Today's Learning Goal(s):

By the end of the class, I will:

a) know all formulas needed for this unit.

b) have anchor charts created for all unit problems.

c) be able to create a practice test to prepare for the unit summative.
(This means you must understand all the topics from this unit, and be able to provide a mathematical example for each. You may use the assigned homework as a guide.)

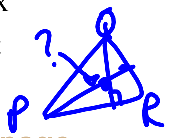
Need to know, from Unit 2: Analytic Geometry

Formulas:

slope	midpoint	length	equation of a circle
$m = \frac{y_2 - y_1}{x_2 - x_1}$	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	$x^2 + y^2 = r^2$

Anchor Charts

- finding the equation of the median of a triangle from a given vertex
- finding the equation of the altitude of a triangle from a given vertex
- finding the equation of the perpendicular bisector of a line segment
- finding the point of intersection of any of the above



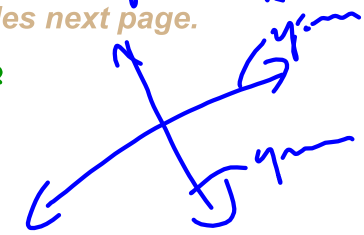
See examples next page.

Other Concepts

- finding the equation of a line
  - is a point on a line?
- finding the equation of a circle
  - is a point inside, outside or on a circle?
- chords, diameters, and radius of a circle
- parallel vs. perpendicular lines and the relationship between their slopes
- converting an entire radical to a mixed radical in lowest terms
- proving a geometric figure is:

a right triangle	an equilateral triangle an isosceles triangle a scalene triangle	a square a rectangle

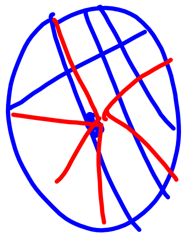
$< r^2$



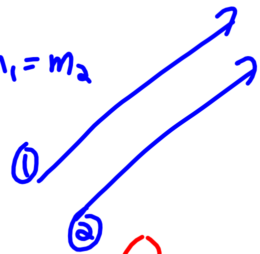
$d = 7$

$x^2 + y^2 = (3.5)^2$

$= 12.25$

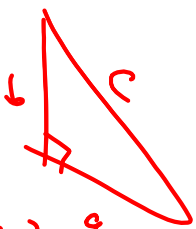


$m_1 = m_2$

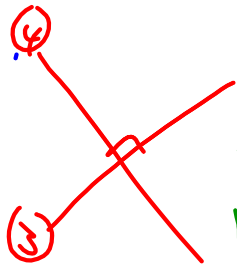


parallel
↳ slopes are equal

$\sqrt{50}$
$= \sqrt{25}\sqrt{2}$
$= 5\sqrt{2}$

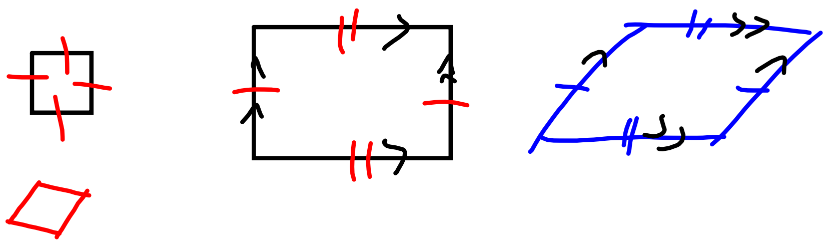


$a^2 + b^2 = c^2$



perpendicular
↳ slopes are negative reciprocals

$m_3 = \frac{-1}{m_4}$



$(7,2)$ $r=?$

$x^2+y^2=r^2$

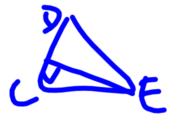
$(7)^2+(2)^2=r^2$

$49+4=r^2$

$53=r^2$

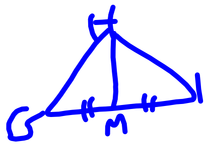
$\therefore x^2+y^2=53$ is the equation.

Suppose you are given only the coordinates for a triangle, CDE.
Using words only, **explain** how you would find the equation of the **altitude** from vertex **E**.



OR

Suppose you are given only the coordinates for a triangle, GHI
Using words only, **explain** how you would find the equation of the **median** from vertex **H**.



OR

A triangle has vertices P(,   ), Q(,) and R(,).
Find an equation for the **median** from vertex **P**.

Note: Extra review, with answers is posted on the website.

Today's Review practice:

pp. 100-103 #2b, 4, 8, 11a, 12abc*,

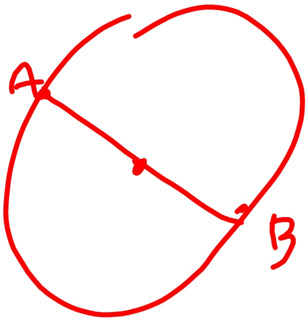
14ab, 15, 18

Error in final answer for 12c: it should read "…y = x – 5…"

Today's solutions follow on the remaining slides.

Circle Hwk: 8, 6, 7, 9

p97 #6 A(-4,3) B(4,-3)



(use A)

$x^2+y^2=r^2$

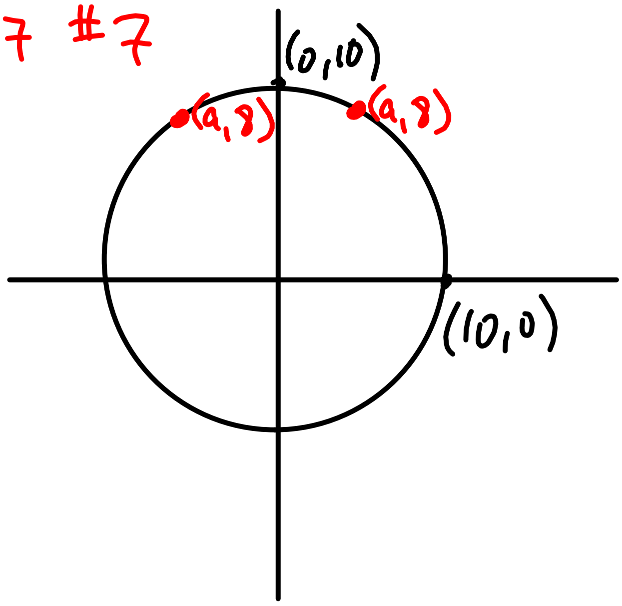
$(-4)^2+(3)^2=r^2$

$16+9=r^2$

$25=r^2$

$\therefore x^2+y^2=25$ is the equation.

p.97 #7



$x^2+y^2=100$

$a^2+8^2=100$

$a^2+64=100$

$a^2=100-64$

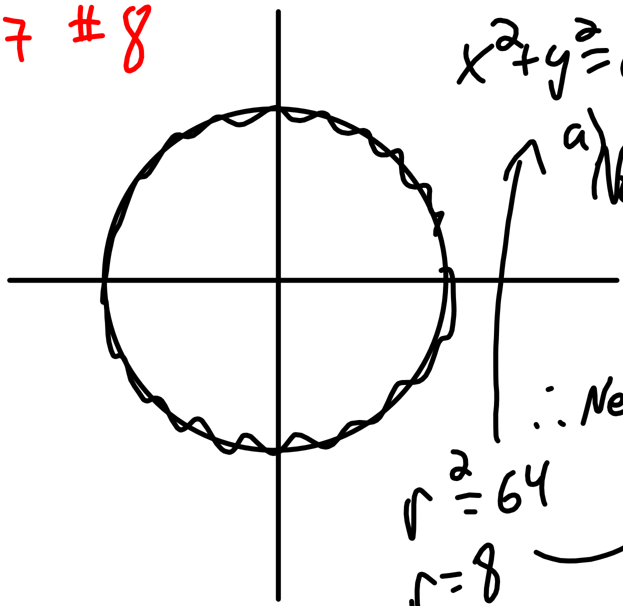
$=36$

$a=\pm\sqrt{36}$

$=\pm 6$

$\therefore (6,8)$ or $(-6,8)$

p.97 #8



$x^2+y^2=64$

a) Need circumfrence

$C=2\pi r$

$\therefore$ Need r.

$r^2=64$

$r=8$

$C=2\pi(8)$

$=16\pi$

$\doteq 50.24$ units

b) $A=?$

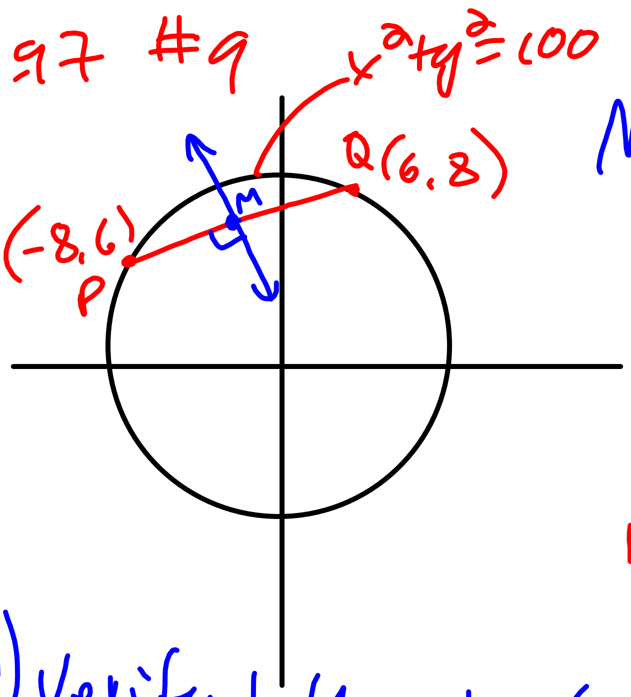
$A=\pi r^2$

$=\pi(8)^2$

$=64\pi$

$\doteq 201.06$ units^2

p97 #9



$M_{PQ}\left(\frac{-8+6}{2}, \frac{6+8}{2}\right)$

$M\left(\frac{-2}{2}, \frac{14}{2}\right)$

$M(-1,7)$

$m_{PQ} = \frac{8-6}{6-(-8)}$

$= \frac{2}{14}$

$= \frac{1}{7}$

$m_\perp = -7$

$\therefore y = -7x + b$

$(7) = -7(-1) + b$

$7 = 7 + b$

$0 = b$

d) Verify ⊥ through C(0,0)

LS = y RS = -7x

$y = -7x$ is the eqn of the right bisector of PQ.

p. 100 #2b

b) $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$= \left(\frac{4 + 4}{2}, \frac{8 + (-2)}{2}\right)$

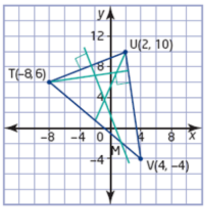
$= (4, 3)$

The coordinates of the midpoint of L(4, 8) and N(4, –2) are (4, 3).

p. 100 #4

Chapter 2 Review **Question 4** **Page 100**

a)



b) Find the coordinates of the midpoint of TV.

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$
$$= \left(\frac{-8+4}{2}, \frac{6+(-4)}{2}\right)$$
$$= (-2, 1)$$

Find the slope of the median.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{10-1}{2-(-2)}$$
$$= \frac{9}{4}$$

Substitute $m = \frac{9}{4}$ and the coordinates of one endpoint, say (−2, 1), to find b.

$$y = mx + b$$
$$1 = \frac{9}{4}(-2) + b$$
$$1 = -\frac{9}{2} + b$$
$$\frac{11}{2} = b$$

The equation of the median from vertex U is $y = \frac{9}{4}x + \frac{11}{2}$.

c) Find the slope of UV.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{-4-10}{4-2}$$
$$= -7$$

The slope of side UV is −7. The slope of the altitude from vertex T is $\frac{1}{7}$.

Substitute $m = \frac{1}{7}$ and the coordinates of point T to find b.

$$y = mx + b$$
$$6 = \frac{1}{7}(-8) + b$$
$$6 = -\frac{8}{7} + b$$
$$\frac{50}{7} = b$$

The equation of the altitude from vertex T is $y = \frac{1}{7}x + \frac{50}{7}$.

d) Find the coordinates of the midpoint of TU.

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$
$$= \left(\frac{-8+2}{2}, \frac{6+10}{2}\right)$$
$$= (-3, 8)$$

Find the slope of TU.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{10-6}{2-(-8)}$$
$$= \frac{4}{10}$$
$$= \frac{2}{5}$$

The slope of TU is $\frac{2}{5}$. The slope of the right bisector of TU is $-\frac{5}{2}$.

Substitute $m = \frac{2}{5}$ and the coordinates of the midpoint to find b.

$$y = mx + b$$
$$8 = -\frac{5}{2}(-3) + b$$
$$8 = \frac{15}{2} + b$$
$$\frac{1}{2} = b$$

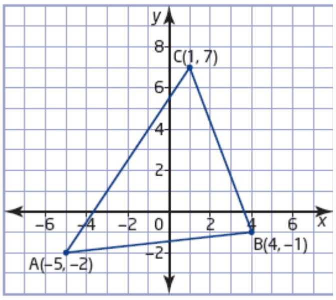
The equation of the right bisector of TU is $y = -\frac{5}{2}x + \frac{1}{2}$.

p. 101 #8

Chapter 2 Review **Question 8** **Page 101**

a) Find the coordinates of the midpoint of side BC.

$$(x, y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$
$$= \left(\frac{1+4}{2}, \frac{7+(-1)}{2}\right)$$
$$= \left(\frac{5}{2}, 3\right)$$



Find the length of the median.

$$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$= \sqrt{\left(\frac{5}{2}-(-5)\right)^2+(3-(-2))^2}$$
$$= \sqrt{\left(\frac{15}{2}\right)^2+5^2}$$
$$= \sqrt{\frac{325}{4}}$$

The length of the median from vertex A is $\sqrt{\frac{325}{4}}$.

b) Find the lengths of the sides.

$$AB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$= \sqrt{(4-(-5))^2+(-1-(-2))^2}$$
$$= \sqrt{9^2+1^2}$$
$$= \sqrt{82}$$

$$CB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$= \sqrt{(4-1)^2+(-1-7)^2}$$
$$= \sqrt{3^2+(-8)^2}$$
$$= \sqrt{73}$$

$$AC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$= \sqrt{(1-(-5))^2+(7-(-2))^2}$$
$$= \sqrt{6^2+9^2}$$
$$= \sqrt{117}$$

The perimeter of the triangle is $\sqrt{82}+\sqrt{73}+\sqrt{117}$, or about 28.4.

p. 102 #11a

Chapter 2 Review **Question 11 Page 102**

a) Find the slopes of the sides of ΔDEF.

$$m_{DE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-7}{-4-(-2)} = \frac{-5}{-2} = \frac{5}{2}$$

$$m_{EF} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-2}{6-(-4)} = \frac{-4}{10} = -\frac{2}{5}$$

The slopes are negative reciprocals. DE is perpendicular to EF. Therefore, ΔDEF is a right triangle with $\angle DEF = 90°$.

p. 102 #12abc

Chapter 2 Review **Question 12** **Page 102**

a) $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(65 - 45)^2 + (40 - 60)^2}$

$= \sqrt{20^2 + (-20)^2}$

$= \sqrt{800}$

$\doteq 28.3$

The distance from A to B is about 28.3 km.

b) $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$= \left(\frac{45 + 65}{2}, \frac{60 + 40}{2}\right)$

$= (55, 50)$

c) Find the equation of line representing the branch pipeline.

$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{40 - 60}{65 - 45}$

$= \frac{-20}{20}$

$= -1$

The slope of the line representing the pipeline is -1. The slope of the branch pipeline is 1. Substitute $m = 1$ and the coordinates of the midpoint to find b.

$y = mx + b$

$50 = 1(55) + b$

$-5 = b$

The equation of the line representing the branch line is $y = x - 5$. Check if the given point satisfies the equation.

L.S. $= y$ **R.S.** $= x - 5$

$= 54$ $= 63 - 5$

$= 58$

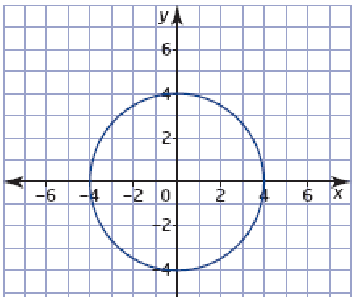
L.S. ≠ R.S.

Point C is not on the branch pipeline.

p. 102 #14ab

Chapter 2 Review **Question 14** **Page 102**

a) $x^2 + y^2 = 16$

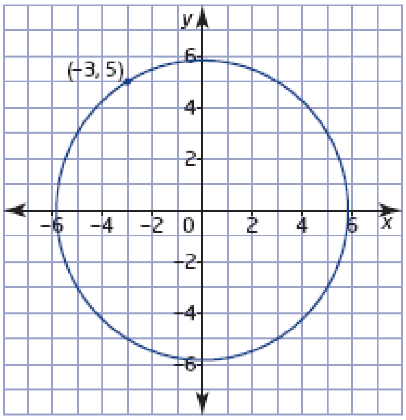


b) $x^2 + y^2 = r^2$

$(-3)^2 + 5^2 = r^2$

$34 = r^2$

An equation for the circle is $x^2 + y^2 = 34$.



p. 103 #15

a) $x^2 + y^2 = r^2$

$x^2 + y^2 = \left(4\frac{1}{2}\right)^2$

$x^2 + y^2 = \frac{81}{4}$

b) $x^2 + y^2 = r^2$

$x^2 + y^2 = \left(\frac{14}{2}\right)^2$

$x^2 + y^2 = 49$

c) $x^2 + y^2 = r^2$

$x^2 + y^2 = \left(\sqrt{12}\right)^2$

$x^2 + y^2 = 12$

d) $x^2 + y^2 = r^2$

$4^2 + 7^2 = r^2$

$65 = r^2$

An equation for the circle is $x^2 + y^2 = 65$.

p. 103 #18

Chapter 2 Review **Question 18 Page 103**

The radius of the signal area is 20 km. Check that the cell phone user is within the circular area.

$$\begin{aligned} r_1 &= \sqrt{x^2 + y^2} \\ &= \sqrt{13^2 + 15^2} \\ &= \sqrt{169 + 225} \\ &= \sqrt{394} \\ &\doteq 19.8 \end{aligned}$$

The user is less than 20 km from the tower. Signals can be received.

Tomorrow's solutions from p.104

Chapter 2 Chapter Test **Question 5** **Page 104**

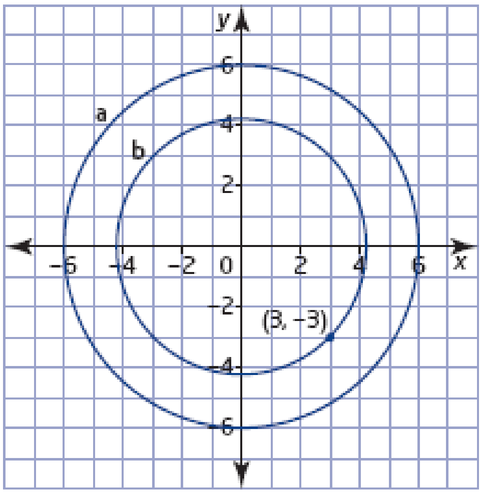
a) $x^2 + y^2 = 36$

b) $x^2 + y^2 = r^2$

$3^2 + (-3)^2 = r^2$

$18 = r^2$

An equation for the circle is $x^2 + y^2 = 18$.



Chapter 2 Chapter Test Question 7 Page 104

a) $PS = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

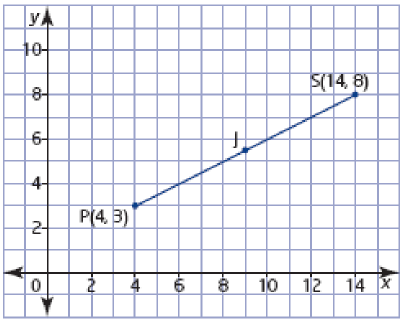
$= \sqrt{(14-4)^2 + (8-3)^2}$

$= \sqrt{10^2 + 5^2}$

$= \sqrt{125}$

$\doteq 11.2$

The schools are about 11.2 km apart.



b) $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$= \left(\frac{4+14}{2}, \frac{3+8}{2}\right)$

$= (9, 5.5)$

The coordinates of Jason's home are (9, 5.5).

c) Answers may vary. For example:

Any point on the perpendicular bisector of PS will be equidistant from the two schools.

d) Find the slope of PS.

$m_{PS} = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{8-3}{14-4}$

$= \frac{5}{10}$

$= \frac{1}{2}$

The slope of the right bisector of PS is –2. Substitute $m = -2$ and the coordinates of the midpoint to find b.

$y = mx + b$

$5.5 = -2(9) + b$

$5.5 = -18 + b$

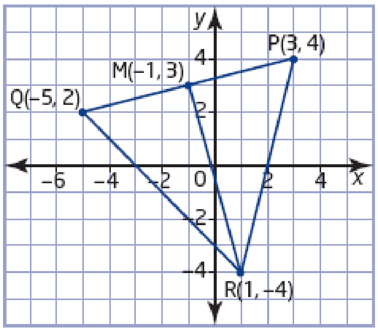
$23.5 = b$

$y = -2x + 23.5$

The equation of the right bisector of PS is $y = -2x + 23.5$.

Chapter 2 Chapter Test **Question 9** **Page 104**

a)



b) Find the coordinates of the midpoint, M, of QP.

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$
$$= \left(\frac{-5+3}{2}, \frac{2+4}{2}\right)$$
$$= (-1, 3)$$

Find the slope of the median.

$$m_{MR} = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{-4-3}{1-(-1)}$$
$$= \frac{-7}{2}$$
$$= -\frac{7}{2}$$

Substitute $m = -\frac{7}{2}$ and the coordinates of one endpoint, say $(-1, 3)$, to find b.

$$y = mx + b$$
$$3 = -\frac{7}{2}(-1) + b$$
$$3 = \frac{7}{2} + b$$
$$-\frac{1}{2} = b$$

The equation of the median from vertex R is $y = -\frac{7}{2}x - \frac{1}{2}$.

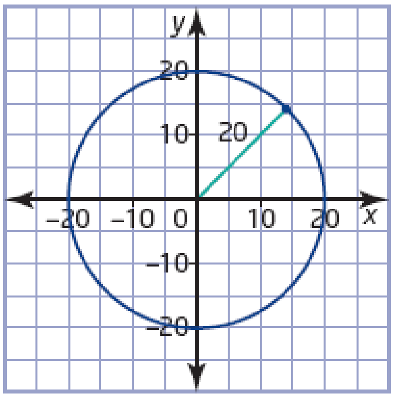
c) Find the slope of side QP.

$$m_{QP} = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{4-2}{3-(-5)}$$
$$= \frac{2}{8}$$
$$= \frac{1}{4}$$

The slope of QP is not the negative reciprocal of the slope of RM. The median is not an altitude.

Chapter 2 Chapter Test Question 13 Page 105

a)



b) The boundary of the area is described by the equation $x^2 + y^2 = 400$.

c)

$$r_1 = \sqrt{x^2 + y^2}$$
$$= \sqrt{(-8)^2 + 16^2}$$
$$= \sqrt{64 + 256}$$
$$= \sqrt{320}$$
$$\doteq 17.9$$

Since $r_1 < 20$, Arif is inside the circle.

$$r_1 = \sqrt{x^2 + y^2}$$
$$= \sqrt{4^2 + 20^2}$$
$$= \sqrt{16 + 400}$$
$$= \sqrt{416}$$
$$\doteq 20.4$$

Since $r_1 > 20$, Diane is outside the circle.

Arif is in range, but Diane is not.

d)
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(-8 - 4)^2 + (16 - 20)^2}$$
$$= \sqrt{(-12)^2 + (-4)^2}$$
$$= \sqrt{160}$$
$$\doteq 12.6$$

Diane and Arif are about 12.6 km apart. They are within range of each other.