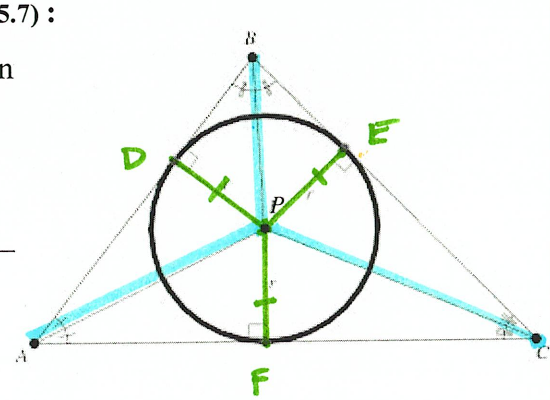
Concurrency of Angles Bisectors of a Triangle **(Theorem 5.7) :**

The angle bisectors of a triangle intersect at a point that is equidistan from the sides of the triangle called the Incenter (point P).



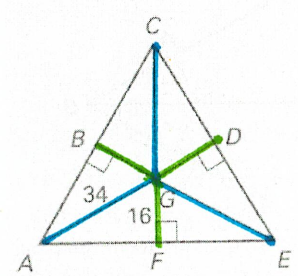
If $\overline{AP}, \overline{BP}$ and $\overline{CP}$ are angle bisectors then $\overline{DP} \cong \overline{EP} \cong \overline{FP}$

* Point P is equidistant to all the sides $\triangle$

The incenter always lies inside the triangle.

Because the incenter is equidistant from the three sides of the triangle, a circle drawn using the incenter as the center and the distance to one side as the radius will just touch the other two sides. The circle is said to be inscribed with the triangle.

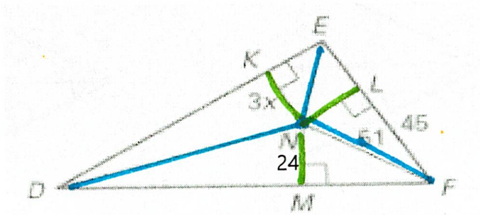
4. Point G is the incenter of $\triangle ACE$. Find BG. ↳ angle bisectors



* BG = FG = 16

$\boxed{BG = 16 \text{ units}}$

5. Find the value of x that makes N the incenter of the triangle. angle bisectors



* KN = MN → $3x = 24$

$\frac{3x}{3} = \frac{24}{3}$

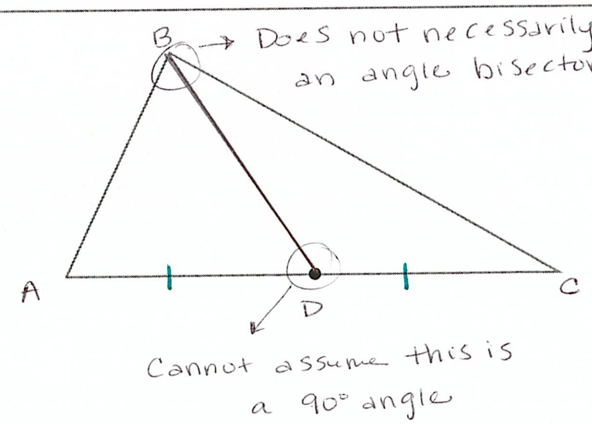
$x = 8$

Chapter 5.4: Use Medians and Altitudes

Median of a Triangle:

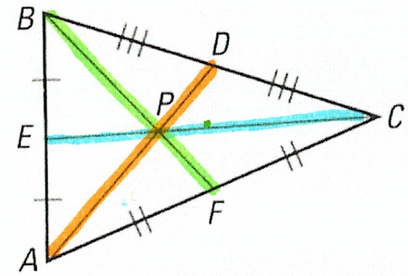
A segment from a vertex to the midpoint (point D) of the opposite side. (AD = CD)

- 3 medians in a triangle
- medians lie inside triangles



Centroid: The point of concurrency of the three **medians** of a triangle.

Concurrency of Medians of a Triangle (Theorem 5.8):



The medians of a triangle intersect at a point (p- centroid)
that is 2/3 of the distance from each vertex to the midpoint of the opposite side.

The medians of triangle ABC meet at P and

AP = $\frac{2}{3}$(AD) BP= $\frac{2}{3}$(BF) CP= $\frac{2}{3}$(CE)

DP = $\frac{1}{3}$(AD) FP= $\frac{1}{3}$(BF) EP= $\frac{1}{3}$(CE)

DP is ½ of AP FP is ½ of BP EP is ½ of CP

Example:

a.) If $BF = 12\ cm$, find BP and FP

BP = 2/3 (BF) FP = 1/3(BF)
BP = 2/3(12) FP = 1/3 (12)
$\boxed{\text{BP = 8 cm}}$ $\boxed{\text{FP = 4 cm}}$

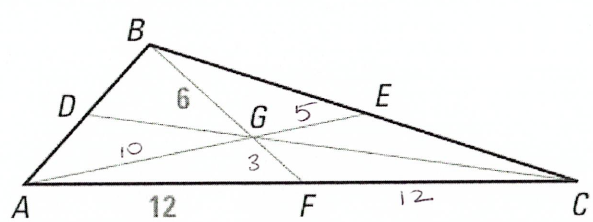
b.) If $CP = 6\ cm$, find EP and CE

EP = 1/2 (CP) CE = CP + EP
EP = 1/2 (6) CE = 6 + 3
$\boxed{\text{EP = 3 cm}}$ $\boxed{\text{CE = 9 cm}}$

c.) If $DP = 2\ cm$, find AP and AD

AP = 2 (DP) AD = AP + DP
AP = 2(2) AD = 4 + 2
$\boxed{\text{AP = 4 cm}}$ $\boxed{\text{AD = 6 cm}}$

1. In $\triangle ABC$, G is the centroid. $BG = 6\ ft, AF = 12\ ft$ and $AE = 15\ ft$. Find the following lengths.



a.) FC = 12 ft

b.) BF = 6 + 3
= 9 ft

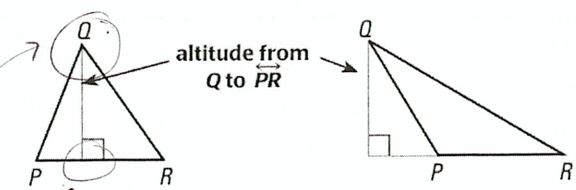
c.) AG = 2/3 (15)
= 10 ft

d.) GE = 1/3 (15)
= 5 ft

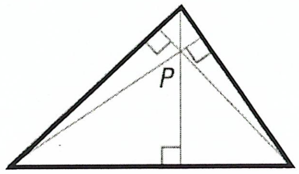
Altitude of a Triangle:

The perpendicular segment from a vertex to the opposite side or to the line that contains the opposite side.

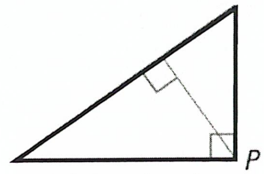
* You cannot assume that an altitude is an angle bisector or meets @ the mid point



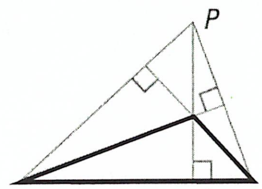
orthocenter: The point (point of concurrency) at which the lines containing the three altitudes of a triangle intersect.



Acute triangle
P is inside triangle.



Right triangle
P is on triangle.



Obtuse triangle
P is outside triangle.

Point of Concurrency Review:

1. Fill in the blanks

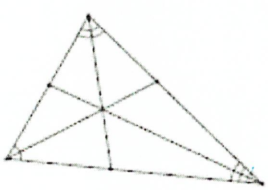
The three **perpendicular bisectors** of a triangles meet at the Circumcenter

The three **altitudes** of a triangles meet at the orthocenter

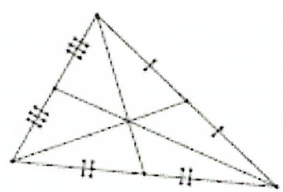
The three **medians** of a triangles meet at the Centroid

The three **angle bisectors** of a triangles meet at the incenter

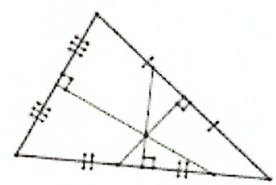
2. In each figure below, tell what point of concurrency is illustrated and identify the line segments that forms that point



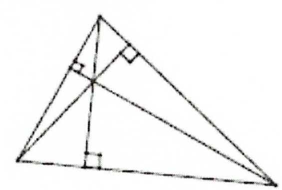
Point: incenter
Line: angle bisectors



Point: centroid
Line: medians



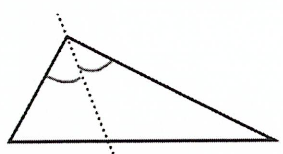
Point: Circumcenter
Line: perpendicular bisectors



Point: orthocenter
Line: altitudes

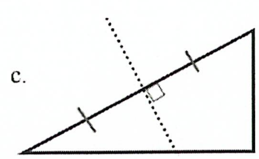
3. Given the following pictures and markings identify if the dotted line is a(n) Angle Bisector,Perpendicular Bisector, Altitude or Median **List All the Apply!**

a.)



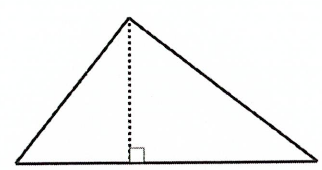
Angle Bisector

b.)



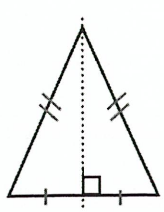
Perpendicular Bisector

c.)



Altitude

d.)

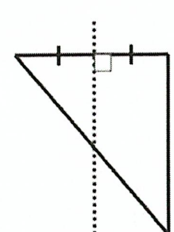


All Apply

e.)

Median

f.)



Perpendicular Bisector