6.1 - 6.3 Special Segments of Triangles with answers

Altitude: A segment that has an endpoint at a vertex of a triangle and the other is on the side opposite the vertex and $\perp$ to this line. (The altitude may lie on the outside or inside of the triangle.)

Orthocenter: The intersection of the altitude of a triangle.

Perpendicular Bisector: A line or line segment that passes through the midpoint of a side of a triangle and is $\perp$ly to that side.

Circumcenter: Point of intersection of the $\perp$ Bisectors of a triangle. The circumcenter is equidistant from the vertices of the triangle.

Median: A segment that connects a vertex of a triangle to the midpoint of the side opposite the vertex.

Centroid: Point of intersection of the Medians of a triangle. The centroid is 2/3 of the distance from each vertex to the midpoint of the opposite side.

Angle Bisector: A segment that Bisects an angle of the triangle and has one endpoint at a vertex of the triangle and the other on another point on the triangle.

Incenter: The intersection of the $\angle$ Bisectors of a triangle. The incenter is equidistant from the three sides of the triangle.

Any point on the perpendicular bisector of a segment is equidistant from the endpoints of the segment.
Any point that is equidistant from the endpoints of a segment lies on the perpendicular bisector of the segment.

Any point on the bisector of an angle is equidistant from the sides of the angle.
Any point on or in the interior of an angle and equidistant for the sides of an angle lies on the bisector of the angle.

Special Triangles:

Isosceles Triangle: The median, angle bisector, altitude, and perpendicular bisector from the same vertex is the same segment. The centroid, incenter, orthocenter, and circumcenter will be collinear.

Equilateral Triangle: The medians, angle bisectors, altitudes, and perpendicular bisectors from each vertex form three segments on the interior of the triangle. The centroid, incenter, orthocenter, and circumcenter are all the same point.

Right Triangle: Two of the altitudes are the legs of the triangle. The orthocenter lies on the vertex of the right angle.

Euler Segment: The segment formed by connecting the Centroid, Orthocenter and Circumcenter. (They are always collinear)

6.1: pg. 306: 3, 11, 15, 19, 23, 25, 39 - 44

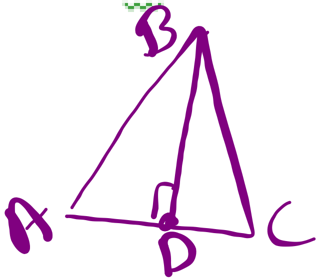
6.2: pg. 315: 3, 5, 11, 25, 29, 31, 52 - 59

6.3: pg. 324: 3, 11, 15, 27, 31, 33, 35, 55 - 58

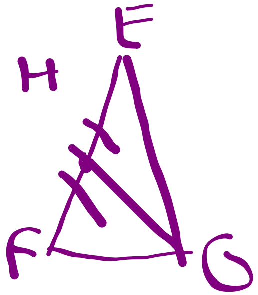
These practice problems are due by your Quiz along with this practice WS.

Draw and label a figure to illustrate each situation. Be sure to include appropriate markings.

1. $\overline{AD}$ is an altitude of ΔABC.

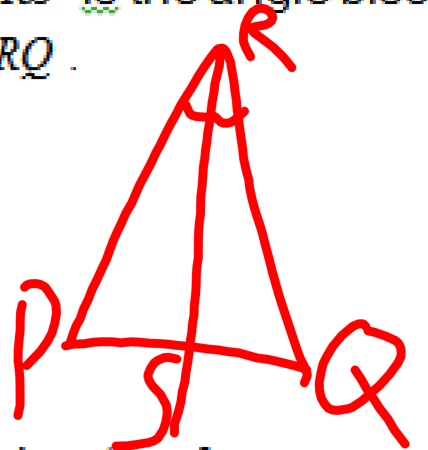


2. $\overline{GH}$ is a median of ΔEFG.

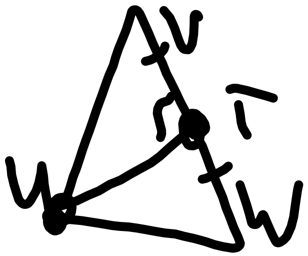


3. $\overline{NP}$ is a perpendicular bisector of $\overline{ML}$ in ΔKLM.

4. $\overline{RS}$ is the angle bisector of ΔPRQ.



5. $\overline{TU}$ is the altitude, median, and perpendicular bisector of ΔUVW.



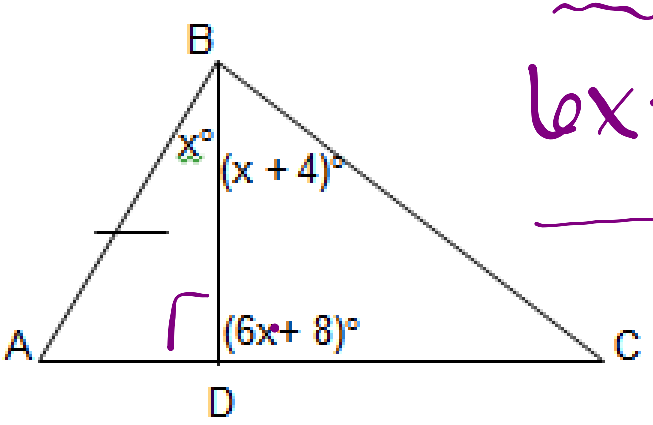
Answer the following with Always, Sometimes or Never.

6. The three altitudes of a triangle intersect at a vertex of the triangle. Sometimes

7. The three medians of a triangle intersect at a point outside the triangle. inside Never

8. The three angle bisectors of a triangle intersect at a point inside the triangle. Always

9. Find the value of x if $\overline{BD}$ is an altitude of ΔABC. ________



$$6x + 8 = 90$$
$$-8 \quad -8$$
$$\frac{6x}{6} = \frac{82}{6}$$
$$\boxed{x = 13.667}$$

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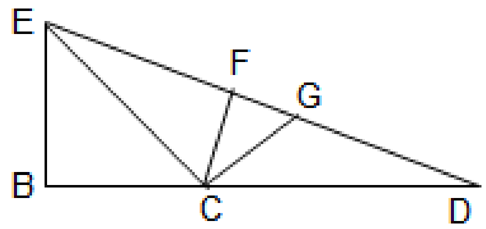
Use the picture to the right to determine True or False:

True 10. If G is the midpoint of $\overline{ED}$, then $\overline{CG}$ is a median of $\triangle EBD$.

True 11. If $\overline{CF} \perp \overline{ED}$, then $\overline{CF}$ is an altitude of both $\triangle ECD$ and $\triangle ECG$.

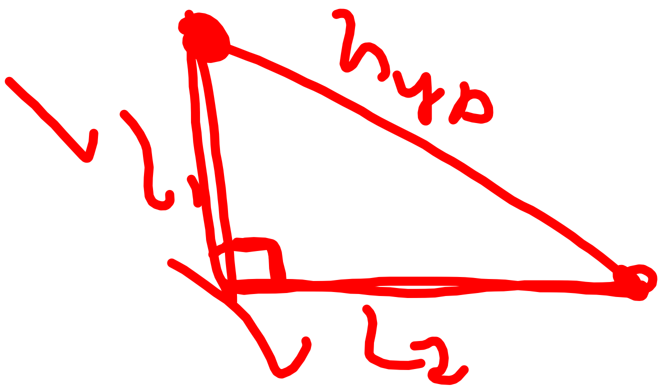


True 12. If $\overline{EB} \perp \overline{BD}$, the $\overline{EB}$ is an altitude of $\triangle ECD$.

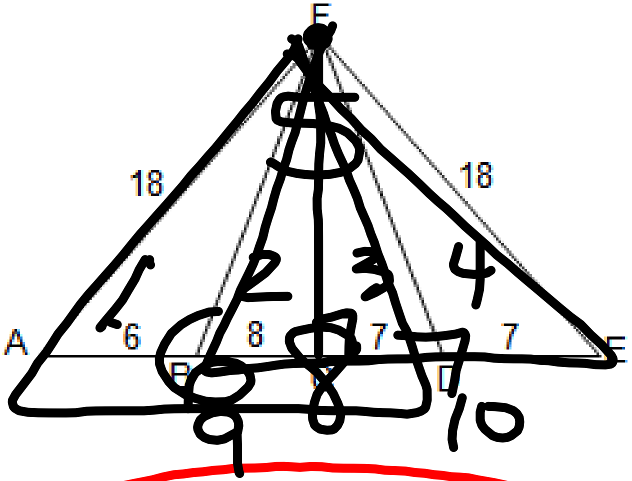
False 13. If $\overline{CF} \perp \overline{ED}$, then $\overline{CF}$ is a perpendicular bisector of $\triangle ECD$.

True 14. If $\overline{CG}$ is a median of $\triangle ECD$, then G is the midpoint of $\overline{ED}$.

True 15. Each leg of a right triangle is also an altitude of the triangle.



Complete each statement in as many ways as possible.

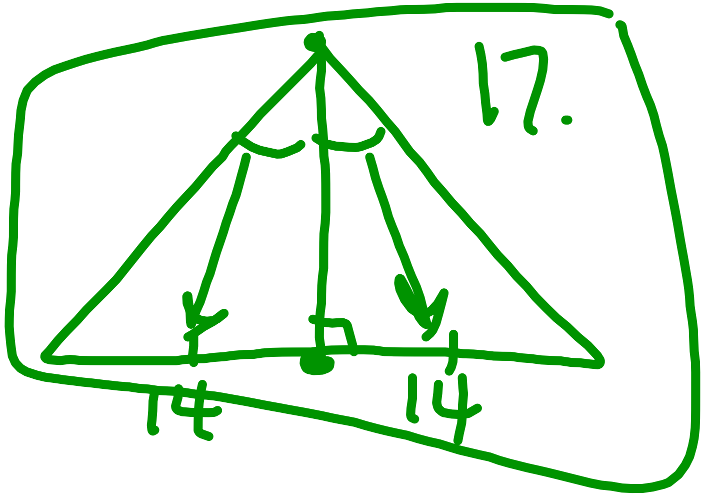


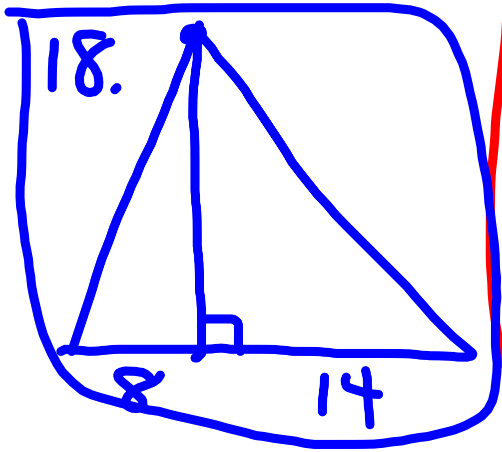
16. $\overline{FD}$ is ___median___ of $\triangle$FCE. (1 answer)

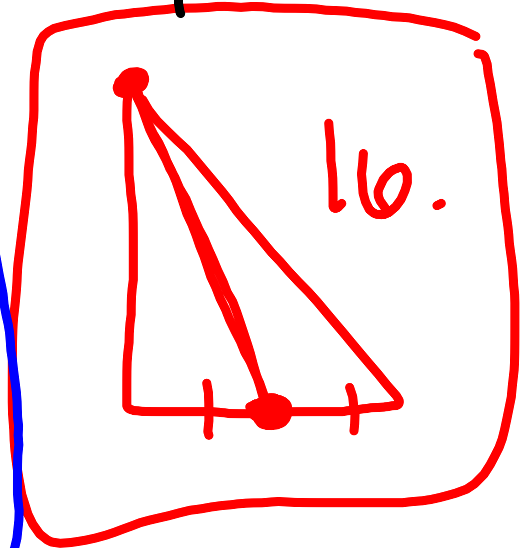
17. $\overline{FC}$ is ___altitude, ⊥ bisector, median, & ∠ bisector___ of $\triangle$ AFE. (4 answers)

18. $\overline{FC}$ is ___altitude___ of $\triangle$BFE. (1 answer)

19. $\overline{FC}$ is an altitude of ___10___ triangles.



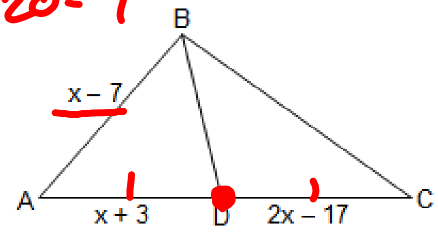




6.1 - 6.3 Special Segments of Triangles with answers

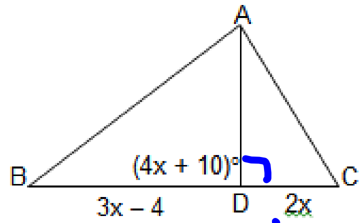
20. Find AB if $\overline{BD}$ is a median of $\triangle ABC$.

$20-7$



$$\cancel{x}+3=2x-17$$
$$-\cancel{x}\qquad -x$$
$$3=x-\cancel{17}$$
$$+17\qquad +\cancel{17}$$
$$\boxed{20=x}$$
$$\boxed{AB=13}$$

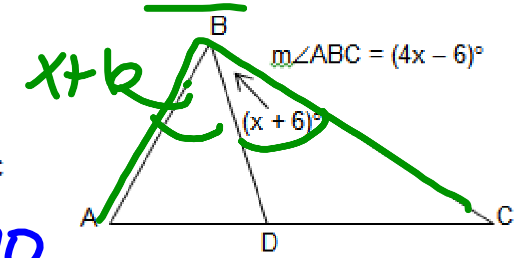
21. Find BC if $\overline{AD}$ is an altitude of $\triangle ABC$.



$$4x+\cancel{10}=90$$
$$-\cancel{10}\qquad -10$$
$$\frac{\cancel{4}x}{\cancel{4}}=\frac{80}{4}$$
$$\boxed{x=20}$$
$$BC=BD+DC$$
$$=3x-4+2x$$
$$=3(20)-4+2(20)$$
$$=60-4+40$$
$$\boxed{BC=96}$$

22. Find $m\angle ABC$ if $\overline{BD}$ is an angle bisector of $\triangle ABC$.

$x+6$



$$x+6+x+6=4x-6$$
$$2\cancel{x}+12=4x-6$$
$$-\cancel{2x}\qquad -2x$$
$$12=2x-\cancel{6}$$
$$+6\qquad +\cancel{6}$$
$$\frac{18}{2}=\frac{\cancel{2}x}{\cancel{2}}$$
$$\boxed{9=x}$$
$$4(9)-6=36-6$$
$$\boxed{m\angle ABC=30^\circ}$$

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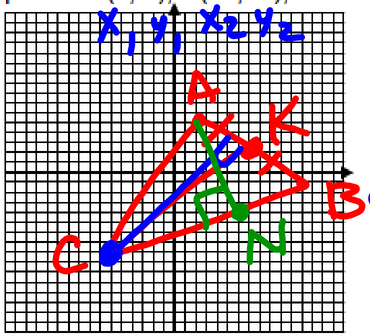
23. Plot the points. A(2, 5), B(12, -1), and C(-6, -8) are the vertices of Δ ABC.



midpoint: $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Slope: $\frac{\Delta y}{\Delta x} = \frac{y_2-y_1}{x_2-x_1}$

24. What are the coordinates of K if $\overline{CK}$ is a median of Δ ABC?

$K = \left(\frac{2+12}{2}, \frac{5-1}{2}\right) = \left(\frac{14}{2}, \frac{4}{2}\right) = \boxed{(7,2)K}$

25. What is the slope of the perpendicular bisector of $\overline{AB}$?

$m\,AB = \frac{-1-5}{12-2} = \frac{-6}{10} = \frac{-3}{5}$ $\boxed{\perp m AB: \frac{5}{3}}$

26. What is the slope of $\overline{CL}$ if $\overline{CL}$ is the altitude from point C?

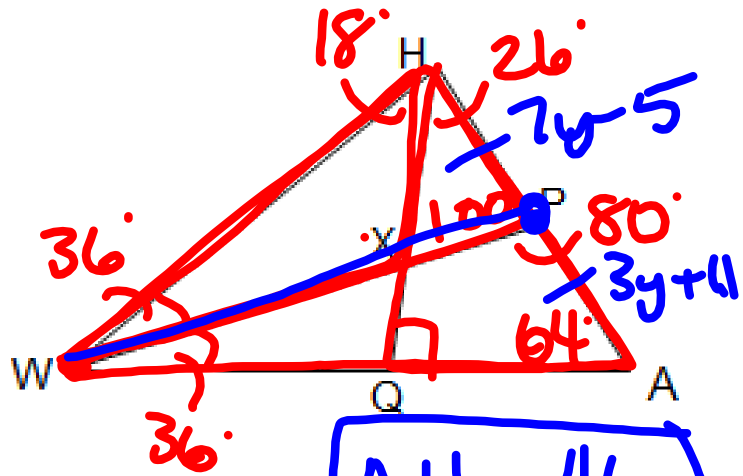
$m = \frac{5}{3}$ ↳ $90° \rightarrow \perp \rightarrow \perp m$ to AB

27. Point N on $\overline{BC}$ has coordinates $(6, \frac{-10}{3})$. Is $\overline{NA}$ an altitude of △ABC? Explain your answer.

AN m: $\frac{\frac{-10}{3} - 5}{6-2} = \frac{\frac{-15}{3}}{4}$ 90° ⊥m $\frac{-15}{3} \cdot \frac{1}{4} = \boxed{\frac{-15}{12}}$

CB m: $\frac{-8+1}{-6-12} = \frac{-7}{-18} = \boxed{\frac{7}{18}}$ $\boxed{\text{Not an altitude}}$

In $\triangle AHW$, $m\angle A = 64°$ and $m\angle AWH = 36°$. If $\overline{WP}$ is an angle bisector and $\overline{HQ}$ is an altitude, find each measure.



28. $m\angle AQH =$ 90°

29. $m\angle APW =$ 80°

30. $m\angle AHQ =$ 26°

31. $m\angle HXW =$ 126°

32. If $\overline{WP}$ is a median, AP = 3y + 11 and PH = 7y – 5, find AH.

$\boxed{AH = 46u}$

$$3y + 11 = 7y - 5$$
$$-3y \qquad -3y$$
$$11 = 4y - 5$$
$$+5 \qquad +5$$
$$\frac{16}{4} = \frac{4y}{4}$$
$$\boxed{4 = y}$$

$$AH = AP + PH$$
$$= 3y + 11 + 7y - 5$$
$$= 10y + 6$$
$$= 10(4) + 6$$
$$= 40 + 6$$

Attachments

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perpendicular bisectors.gsp

Angle bisectors.gsp

Altitudes copy.gsp

medians.gsp

3 medians.gsp

3 altitudes.gsp

3 perpendicular bisectors.gsp

3 angle bisectors.gsp

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