FAIRFIELD COUNTY MATH LEAGUE 2019-2020

Match 5 Round 1
Algebra I:
Fractions and
Exponents

1.) 1.625

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

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

1. Express as a decimal, correct to three decimal places.

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+1}}}}$$

2) Simplify: $\dfrac{(55)^3(121)^4}{(1331)^3(275)^2}$

3.)_ If $x - 3y = -2$, express the following as a single fraction without negative exponents.

$$\frac{(a^x b^{3y})^4((a^{3x}+b^{2y})^2 - b^{2y}(2a^{3x}+b^{2y}))(a^{-2x}b^{-3y})^{-4}}{(a^{3x})^5(ab^7)^{3y}(a^2b)^x}$$

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Match 5 Round 2
Algebra I:
Fractional Expressions and Equations

1.) $\frac{-x}{x+10}$

2.) $3, \frac{1}{33}$

3.) $\frac{-3}{4}$

Assume no values of x make any denominator equal to zero.

1). Multiply and simplify: $\frac{x^2-18x+80}{x^2-17x+72} * \frac{9x-x^2}{x^2-100}$

2). Solve for x: $\frac{3}{3x+1} - \frac{1}{4} = \frac{x-2}{7x-1}$

3.): Solve for x: $\frac{5}{x+\frac{3}{x+4}} - \frac{4}{x+\frac{2}{x+3}} = \frac{1}{\frac{x^2+5x+6}{x+1}}$

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2019-2020

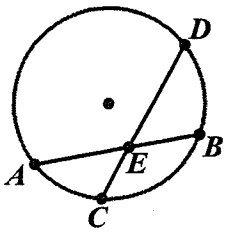
Match 5 Round 3
Geometry:
Circles

1.) 5

2.) 12

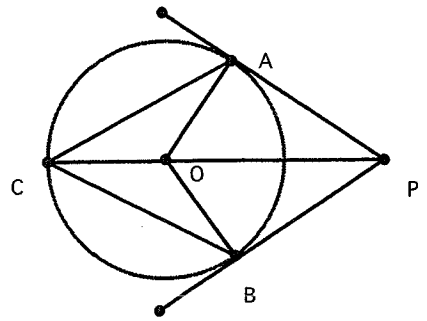
Note: Diagrams not necessarily to scale

3.) $20\sqrt{3}$



1.)_ In the picture above, $\overline{AB}$ and $\overline{CD}$ are chords of a circle that intersect at E. AE=x-1, AB=2x, CE=x-4, and DE=3x-5. Find the difference CD –AB.

2) Two circles with circles P and Q are tangent to the same line at points A and B and tangent to each other. If the radius of circle P is 9 and the radius of circle Q is 4, what is the length of segment $\overline{AB}$?



3.) For the circle with center O above, $\overleftrightarrow{PA}$ and $\overleftrightarrow{PB}$ are tangent to circle O at A and B. The line from P through O intersects the circle at C as shown above. If OA = x-20, OP=x-15, and AP=$\sqrt{3x}$, find the perimeter of quadrilateral APBC.

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Match 5 Round 4 Quadratic Equations and Complex Numbers

1.) $3+2i, 3-2i$

2.) $7i$

3.) $-3, 4i$

1) Find the two complex solutions of $x^2 + bx + c = 0$ if the sum of the solutions is 6 and the product of the solutions is 13.

2.) Simplify: $\dfrac{(2+i)^3}{3-i} - \dfrac{(2-i)^3}{3+i}$

3) Solve for all complex x: $x^2 + (3-4i)x - 12i = 0$

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Match 5 Round 5
Solving Trig Equations

1.) 6, 30, 78, 102, 150, 174 degrees

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

3.) $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{7\pi}{12}, \frac{11\pi}{12}$

1) Solve for all x $0° \le x \le 180°$: $\sin(5x) = \frac{1}{2}$

2) Solve for all x: $0 \le x < 2\pi$ $\tan^2(x) - \sec(x) = 1$

3.) Solve for all x $0 \le x < \pi$: $\sin(4x) + \cos(2x) = 0$

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2019-2020

Match 5 Round 6
Sequences and Series

1.) 4

2.) 3.28

3.) $\frac{1}{25}$

1.) For what natural number n is $0.76 < \sum_{k=1}^{n} \frac{(-1)^{k+1}}{k^2} < 0.80$

2.) An arithmetic sequence has first term -2. The ~~second~~ fourth term is the square ~~root~~ of the ~~fourth~~ second term. Find all possible values of the sixth term.

3.) An infinite geometric series converges to 6.25. The second term of the original geometric sequence is 4 less than the first term. Give all possible values for the fourth term of the sequence.

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Match 5
Team Round

Note: Diagrams not necessarily drawn to scale.

1.) $\frac{4}{77}$

2.) $\pm 3\sqrt{10}$

3.) $55, \frac{589}{9}$ degrees

4.) $\frac{\sqrt{2}+i\sqrt{6}}{2}, \frac{-2-i\sqrt{6}}{2}$

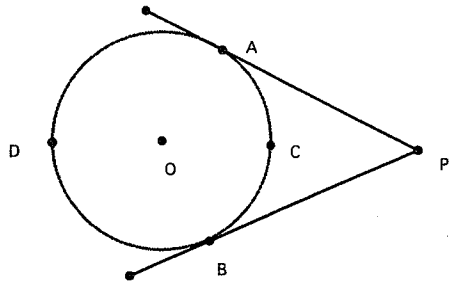
5.) $\frac{-3\sqrt{2} \pm \sqrt{14}}{8}$

6.) $-4, 2+2i\sqrt{3}, 2-2i\sqrt{3}$

1.) Simplify: $\frac{1}{7}*\frac{1}{8}+\frac{1}{8}*\frac{1}{9}+\frac{1}{9}*\frac{1}{10}+\frac{1}{10}*\frac{1}{11}$

2.) Solve for x:

$$2-\cfrac{x}{3-\cfrac{x}{4-\cfrac{x}{5-\frac{x}{6}}}}=4$$



3.) In the diagram above, $\overleftrightarrow{PA}$ and $\overleftrightarrow{PB}$ are tangent to the circle with center O at points A and B. The measure of arc ACB is $2x^2-3$ and the measure of arc ADB is $4x^2 - 2x - 5$. Find the degree measure of $\angle APB$.

4.) Find the two complex square roots of $-1+i\sqrt{3}$.

5.) What are all possible values for sin(x) if $\cos(x+\frac{\pi}{4})=\frac{3}{4}$?

6.) A geometric sequence $\{a_n\}$ of complex numbers has the property that $a_4 = -64a_1$. Find all possible values for the common ratio of the sequence.