# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Round 1
Arithmetic: Percent

1.) ________________________

2.) ________________________

3.) ________________________

1.) On day 1 Harry spent 20% of his birthday money. On day 2 Harry spent 40% of the remainder of his birthday money. On day 3 Harry spent 60% of the remainder of his birthday money from day 2. What percentage of his original birthday money now remained after day 3?

2.) Cassandra's piece of lasagna was 60% the size of Dillon's. Dillon's piece was 25% larger than Ellen's piece. Fred's piece was only 20% the size of Dillon's piece. Gertrude noted that her piece was the average size of the five pieces of lasagna. What percent of Ellen's piece was Gertrude's piece?

3.) Albert invests his money such that it increases by 17% over six months. He then reinvests this total amount, which increases by 10% over the next six months. At the beginning of the same year Harriet invests her money such that it increases by 50% over the first four months. Harriet then reinvests this total amount, but the investment sours and she loses 40% of her investment over the next four months. Finally, she takes all her remaining money from that investment and it gains 10% of its value over the final four months of the year. If Albert and Harriet ended with exactly the same amount of money, then what percent of Albert's money did Harriet start with?

# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Round 2
Algebra I: Solving Equations

1.) ____________________

2.) ____________________

3.) ____________________

1.) Solve for $x$: $3x-\left(4-\left(4x-5-\left(5x-6^2\right)\right)\right)=63$

2.) Solve for $x$: $\dfrac{x^2+10}{(x-4)\left(x+\frac{1}{3}\right)}+\dfrac{5}{\left(x+\frac{1}{3}\right)}=\dfrac{6}{(x-4)}$

3.) Solve for $x$: $\left(\frac{2}{3}x-4\right)\left(\frac{9}{4}x+3\right)=\frac{3x}{2}\left(3x-\frac{5}{2}\right)+\left(\frac{7}{2}-\frac{1}{2}x\right)\left(6x+\frac{5}{2}\right)$

# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Round 3
Geometry: Triangles and Quadrilaterals

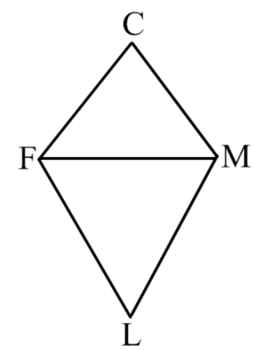
1.) ______________________

2.) ______________________

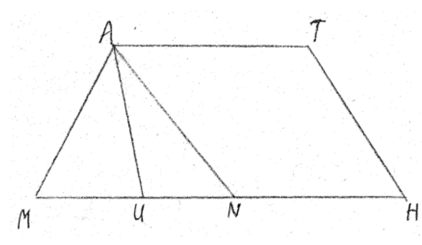
3.) ______________________

1.) The triangle *RAT* has a right angle at *T*. If $m\angle R = 2m\angle A - 12$, with angles being measured in degrees, then find $m\angle R$.

2.) Let *FCML* be a kite with $FC = CM$, $FL = ML$, $FM = 12$, $m\angle FCM = 90^\circ$, and $m\angle FLM = 60^\circ$. Find the perimeter of quadrilateral *FCML*.




3.) Trapezoid *MATH* has an acute angle at *M* and parallel sides $\overline{AT}$ and $\overline{MH}$. *U* and *N* are points on *MH*, with *N* between *U* and *H*. The lines $\overline{AU}$ and $\overline{AN}$ are trisectors of the angle *A*, and the number of degrees in $\angle MUA$ is *θ*. Find, in terms of *θ*, the number of degrees in $\angle MAT$.



# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Round 4
Algebra II: Systems of Equations

1.) ______ $x =$ ________ $y =$ ______

2.) ________________________

3.) ________________________

1.) Solve the following system for $x$ and $y$.

$$4x - 3y = 11$$
$$2x + y = -2$$

2.) Solve for $y$.

$$2(u+2)^2 - 5(y+2) = 2$$
$$3u^2 + 12u + 12 + 10y + 5 = 18$$

3.) If $a$, $b$, and $c$ are all 2-digit positive integers, then solve for $a$ given the following conditions:

$$4a + b - 19c = 0$$
$$2a + b - 14c = 0$$

# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Round 5
Trigonometry: Right Triangles

1.) ________________________

2.) ________________________

3.) ________________________

1.) Triangle *TAG* has altitude $\overline{AS}$. If $m\angle T = 30^\circ$, $m\angle G = 45^\circ$, and $TA = 12$, then what is the length of $\overline{AG}$?

2.) If $\Delta BOW$ has altitude $\overline{OS}$ with *S* on $\overline{BW}$ such that $BS = 8$, $\sin B = \frac{3}{5}$ and $\sin W = \frac{2}{5}$, then find the length of the longest side of $\Delta BOW$.

3.) Pierre Imaginatious walked 100 meters horizontally away from the base of a building. Looking at the building, Pierre stops to measure an angle of elevation to the top of the building of 60 degrees. After stopping, Pierre walks down a hill. At this point he has moved 100 meters horizontally and dropped $y$ meters. From this new vantage point he now measures that the angle of elevation to the top of the building is now 45 degrees. Find $y$.

# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Round 6
Coordinate Geometry: Coordinate Geometry

1.) ______________________

2.) ______________________

3.) ______________________

1.) Point $P_2$ is generated from point $P_1 = (a,b)$ by

-First, reflecting $P_1$ in the origin,
-Then, translating the point 2 to the right and 1 down,
-Then, reducing the vertical distance to the *x*-axis by a factor of 2.

List all points $(a,b)$ such that $P_2$ is the same point as $P_1$.

2.) Find all values of, *a* such that the four points $A(1,-1)$, $B(a,8)$, $C(10,12)$, and $D(8,6)$ form trapezoid $ABCD$.

3.) In pentagon $TABLE$ the vertices have coordinates $T=(-1,2)$, $A=(3,5)$, $B=(7,2)$, $L=(4,-2)$, and $E=(2,-2)$. Find the perimeter of the pentagon whose vertices are the midpoints of the segments of pentagon $TABLE$.

# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 1 Team Round

1.) Every year the caribou population of a nature preserve increases by 50% of its population that year, but decreases by 400% of the wolf population that year. Every year the wolf population of the nature preserve decreases by 50% of its population that year, but increases by 10% of the caribou population that year. On January 1st of 2011, there were 10 times as many caribou than there were wolves. What is the percent increase in the wolf population from January 1st of 2011 to January 1st of 2014?

2.) Solve for $x$: $(x-4)(x+3)+(x+2)(x+3)+9(x+2)=(x+1)^2+(x-3)(x+2)-4$

3.) While triangle *OCT* is not a 3:4:5 right triangle, its angles are in the ratio 3:4:5. If $\overline{OC}$ is ***not*** the longest side of the triangle and $OC=12$, then find all possible areas of triangle *OCT*.

4.) Find all real points $(a,b,c)$ which satisfy the following system of equations:

$$a(b+c)=0$$
$$b(a+c)=1$$
$$c(a+b)=-3$$

5.) Write the letters of all the following five statements which are true in the answer blank. In all cases, $0^\circ < x^\circ < 90^\circ$.

A. $\cot 40^\circ > \cos 5^\circ$

B. $\tan x^\circ > \tan\left(\dfrac{x+90}{2}\right)^\circ$

C. $\cot 50^\circ > \sec 50^\circ$

D. $\tan x^\circ + \tan\dfrac{x^\circ}{2} > \sec x^\circ + \sec\dfrac{x^\circ}{2}$

E. $\sin x^\circ - \sin\dfrac{x^\circ}{2} > \csc x^\circ - \csc\dfrac{x^\circ}{2}$

6.) Triangle *CAT* has points $C=(6,6a)$, $A=(3,8b)$, and $T=(6c,10)$. The midpoint of $\overline{AC}$ is $D=(3d,2)$. The midpoint of $\overline{AT}$ is $O=(8f,2)$. The midpoint of $\overline{CT}$ is $G=(5,10g)$. Find the product $a\cdot b\cdot c\cdot d\cdot f\cdot g$.