

8. $\overline{PX} \cong \overline{PY}$ 8. CPCTC
7. $\triangle PEX = \triangle PEY$ 7. A.A.S.
6. $\overline{PE} \cong \overline{PE}$ 6. Reflexive
5. $\angle PYE \cong \angle PXE$ 5. all right \angle s are \cong (T2-2)
4. $\angle PYE$ and $\angle PXE$ are right angles 4. Lines form right \angle s
 $\overline{PY} \perp \overline{EN}$ a point to a line
 3. $\overline{PX} \perp \overline{EN}$ 3. Definition of distance from
 2. Definition of an angle bisector
 1. Given \overline{ER} bisects $\angle TEN$ P lies on \overline{ER}
7. STATEMENTS REASONS
6. 9
5. $15 \frac{1}{3}$
4. 14 (T12-1)
3. C
2. A
1. B

GEOMETRY

The Complete Course

Lesson Twelve

Median, Altitudes, Perpendicular Bisectors, And Angle Bisector

KA8472

Worksheet

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I. VIDEOTAPE FOLLOW-UP QUESTIONS

- I. Introduction.
- II. Medians and geometric relationships.
 - A. Definition
 - B. Terms related to medians
 1. Vertex
 2. Midpoint
 3. Concurrence
 - C. Point of concurrence - Centroid
 1. Always in the interior of triangle
 - a) acute
 - b) right
 - c) obtuse
 2. The medians of any triangle are concurrent, intersecting in a point that is $\frac{2}{3}$ of the distance from each vertex to the midpoint of the opposite side. (T12-1)
 3. Centroid is the center of balance
 - D. Another theorem related to medians
 1. Corresponding medians of congruent triangles are congruent. (T12-2)
- III. Altitudes and geometric relationships.
 - A. Definitions
 - B. Terms related to altitudes
 1. Vertex
 2. Perpendicular
 - C. Point of concurrence - orthocenter
 1. In acute triangle - inside the triangle
 2. In right triangle - on the triangle
 3. In obtuse triangle - outside the triangle
 - D. Theorems related to altitudes: Corresponding altitudes of congruent triangles are congruent. (T12-4)
 1. The lines that contain the altitudes of a triangle intersect in one point. (T12-3)
 2. Corresponding altitudes of congruent triangles are congruent. (T12-4)
- IV. Perpendicular bisectors and geometric relationships.
 - A. Definition
 1. Line
 2. Segment
 3. Ray
 4. Plane
 - B. Terms related to perpendicular bisector
 1. Perpendicular
 2. Bisect

3. Midpoint
4. Equidistant
5. Concurrence
- C. Point of concurrence - Circumcenter
 1. In acute triangle
 2. In right triangle
 3. In obtuse triangle
- D. Theorems related to perpendicular bisectors
 1. The perpendicular bisectors of the sides of a triangle intersect in a point that is equidistant from the equidistant vertices of the triangle. (T12-5)
 2. If a point lies on the perpendicular bisector of a segment then the point is equidistant from the endpoints of the segment. (T12-6)
 3. If a point is equidistant from the endpoints of a segment, then it lies on the perpendicular bisector of the segment. (T12-7)
 4. If two points are each equidistant from the endpoints of a segment, then the line joining the points is the perpendicular bisector of the segment. (T12-8)

- V. Angle bisectors and geometric relationships.
 - A. Definition
 1. Ray
 2. Line
 3. Segment
 4. Plane
 - B. Terms related to angle bisector
 1. Bisect
 2. Equidistant
 3. Concurrence
 - C. Point of concurrence-incenter
 - D. Theorems related to angle bisectors
 1. The bisectors of the angles of a triangle intersect in a point that is equidistant from the three sides of the triangle. (T12-9)
 2. If a point lies in the bisector of an angle, then the point is equidistant from the sides of the angle. (T12-10)
 3. If a point is equidistant from the sides of an angle, then the point lies on the bisector of the angle. (T12-11)
- VI. Other special geometric relationships of medians, altitudes, perpendicular bisectors, angle bisectors.
 - A. In an isosceles triangle
 1. The altitude from the vertex angle to the base of an isosceles triangle is a median. (The altitude bisects the base.) (T12-12)

2. The bisector of the vertex angle of an isosceles triangle is the perpendicular bisector of the base. (T 12-13)
 3. The bisector of the vertex angle of an isosceles triangle is also a median and an altitude of the triangle. (T12-14)
- B. In an equilateral triangle.

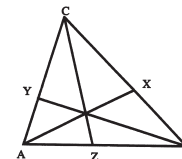
II. SUPPLEMENTARY EXERCISES

1-3 Complete the following sentences with the following choices:

- A. In the interior of the triangle
- B. On the triangle
- C. In the exterior of the triangle

1. The perpendicular bisectors of a right triangle are always concurrent _____
2. The medians of any triangle are always concurrent _____
3. The altitudes of an obtuse triangle are always concurrent _____

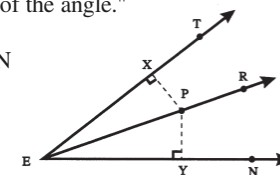
4-6 Given $\triangle ABC$ and medians \overline{AX} , \overline{BY} , and \overline{CZ} . If $AX = 21$, $BY = 27$, and $CZ = 23$, find the measures of the following segments:



4. $AM =$ _____
5. $CM =$ _____
6. $YM =$ _____

7. Complete the proof of Theorem 12-10. "If a point lies on the bisector of an angle, then the point is equidistant from the sides of the angle."

Given: \overline{ER} bisects $\angle TEN$
 P lies on \overline{ER} .
 Prove: $PX = PY$



STATEMENTS

REASONS

- | | |
|---|----|
| 1. \overline{ER} bisects $\angle TEN$ | 1. |
| 2. P lies on \overline{ER} | 2. |
| 3. $\angle XEP \cong \angle YEP$ | 3. |
| 4. $\overline{PX} \perp \overline{ET}$ $\overline{PY} \perp \overline{EN}$ | 4. |
| 5. $\angle PYE$ and $\angle PXE$ are right angles | 5. |
| 6. $\angle PYE \cong \angle PXE$ | 6. |
| 7. $\overline{PE} \cong \overline{PE}$ | 7. |
| 8. $\triangle PEX = \triangle PEY$ | 8. |
| 9. $\overline{PX} \cong \overline{PY}$ | 8. |