

**FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016**

Match 6 Round 1  
 Geometry: Lines  
 and Angles

1.) 28

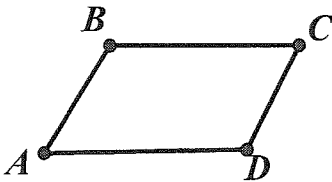
2.) 148.5

3.) 109.8, 129

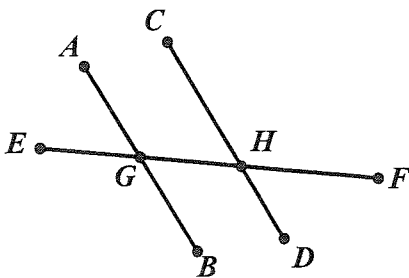
Note: Figures not necessarily  
 Drawn to scale

1.) Angle J is complementary to angle K. Twice the degree measure of angle J is 6 less than the degree measure of angle K. Find the degree measure of angle J.

2.) In parallelogram ABCD, twice the degree measure of angle A plus 5 less than three times the degree measure of angle C is 4 more than the degree measure of angle B. Find the measure of angle D.



3.)  $\overline{AB}$  is parallel to  $\overline{CD}$ . The lines are cut by transversal  $\overline{EF}$ , which intersects line  $\overline{AB}$  at G and  $\overline{CD}$  at H. If  $m\angle AGE = (67-8x)$  degrees and  $m\angle CHF = (5x^2+109)$  degrees, find all possible values of  $m\angle CHF$  in degrees.



# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 6 Round 2  
Algebra: Literal  
Equations

$$1.) x = \frac{2b-3d}{a-4c}$$

$$2.) y = -k - m$$

$$3.) z = \frac{e-1}{2e} + \frac{-1}{2}$$

1.) If  $a \neq 4c$ , solve the equation for  $x$  in terms of the other variables:

$$ax - 2b = 4cx - 3d$$

2.) If  $p \neq 2$  and  $m \neq k$ , solve for  $y$  in terms of  $k$ ,  $m$ , and  $p$

$$kpy + 2my + k^2p + 2m^2 = mpy + 2ky + m^2p + 2k^2$$

3.) If  $e \neq 0$ , solve for  $z$  in terms of  $e$ :  $5ez^2 + z + 1 = ez^2 + e - z$

**FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016**

Match 6 Round 3  
Geometry:  
Solids and  
Volumes

1.)  $\frac{144\pi}{\quad}$   $\text{in}^2$

2.)  $\frac{96\pi}{\quad}$   $\text{in}^3$

3.)  $\frac{5832 - 1458\pi}{\quad}$   $\text{in}^3$

1) A sphere has volume  $288\pi$  cubic inches. What is the surface area of the sphere in square inches?

2. The lateral area of a cone is its surface area excluding the base. If the lateral area of a cone is  $60\pi$  square inches and the radius, height, and slant height are all integer values of inches, what are all the possible values for the volume of the cone?

3. A cubical box of side 1.5 feet is used to stack cylindrical cans in layers of 6 cans x 6 cans. Each can has base radius 1.5 inches and height 4.5 inches. What is the volume of the space between the cube and the cylinders? Give your answer in cubic inches.

# FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 6 Round 4  
Radical  
Expressions and  
Equations

1.)  $\pm\sqrt{19}$

2.)  $\frac{187\sqrt[3]{4}}{4}$

3.)  $6558, -2$

1) Solve for all real values of x:

$$\sqrt[4]{x^2 - 3} + 5 = 7$$

2) Express as a single fraction in simplest radical form:

$$4\sqrt[3]{32} - \frac{5}{\sqrt[3]{16}} + 10\sqrt[3]{256}$$

3) Solve for all real values of x:  $4\sqrt[8]{x+3} - \sqrt[4]{x+3} = 3$

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 6 Round 5  
Polynomials and  
Advanced  
Factoring

1.) 2, 3, -5

2.)  $(x-2)(x+3)^2(x-3)^2$

3.)  $(x^2-2x+5)(x^2-3x+9)$

1.) Find the 3 integer zeros of  $x^3 - 19x + 30$ .

2.) Factor  $x^5 - 2x^4 - 18x^3 + 36x^2 + 81x - 162$  into 5 linear binomials with integer coefficients.

3) Given that  $1+2i$  is a complex zero of  $x^4 - 5x^3 + 20x^2 - 33x + 45$ , factor  $x^4 - 5x^3 + 20x^2 - 33x + 45$  into two quadratic trinomials with integer coefficients.

**FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-16**

Match 6 Round 6  
Counting and  
Probability

1.)  $\frac{(4, 2)}{15}$

2.)  $\frac{17}{35}$

3.)  $\frac{17}{35}$

1) For what ordered pairs  $(N, R)$  is the number of permutations of  $N$  objects equal to four times the number of combinations of  $N$  objects taken  $R$  at a time? Express your answers as ordered pairs  $(N, R)$ .

2.) At a certain company, 60% of the workers are female and 40% of the workers are male. 25% of the female workers are classified as managers, while 20% of the male workers are classified as managers. What is the probability that if you choose a manager at random that the manager is female?

3.) A regional board of education representing 2 towns has 4 members from each town. If a committee of 4 is randomly selected from the 8 board members, what is the probability that the committee contains at least 3 board members from either of the towns?

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 6 Team  
Round

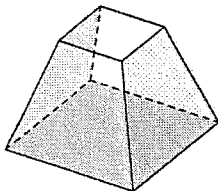
1.)  $C = 3A$  4.)  $-7$

2.)  $90$   $\text{cm}^2$  5.)  $(5x^2 + 2y^2 + 10xy)(5x^2 + 2y^2 - 10xy)$

3.)  $\frac{(\pi\sqrt{3} - 2)L^3}{2}$  6.)  $(5, 3], (16, 8]$

1) Four times the measure of  $\angle A$  is equal to the measure of the supplement of  $\angle B$ . The measure of  $\angle B$  is equal to the sum of the measures of the complements of  $\angle A$  and  $\angle C$ . Solve for the measure of  $\angle C$  in terms of the measure of  $\angle A$  if all measurements are in degrees. Use C for the measure of  $\angle C$  and A for the measure of  $\angle A$ .

2) When the top of a pyramid is cut from another pyramid, the remaining solid is called a frustum. A square pyramid has the length of its base 6 cm and its height 4 cm. A slice is made parallel to the base of the pyramid to create a new pyramid which is one-eighth of the volume of the original pyramid. This pyramid is removed to create a frustum. Find the total surface area of the frustum.



3) A cube of side length  $L$  is inscribed in a sphere. Find the volume between the sphere and the cube in terms of  $L$ . Give your answer as single fraction in simplest radical form.

4.) Solve for all real numbers  $x$  such that  $\sqrt{2-x} - \sqrt{x+11} = \sqrt{2x+15}$ .

5.) Factor into 2 quadratic trinomials in  $x$  and  $y$ :  $25x^4 - 80x^2y^2 + 4y^4$

6.) A set of  $N$  marbles contains exactly  $B$  blue marbles. You draw 3 marbles from the set without replacement. The probability of drawing 3 marbles which are all blue is 0.1. If  $N \leq 20$ , find the two possible combinations of  $N$  and  $B$  for which this is true. Express your answers as ordered pairs  $(N, B)$ .