

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 2 Round 1
Arithmetic: Factors
And Multiples

1.) 3, 4, 5, 7

2.) 30

3.) 126

1) Given N is an integer $1 \leq N \leq 10$, for which integers N is the expression $2^N - 7$ a perfect square?

2.) How many whole numbers between 1 and 100 can be factored as pq where p and q are both prime, and $p \neq q$?

3) The greatest common factor of N and 540 is 18 . The least common multiple of N and 120 is 2520. Find all possible values of N .

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Match 2 Round 2
Algebra: Polynomials
And Factoring

1.) $\underline{-8x^2 + 2y^2 + 18z^2 + 12yz}$

2.) $\underline{2(3a-5b)(5a+b)}$

3.) $\underline{4c^2 - d^2}$ Alt. $(d^2 - 4c^2)$

1). Express as a polynomial of 4 terms: $(2x + y + 3z)(-4x + 2y + 6z)$.
Do not factor your answer.

2) Factor completely: $30a^2 - 44ab + 10b^2$

3). The expression $(4c^2 + d^2)^2 - (4cd)^2$ is the square of some binomial involving c and d. What is that binomial?

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Match 2 Round 3
Geometry;
Area and Perimeter

Drawings are not necessarily to scale

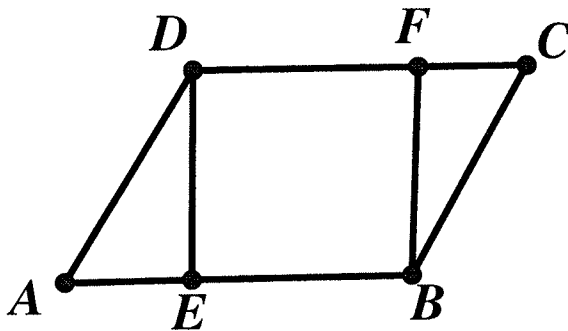
1.) 60 cm²

2.) $20 + 4\sqrt{10}$ cm

3.) $2\sqrt{71}$ cm

1.) The lengths of the sides of a right triangle are all whole numbers. The perimeter is 40 cm. Find the area of the triangle.

2.) Parallelogram ABCD is shown. \overline{DE} and \overline{FB} are drawn so that they are perpendicular to bases \overline{AB} and \overline{CD} . The area of rectangle DEBF is $\frac{4}{5}$ of the area of parallelogram ABCD. If $BF = 3x$, $DF = 5x - 2$, and $AB = 2x + 6$, give the perimeter of ABCD.



3.) A right triangle has area 30 cm^2 . The length of its hypotenuse is $2\sqrt{41}$ cm. Find the sum of the two legs of the triangle.

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Match 2 Round 4
Algebra 2: Inequalities
And Absolute value

1.) $9 < x < 11$

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.) $x \geq 3$ or $x \leq -5$

3.) $\frac{2}{3}, \frac{4}{3}, 2, 4$

1) Solve for x: $6 < 5x - 7(x - 4) < 10$

2.) Find all values of x such that $|2x + 1| - |x| \geq 4$

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

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 2 Round 5
Trigonometry:
Laws of Sine and Cosine

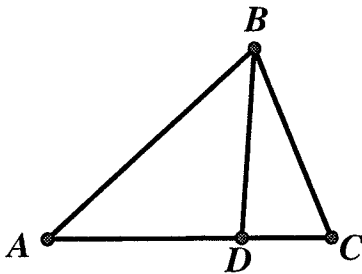
1.) $\frac{1}{5}$

2.) $\sqrt{2}$

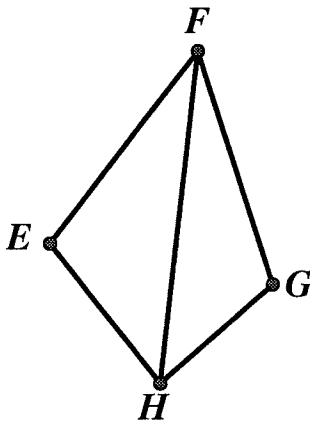
3.) 0.75

1.) The sides of a triangle measure 5 cm, 6 cm and 7 cm. Find the cosine of the largest angle of the triangle.

2.) In the figure below, $\angle ABD$ measures 45 degrees, $\angle DBC$ measures 30 degrees, and $AD = 2(DC)$. Find the ratio of $\frac{AB}{BC}$ as a radical in simplest radical form.



3.) In the figure below, \overline{FH} bisects $\angle EFG$. $\angle FEH$ measures 150 degrees. $EH = 1.5(GH)$. Find $\sin(\angle FGH)$



FAIRFIELD COUNTY MATH LEAGUE (FCML) 2015-2016

Match 2 Round 6
Equations of Lines

1.) $\frac{6}{7}$

2.) $y = x - 4$

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

1.) What is the slope of the line given by the equation $2x + 3(x+y) - 4(2x - \frac{1}{8}y) = 6$?

2.) Point A has coordinates (6,3), point B has coordinates (3,-1), and point C has coordinates (7,2). Find the equation of the line that bisects $\angle ABC$. Express your answer as $y=mx+b$.

3.) A line is tangent to the circle $x^2 + y^2 = 25$ at the point (4,3). Find the equation of a line that is also tangent to $x^2 + y^2 = 25$ and intersects the original line at (1,7). Express your answer as $y=mx+b$.

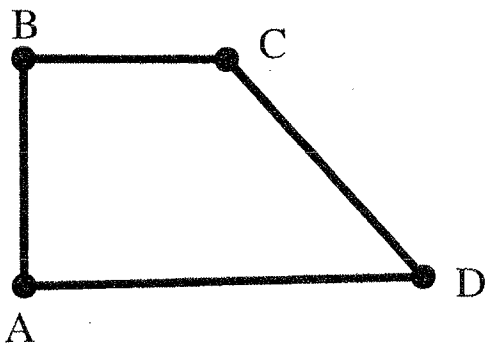
FAIRFIELD COUNTY MATH LEAGUE 2015-16 Match 2 Team Round

1.) $\sqrt{2501}, \sqrt{629}, 5\sqrt{5}$ 4.) $-2.25 < x < -2$ OR $.75 < x < 1$

2.) $\frac{4+3\sqrt{3}}{10}, \frac{-4+3\sqrt{3}}{10}$ 5.) $\frac{1}{6}, \frac{5}{12}, \frac{1}{2}, \frac{3}{4}$

3.) $y = -\frac{1}{18}x + \frac{325}{9}$ 6.) -20

- 1.) Trapezoid ABCD has bases \overline{AD} and \overline{BC} and has right angles at A and B. $AD = 2(BC)$ and the area of the trapezoid is 75 cm^2 . If the bases and height of the trapezoid are all whole numbers, find all possible values of CD. (Diagram not necessarily drawn to scale).



- 2.) In $\triangle ABC$, $\angle A = 30$ degrees, $AC=6$, and $BC=5$. Given $\sin(X+Y)=\sin(X)\cos(Y) + \cos(X)\sin(Y)$, find the two possible values of $\sin(\angle C)$
- 3.) A line segment has one endpoint at the origin and the other endpoint in the first quadrant. The slope of the line segment is the greatest common factor of 198 and 630. The length of the line segment is \sqrt{N} , where N is the least common multiple of 50, 52, and 65. Give the equation of the line which is perpendicular to the segment and passes through the endpoint that is in the first quadrant. Express your answer in the form $y=mx+b$.
- 4.) Find all real values of x such that $4 < 4x^2 + 5x - 2 < 7$.
- 5.) Find all real values of k such that the line $y = |4k - 1|x + 4$ is perpendicular to the line $y = -|4 - 6k|x + 5$.
- 6) Segments x, y, and z form a right triangle with the right angle opposite side z. If the lengths x and y stayed the same but the length of the longest side were increased by 2, the cosine of the angle opposite side z in the new triangle formed would be -0.3. Find the value of the expression $20z - 3xy$.