

FAIRFIELD COUNTY MATH LEAGUE 2016-2017

Match 2 Round 1
Arithmetic: Factors
And Multiples

1.) 267

2.) 70

3.) 88, 264, 792

1.) How many natural numbers are in the set {positive integers less than 1000 which are multiples of 3 but not multiples of 15} ?

2.) How many natural numbers M where $1 \leq M \leq 100$ have at least 4 distinct natural number factors?

3.) The greatest common factor of N and 2420 is 44 . The least common multiple of N and 99 is 792. Find all possible values of N .

FAIRFIELD COUNTY MATH LEAGUE 2016-2017

Match 2 Round 2
Algebra: Polynomials
And Factoring

1.) 9

2.) 225

3.) $(a^2+1)(2a-5)(a-1)$

1.) For how many different integers k is the expression $x^2 + kx - 36$ factorable into two binomials with integer coefficients?

2). What is the coefficient of x^2 in the expansion of $(x+1)(x+2)(x+3)(x+4)(x+5)$?

3). Factor into three binomials with integer coefficients:
 $2a^4 - 7a^3 + 7a^2 - 7a + 5$

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Match 2 Round 3
Geometry:
Area and Perimeter

1.) $\frac{27\sqrt{3}}{2}$ cm²

Drawings are not necessarily to scale

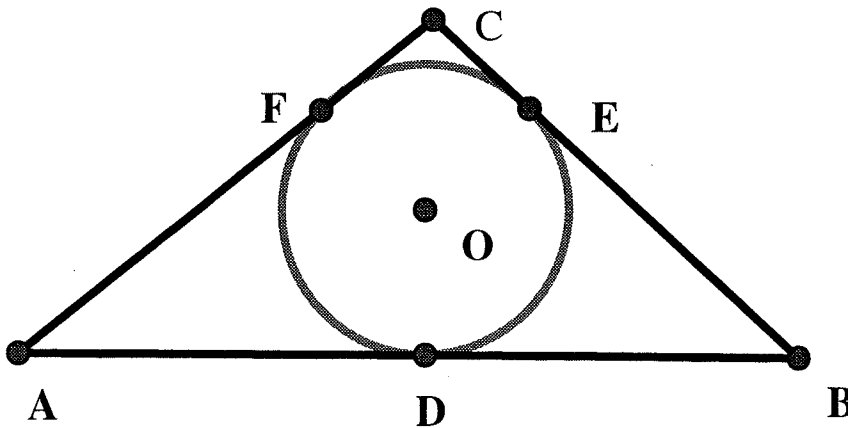
2.) 56 cm

3.) $18 + 12\sqrt{2}$ cm

1.) The perimeter of a regular hexagon is 18 cm. Find its area.

2) The hypotenuse of a right triangle is 6 less than the sum of the legs. The area of the triangle is 84 cm^2 . Find the perimeter of the triangle.

3.) A circle is inscribed in isosceles right triangle ABC with the right angle at C as shown. If the area of the circle is $9\pi \text{ cm}^2$ and the tangent of 22.5 degrees is $\sqrt{2} - 1$, find the perimeter of the triangle.



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Match 2 Round 4
Algebra 2: Inequalities
And Absolute value

1.) $-1 \leq x \leq 6$

Remember to use AND or OR or the shorthand notation for a conjunction if you answer with $<$, $>$, \leq , or \geq .

You may use union and intersection symbols if you answer using interval notation.

2.) $-2, 2, 4, 8$

3.) $x > \frac{5}{2}$ or $x < -5$

1.) Solve for x: $|5 - 2x| \leq 7$

2.) Find all values of x such that $|3 - |x - 3|| = 2$.

3.) Solve for x: $0 < \frac{x+5}{x} < 3$

FAIRFIELD COUNTY MATH LEAGUE 2016-2017

Match 2 Round 5
 Trigonometry:
 Laws of Sine and Cosine

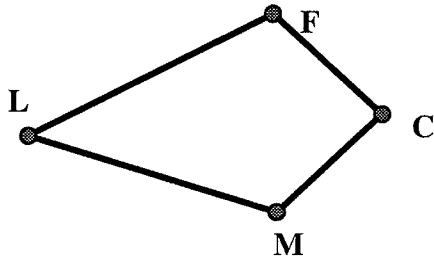
Note: Drawings not necessarily drawn to scale.

1.) $\frac{3\sqrt{2}}{5}$

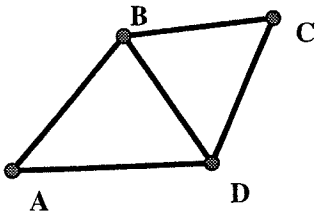
2.) 0.52 , $(\frac{13}{25})$ also ~~OK~~

3.) 10

1.) In $\triangle XYZ$, the measure of $\angle Z$ is 45 degrees. $YZ=6$ and $XY=5$. Find the sine of $\angle X$.



2.) In kite FCML above, $FC=CM=8$, $FL=ML=10$, and $\cos(\angle C)=0.25$. Find $\cos(\angle L)$.



3. Diagonal \overline{BD} is drawn in quadrilateral ABCD as above.. $AB=15$, $BC=12$. $\sin(\angle BAD)=0.7$, $\sin(\angle BDA)=0.75$, and $\sin(\angle BCD)=\frac{2\sqrt{6}}{5}$. $\angle BAD$, $\angle BDA$, and $\angle BCD$ are all acute angles. Find CD.

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Match 2 Round 6
Equations of Lines

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

2.) $y = -\frac{3}{4}x + \frac{25}{2}$

3.) $\frac{5}{2}$

1.) A line is given in parametric form by $x = 2t - 1$
 $y = 3t + 4$

Express the equation of the line in the form $y = mx + b$

2. Find the equation of the line that passes through the point of tangency of the circles $x^2 + y^2 = 100$ and $(x - 9)^2 + (y - 12)^2 = 25$ and is tangent to both circles. Express your answer as $y = mx + b$.

3.) $x + 2y = 5$ is the perpendicular bisector of the line segment whose endpoints are $(k^2 - \frac{37}{4}, k - 1)$ and $(2k - 6, -3k + 13)$. Find all possible values of k .

FAIRFIELD COUNTY MATH LEAGUE 2016-17 Match 2 Team Round

1.) 10416

4.) $-7 < x < -5$ or $-3 < x < -1$

2.) $(a+2b)(a^2+3+2b)(a^2+3-2b)$

5.) INVALID QUESTION

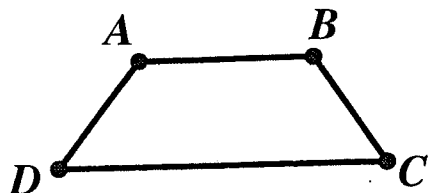
3.) 343, 675, 768, 800

6.) $y = x - 4$

1.) 496 is called a perfect number, because the sum of its proper divisors $1+2+4+8+16+31+62+124+248=496$. The only two perfect numbers less than 496 are both less than 30. Find the least common multiple of the three smallest perfect numbers.

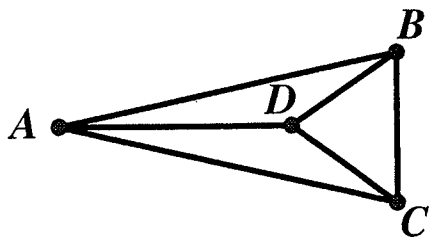
2.) Factor into a binomial and two trinomials:

$$a^5 + 2a^4b + 6a^3 + 12a^2b - 4ab^2 - 8b^3 + 9a + 18b$$



3.) ABCD is an isosceles trapezoid with bases \overline{AB} and \overline{CD} as the bases. The shorter base is \overline{AB} , and $AB = AD = BC = 25$ cm. The height and perimeter of the trapezoid are both integers. Find all possible values for the area of ABCD.

4.) Solve for x: $|x+2| - |x+4| + |x+6| < 3$



5.) In the diagram above, $DB=DC=10$, $AB=AC$, $AD=15$, $\cos(\angle CDB) = 0.25$, and $\angle ADB = 120^\circ$. Find $\cos(\angle CAB)$.

6.) $\triangle ABC$ lies entirely in the first quadrant. \overline{AB} lies on the line $3x - 4y = 4$, and \overline{AC} lies on the line $4x - 3y = 24$. $AB=30$ and $AC = 40$. Find the equation of the line containing the angle bisector of $\angle A$. Express your answer as $y=mx+b$.