____