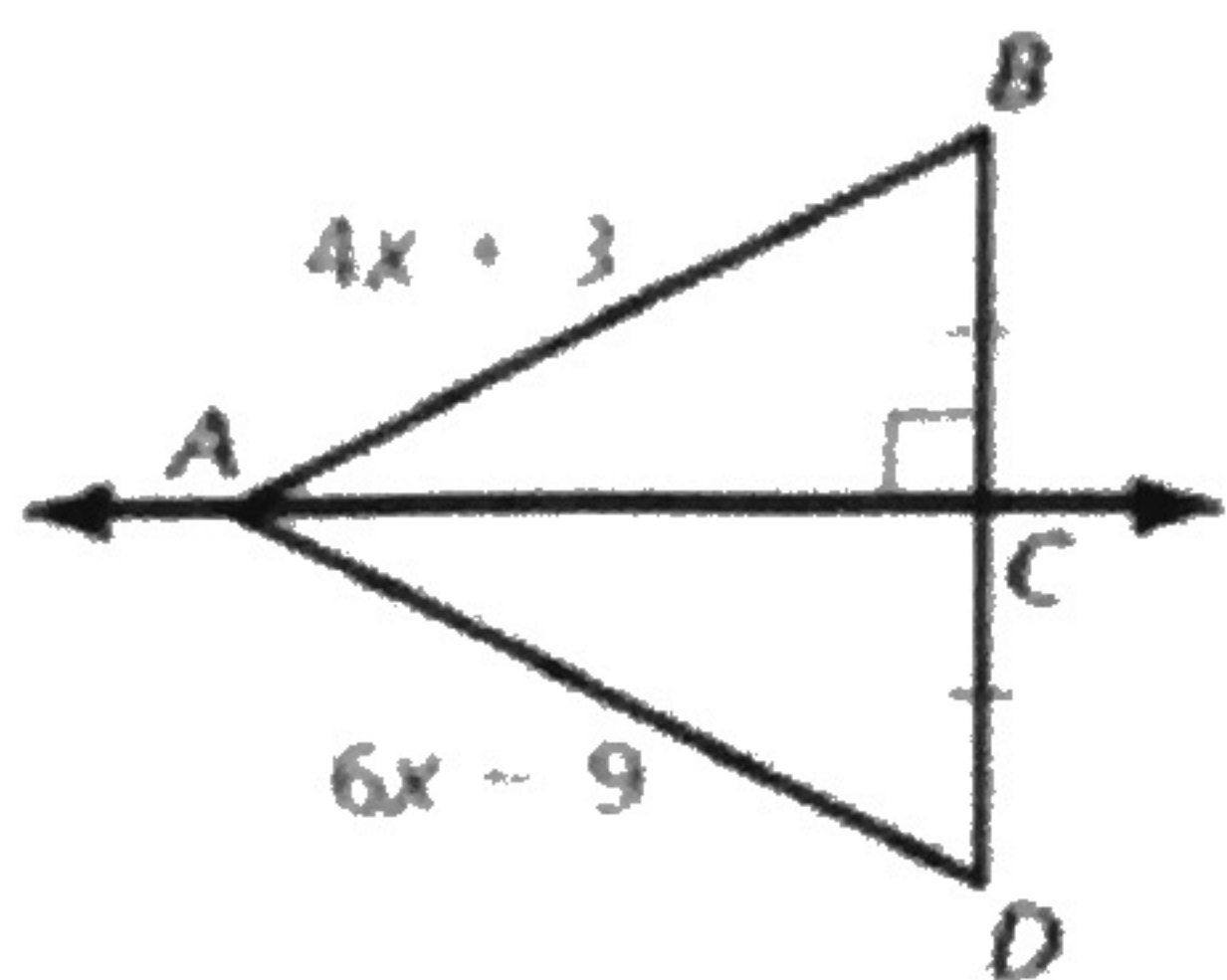


Unit 5 Relationships Within Triangles Study Guide

6.1 Perpendicular and Angle Bisectors

① Find AD.



$$4x + 3 = 6x - 9$$

$$12 = 2x$$

$$6 = x$$

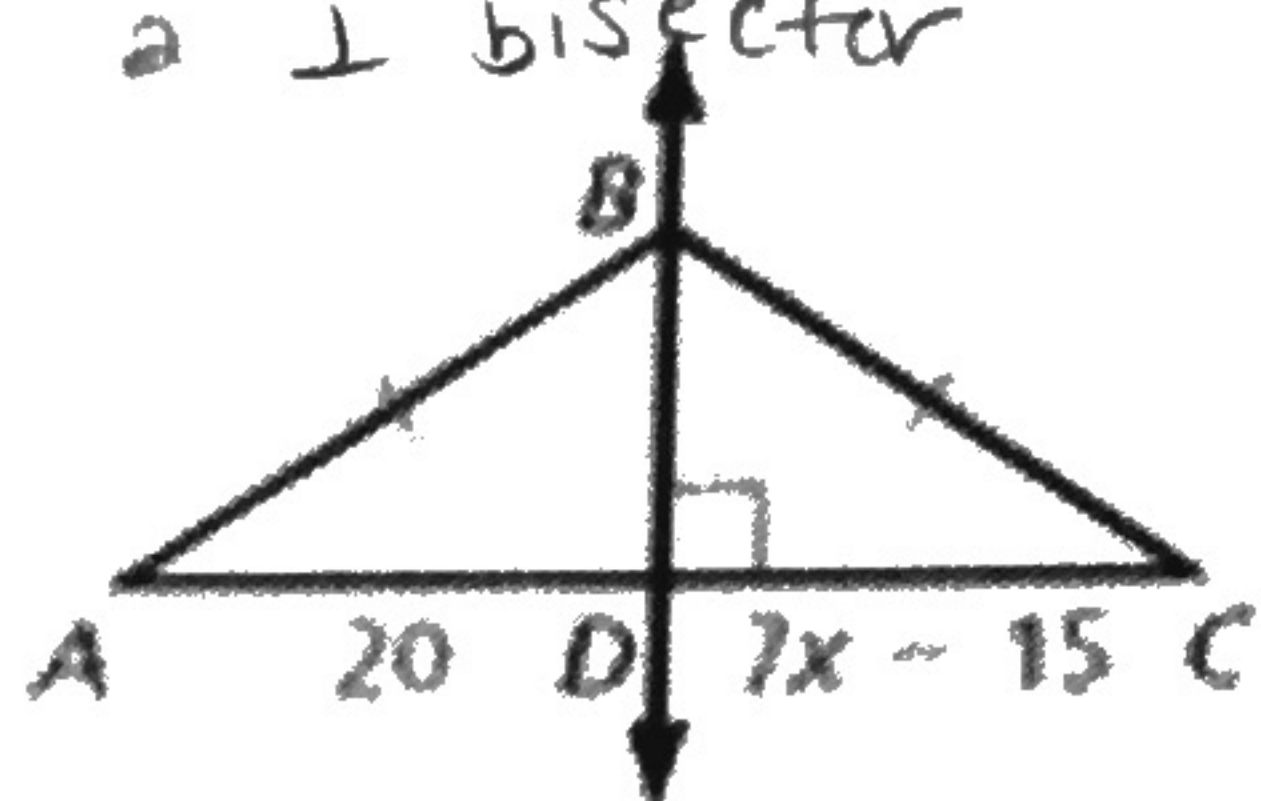
$$AD = 6(6) - 9$$

$$\boxed{AD = 27}$$

Find the indicated measure. Explain your reasoning.

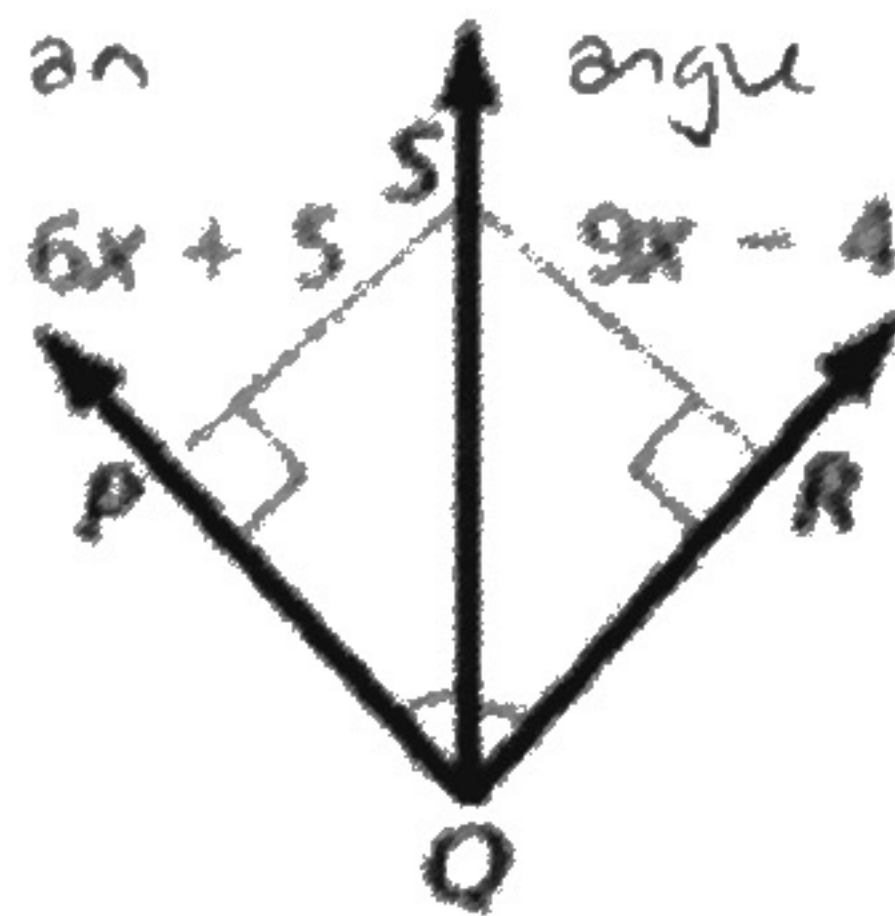
② DC

DC = 20 because \overleftrightarrow{BD} is a \perp bisector



③ RS

RS = 23 because \overleftrightarrow{QS} is an angle bisector.



$$RS = 9(3) - 4$$

$$RS = 23$$

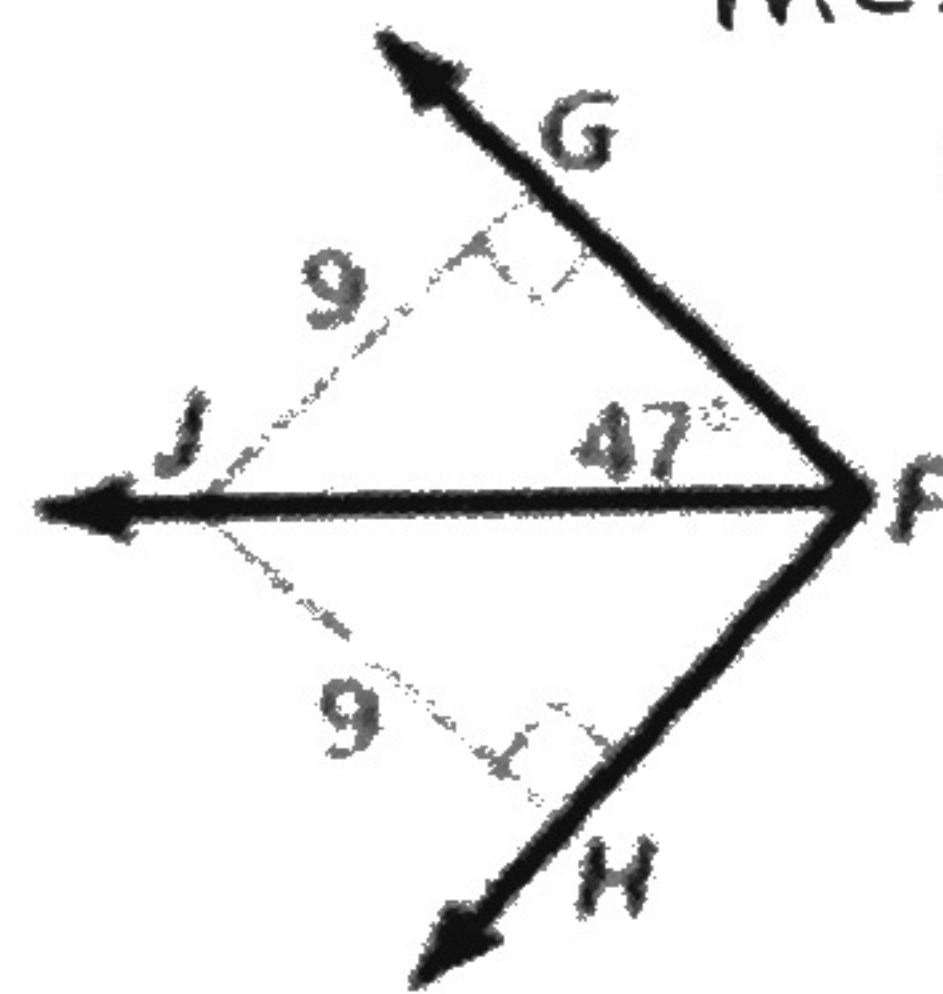
$$6x + 5 = 9x - 4$$

$$9 = 3x$$

$$3 = x$$

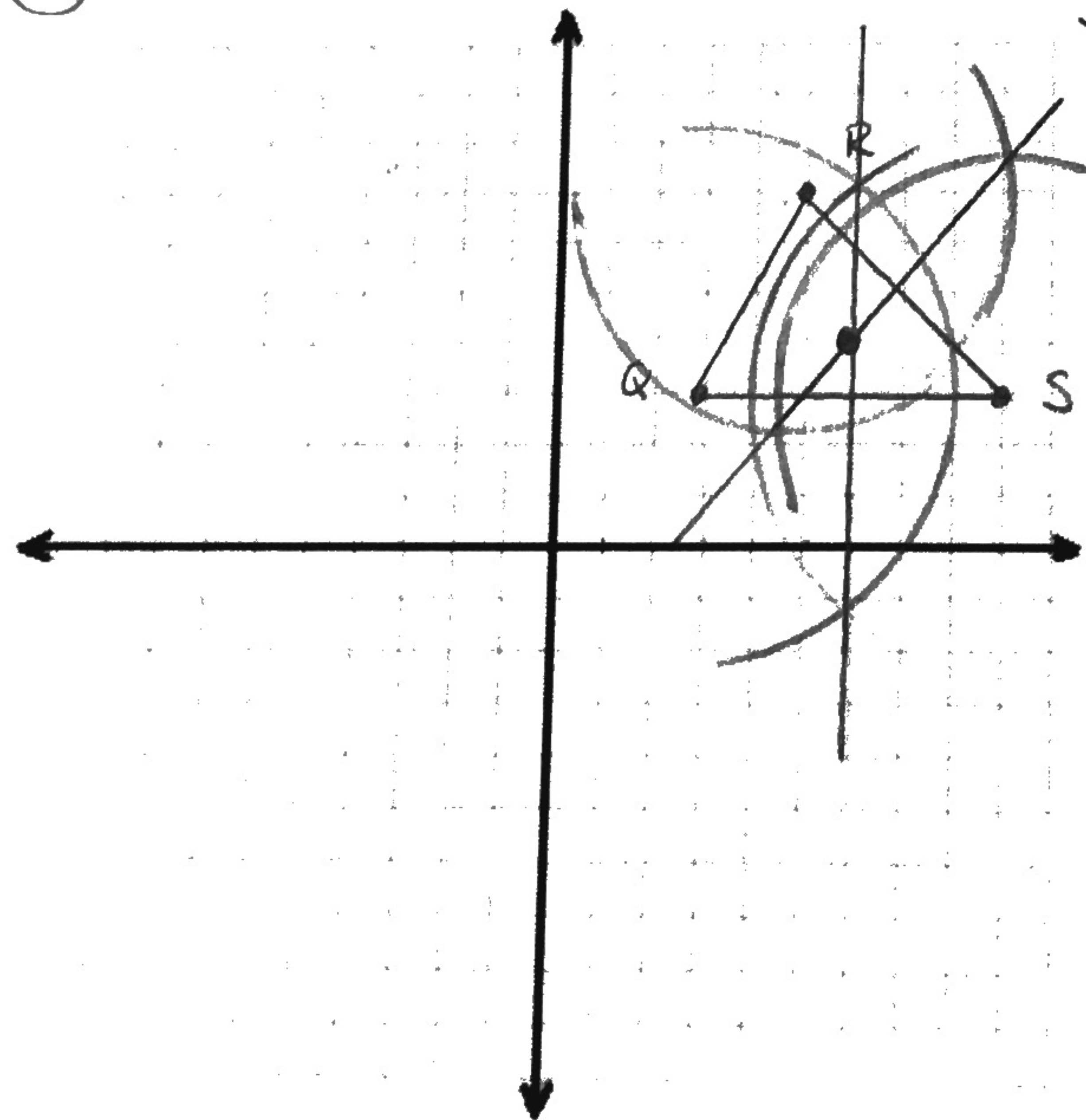
④ $m\angle JFH$

$m\angle JFH = 47^\circ$ because \overleftrightarrow{JF} is an angle bisector.



6.2 Bisectors of Triangles

⑤ Find the coordinates of the circumcenter of $\triangle QRS$ with vertices $Q(3,3)$, $R(5,7)$, and $S(9,3)$.



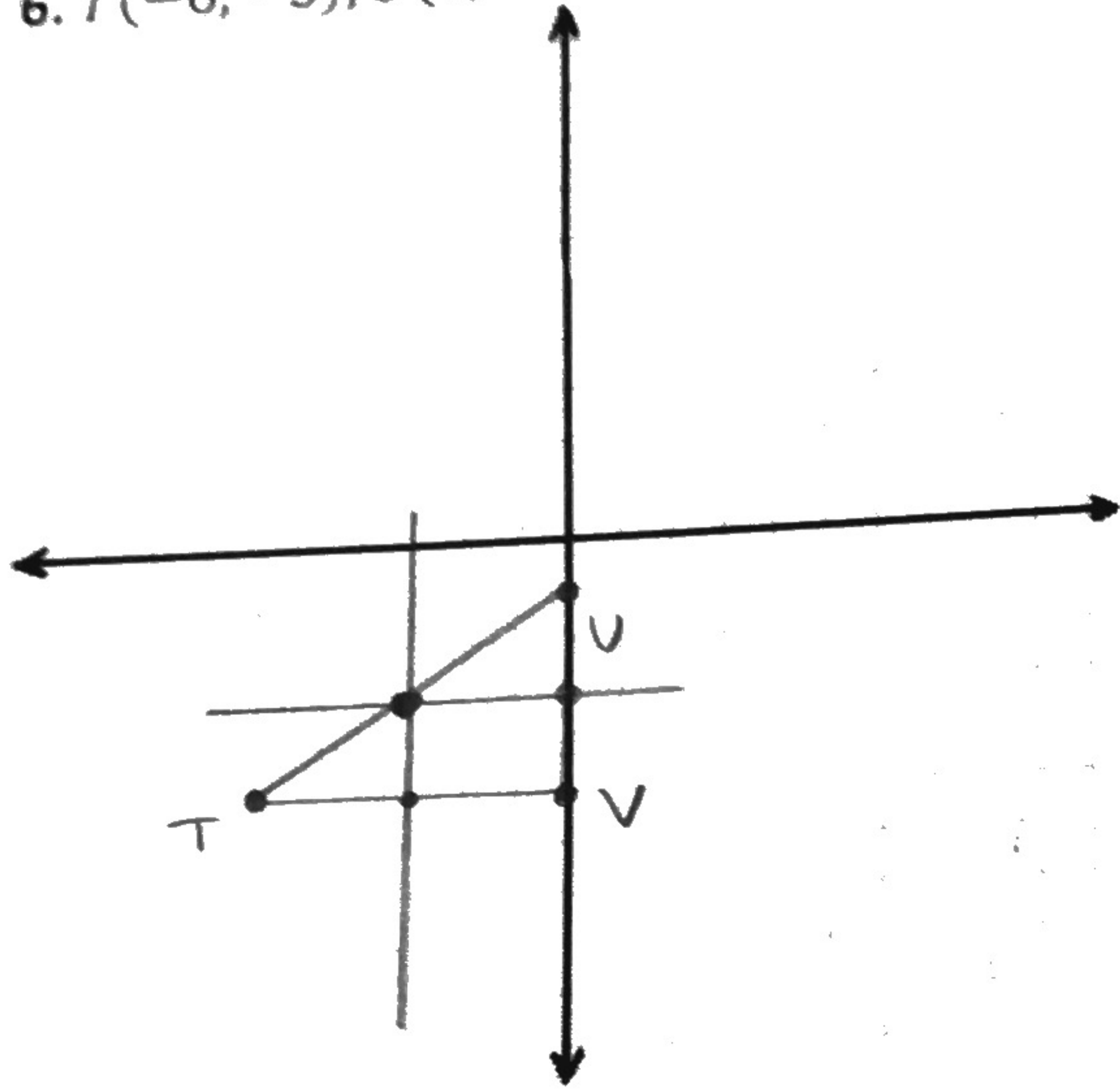
\perp bisectors

$$\boxed{(6,4)}$$

Find the coordinates of the circumcenter of the triangle with the given vertices.

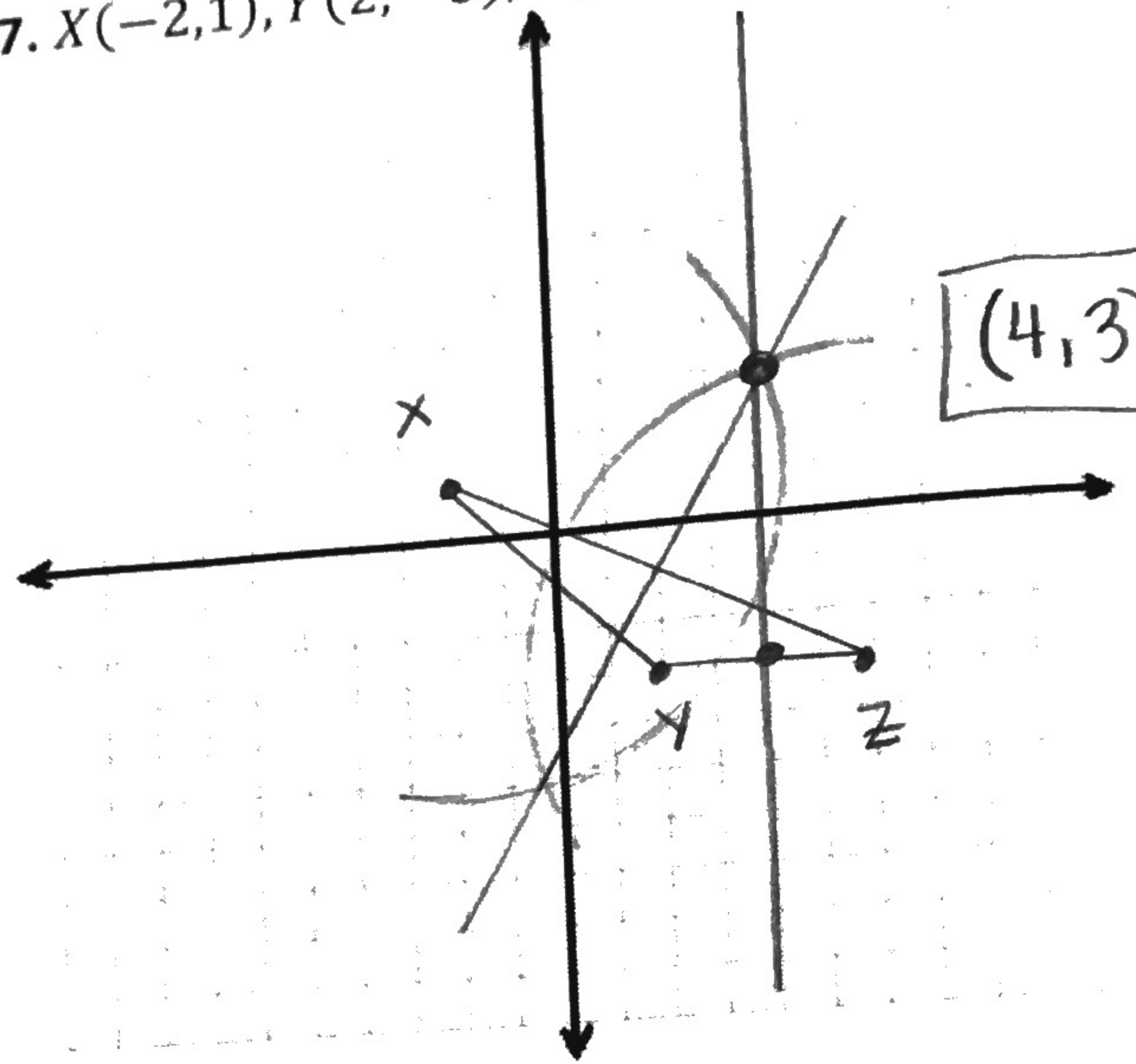
6. $T(-6, -5), U(0, -1), V(0, -5)$

$(-3, -3)$



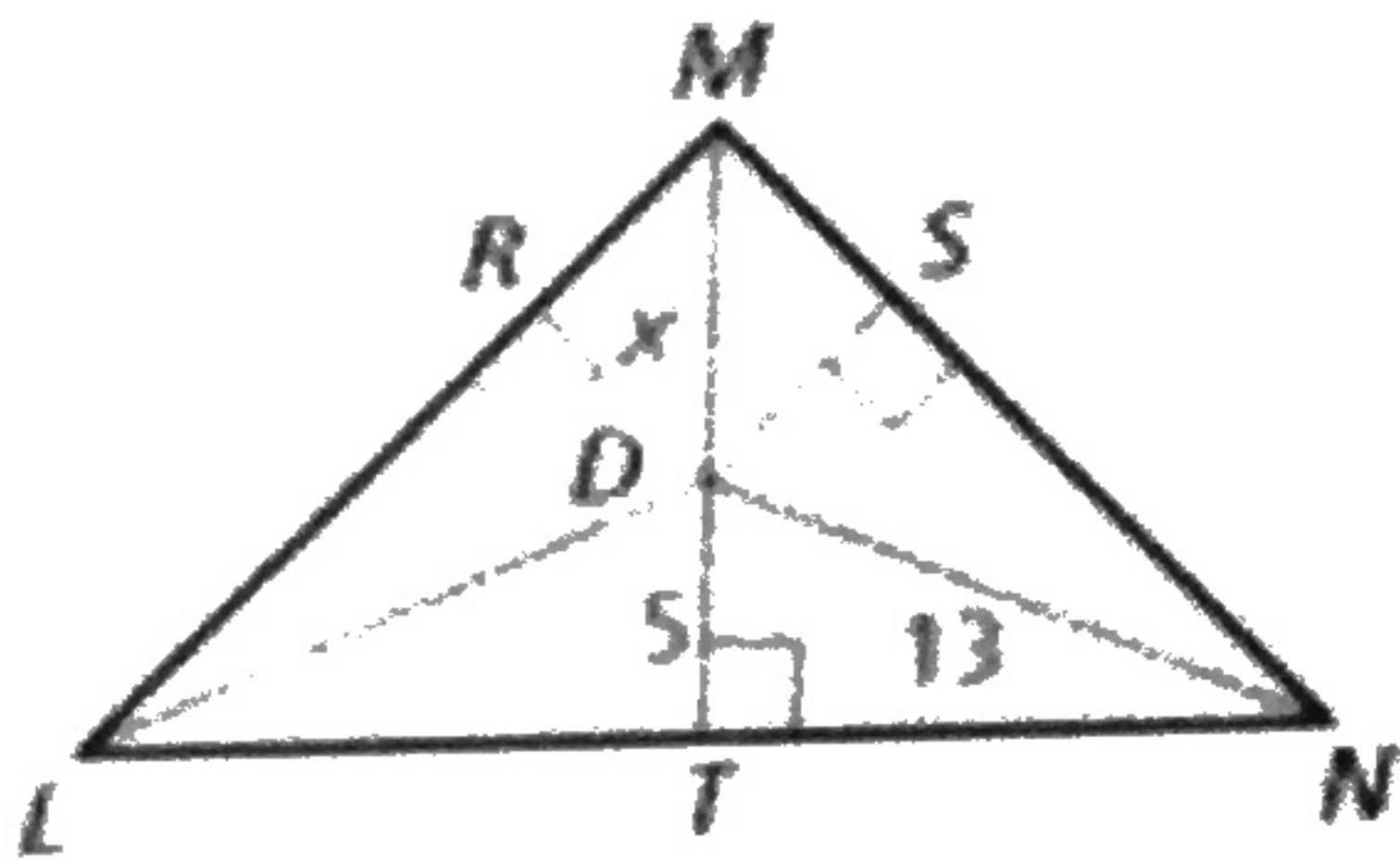
7. $X(-2, 1), Y(2, -3), Z(6, -3)$

$(4, 3)$



8. Point D is the incenter of $\triangle LMN$. Find the value of x .

$x = 5$

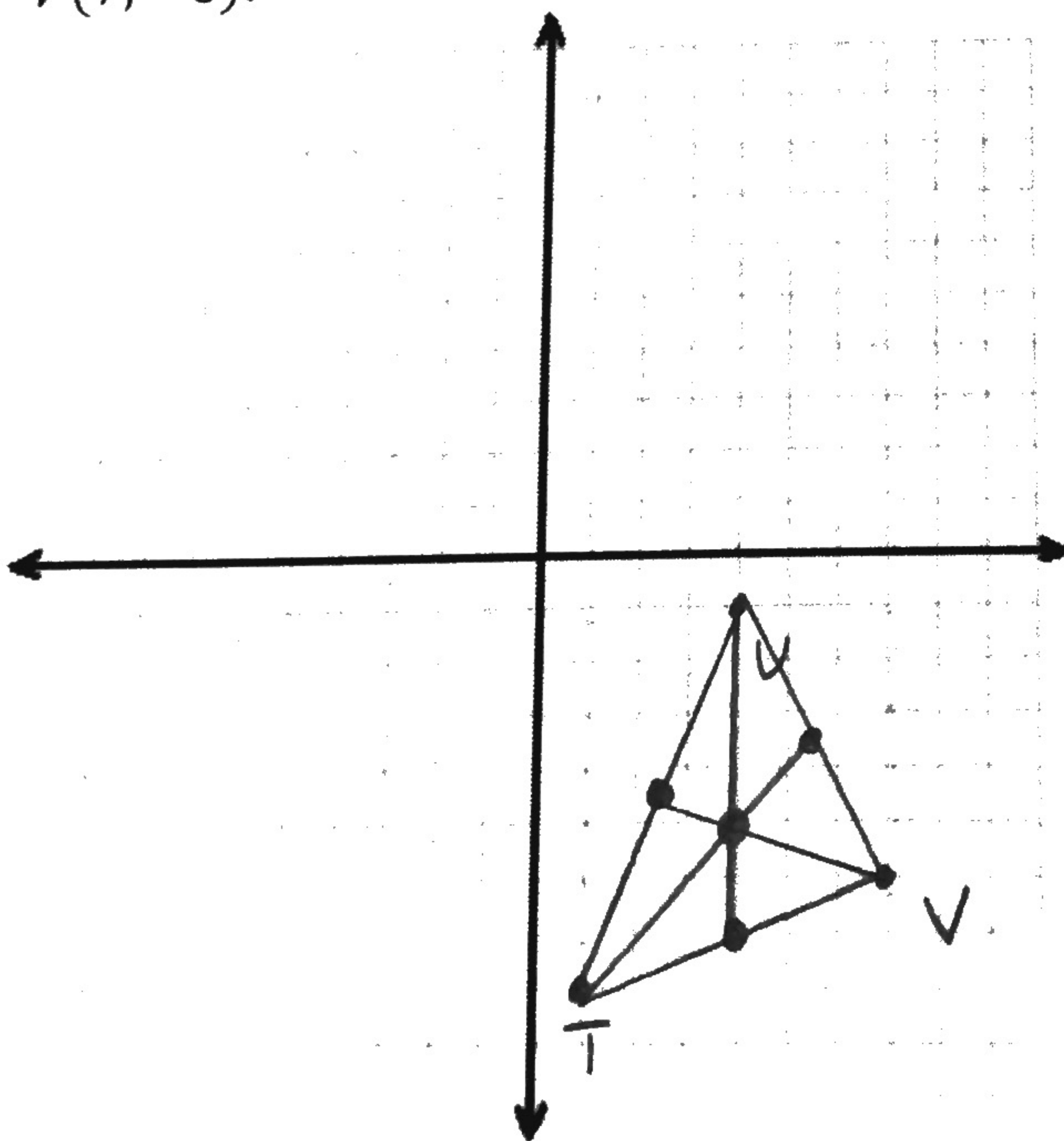


6.3 Medians and Altitudes of Triangles

9. Find the coordinates of the centroid of $\triangle TUV$ with vertices $T(1, -8), U(4, -1),$ and $V(7, -6)$.

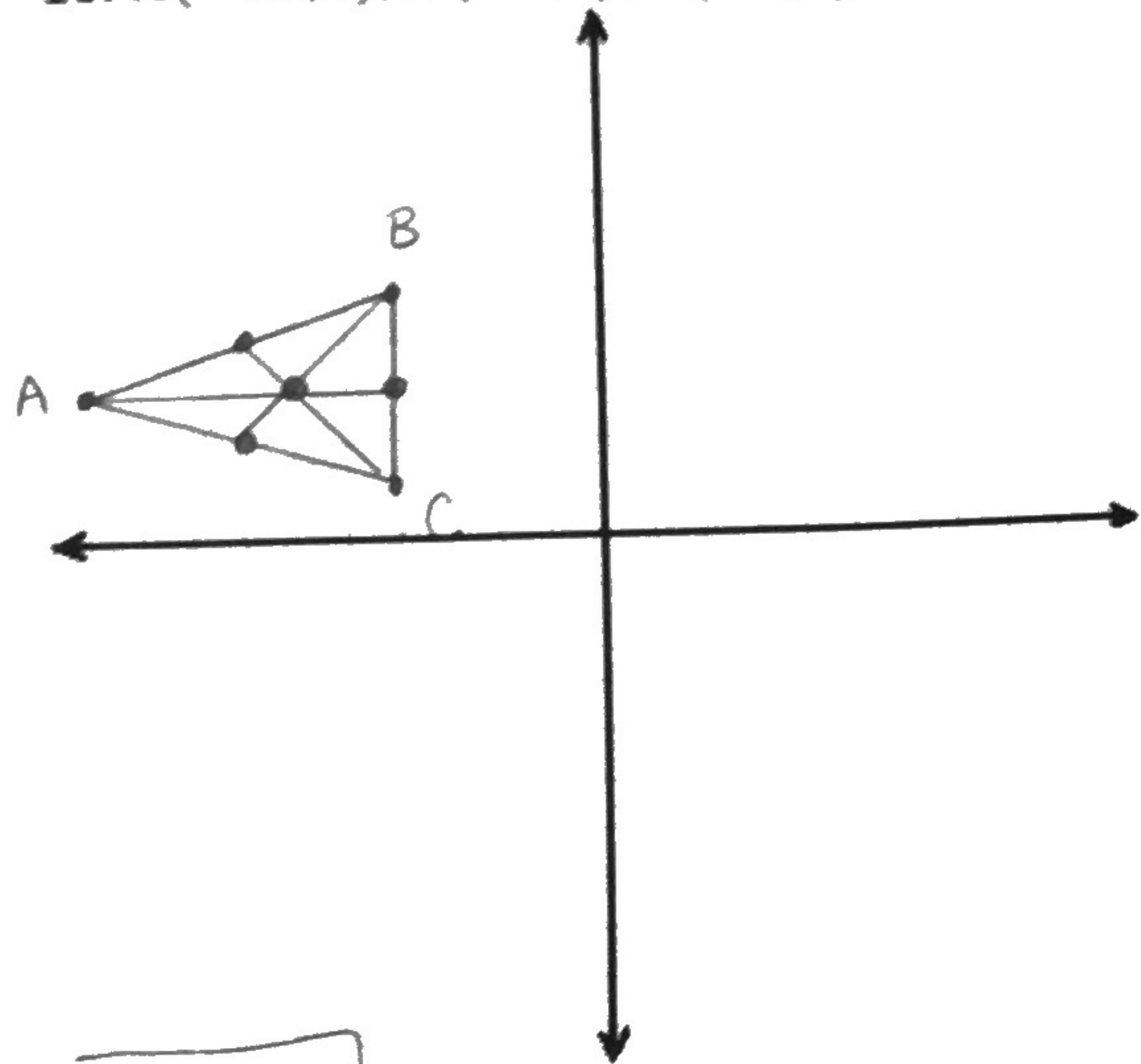
↳ medians

$(4, -5)$



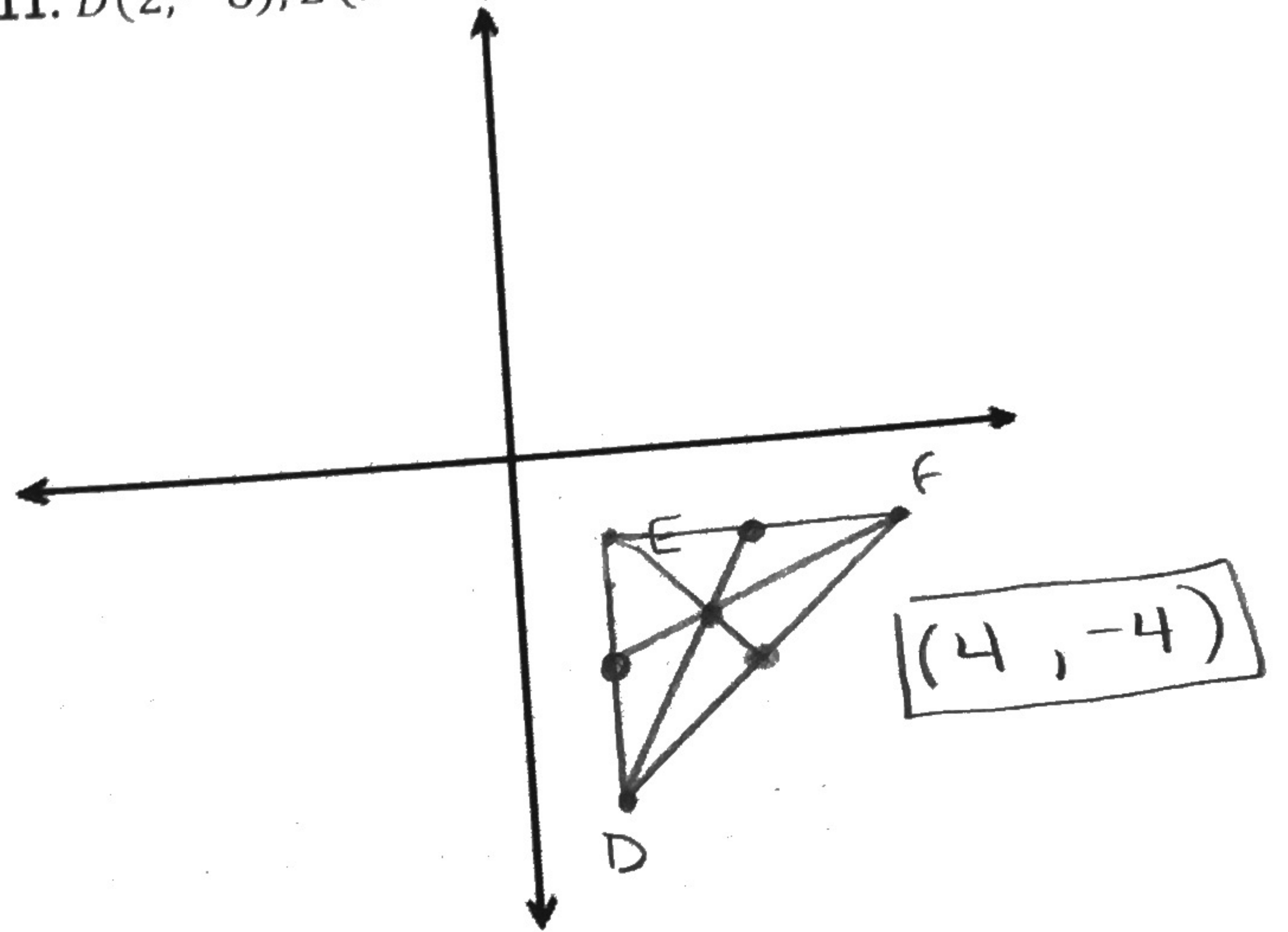
Find the coordinates of the centroid of the triangle with the given vertices.

10. $A(-10,3), B(-4,5), C(-4,1)$ 4 medians



$(-6, 3)$

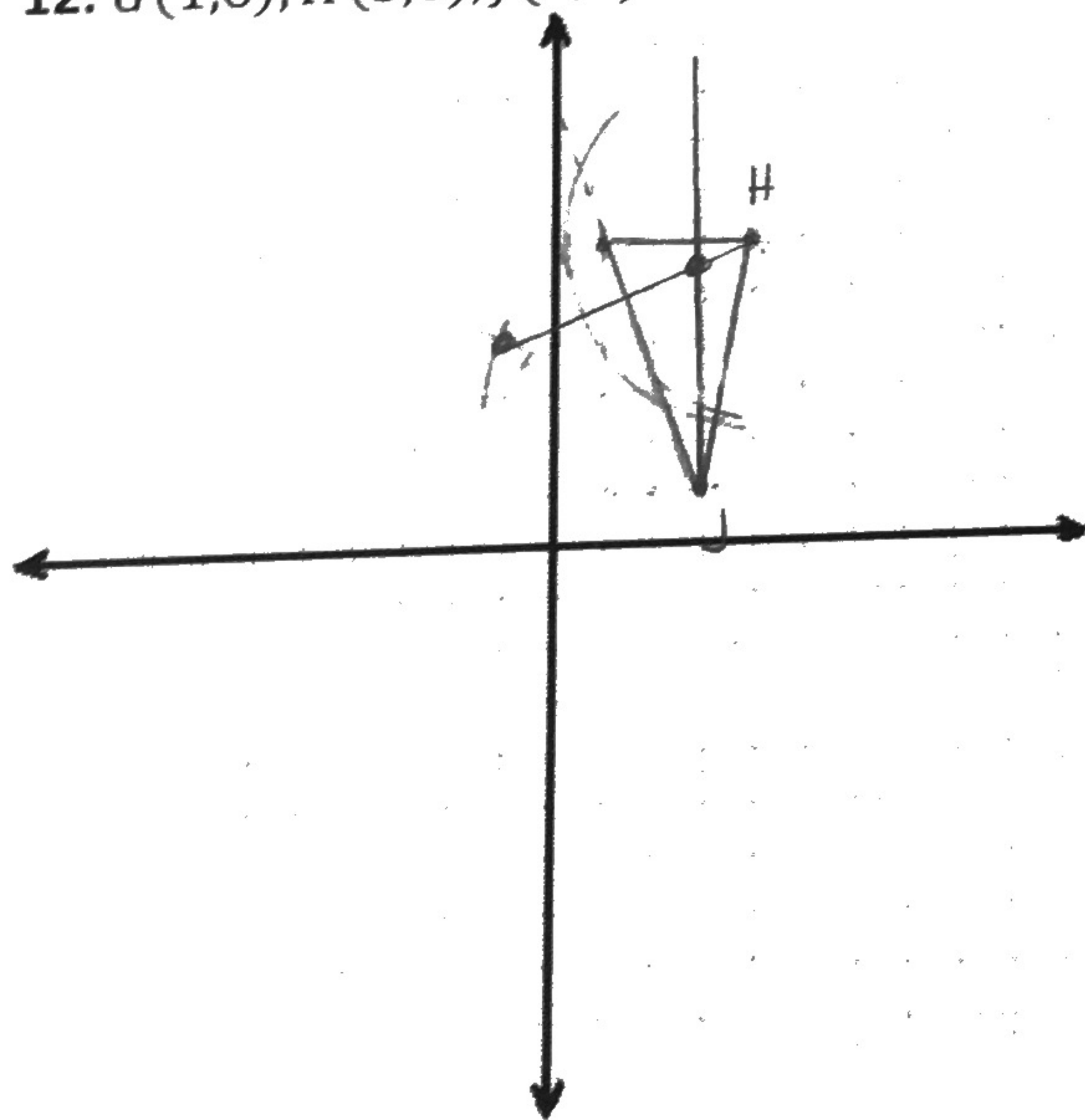
11. $D(2, -8), E(2, -2), F(8, -2)$



$(4, -4)$

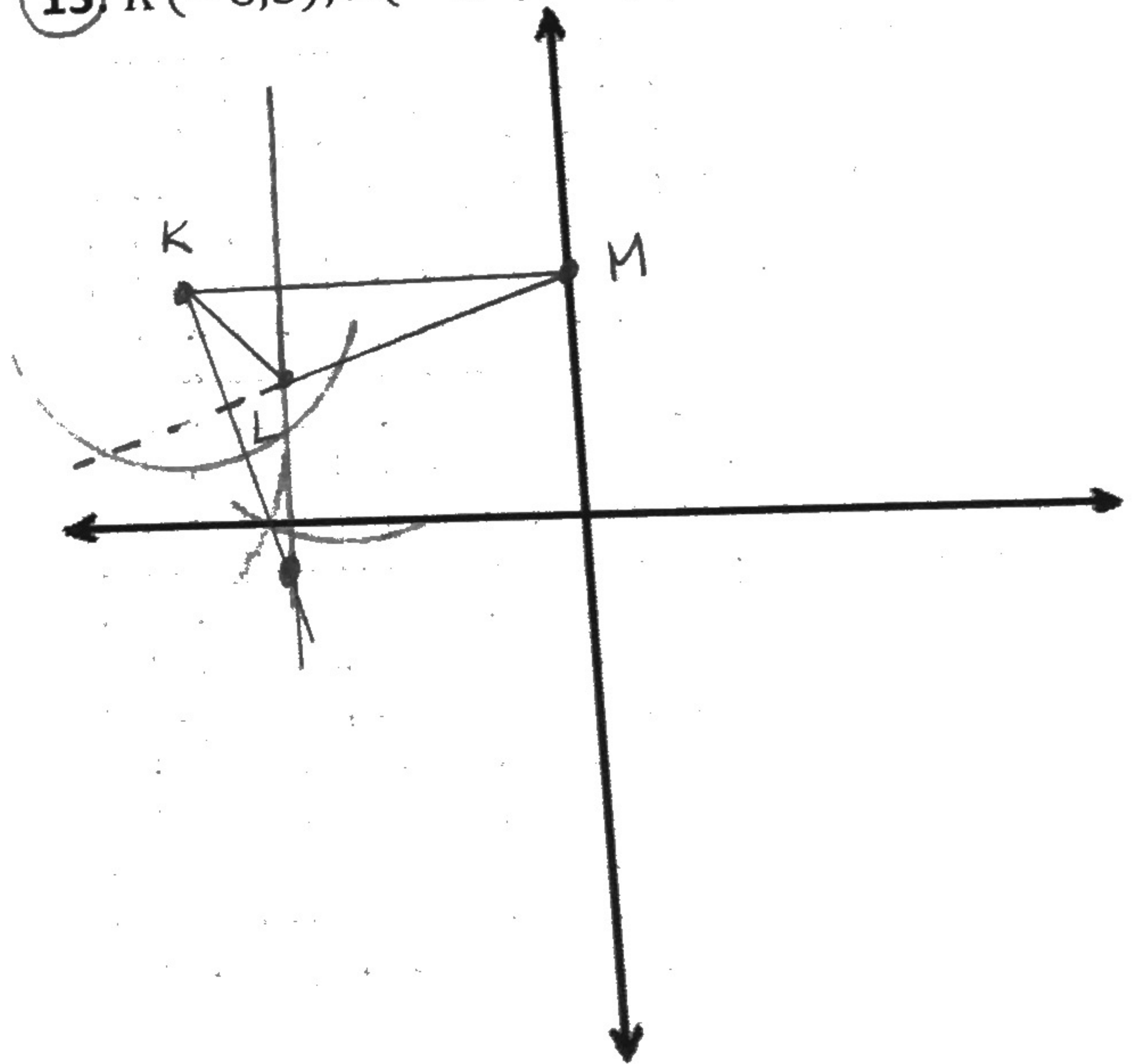
Tell whether the orthocenter of the triangle with the given vertices is *inside*, *on*, or *outside* the triangle. Then find the coordinates of the orthocenter.

12. $G(1,6), H(5,6), J(3,1)$



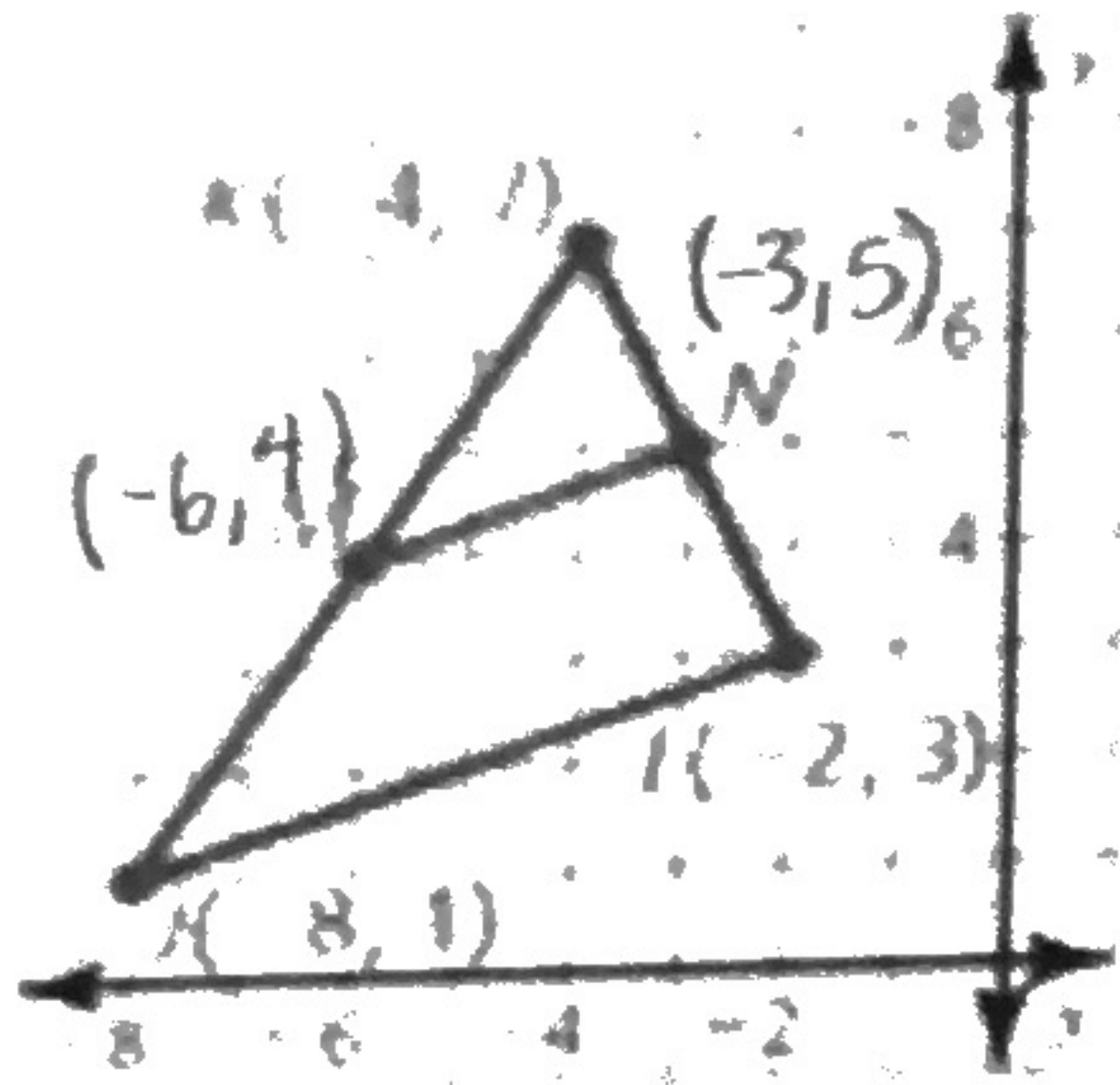
inside $(3, 5.5)$

13. $K(-8,5), L(-6,3), M(0,5)$



outside $(-6, -1)$

6.4 The Triangle Midsegment Theorem focus on Algebra problems like in the new
 14. In $\triangle JKL$, show that midsegment \overline{MN} is parallel to \overline{JL} and that $MN = \frac{1}{2}JL$.



Slope of $\overline{MN} = \frac{1}{3}$ slope of $\overline{JL} = \frac{1}{3}$ so parallel

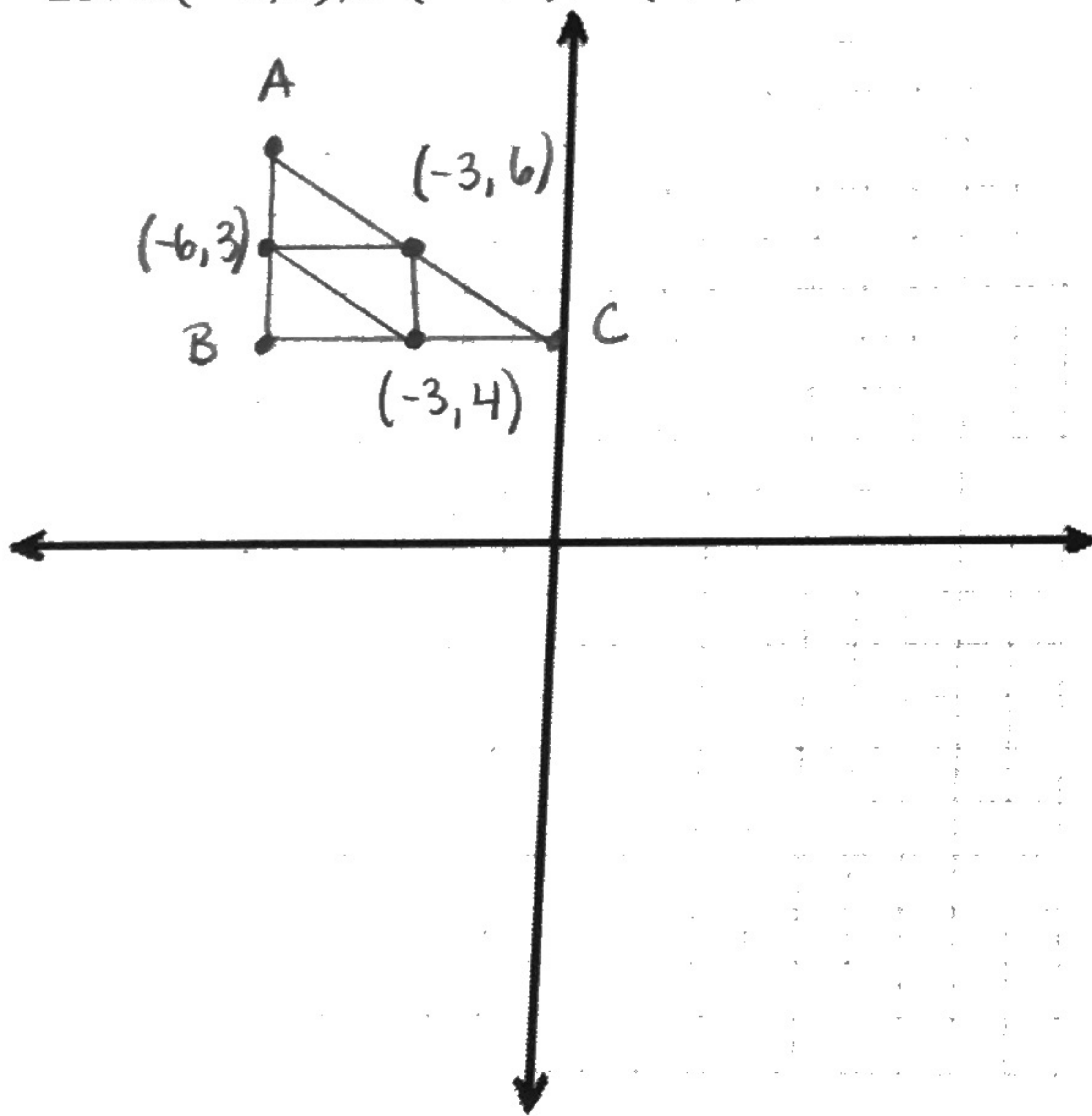
$$MN = \sqrt{(-6 - (-2))^2 + (4 - 3)^2} = \sqrt{(-4)^2 + (1)^2} = \sqrt{16 + 1} = \sqrt{17}$$

$$JL = \sqrt{(-6 - (-2))^2 + (4 - 3)^2} = \sqrt{(-4)^2 + (1)^2} = \sqrt{16 + 1} = \sqrt{17}$$

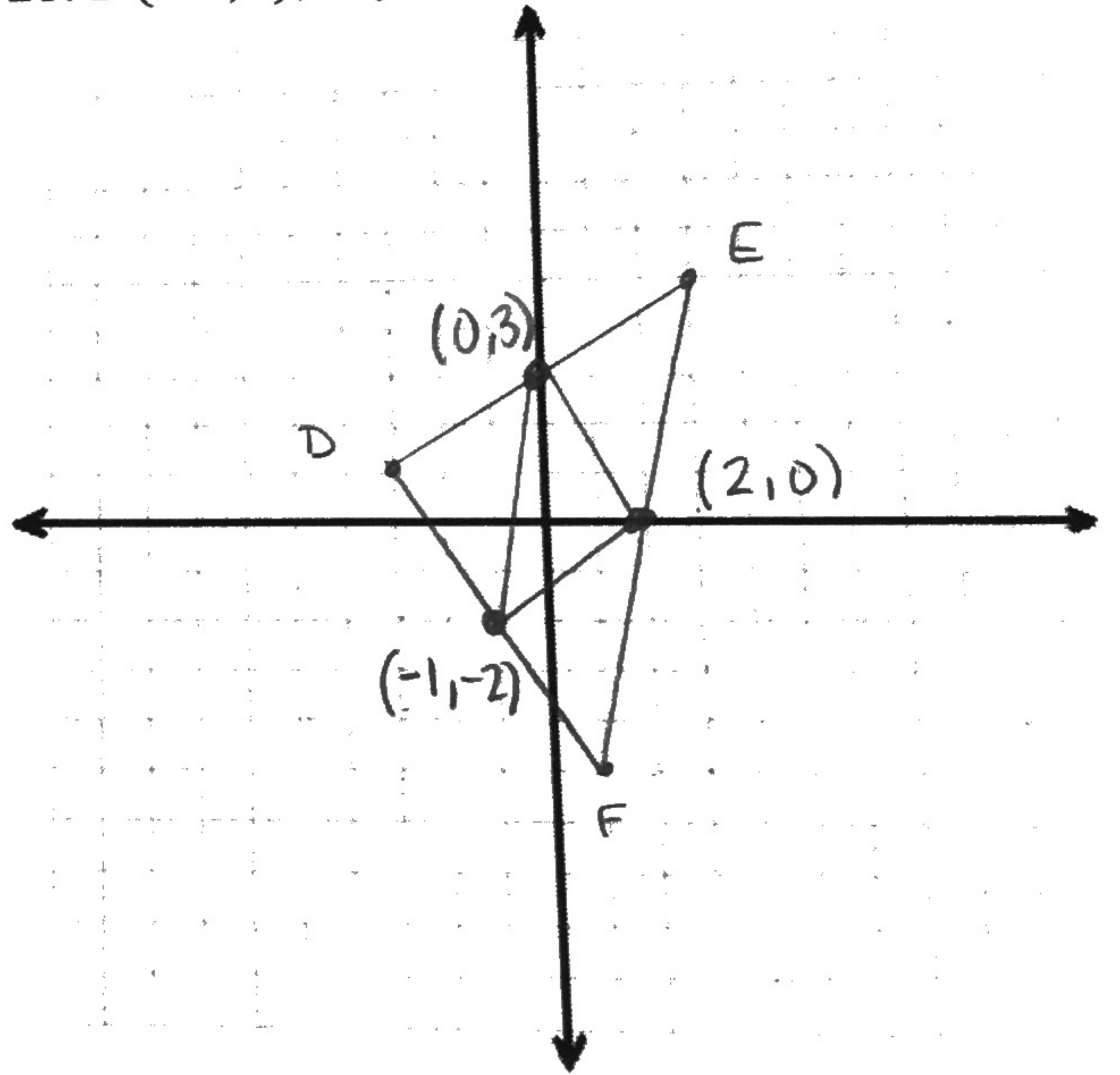
so $MN = \frac{1}{2}JL$

Find the coordinates of the vertices of the midsegment triangle for the triangle with the given vertices.

15. $A(-6, 8), B(-6, 4), C(0, 4)$

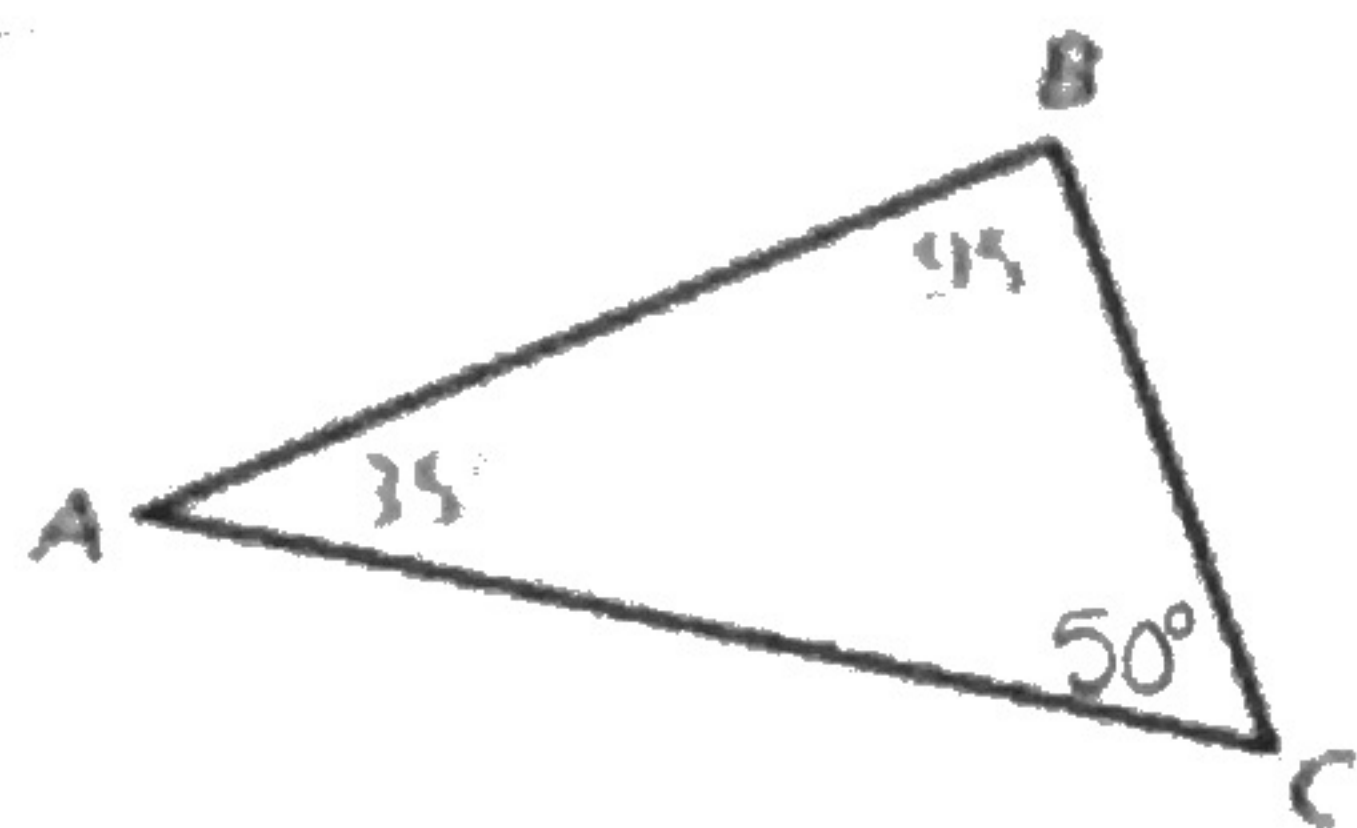


16. $D(-3, 1), E(3, 5), F(1, -5)$



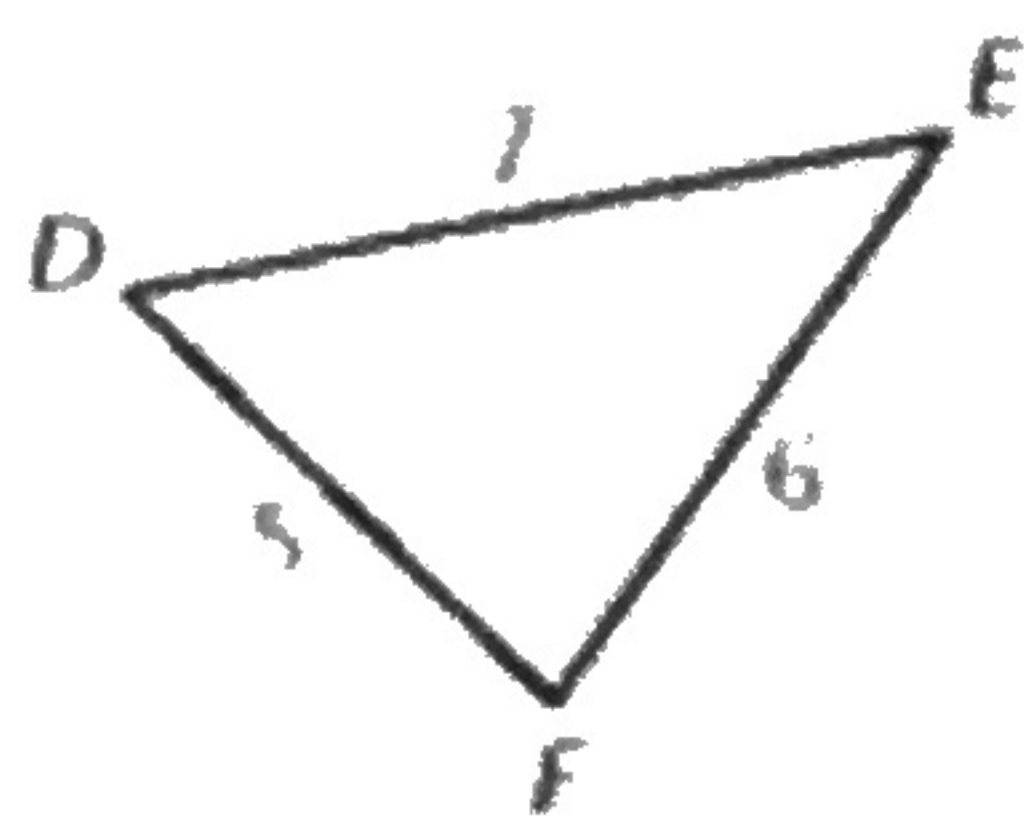
6.5 Inequalities in One Triangle

17. List the sides of $\triangle ABC$ in order from shortest to longest.



$\overline{BC}, \overline{AB}, \overline{AC}$

18. List the angles of $\triangle DEF$ in order from smallest to largest.



$\angle E, \angle D, \angle F$

Describe the possible lengths of the third side of the triangle given the lengths of the other two sides.

19. 4 inches, 8 inches

$$4 + 8 > x$$

$$12 > x$$

$$4 < x < 12$$

$$4 + x > 8$$

$$x > 4$$

~~$$8 + x > 4$$~~

~~$$x > -4$$~~

20. 6 meters, 9 meters

$$6 + 9 > x$$

$$15 > x$$

$$3 < x < 15$$

$$6 + x > 9$$

$$x > 3$$

~~$$9 + x > 6$$~~

~~$$x > -3$$~~

21. 11 feet, 18 feet

$$11 + 8 > x$$

$$19 > x$$

$$3 < x < 19$$

$$8 + x > 11$$

$$x > 3$$

~~$$11 + x > 8$$~~

~~$$x > -3$$~~