

FAIRFIELD COUNTY MATH LEAGUE 2018-2019

Match 2 Round 1
Arithmetic: Factors
And Multiples

1.) 15

2.) 0, 5, 8, 9

3.) 1830

1.)_ How many natural numbers M where $1 \leq M \leq 100$ can be factored as p^2q where p and q are primes and $p \neq q$?

2.)_ N is a whole number $0 \leq N \leq 9$. For what values of N is the expression $2^N + 3$ not a prime number?

3.) A and B are positive integers. The greatest common factor of A and B is 30. The least common multiple of A and B is 27000. What is the smallest possible value of $A+B$?

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Match 2 Round 2
Algebra: Polynomials
And Factoring

1.) 231

2.) $2(x^4 + 6x^2 + 1)$

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

1.)_ $(x+2)(3x+4)(5x+6)=ax^3 + bx^2 + cx + d$. Find $a+b+c+d$.

2.) Factor completely over the integers: $(x+1)^4 + (x-1)^4$

3.) Express as the product of a trinomial and a binomial:
 $4a^2 - 9b^2 + 6b - 4a$

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Match 2 Round 3
Geometry:
Area and Perimeter

1. 60 cm²

2. $12\pi - 18\sqrt{3}$ cm²

3. 23 cm

1.)_ A right triangle has sides of length x cm, $(x+7)$ cm, and $(x+9)$ cm. Find the area of the triangle in cm².

2.)_ A circle is circumscribed about a regular hexagon which has perimeter $12\sqrt{3}$ cm. Find the area that is inside the circle but outside the hexagon.

3.)_ An isosceles trapezoid has area 30 cm². The height of the trapezoid is 6 cm and one base is 5 cm longer than the other base. Find the perimeter of the trapezoid.

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Match 2 Round 4
Algebra 2: Inequalities
And Absolute value

$$1.) \underline{-\frac{9}{5} < x < 3}$$

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.

$$2.) \underline{-\frac{5}{4}, \frac{3}{2}}$$

$$3.) \underline{x < -1 \text{ or } 0 < x < 1 \text{ or } x > 5}$$

$$1.) \text{ Solve for } x: \frac{|3-5x|}{2} + 7 < 13$$

$$2.) \text{ Solve for } x: |5x-2| = |x-4| + 3$$

$$3.) \text{ Solve for } x: \frac{3}{x+1} < 1 - \frac{2}{x-1}$$

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Match 2 Round 5
 Trigonometry:
 Laws of Sine and Cosine

Note: Drawings not necessarily drawn to scale. _

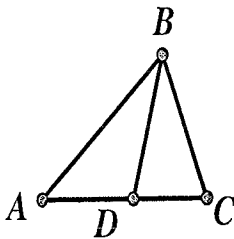
1.) $\underline{2\sqrt{6}}$

2.) $\underline{\frac{\sqrt{2}}{3}}$

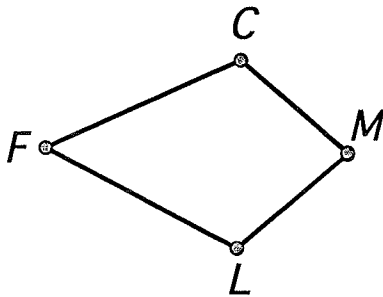
3.) $\underline{700 + 400\sqrt{3}}$

1.) In $\triangle XYZ$, ~~$XZ=3$~~ , $YZ=4$, $\angle X = 45^\circ$, $\angle Y = 15^\circ$. Find XY .

2.) \overline{BD} bisects $\angle ABC$ in $\triangle ABC$. If $AD=4$, $CD=6$, and $\angle BAD = 45^\circ$, find the sine of $\angle BCD$



3.) In kite $FCML$, $CM=ML$, $FC=FL$, $\angle F = 30^\circ$ and $\angle M = 150^\circ$. and $CM=10$. Find $(FC)^2$



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Match 2 Round 6
Equations of Lines

1.) $y = -\frac{2}{11}x + \frac{58}{11}$

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

3.) $y = \frac{1}{2}x - \frac{11}{2}$

1.) $\triangle ABC$ has vertices $A(7,4)$, $B(5,2)$, and $C(-2,8)$. Give the equation of the line that contains the median of the triangle from point A . Express your answer as $y=mx+b$

2.) Give the equation of the line tangent to the circle $(x-3)^2 + (y-4)^2 = 25$ at the point $(6,8)$. Express your answer as $y=mx+b$

3.) A line intersects the parabola $x = y^2 - 4$ at the points $(k+16, n)$ and $(k, n-8)$. Find the equation of the line. Express your answer as $y=mx+b$.

1.) 78, 390

4.) 5, -5, $\sqrt{7}$, $-\sqrt{7}$

2.) $x(x+2)(x^2+x-1)$

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

3.) $x < -2$ or $2 < x < 6$

6.) $y = \frac{11}{2}x + 40$

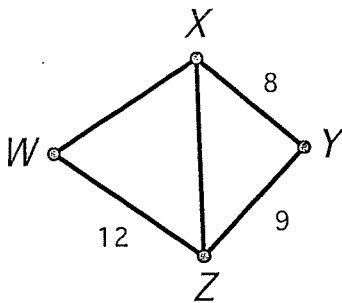
1.) The greatest common factor of N and 702 is 78. The least common multiple of N and 1755 is 3510. Find all possible values of N .

2.) Factor as the product of a monomial, binomial, and trinomial with integer coefficients: $x^4 + 3x^3 + x^2 - 2x$

3.) Solve for all values of x : $2x^3 - 12x^2 - 8x + 53 < 5$

4.) Two adjacent sides of a rectangle have lengths $|x+4|$ cm and $|x-4|$ cm. The area of the rectangle is 9 cm^2 . Find all possible values for x .

5.) In quadrilateral $WXYZ$, $XY=8$, $YZ=9$, $ZW=12$, $\angle Y = 60^\circ$. The total area of the quadrilateral is $18\sqrt{3} + 4\sqrt{73}$. Diagonal \overline{XZ} is drawn. Find $\sin(\angle XZW)$



6.) In $\triangle ABC$, point A lies in the second quadrant and point C lies in the third quadrant. \overline{AB} is contained in the line $3x + 4y = 10$ and \overline{BC} is contained in the line $4x - 3y = 5$. \overline{BC} has twice the length of \overline{AB} and the area of $\triangle ABC$ is 100. Find the equation of the line that contains \overline{AC} . Express your answer as $y=mx+b$.