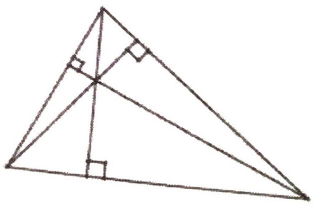
Name: ______________________ Period: ______

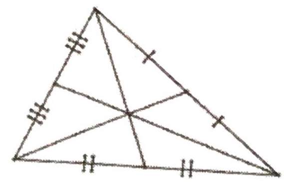
Geometry – Points of Concurrency Worksheet

In each figure below, tell what point of concurrency is shown and what constructions form that point:



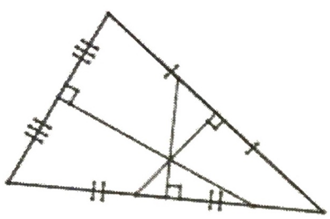
Point: Orthocenter

Formed by: Altitudes



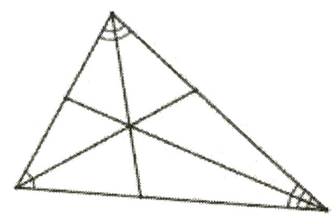
Point: Centroid

Formed by: Medians



Point: Circumcenter

Formed by: Perpendicular Bisectors



Point: Incenter

Formed by: Angle Bisectors

Important Questions

1. Which points of concurrency are always inside the triangle? Incenters, Centroids

2. Which point of concurrency is always on the vertex of a right triangle? Orthocenter

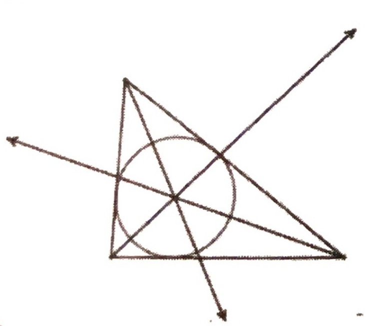
3. Which point of concurrency is always on the midpoint of the hypotenuse in a right triangle? Circumcente

4. Which points of concurrency are always outside of an obtuse triangle? Circumcenter & Orthocenter

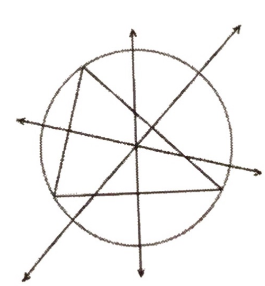
5. Which point of concurrency is the center of gravity in a triangle? Centroid

6. Which point of concurrency is equidistant from every vertex? Circumcenter

7. Which point of concurrency is the center of an inscribed circle as shown below? Incenter



8. Which point of concurrency is the center of a circumscribed circle as shown below? Circumcenter



9. Point G is the Centroid of ΔABC. AD = 8, AG = 10, and CD = 18. Find the length of the given segment.

$\overline{BD}$ 8

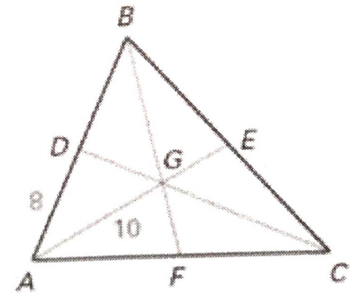
$\overline{AE}$ 15

$\overline{AB}$ 16

$\overline{CG}$ 12

$\overline{EG}$ 5

$\overline{DG}$ 6



D is the centroid of ΔABC, $\overline{AE}$ = 12, $\overline{AD}$ = 10, $\overline{CF}$ = 12. Find the length of each segment.

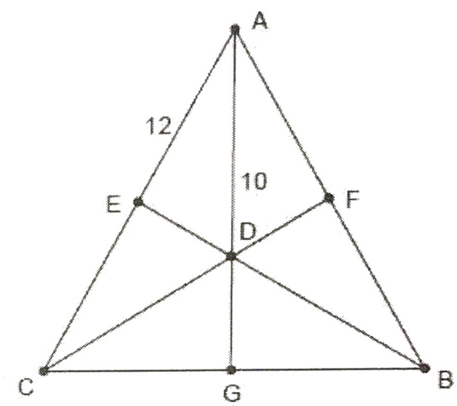
10. $\overline{DG}$ 5

$\overline{AG}$ 15

$\overline{EC}$ 12

$\overline{AC}$ 24

$\overline{DF}$ 4

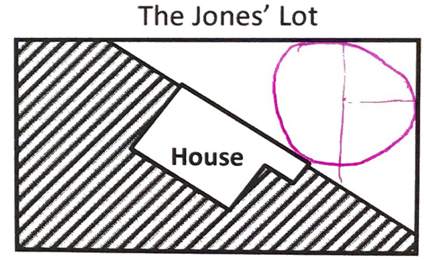


State a point of concurrency that would help solve each of the problems below. Then state how you would find that point of concurrency.

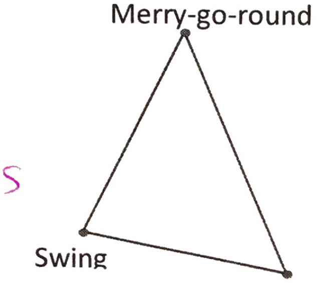
11. This rectangle represents the Jones' lot. The non-shaded triangular region represents their backyard. The Jones' want to build the largest possible circular pool in their back yard, how would you determine the location of the pool's center?

Incenter - where the angle bisectors meet
(used for inscribed circles)

The Jones' Lot

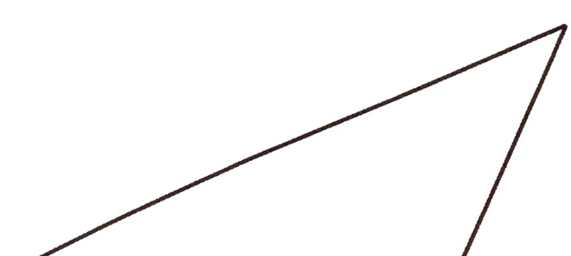


12. The Smith Construction Company has been hired to install a new water fountain at Winstonian Park. They would like to find the best location for the fountain so that the walking distance from each of the three main pieces of playground equipment is the same. How would they determine this point? Circumcenter - where the perp. bisectors meet



13. You are a sculptor and have just completed a large metal mobile. You want to hang this mobile, made of a flat triangular metal plate, in the State Capitol. This triangular piece will hang so that it will be suspended with the triangular surface parallel to the ground. How would you locate the point where the mobile will balance?

Find the centroid (center of gravity) where the medians cross



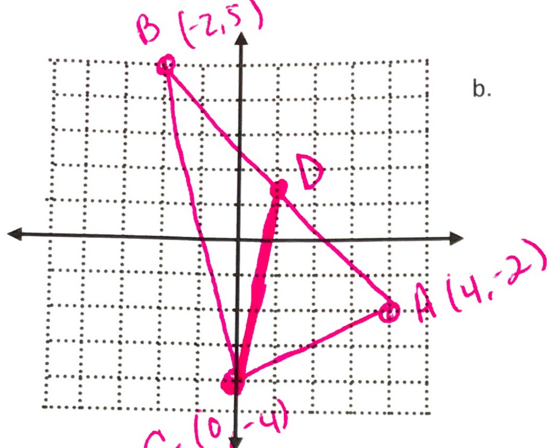
about

Circumcenter Theorem

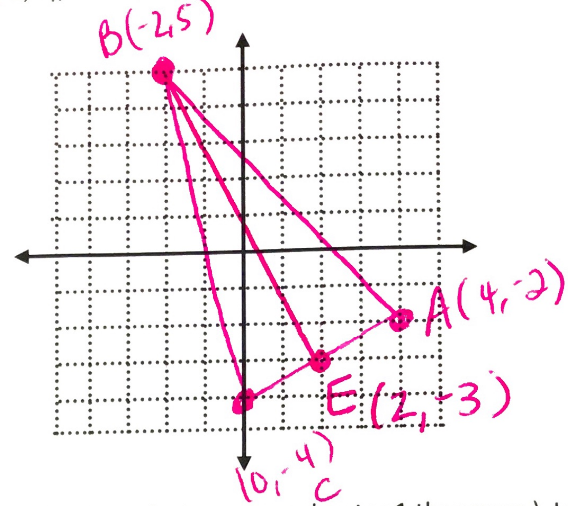
m, and n are the perpendicular ... BC, and AC, respectively.

14. Graph ΔABC on **both** grids below using the points A(4, -2), B(-2, 5), and C(0, -4).

a.



b.



15. Using the graph in 14a, find the midpoint of $\overline{AB}$. (Hint: Midpoint Formula is on your chapter 1 theorems.) Label this point D on graph 14a. Connect point D to C. What special segment is $\overline{CD}$?

midpoint of $\overline{AB}$ = (1 , 1.5) $\quad$ $\overline{CD}$ is a median

$\frac{-2+4}{2}, \frac{5+-2}{2}$

16. Using the graph in 14b, find the midpoint of CA. Label this point E on graph 14b. Connect point E to point B. Now, find the slope of $\overline{BE}$ and $\overline{AC}$. What kinds of lines are $\overline{BE}$ and $\overline{AC}$? Name the three special segments that $\overline{BE}$ could be.

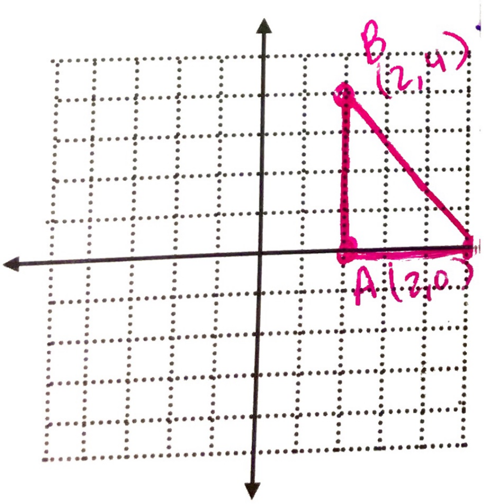
$\frac{0+4}{2}, \frac{-4+-2}{2}$ $\quad$ midpoint of $\overline{CA}$ = (2 , -3) $\quad$ slope of $\overline{BE}$ = -2 $\quad$ slope of $\overline{AC}$ = 1/2

$\overline{BE}$ and $\overline{AC}$ are perpendicular lines.

$\overline{BE}$ could be a altitude, perpendicular bisector or median.

Find the orthocenter of ΔABC.

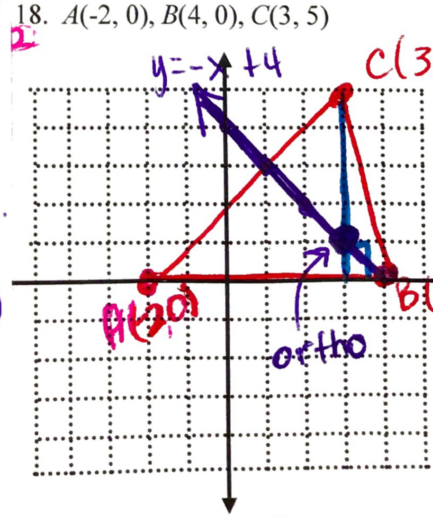
17. $A(2, 0)$, $B(2, 4)$, $C(5, 0)$



A: The orthocenter of a right Δ always lies on the vertex of the right ∠.

Orthocenter = (2,0)

18. $A(-2, 0)$, $B(4, 0)$, $C(3, 5)$



B(4,0) $\quad$ B - $\overline{AC}$

C → $\overline{AB}$

[x = 3]

slope $\overline{AC}$ = $\frac{0-5}{-2-3} = \frac{-5}{-5}$ = 1

perp = -1 (m)

B(4,0)
x, y

0 = -1(4) + b

0 = -4 + b

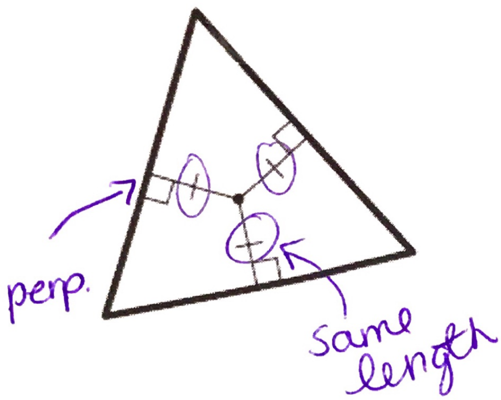
4 = b

$\boxed{y = -x + 4}$

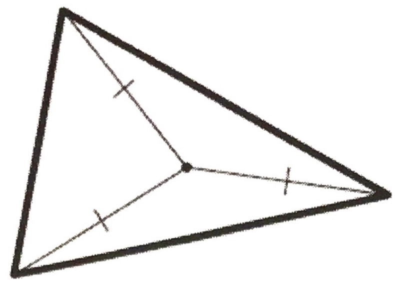
Ortho: x = 3
(3,1) $\quad$ y = -3 + 4
y = 1

Name the point of concurrency shown for the bold triangle.

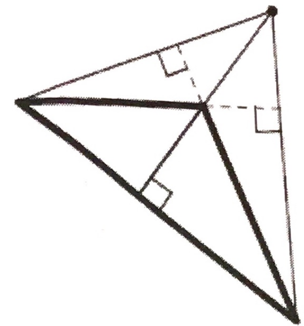
19. incenter



20. circumcenter

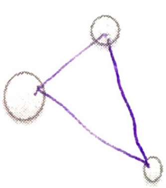


21. orthocenter



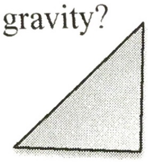
22. Suppose that a space station needs to be placed equidistant from a group of three planets. How could you determine the location of the space station?

circumcenter



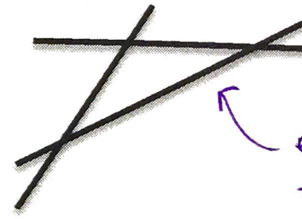
equidistant from vertex

23. A new aircraft is going to be triangular in shape. How would you find its center of gravity?



find its centroid

24. Suppose the state highway patrol wants to build a new station so that is the same distance to three intersecting highways. How would you go about finding the location?



Incenter

equidistant to sides

Circle the letter with the name of the correct point of concurrency.

25. The three altitudes of a triangle intersect at the ________________________.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter

26. The three medians of a triangle intersect at the ________________________.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter

27. The three perpendicular bisectors of a triangle intersect at the _________________________.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter

28. The three angle bisectors of a triangle intersect at the ________________________.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter

29. It is equidistant from the three vertices of the triangle.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter

30. It is equidistant from the three sides of the triangle.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter

31. It divides each median into two sections at a 2:1 ratio.

(a) circumcenter (b) incenter (c) centroid (d) orthocenter