

**FAIRFIELD COUNTY MATH LEAGUE 2016-2017**

Match 6 Round 1  
 Geometry: Lines  
 and Angles

1.) 15 degrees

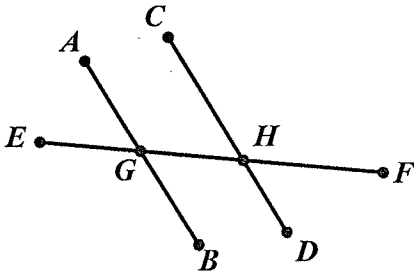
2.) 196 degrees

3.) 159 degrees

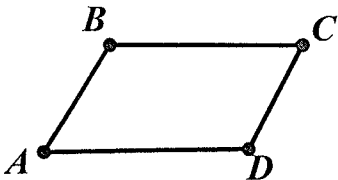
Note: Figures not necessarily  
 Drawn to scale

1.) What is the degree measure of the acute angle formed by the intersection of the lines  $2x - 2y = 1$  and  $4x - (4\sqrt{3})y = 2$  ?

2.)  $\overline{AB}$  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  $m(\angle AGH) = (11 + 6x)^\circ$  and  $m(\angle FHD) = (12x - 92)^\circ$ , find  $m(\angle CHF) + m(\angle EGB)$ .



3.) In parallelogram  $ABCD$ ,  
 $\angle BAD = (8x - 3)^\circ$ ,  $\angle BCD = (3x^2 - 2x)^\circ$ .  
 Find the degree measure of  $\angle ADC$ .



## FAIRFIELD COUNTY MATH LEAGUE 2016-2017

Match 6 Round 2  
Algebra: Literal  
Equations

1.)  $z = \frac{4x+3y-2}{1}$

2.)  $b = \frac{a^2-3}{1}$

3.)  $k = \frac{m}{2}, \frac{m+1}{2}$

1.) Solve for z in terms of x and y:  $8x+6y-2z=4$

2.) If  $a \neq 6$ , solve for b in terms of a:

$$ab+6a^2+3a=a^3+6b+18$$

3. Solve for k in terms of m:

$$4k^2+m=4mk+2k-m^2$$

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Match 6 Round 3

Geometry:  
Solids and  
Volumes

1.)  $\underline{25\pi + 40\pi\sqrt{2}}$  in<sup>2</sup>

2.)  $\underline{108\pi\sqrt{3} - 216}$  cm<sup>3</sup>

3.)  $\underline{18\sqrt{7}}$  cm<sup>2</sup>

1. The volume of a cylinder with height 8 inches is  $100\pi$  in<sup>3</sup>. What is its total surface area, including the bases ?

2. A cube of side 6 cm is inscribed in a sphere. What is the volume that is inside the sphere but outside the cube?

3. The lateral area of a pyramid is the surface area, not including the area of the base. A triangular pyramid has an equilateral triangle of side 6 cm for its base and isosceles triangles for its sides. The pyramid has a height of 5 cm. Find the lateral area of this pyramid.

# FAIRFIELD COUNTY MATH LEAGUE 2016-2017

Match 6 Round 4  
Radical  
Expressions and  
Equations

1.)  $\frac{208\sqrt{10}}{15}$

2.)  $-\frac{2}{3}$

3.)  $3$

1.)\_ Express as a single reduced fraction in simplest radical form:

$$\sqrt{160} - \frac{4}{\sqrt{90}} + 5\sqrt{40}$$

2) Solve for all real values of x:

$$\sqrt{x^2} = 2x + 2$$

3.)\_ Solve for all real values of x:

$$\sqrt{3x+7} - \sqrt{x-2} = \sqrt{6x-9}$$

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Match 6 Round 5  
Polynomials and  
Advanced  
Factoring

1.) 5

2.) 4

3.)  $(5x^2 - 6y^2 + 2xy)(5x^2 - 6y^2 - 2xy)$

1.) When  $x^{16} - 1$  is completely factored into binomials with integer coefficients, how many binomials are there?

2.)  $1+3i$  is a zero of the polynomial  $x^3 + ax^2 + bx + 40$  for some integer values of  $a$  and  $b$ . Find  $a+b$ .

3) Factor into two trinomials:  $25x^4 - 64x^2y^2 + 36y^4$

**FAIRFIELD COUNTY MATH LEAGUE 2016-17**

Match 6 Round 6  
Counting and  
Probability

1.) 48

2.)  $\frac{3}{8}$

3.) 48, 54, 66

1.)\_ For how many four-digit whole numbers in which no digits are repeated is the sum of the digits equal to 28?

2.) A men's tennis match is complete when one player wins three sets. Suppose two players are evenly matched so that the probability of either player winning any one set is 0.5. What is the probability that the match will last for five sets?

3.) A container of  $N$  balls contains  $R$  blue balls. The probability that if you draw one ball from the container it is blue is  $p$ . If 6 blue balls are removed from the container, the probability that if you draw one ball from the container it is blue is  $p-0.1$ . Find the three possible values of  $N+R$

FAIRFIELD COUNTY MATH LEAGUE 2016-2017  
Match 6 Team Round

1.)  $D = 1440 - 19A$  4.)  $40$

2.)  $48$  5.)  $41, -43$

3.)  $5\sqrt[3]{2}$  6.)  $\frac{1}{4}$

1.) Angles A, B, C and D are the four interior angles of a convex quadrilateral. Twenty less than six times the measure of the complement of  $\angle A$  is equal to the measure of the supplement of  $\angle B$ . Two times the measure of  $\angle B$  is sixty degrees more than the measure of  $\angle C$ . Find  $\angle D$  in terms of the measure of  $\angle A$  if all measurements are in degrees. Use D for the measure of  $\angle D$  and A for the measure of  $\angle A$ .

2.) How many triangles that are not equilateral can be made by connecting 3 of the 8 vertices of a cube?

3.) The vertex of a right circular cone which extends above the x-y plane is at the origin and the cone has base radius 6 inches and height 10 inches. The plane  $z=k$  cuts the cone so that the volume below  $z=k$  is one-fourth of the volume of the entire cone. Find the value of k.

4.) The following can be expressed as  $a + b\sqrt[3]{c} + d\sqrt[3]{e}$  where a, b, c, d and e are natural numbers and all radicals are in simplest form:

$$\frac{\sqrt[3]{9} + \sqrt[3]{4}}{\sqrt[3]{9} + \sqrt[3]{6} + \sqrt[3]{4}} + \frac{\sqrt[3]{3} + \sqrt[3]{2}}{\sqrt[3]{3} - \sqrt[3]{2}}$$

Give the sum  $a + b + c + d + e$ .

5.)  $x^3 - 12x^2 + cx - 30$  has three distinct integer zeros. Find all possible values of c.

6.) A standard deck of 52 cards has 13 spades. Your friend removes two cards at random. You draw a card from the deck of 50 cards. What is the probability that you draw a spade?