LESSON 5-3 Practice A
Medians and Altitudes of Triangles

Fill in the blanks to complete each definition.

1. A median of a triangle is a segment whose endpoints are a vertex of the triangle and the _________ of the opposite side.

2. An altitude of a triangle is a _______________ segment from a vertex to the line containing the opposite side.

3. The centroid of a triangle is the point where the three _______________ are concurrent.

4. The orthocenter of a triangle is the point where the three _______________ are concurrent.

Use the Centroid Theorem and the figure for Exercises 5–8.
\( QU, RS, \) and \( PT \) are medians of \( \triangle PQR \). \( RS = 21 \) and \( VT = 5 \).

Find each length.
5. \( RV \)
6. \( SV \)
7. \( TP \)
8. \( VP \)

The centroid is also called the center of gravity because it is the balance point of the triangle. By holding a tray at the center of gravity, a waiter can carry with one hand a large triangular tray loaded with several dishes.

9. If the vertices of the tray have coordinates \( A(0, 0), B(9, 0), \) and \( C(0, 6) \), find the coordinates of the balance point (centroid) of the tray. (\textit{Hint:} The \( x \)-coordinate of the centroid is the average of the \( x \)-coordinates of the three vertices, and the \( y \)-coordinate of the centroid is the average of the \( y \)-coordinates of the three vertices.)

\((_______, ______)\)

10. If the waiter’s hand is at the balance point and the distance from his hand to \( A \) is 16 inches, find the distance from his hand to \( BC \).

\(_______\)

Complete Exercises 11–15 to find the coordinates of the orthocenter of \( \triangle DEF \) with vertices \( D(0, 0), E(3, 6), \) and \( F(4, 0) \).

11. Plot \( D, E, \) and \( F \) and draw \( \triangle DEF \).

12. Find the equation of a line perpendicular to \( DF \) through \( E \).
   (\textit{Hint:} A vertical line always takes the form \( x = ____ \).)

\(_______\)

13. Find the slope of \( ED \).

14. Find the slope of a line perpendicular to \( ED \).

15. Find the equation of a line perpendicular to \( ED \) through \( F \).
**Practice A**

**Medians and Altitudes of Triangles**

Fill in the blanks to complete each definition.

1. A median of a triangle is a segment whose endpoints are a vertex of the triangle and the midpoint of the opposite side.

2. An altitude of a triangle is a line segment from a vertex to the line containing the opposite side.

3. The centroid of a triangle is the point where the three medians are concurrent.

4. The orthocenter of a triangle is the point where the three altitudes are concurrent.

Use the Centroid Theorem and the figure for Exercises 5–8.

**EXERCISES**

5. Complete Exercises 11–15 to find the coordinates of the orthocenter of a triangle.

6. \( PQ = 12 \) and \( CD = 10 \). Find each length.

7. Complete Exercises 11–15 to find the coordinates of the orthocenter of a triangle.

8. Use the figure for Exercises 8 and 9. The centroid of a triangle is located \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

9. The midpoint of \( AB \) is \((2, 0, 0)\). Name this point \( D \).

10. The midpoint of \( AB \) is \((2, 0, 0)\). Name this point \( D \).

11. Use the figure for Exercises 8 and 9. The centroid of a triangle is located \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

**Practice B**

**Medians and Altitudes of Triangles**

Use the figure for Exercises 1–4.

1. \( FG = 1 \frac{1}{2} \) and \( CD = 10 \). Find each length.

2. \( GF = \frac{3}{4} \) and \( CD = 10 \). Find each length.

3. \( FG = \frac{3}{3} \) and \( CD = 10 \). Find each length.

4. \( GF = \frac{3}{6} \) and \( CD = 10 \). Find each length.

5. An altitude of a triangle is a line segment from a vertex to the line containing the opposite side.

6. The centroid of a triangle is the point where the three medians are concurrent.

7. The orthocenter of a triangle is the point where the three altitudes are concurrent.

**EXERCISES**

5. Use the figure for Exercises 8 and 9. The centroid of a triangle is located \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

6. \( AB = 12 \) and \( CD = 10 \). Find each length.

7. Use the figure for Exercises 8 and 9. The centroid of a triangle is located \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

8. The point of intersection of the medians is called the centroid of \( \triangle ABC \).

9. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

10. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

11. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

12. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

13. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

14. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

15. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

16. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

17. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.

18. \( \triangle ABC \) is \( \frac{2}{3} \) of the distance from each vertex to the midpoint of the opposite side.