

FAIRFIELD COUNTY MATH LEAGUE 2017-2018

Match 2 Round 1
Arithmetic: Factors
And Multiples

1) 217

2.) 567, 1134, 2268

3.) 8

1.)_ What is the sum of the natural number factors of 100?

2.)_ The greatest common factor of N and 3465 is 63 . The least common multiple of N and 756 is 2268. Find all possible values of N .

3.) How many natural numbers M where $1 \leq M \leq 160000$ have exactly five natural number factors?

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Match 2 Round 2
Algebra: Polynomials
And Factoring

1.) 9

2.) $-48x^3 + 40x^2 - 6x + 1$

3.) $(k^2 - p)(k^2 + p + 1)$

1.) For how many different whole numbers k is the expression $x^2 + 2x - k$ factorable into two binomials with integer coefficients if $0 \leq k \leq 100$?

2.) Express as a polynomial $ax^3 + bx^2 + cx + d$ for real numbers a, b, c, d :
 $1 - 2x(3 - 4x(5 - 6x))$

3.) Factor into a binomial and a trinomial: $k^4 + k^2 - p^2 - p$

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Match 2 Round 3
Geometry:
Area and Perimeter

1.) $\underline{12\sqrt{3}} \text{ cm}$

2.) $\underline{\frac{152\pi}{4}, \frac{163\pi}{4}} \text{ cm}^2$

3.) $\underline{\frac{4\pi - 3\sqrt{3}}{12\pi}}$

1) The area of a regular hexagon is $18\sqrt{3} \text{ cm}^2$. Find its perimeter.

2) A right triangle with sides of integer lengths has perimeter 90 cm. A circle is circumscribed around the triangle. Give all possible areas of the circle.

3.) A circle of radius 6 is centered at (0,6). What fraction of the area of the circle is above the line $y=9$?

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Match 2 Round 4
Algebra 2: Inequalities
And Absolute value

1.) $0 < x < \frac{1}{2}$

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.) $\frac{3}{7}, -1$

3.) $x \geq \frac{1}{2}$ or $x \leq -\frac{1}{6}$

1.) Solve for x: $\frac{1}{x} > 2$

2.) Find all values of x such that $|4x - 1| = |2 - 3x|$.

3.) Solve for x: $|5x - |x - 1|| \geq 2$

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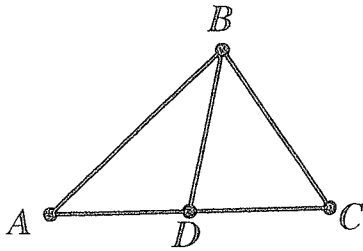
Match 2 Round 5
 Trigonometry:
 Laws of Sine and Cosine

Note: Drawings not necessarily drawn to scale. _

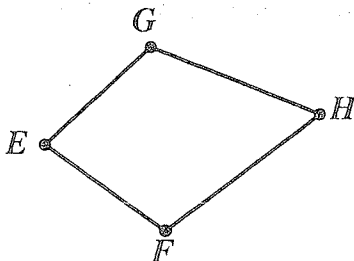
- 1.) $\frac{5\sqrt{6}}{2}$
- 2.) $\frac{9}{10}$
- 3.) $\frac{67}{112}$

1.) In $\triangle XYZ$, the measure of $\angle Z$ is 45 degrees and the measure of $\angle X$ is 60 degrees. If $XY=5$, find YZ .

2.) In $\triangle ABC$ below, a segment from B intersects \overline{AC} at D . If $\sin(\angle ACB) = \frac{2}{3}$ and $\sin(\angle CAB) = \frac{3}{5}$, find the ratio $\frac{BC}{AB}$.



3. In quadrilateral EFGH below, $EF=5$, $EG=6$, $GH=7$, and $FH=8$. If $\cos(\angle GEF) = \frac{1}{4}$, find $\cos(\angle GHF)$.



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Match 2 Round 6
Equations of Lines

1.) $y = \frac{3}{2}x - \frac{7}{2}$

2.) $y = \frac{-4}{3}x + 5$

3.) $\frac{81}{5}$

1.)_ A line is given in parametric form by

$$x = \frac{1}{5}t + 2$$

$$y = \frac{3}{10}t - \frac{1}{2}$$

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

2. Give the equation of the line tangent to the circle

$(x - 2)^2 + (y + 6)^2 = 25$ at the point $(6, -3)$. Express your answer in $y=mx+b$ form.

3.) Find the slope of the line connecting the centroid and the circumcenter of the triangle with vertices $(2, 2)$, $(-4, 6)$, and $(6, 4)$.

FAIRFIELD COUNTY MATH LEAGUE 2017-18 Match 2 Team Round

Diagrams not necessarily to scale.

1.) 80, 120, 130, 160, 170, ~~210~~ $y = \frac{2}{3}x$
 210, 90

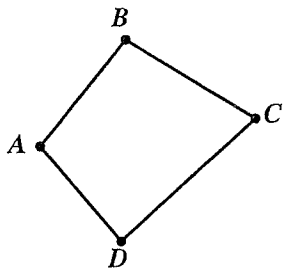
2.) $(a+2b)(2a+b)^2$ 5.) $16 + 4\pi$

3.) $3\sqrt{399} + 21\sqrt{23}$ 6.) $x < -4$ or $\frac{2}{3} < x < 3$ or $4 < x < 8$

1.) M, N, and P are whole numbers, not necessarily distinct. The greatest common factor of M, N, and P is 10 and the least common multiple of M, N, and P is 100. Give all possible values of M+N+P.

2.) Factor into three binomials:

$$4a^3 + 12a^2b + 9ab^2 + 2b^3$$



3.) Quadrilateral ABCD has $AB = 10, AD = 12, CD = 14, BC = 16$, and $\cos(\angle A) = \frac{-1}{20}$. Find the area of the quadrilateral.

4.) Give the equation of the line that connects the two intersection points of $y = |x - |5 - 2x||$ and $y = 4|x - \frac{5}{2}|$. Express your answer in $y = mx + b$ form.

5.) Give the perimeter of the region bounded by the system of inequalities
 $x^2 - 2x + y^2 + 6y \leq 54$
 $2x + 5y \geq -13$
 $5x - 2y \leq 11$

6. Solve for x: $\frac{5}{x^2 - 7x + 12} > \frac{3}{x + 4}$