Name: **AK**   Period: _____

Unit 6 Practice Test: Relationships with Triangles   Calculator Permitted

Identify whether each statement as true or false. For each false statement, explain why it is false or correct the false statement by deleting and replacing a word or words.

1. The circumcenter is equidistant to the ~~sides~~ of the triangle.

    Angles or vertices

    False

2. The incenter is the point of concurrency of the angle bisectors.

    True

3. The orthocenter is always inside the triangle.

    an acute

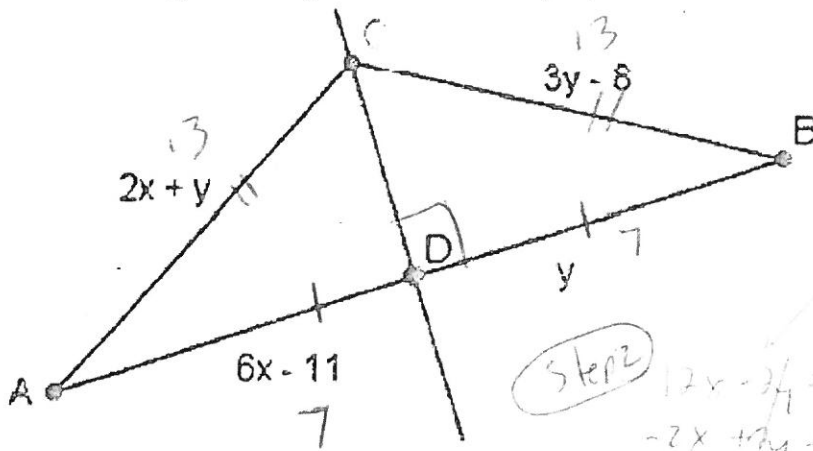   False

4. The distance from the vertex to the centroid is twice the distance from the centroid to the other side.

    True

5. Find the length of CD given line CD is a perpendicular bisector.

Step 1
$$6x - 11 = y$$
$$\downarrow$$
$$6x - y = 11$$

$$2x + y = 3y - 8$$
$$8 = 2y - 2x$$

Step 2
$$12x - 2y = 22$$
$$-2x + 2y = 8$$
$$10x = 30$$
$$x = 3$$

$$8 = 2y - 6$$
$$14 = 2y$$
$$7 = y$$

Step 3
$$7^2 + a^2 = 13^2$$
$$a^2 = 120$$
$$a = \sqrt{120} = 2\sqrt{30}$$

(diagram labels: C, 3y-8, 13, B, 2x+y, 3, D, y, 7, 6x-11, 7, A)

6. Write an equation of the perpendicular bisector of the segment with endpoints M(-1, -1) and N(7, 3).

$$M = \frac{3--1}{7--1} = \frac{4}{8} = \frac{1}{2}$$

$$\boxed{\perp m = -2}$$

midpoint

$$\left(\frac{-1+7}{2}, \frac{-1+3}{2}\right)$$

$$\boxed{(3, 1)}$$

$$y - 1 = -2(x-3)$$

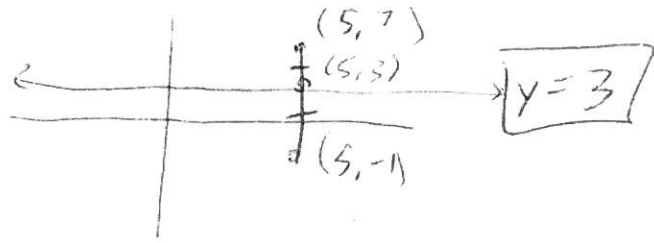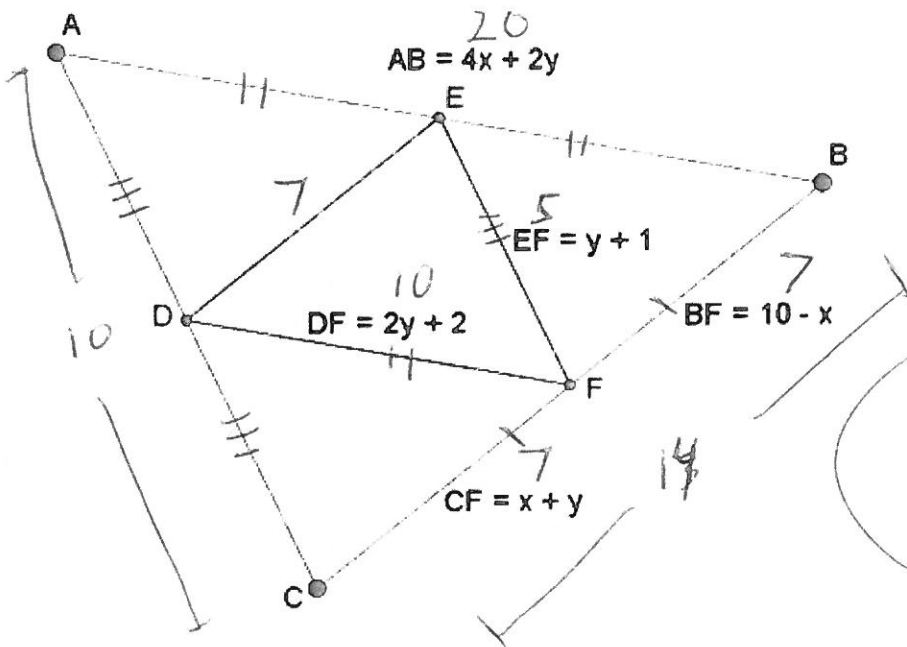$$\boxed{y = -2x + 7}$$

7. Which point lies on the perpendicular bisector of the segment with endpoints C (5, 7) and D (5, -1)?
Check all that apply.

A. (2, 3)   B. (3, 9)   C. (4, 1)   D. (1, 3)

(5, 7)
(5, 3)
$\boxed{y = 3}$
(5, -1)

8. Find the perimeter of triangle DEF.

A

AB = 4x + 2y   20

E

B

7

EF = y + 1   5

10

D   DF = 2y + 2   BF = 10 - x   7

CF = x + y   7   14

C

Perimeter DEF
22 units

$$x + y = 10 - x$$

$$\boxed{2x + y = 10}$$

$$2(2y + 2) = 4x + 2y$$

$$4y + 4 = 4x + 2y$$

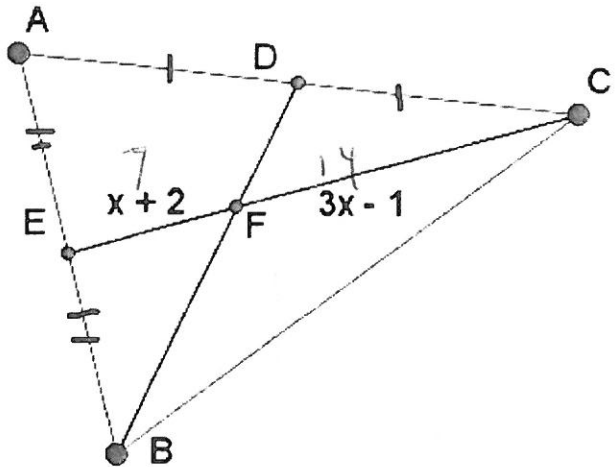$$\boxed{4 = 4x - 2y}$$

$$2x + y = 10$$
$$+\ 2x - y = 2$$
$$4x = 12$$
$$\boxed{x = 3}$$

$$2(3) - y = 2$$
$$\boxed{y = 4}$$

Perimeter = ___22___

9. Find the length of median CE.

A

D

C

E   x + 2   F   3x - 1

B

7

14

$2(x+2) = 3x - 1$

$2x + 4 = 3x - 1$

$5 = x$

CE = ___21___

10. Coach Johnson is creating a new drill for his football players. He needs some help so he asks Dan Brito to help him. The cones are set up as shown in the picture below (cones A, B and C). The drill will start at a point D (not shown), then the player will run to each cone and back to point D. Coach Johnson wants Dan to run the drill so that he starts at a point D that is equidistant to the three cones A, B and C. How should Dan find the location of point D? What is the geometric term for this point called? Do your best to estimate the location of point D and draw it below.

C

A

D

B
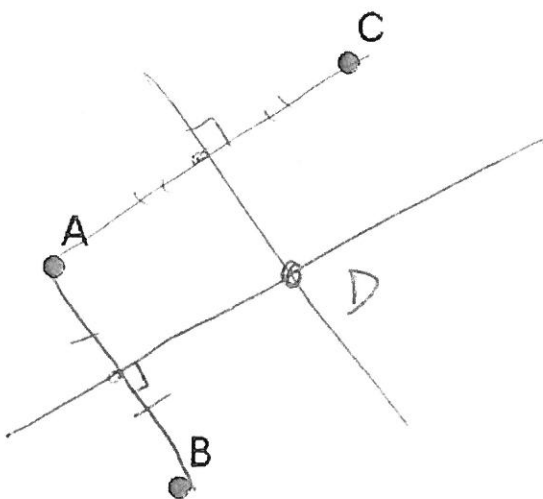
Find the intersection of the perpendicular bisectors.

Circumcenter

11. Find the indicated measure.
     m∠QRS

Q

7.5

R   26   T

7.5

S

26°
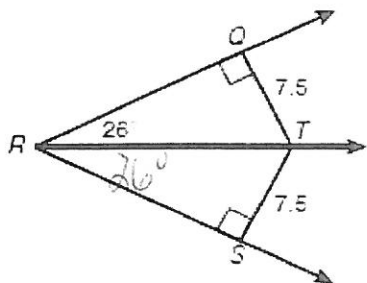
$52°$

12. The coordinates of triangle ABC are A(-2, 3), B(1, 2), C(3, -2). Find the coordinates of the circumcenter by writing the equations of two perpendicular bisectors and finding where they intersect by solving the system. Then check it with graph paper.

A(-2,3)

(1,2) B

(-2,-2)

C(3,-2)
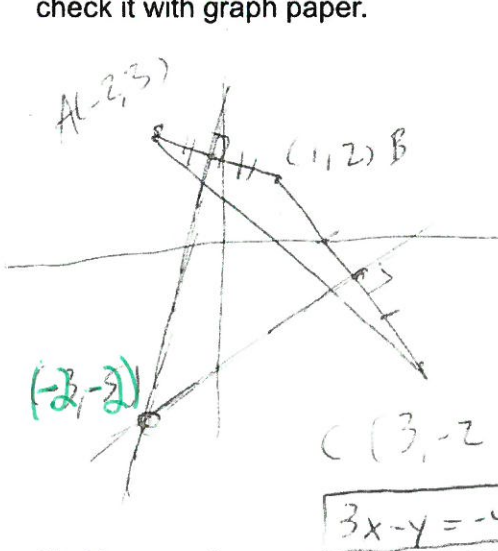
Perp Bisector of AB
$m = -\frac{1}{3}$
midpoint $(-\frac{1}{2}, \frac{5}{2})$
$\perp m = 3$
$y - \frac{5}{2} = 3(x + \frac{1}{2})$
$y - \frac{5}{2} = 3x + \frac{3}{2}$
$2y - 5 = 6x + 3$
$-8 = 6x - 2y$
$3x - y = -4$

of BC
$(2, 0)$ $m = -2$
$\perp m = \frac{1}{2}$
$y - 0 = \frac{1}{2}(x - 2)$
$y = \frac{1}{2}x - 1$
$\frac{1}{2}x + y = -1$
$3x - y = -4$
$2.5x = -5$
$x = -2$ $y = -2$

$(-2, -2)$

13. The coordinates of triangle ABC are A(2, 2), B(3, 5), C(-4, 5). Find the coordinates of the orthocenter by writing the equations of two of the altitudes and finding where they intersect by solving the system. Then check it with graph paper.

C(-4,5)   B(3,5)
X(2,3)
A(2,2)
x=2
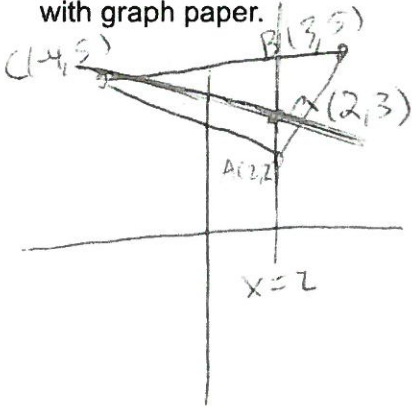
Altitude through A
$x = 2$ since
A is (2, 2) and
CB is horizontal
$y - 5 = -\frac{1}{3}(2 + 4)$
$-\frac{1}{3}(6)$
$y - 5 = -2 \Rightarrow y = 3$

Altitude through C
C is (-4, 5)
m of $AB = \frac{3}{1}$
$\perp m$ to $AB = -\frac{1}{3}$
$y - 5 = -\frac{1}{3}(x + 4)$

$(2,3)$

14. The coordinates of triangle ABC are A(-5,3), B(-5, -3), C(1, -3). Find the coordinates of the centroid by writing the equations of two of the medians and finding where they intersect by solving the system. Then check it with graph paper.

A(-5,3)
(-5,0)
(-3,-1)
B(-5,-3)   (-2,-3)   C(1,-3)
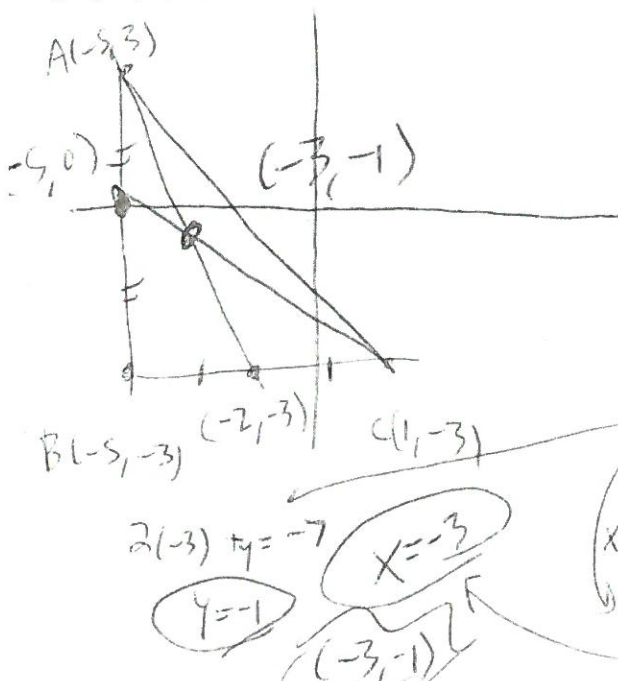
Median through A
vertex (-5,3) midpoint (-2,-3)
Slope $\frac{3 - -3}{-5 - -2} = \frac{6}{-3} = -2$
$y - 3 = -2(x + 5)$
$y - 3 = -2x - 10$
$2x + y = -7$
$x + 2y = -5$
$-4x - 2y = 14$
$-3x = 9$
$x = -3$
$2(-3) + y = -7$
$y = -1$
$(-3, -1)$

Median through C
vertex (1, -3)
Midpoint (-5, 0)
Slope $= \frac{-3 - 0}{1 - -5} = \frac{-3}{6} = -\frac{1}{2}$
$y + 3 = -\frac{1}{2}(x - 1)$
$y + 3 = -\frac{1}{2}x + \frac{1}{2}$
$2y + 6 = -x + 1$