Review for FINALS

15% TERM TEST #1   date_____

15% TERM TEST #2   date_____

FORMULAS GIVEN ON EXAM:

FORMULAS:

$$y = mx + b$$

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

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

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

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

$$y = ax^2 + bx + c$$

$$y = a(x - h)^2 + k$$

$$y = a(x - r)(x - t)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

On Term Test #1 – 75min:

Total 4 pages & 8 questions (some with a,b,c…)

UNITS
Trigonometry
Algebra
Linear Systems

On Term Test #2 – 75min:

Total 4 pages & 7 questions (some with a,b,c…)

UNITS
Quadratics – long unit
Geometry

Linear Systems

1. Solve this system of linear equations using *substitution* and check

$$5x - y = 27$$
$$2y = x + 9$$

2. Solve this system of linear equations using *elimination* and check

$$2x - 5y = 3 \quad \text{and} \quad 3x + 2y = 14$$

3. Below are three systems of equations:

(A) $y = -6x + 10$

$y = \frac{5}{2}x + 7$

(B) $4x + 10y + 100 = 0$

$2x + 5y + 50 = 0$

(C) $-15x + 5y + 10 = 0$

$y = 3x + 5$

DO NOT solve these systems!

State how many solutions each system has. (Hint: isolate y to find out m and b)

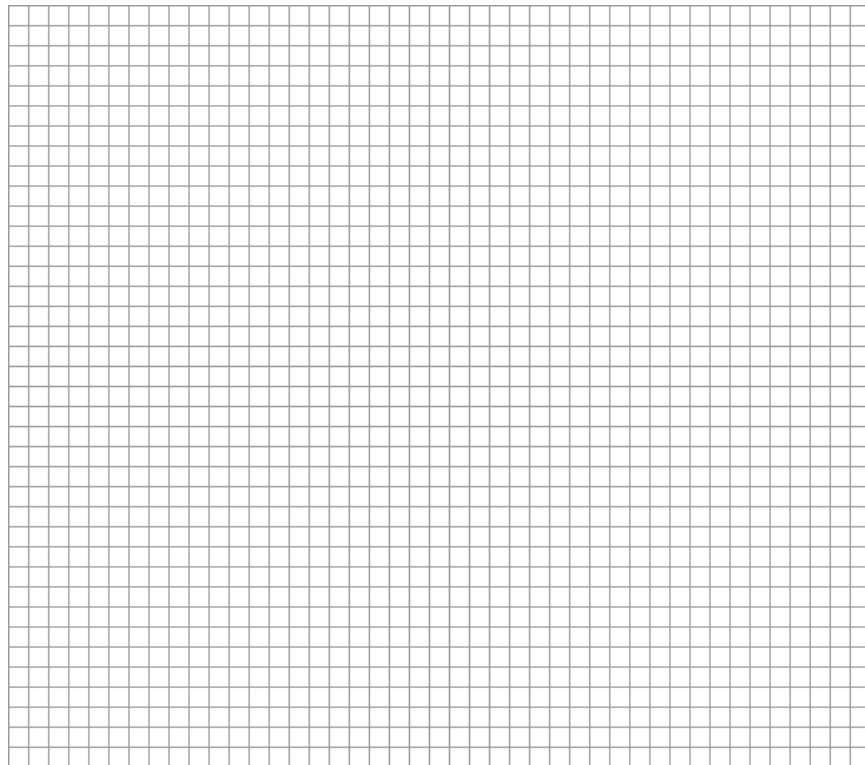<u>Explain</u> your answer

(A) Number of solutions _____
Reason:

(B) Number of solutions _____
Reason:

(C) Number of solutions _____
Reason:

④ 4. Solve the following system of linear equations *graphically* by drawing the graph of each equation on the same set of axes

$$x + 2y = 2$$
$$3x + 2y = -6$$

Isolate y in equation one:

m=

b=

Isolate y in equation two:

m=

b=

Graph the two lines

Check in both

5. Movies -To - Go has no membership fee and rents videos for $3 each. Universal Videos has a yearly membership fee of $15 and charges $2 per video

Write two equations to represent the cost of renting videos at these stores for ONE year. Define your variables.

Solve this system using a method of your choice. (graphing, substitution or elimination)

6. A sales clerk can choose from two salary plans:
Plan A: $750 per week plus 4% commission
Plan B: $700 per week plus 5% commission

Write two equations to represent the earnings for these plans for ONE week. Define your variables.

Solve this system using a method of your choice. (graphing, substitution or elimination)

What does the solution of this system represent?

What does the solution of this system represent?

Analytic Geometry

Calculate **distance, slope and midpoint** for the line segment with endpoints $A(9,10)$ and $B(-3,4)$

1. Distance: 2. Slope: 3. Midpoint:

Finding the equation of a line $y = mx + b$

4. Given slope and a point:

$m = \dfrac{1}{2}$ and point $(-3,-2)$
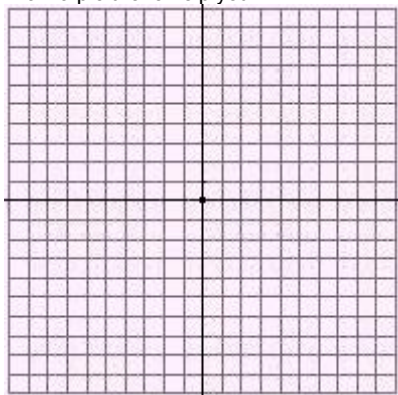
5. Given two points:

$(6,-8)$ and $(-2,4)$

Finding the equation of a PERPENDICULAR line

6. Find the equation of a line perpendicular to $y = -\dfrac{2}{5}x + 3$ and passing through the point $(4,-1)$

7. Finding a **point** that lies on **two** given lines

$y = -\dfrac{1}{2}x$ and $y = 2x + 10$

8. Find the equation of the **median** line from vertex A in $\triangle ABC$ with coordinates $A(-3,-1)$, $B(3,5)$ and $C(7,-3)$

Draw a picture to help you

9. Find the equation of the **perpendicular bisector** of the line segment joining two points $A(-1,4)$ and $B(3,-2)$

Draw a picture to help you
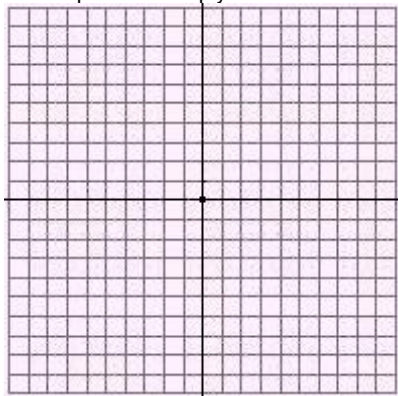
10. Explain how you would find the **orthocentre (intersection of altitudes)** in $\triangle ABC$ with coordinates $A(-3,-1)$, $B(3,5)$ and $C(7,-3)$ Outline all the steps and include a labeled diagram. (do NOT need to solve)
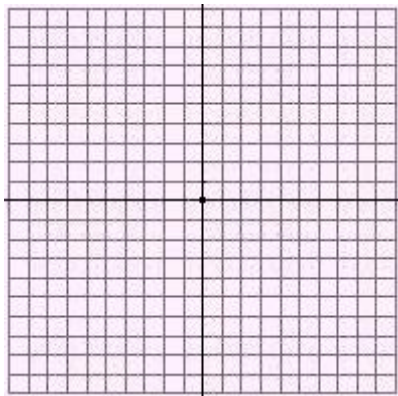
11. Find the **shortest distance** from line $3x - 5y = 15$ to the point $(0,0)$
     Outline all the steps and include a labeled diagram. (DO solve)
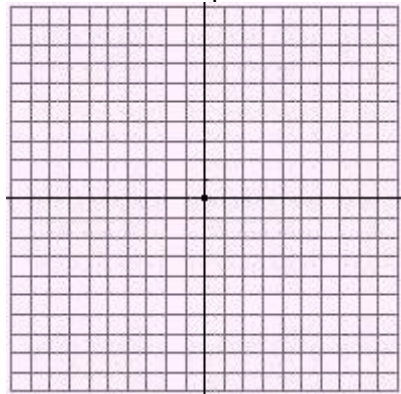
12. Classify the following quadrilateral with vertices at the coordinates: $A(-5,1)B(3,3)C(4,-1)D(-4,-3)$
                              Find all slopes: Find all side lengths:
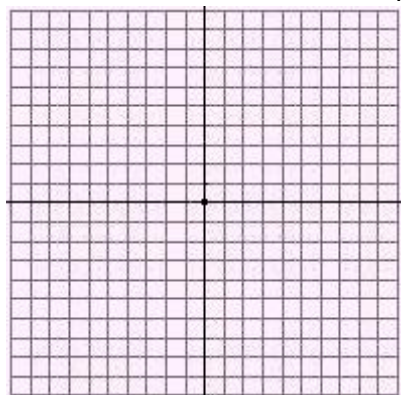
     Conclusion:

13. State the equation of a the circle centered at (0,0) that has a diameter 18.

14. What is the radius of the circle whose equation is

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

15. State the equation of the circle that is centered at (0,0) and that passes through the point (-3, 4)

16. What is the radius of the circle if the endpoints of the diameter are (-8, 6) and (8, -6)

17. A stone is dropped into a pond and it sends out a circular ripple whose radius increases by 3 cm/s. Find the equation of the circle 12 s after the stone is dropped.

18. For the line segment PQ the coordinates of P are $(-2,7)$ and the coordinates of the **midpoint** are $(3,6)$. What are the coordinates of the **other endpoint Q**?

Quadratics

Answer the following questions by analyzing the given graph of a quadratic function.

1.
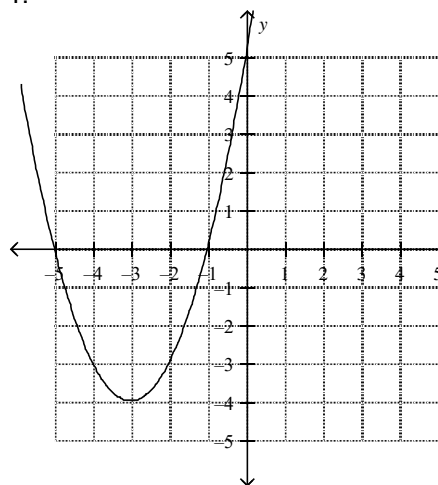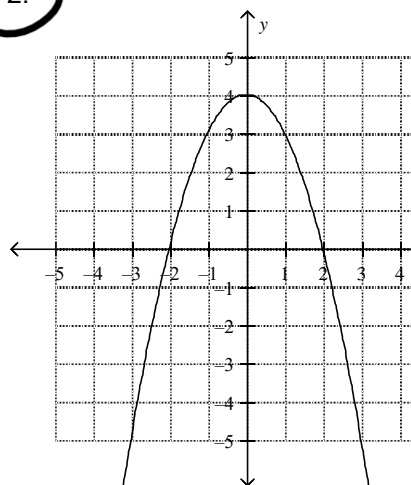

i) Axis of symmetry is
x = _____

ii) Optimal value is a _____
(max/min)

it has a value of
y = _____

iii) vertex is
(,)

iv) y-intercept is

v) x-intercepts/zeros/roots are

2.

i) Axis of symmetry is
x = _____

ii) Optimal value is a _____
(max/min)

it has a value of
y = _____

iii) vertex is
(,)

iv) y-intercept is

v) x-intercepts/zeros/roots are

3. Identify what characteristics of the quadratic (ie. Direction of opening, vertex, zeros) you can find very quickly, given
    a. Standard Form

    b. Factored Form

    c. Vertex Form

4. Explain what you need to do to convert
    a. Standard form to Factored form

    b. Standard form to Vertex form

    c. Factored form to Standard form

    d. Vertex form to Standard form

    e. Factored form to Vertex form

    f. Vertex form to Factored form

Practice EXPANDING by FOIL

5. $(5x-7)(4x+3)$

6. $(3-2x)(x+5)$

7. $2(4x-3)^2$

8. $2(x-7)(5x+3)-(2x-1)^2$

Practice FACTORING

9. $2x^2-8x$

10. x^2-36

11. $x^2-8x+16$

12. $3x^2+14x+8$

Practice COMPLETING THE SQUARE

13. $y = x^2 + 6x - 3$

14. $y = -2x^2 + 8x - 11$

State all the transformations on the given quadratics

15. $y = -3(x+1)^2 - 4$

16. $y = 0.5(x-5)^2$

17. $y = -x^2 + 3$

18. $y = (x-40)^2 - 20$

State the equations of the following parabolas

19. State the equation in *factored form*, given that the parabola has zeros at -3, and 4 and a y-intercept of 2

20. State the equation in *vertex* form given the parabola has a vertex of (-5, -7) and that the graph goes through the point (-1, 11)

21. State the equation in *vertex form* given that the quadratic has a MAXIMUM of y = -4, is shifted to the right by 6 units and is stretched by factor of 2

22. State the equation in *vertex form* given that the quadratic opens up, is not stretched, has an axis of symmetry of x=-8 and shifted down by 5 units.

Find EVERYTHING about each quadratic

23. $y = x^2 - 5x + 4$	24. $y = -(x-1)^2 + 9$	25. $y = (x+6)(2-x)$
i) This quadratic is in _____ (factored/standard/vertex) form	**i)** This quadratic is in _____ (factored/standard/vertex) form	**i)** This quadratic is in _____ (factored/standard/vertex) form
ii) direction of opening	**ii)** direction of opening	**ii)** direction of opening
iii) optimal value is a _____ (max/min)	**iii)** optimal value is a _____ (max/min)	**iii)** optimal value is a _____ (max/min)
iv) state the coordinates of the vertex(Hint: complete the square)	**iv)** state the coordinates of the vertex	**iv)** state the coordinates of the vertex (Hint: middle of zeros)
optimal value is y = ____ and it occurs at x = ____	optimal value is y = ____ and it occurs at x = ____	optimal value is y = ____ and it occurs at x = ____
v) find the y-intercept	**v)** find the y-intercept	**v)** find the y-intercept
vi) find the x-intercepts (Hint: factor)	**vi)**find the x-intercepts(Hint: isolate x)	**vi)** find the x-intercepts
vii)sketch the graph on grid	**vii)**sketch the graph on grid	**vii)**sketch the graph on grid
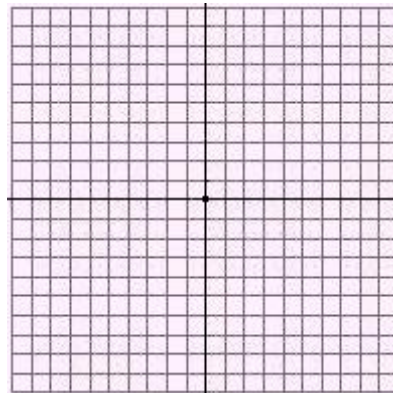
State the number of zeros each quadratic has without graphing or solving
(Hint: if the parabola is in vertex form - look at the sign of 'a' and 'k'

if the parabola is in standard form - look at $b^2 - 4ac$)

26. $y = -2(x+5)^2 - 3$	27. $y = 3(x-1)^2$
28. $y = (x-2)^2 - 4$	29. $y = 3x^2 - 6x + 10$
30. $y = 5x + 2x^2 - 6$ (hint: watch the order!)	31. $y = x^2 + 10x + 25$

There are three different ways to SOLVE quadratics, ie. find zeros/roots/x-intercepts (y=0 there)
- ☐ Factoring and setting each bracket to zero (this method does not always work - some quadratics can NOT be factored)
- ☐ Completing the square and isolating x
- ☐ Quadratic Formula

Practice SOLVING by factoring

32. $x^2 = 2x + 48$ (Hint: bring all terms to one side first)	33. $2x^2 + 9x + 4 = 0$

Practice SOLVING using the quadratic formula

34. $-3x^2 + 12x - 7 = 0$	35. $x^2 - 4x - 1 = 0$

Word Problems
- ☐ Type 1 – substitute the given values and SOLVE (see section above Questions #32 - #35)
- ☐ Type 2 – the word problem uses the words *maximize/minimize/largest/smallest* etc. (you need to find the vertex and analyze it)

---

36. A pyrotechnic is designing a fireworks display to set off from the top of a 105-m cliff. The path of one rocket can be described by the quadratic function $y = -5(x-2)^2 + 125$ where x is time (in seconds) and y is the height (in metres) of the rocket from ground level.

a) What is the vertex of this parabola?

b) What maximum height does the rocket reach?

c) When does the rocket reach its maximum height?

37. A supporting arch of a bridge can be represented by the quadratic function $y = -0.0625x^2 + 9$, where x is the horizontal distance (in metres) and y is the height of the arch (in metres).

a) What is the vertex of this parabola?

b) What is the maximum height of the arch?

c) If the x-intercepts represent the beginning and the end of the arch, how wide is the base of the arch?

---

38. Student council is selling cookies for $1.50 each. Last week they sold 600 cookies. They noticed that if they reduce the price by $0.25, twenty more cookies would be sold. Determine the price that would maximize the revenue for the student council.

39. The quadratic function $y = -x^2 + 3x + 10$ models the path of a stone thrown from the top of a cliff, where x represents the horizontal distance of the stone (in metres) from the cliff and y is the height of the stone (in metres) above the ocean.

a) Find the x- and y-intercepts.

x-intercepts: (Finish factoring and solve)

$y = -(x^2 - 3x - 10)$

$0 = -(\underline{\quad\quad})(\underline{\quad\quad})$

y -intercept: (sub x=0 and solve)

b) Are all of the intercept values reasonable in this context? Explain.

c) How high is the cliff above the water?

d) What is the maximum height of the stone?

e) How far from the base of the cliff does the stone hit the water?

40. A water balloon is catapulted into the air so that its height h, in metres after t seconds is given by the relation: $h = -4.9t^2 + 27t + 2.4$

a) How high is the balloon after 1 second?

b) How long does it take for the balloon to reach 30 m in height?

c) What is the maximum height the balloon will reach?

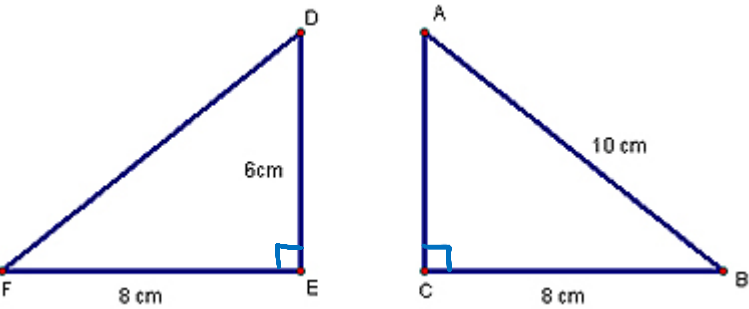**d)** When will the balloon hit the ground?

41. For a park swimming area, 840 m of line is used to mark off the permissible area. One side not roped off is next to the beach. Find the dimensions of the swimming area that will make it a maximum.
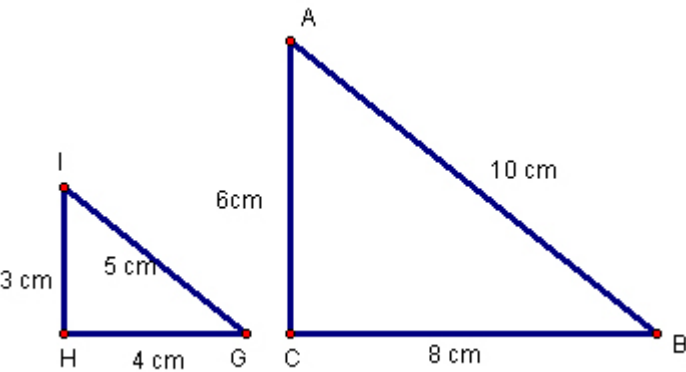
l

w | A
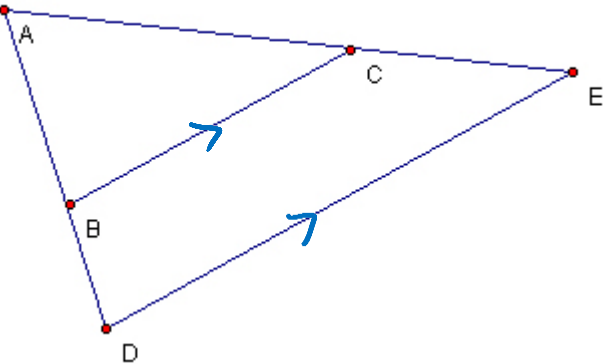
SHORE
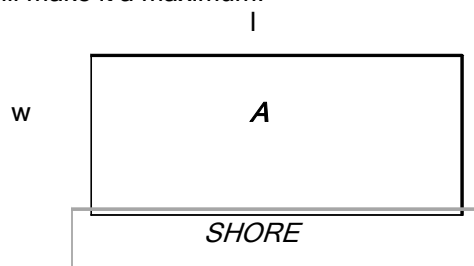
Trigonometry

1. Prove the following triangles are congruent

Show congruent	Justification

2. Prove the following triangles are similar

Show similar	Justification

3. Prove the following triangles are similar

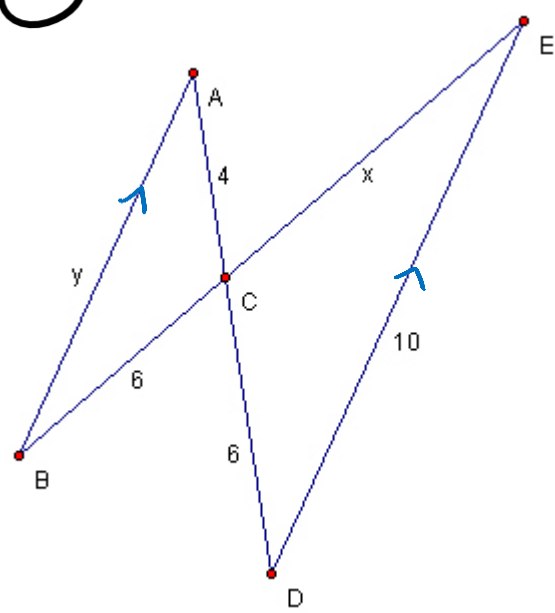| Show similar	Justification

4. A person 1.9 m tall casts a shadow 3.8 m long. At the same time a tree casts a shadow 18 m long. Find the height of the tree.

Diagram	Show similar	Justification	Find the height of the tree

5. Show the triangles are similar, then find the unknown measures

Show similar	Justification	Find x and y

6. Show the triangles are similar, then find the unknown measures
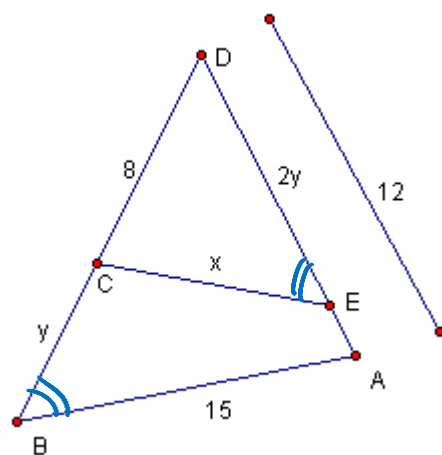
Show similar	Justification	Find x and y

7. Bill placed a mirror on the ground 5 m from the base of a flagpole. He stepped back until he could see the top of the flagpole reflected in the mirror. Bill is 1.5 m tall and saw the reflection when he was 1.25 m from the mirror. How high is the flagpole?
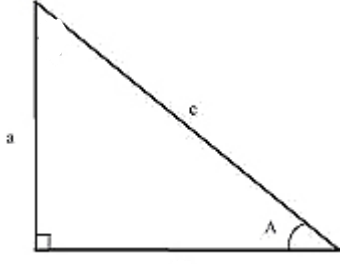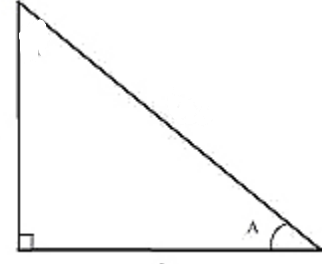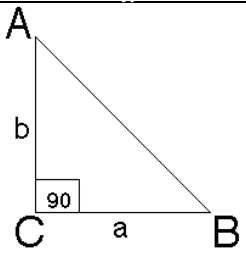
Diagram
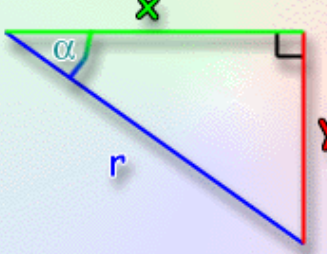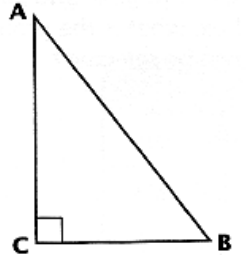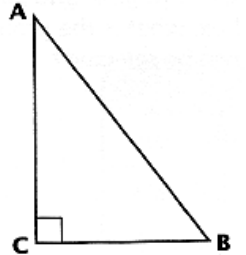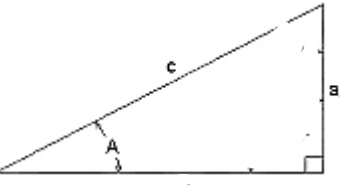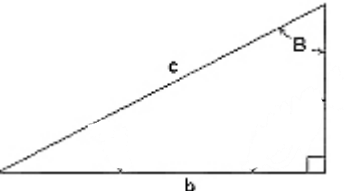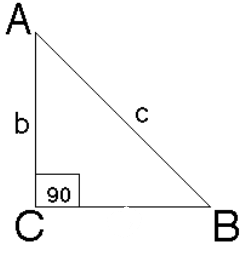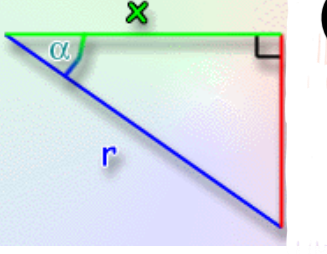
Show similar	Justification	Find the height

Solving *Right* Triangles - involves using SOH CAH TOA and Pythagorean Theorem
Solving *Non-Right* Triangles - involves using the Sine and Cosine Laws

Practice Solving RIGHT Triangles:

8. Find the following measures

	a) $A=28°$ $c=15$ cm $a=$ _____		**b)** $a=7$ cm $b=4$ cm $<A=$ _____
	c) $a=14$ cm $<B=70°$ $b=$ _____		**d)** $x=7$ cm $r=18$ cm $y=$ _____
	e) $a=20$ cm $b=15$ cm $<B=$ _____		**f)** $<B=42°$ $c=15$ cm $b=$ _____
	g) $a=17$ cm $<A=40°$ $c=$ _____		**h)** $<B=85°$ $c=13$ cm $b=$ _____
	i) $b=6$ cm $c=8$ cm $<A=$ _____		**j)** $α=39°$ $x=17$ cm $r=$ _____

9. From a helicopter flying at a height of 1625 m, the angle of depression to the landing pad is 36°. How far is the pad from the helicopter to the nearest meter?

Diagram	Solution

10. A carpenter leans a 4 m ladder against a wall. It reaches 3.5 m up the wall. Find the angle the ladder makes with the wall.

Diagram	Solution

11. A rocket is launched at an angle of 80° to the ground and travels in a straight line. What is the rocket's altitude when it has travelled for 15 km?

Diagram	Solution

12. The angle of elevation from the top of 16 m building to the top of the second taller building is 48° . The buildings are 30 m apart. How high is the taller building?

Diagram	Solution

Practice Solving NON-RIGHT Triangles:

13. Express all forms of the sine law and the cosine law for $\triangle KLM$

Sine law	Cosine law	
_____ = _____ = _____ _____ = _____ = _____	$k^2 =$ $l^2 =$ $m^2 =$	$\cos K =$ $\cos L =$ $\cos M =$

14. Fill out this table to remind yourself when to use which law

Number of known sides	Number of known angles	Method of solution
1	2	
2	1(uncontained)	
2	1(contained)	
3	0	

The contained angle in triangle is the angle between the two given sides.

15. In $\triangle ABC$, $a = 4$ cm, $\angle A = 49^o$, and $\angle B = 73^o$. How long is b ?

Diagram	Solution

16. In $\triangle PWR$, $w = 5.4$ cm, $r = 6.2$ cm, and $\angle W = 56^o$. Find the measure of $\angle R$.

Diagram	Solution

17. Allison is flying a kite and has let out the entire 150 m ball of kite string. She notices that the string forms a 70° angle with the ground. Marc is on the other side of the kite and sights the kite at an angle of elevation of 30⁰. How far is Marc from Allison, to the nearest meter?

Diagram	Solution

18. In $\triangle CAT$, $c = 6.4$ m, $a = 4.0$ m, and $\angle T = 65^o$. How long is the side t ?

Diagram	Solution

19. An isosceles triangle has sides 8 cm, 12 cm and 12 cm. Find the measures of the angles in the triangle.

Diagram	Solution

20. Two airplanes leave the airport at the same time. One travels 355 km/h and the other at 450 km/h. Two hours later they are 800 km apart. Find the angle between their courses.

Diagram	Solution

21. Solve (find all sides and all angles) $\triangle MAT$, given that $m = 6.8$ cm, $t = 4.2$ cm, and $\angle A = 68^o$

Diagram	Solution

22. From the top of an 8 m house, the angle of elevation to the top of the school's flagpole across the street is 9°. The angle of depression is 42° to the bottom of the pole. How tall is the flagpole?

Diagram	Solution

23. A baseball diamond is a square that is about 30 m on a side. The pitcher's mound is about 20 m from home plate on the diagonal from home to second base, (closer to home plate, not in the middle). How far does the pitcher have to throw the ball to first base, to the nearest meter?

Diagram	Solution

ALL TYPES of WORD PROBLEMS – use a separate piece of paper

Linear System Word problems

1. A sports club charges an initiation fee and a monthly fee. At the end of 5 months, a member had paid a total of $275. At the end of 10 months, she had paid a total of $400. What is the initiation fee? What is the monthly charge?

2. For the school play, one adult ticket costs $5.00 and one student ticket costs $3.00. Twice as many student tickets as adult tickets were sold. The total receipts were $1650. How many of each kind of ticket were sold?

3. Five kilograms of tea and 8 kg of coffee cost $58. The price of tea increases by 15% and that of coffee by 10%. The new cost is $65.30. What are the new prices for 1 kg of tea and 1 kg of coffee?

4. A police car arrives at the scene of a robbery of The Fifth National Bank of Hometown, just as the thief in a get-away car round a corner 1000 yards away. The police car chases after the thief at an average speed of 70mph. If the get-away car averages 55mph, how long will it be before the cop catches the thief? [1000 yards = 0.5682 miles]

5. Two cars leave a gas station at the same time, one traveling north and the other south. The northbound car travels at 50mph. After 3 hours, the cars are 345 miles apart. How fast is the southbound car traveling?

6. You have already invested $550 in a stock with an annual return of 11%. How much of an additional $1100 should be invested at 12% and how much at 6% so that the total return on the entire $1650 is 9%?

Quadratic Word problems

7. A field bounded on one side by a river is to be fenced on three sides so as to form a rectangular enclosure. 200 feet of fencing is to be used, what dimensions will yield an enclosure of the largest possible area?

8. At the Mini Market, as the price of milk drops, sales increase. On an average day, a 4L bag of milk costs $3.90, and the store sells an average of 120 bags. Studies have shown that for each $0.10 reduction in price, sales increase by 20 bags per day. Find what price will make the revenue maximum

9. A corner lot has dimensions 25 by 40 yards. The city plans to take a strip of uniform width along the two sides bordering the streets to widen these roads. How wide should the strip be if the remainder of the lot is to have an area of 844 square yards?

10. A rectangle is twice as long as it is wide. If it has an area of 24.5 sq inches, what are its dimensions?

11. The average of two real numbers is 41.125. What are the numbers to create maximum product?

12. A 15-foot-long pole leans against a wall. The bottom is 9 feet from the wall. How much further should the bottom be pulled away from the wall so that the top moves the same amount down the wall?

Trig Word problems

13. A ladder leans against a building forming an angle of 50 degrees with the ground. The base of the ladder is 8 feet from the building. Determine the length of the ladder

14. Frank is standing 110 yards from 32-yard high waterfall. What angle does he look at to see the top?

15. A train is traveling up a slight grade with an angle of inclination of only 2 degrees. After traveling 1 mile what is the vertical change in feet?
[1 mile = 5280 feet]

16. The course for a bike race follows a triangular shaped trail. The first leg is a straight 6-kilometer ride. After that, the biker must turn 283° to the left and follow the trail to the next turn. Turning 269° again to the left will take the biker to the finish line, which is exactly where he started. How long is the entire race?

17. A building is of unknown height. At a distance of 100 feet away from the building, an observer notices that the angle of elevation to the top of the building is 41º and that the angle of elevation to a poster on the side of the building is 21º. How far is the poster from the roof of the building?

18. Two points, A and B, are on the same side of a tower in the same line as the tower. Then angle of elevation of the top of the tower from Point A is 28º. Point B is closer to the tower, 140 m from point A. The angle of elevation of the top of the tower from point B is 37º. Determine the height of the tower.

19. An observer is near a river and wants to calculate the distance across the river. He measures the angle between his observations of two points on the shore, one on his side and one on the other side, to be 28º. The distance between him and the point on his side of the river can be measured and is 300 feet. The angle formed by him, the point on his side of the river, and the point directly on the opposite side of the river is 128º. What is the distance across the river?

20. You are heading to Beech Mountain for a ski trip. Unfortunately, state road 105 in North Carolina is blocked off due to a chemical spill. You have to get to Tynecastle Highway which leads to the resort at which you are staying. NC-105 would get you to Tynecastle Hwy in 12.8 miles. The detour begins with a 18 veer off onto a road that runs through the local city. After 6 miles, there is another turn that leads to Tynecastle Hwy. Assuming that both roads on the detour are straight, how many extra miles are you traveling to reach your destination?
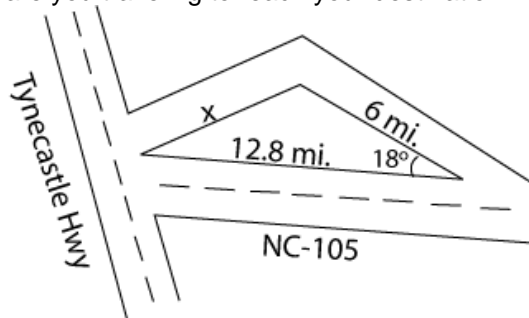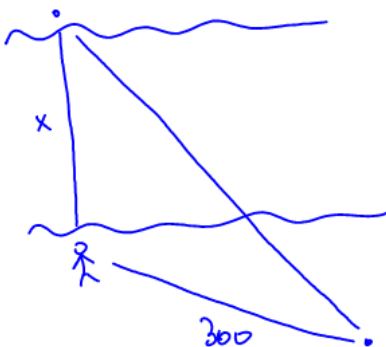
21. To approximate the length of a lake, a surveyor starts at one end of the lake and walks 245 yards. He then turns 110° and walks 270 yards until he arrives at the other end of the lake. Approximately how long is the lake?

110°

70°

245 yd.

270 yd.

x
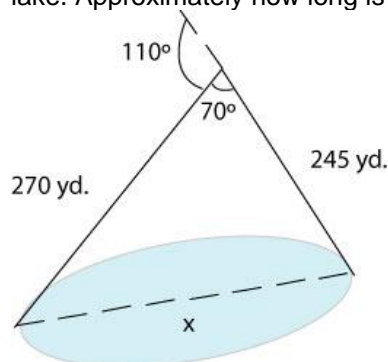
22. After the hurricane, the small tree in my neighbor's yard was leaning. To keep it from falling, we nailed a 6-foot strap into the ground 4 feet from the base of the tree. We attached the strap to the tree 3½ feet above the ground. How far from vertical was the tree leaning?

6 ft

3.5 ft

4 ft
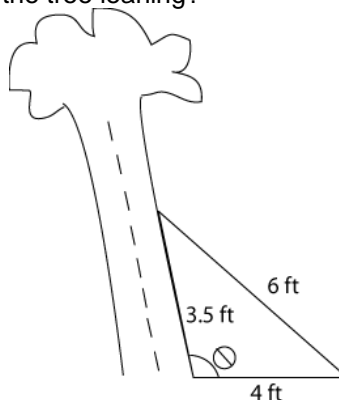
Mix of Word problems

23. A train leaves New York for Boston, 200 miles away, at 3:00pm and averages 75mph. Another train leaves Boston for New York on an adjacent set of tracks at 5:00pm and averages 45mph. At what time will the trains meet?

24. The diameter of a circle is 16 cm. By what amount must the radius be decreased to decrease the area by 48π square centimeters?

25. A 13-foot-long ladder leans on a wall. The bottom of the ladder is 5 feet from the wall. If the bottom is pulled out 3 feet further from the wall, how far does the top of the ladder move down the wall?

26. A worker gets an 8% pay raise and now makes $1600 per month. What was the worker's old salary?

27. A concrete walk of uniform width is to be build around a circular pool, as shown in the diagram. The radius of the pool is 12 meters. If enough concrete is available to cover 52π square meters, how wide should the walk be?

12 m

28. An aging king decides it was time to divide his vast land among his three daughters, Goneril, Regan and Cordelia. He decided to have the race for the amount of land that they would acquire. Each would get a square piece that was as large as the square of the distance they ran in 1hour. Goneril's average speed was 2mph less than Regan's, but 3mph faster than Cordelia. After the race the king awarded 109 sq miles of land in total, how much land did the king leave to Cordelia?
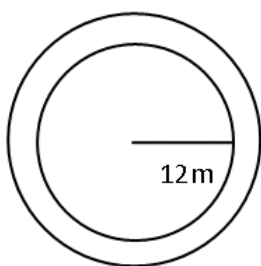
ANSWERS

Linear Systems
1. (7, 8)
2. (4, 1)
3. (A) - one solution (slopes are different)

(B) - infinitely many solutions (slopes and y - intercepts are the same)

(C) - no solutions (slopes are the same but different y-intercepts)

4. (-4, 3)
5. Let y be the total cost
Let x by the number of videos rented.
$y = 3x$ $y = 2x + 15$ Solution (15, 45)
Meaning: renting 15 movies results in the same cost ($45) at both stores.
6. Let y be the total salary.
Let x be the dollar value of sales
$y = 750 + 0.04x$ $y = 700 + 0.05x$
Solution (5000,950)
Meaning: the amount of total sales that gives the same weekly salary for each plan.

Analytic Geometry

1. Distance = $6\sqrt{5}$

2. Slope = $\dfrac{1}{2}$

3. Midpoint = (3, 7)

4. $y = \dfrac{1}{2}x - \dfrac{1}{2}$

5. $y = -\dfrac{3}{2}x + 1$

6. $y = \dfrac{5}{2}x - 11$

7. (-4, 2)

8. $M_{BC} = (5,1)$ $m_{AM} = \dfrac{1}{4}$

$y = \dfrac{1}{4}x - \dfrac{1}{4}$

9. $M_{AB} = (1,1)$ $m_{AB} = -\dfrac{3}{2}$

$m_{\perp} = \dfrac{2}{3}$ $y = \dfrac{2}{3}x + \dfrac{1}{3}$

10. Find slope of BC. Take negative reciprocal for slope of altitude through A. Find equation of the altitude from A.

Find slope AC. Take negative reciprocal for slope of altitude through B. Find equation of the altitude from B.

Find the point of intersection of the above two lines.

11. isolate y in the given equation to find the slope of the given line: $m = \dfrac{3}{5}$. Find equation of perpendicular line: $y = -\dfrac{5}{3}x$.

Intersection of two lines is $\left(\dfrac{45}{34}, -\dfrac{75}{34}\right)$

Distance between this point and (0,0) is

$d = \dfrac{15\sqrt{34}}{34} \approx 2.6$

12. Rectangle, show two pairs of sides equal and parallel and two pairs of slopes perpendicular.

13. $x^2 + y^2 = 81$

14. r = 6

15. $x^2 + y^2 = 25$

16. r = 10
17. $x^2 + y^2 = 36^2 = 1296$
18. Q = (8,5)

Quadratics
1. i) x= -3 ii) Min value y = -4 iii)(-3, -4)
iv) y-int = 5 v) x = -5 and x = -1
2. i) x= 0 ii) Max value y = 4 iii)(0, 4)
iv) y-int = 4 v) x = -2 and x = 2
3. a) Direction of opening
b) zeros c) vertex and direction of opening
4. a) Factor b) Complete the square
c) Expand d) Expand e) Expand and complete the square f) Expand and factor

5. $20x^2 - 13x - 21$

6. $-2x^2 - 7x + 15$

7. $32x^2 - 48x + 18$

8. $6x^2 - 60x - 43$

9. $2x(x - 4)$

10. $(x + 6)(x - 6)$

11. $(x - 4)^2$

12. $(x + 4)(3x + 2)$

13. $y = (x + 3)^2 - 12$

14. $y = -2(x - 2)^2 - 3$

15. reflected in x-axis, stretched by 3, shifted left by 1, shifted down by 4
16. no reflection, compressed by 1/2, shift right by 5, no shift up/down
17. reflected in x-axis, no stretch, no shift left/right, shifted up by 3
18. no reflection, no stretch, shift right by 40, shift down by 20
19. sub zeros in and get:
$y = a(x + 3)(x - 4)$ then sub yint(0,2)
and solve for a:
$y = -\dfrac{1}{6}(x + 3)(x - 4)$

20. sub the vertex and get:
$y = a(x + 5)^2 - 7$ the sub pt (-1,11) and solve for a:
$y = \dfrac{9}{8}(x + 5)^2 - 7$

21. $y = -2(x - 6)^2 - 4$

22. $y = (x + 8)^2 - 5$

23. i) standard ii) up iii) Min
iv)complete the square and get:
$y = \left(x - \dfrac{5}{2}\right)^2 - \dfrac{9}{4}$ so vertex is $\left(\dfrac{5}{2}, -\dfrac{9}{4}\right)$
v) y-int = 4 vi) x=1and x=4
24. i) vertex ii)down iii) Max iv) (1, 9)
v) y-int=8 vi) x=4 and x= -2
25. i) factored ii) need to expand and look at the coefficient of x^2 - down iii) Max
iv) (-2, 16) v) y-int= 12 vi) x= -6 and x=2
26. no zeros (a and k are both negative)
27. one zero (k is zero)
28. two zeros (a is positive and k is neg.)
29. no zeros (b^2-4ac is negative)
30. two zeros (b^2-4ac is positive)
31. one zero (b^2-4ac is zero)
32. x= -6 and x = 8

33. x = -4 and $x = -\dfrac{1}{2}$

34. $x = 2 + \dfrac{\sqrt{15}}{3}$ and $x = 2 - \dfrac{\sqrt{15}}{3}$

35. $x = 2 + \sqrt{5}$ and $x = 2 - \sqrt{5}$
36. a) (2, 125) b) 125 m c) 2 seconds
37. a) (0, 9) b) 9 m c) width is 24 m
38. Vertex (-12, 1620)
Price is $4.50
Quantity 360 cookies sold
Revenue is $1620 at max
39. a) x-int=5 and -2 y-int=10 b) NO, horizontal distance cannot be negative
c) when x=0 get the height of the cliff y=10 m d) max height is $\dfrac{49}{4}$ m

e)surface of the water is when y=0, the stone landed x= 5 m away
40. a) sub t=1 and get h = 24.5 m b)sub h=30, bring everything to one side and use quadratic formula to find t=1.36 and t=4.15 (the first solution is when the balloon reaches 30 m height on the way up and the second solution is when the balloon reaches the 30 m height on the way down.) c) max height is 39.6 m d) height on the ground is zero so sub h=0 and solve for t using quadratic formula and get t=-0.09 and t=5.60 (discard the negative solution)
41. $A = lw$ and $2w + l = 840$ sub second equation into the first and complete the square. After analyzing the vertex you should find w=210 m and l=420 m and A=88 200 m²

ANSWERS

Trigonometry

1.

EF=CB	Given
$\angle E = \angle C$	Given
AC=6	by Pythagorean theorem
$\triangle ABC \cong \triangle DFE$	by SAS $\cong$

2.

$\dfrac{IH}{AC} = \dfrac{3}{6} = \dfrac{1}{2}$	Check if ratios of sides are equal
$\dfrac{IG}{AB} = \dfrac{4}{8} = \dfrac{1}{2}$	
$\dfrac{GH}{BC} = \dfrac{5}{10} = \dfrac{1}{2}$	By SSS $\approx$
$\triangle ABC \approx \triangle IGH$	

3.

$\angle A$	Shared F-pattern
$\angle ABC = \angle D$	
$\triangle ABC \approx \triangle ADE$	By AA $\approx$

4. Show similar by AA $\approx$ (both have 90º and the sun's rays hit ground with the same angle) The height of the tree is 9m.

5. Show similar by AA $\approx$ (z-patterns and opposite angle) x = 9 and y = $\dfrac{20}{3}$

6. Show similar by AA $\approx$ (given angles and shared angle D) x = 10 and y = 4

7. Show similar by AA $\approx$ (both have 90º and reflected angles are equal) The flagpole is 6m tall.

8. a) 7.0cm b)60° c)38.5cm d)16.6cm e)37° f)10 cm g)26.4cm h)13.0cm i)41° j)21.9cm

9. 2765 m

10. 29°

11. 14.8 km

12. 49.3 m

15. 5.1 cm
16. 72°
17. 295 m
18. 5.9 m
19. 39° 70.5° and 70.5°
20. 58°
21. a=6.5 cm $\angle M = 76^o$ and $\angle T = 36^o$
22. 9.4m
23. 21 m

Word Problems

1. Initiation $150, monthly $25
2. 300 students, 150 adults
3. Tea $6/kg, Coffee $3.50/kg
4. Thief travels 2.0834mi after turning the corner, takes 2.2728min to catch him
5. 65mph
6. $366.67 at 12% and $733.33 at 6%
7. 50ft by 100ft
8. $2.25
9. 2.5yd
10. 3.5in by 7in
11. 41.125 and 41.125
12. 3ft
13. 12.4ft
14. 16 º
15. 184.4ft
16. 13.1km
17. 48.5ft
18. 252.9m
19. 346.3ft
20. x=7.3yd, extra 0.5yd
21. 296.1 yd
22. 106 º from ground, 16 º from vertical
23. 5:25pm
24. 4cm
25. 1.75ft
26. $1481.48/month
27. 2m
28. 9mi²