

WMML
Meet #4
Jan. 8, 2019

Name _____

School _____

Arithmetic and Number Theory

1) What is the largest integer whose cube is less than 10,000?

1. _____

2) What is the greatest common factor of the 10 smallest positive common multiples of the numbers 30 and 50?

2. _____

3) A set of tiles numbered from 1 through 100 is modified repeatedly by the following operation: remove all tiles that are perfect cubes, and re-number all remaining tiles starting with 1. How many times must this operation be performed to reduce the number of tiles to 1?

3. _____

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Algebra 1

1) The population of a Massachusetts town increased by 25% during 2018. By what percent will it need to decrease during 2019 to return to the population it was at the beginning of 2018?

1. _____

2) Pipe A can fill a pool in 5 hours, while pipe B can fill it in four. How many hours will it take to fill the pool if both are operating at the same time?

2. _____

3) Adam has \$3.08 in pennies, nickels, and quarters. He has four more pennies than quarters and one more nickel than pennies. How many coins does he have?

3. _____

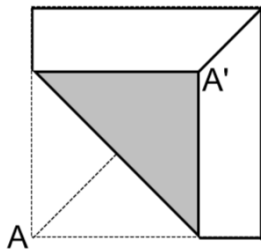
Geometry

1) The area of a trapezoid is 96. One base is 6 units longer than the other, and the height of the trapezoid is 8. Find the length of the shorter base.

1. _____

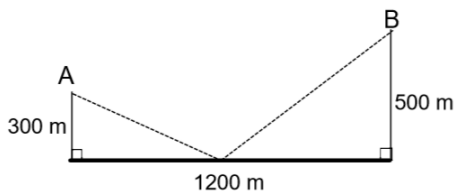
2) A square sheet of paper has an area of 6 cm^2 . The front is white and the back is shaded. When the sheet is folded so that point A rests on the diagonal as shown, the visible shaded area is equal to the visible white area. How many centimeters is A' from its original position, A ?

2. _____



3) The rules of a race require that all runners start at A , touch any part of the 1200-meter wall, and stop at B . What is the number of meters in the minimum distance a participant must run?

3. _____



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Algebra 2

1) Find all x such that $-4 < \frac{1}{x} < 3$.

1. _____

2) Let $f(x) = \frac{4x}{x+2}$ and $g(x) = \frac{2x}{x+4}$. Find $f(g(x))$ in simplest terms.

2. _____

3) Solve for x :

$$\sqrt{x + \sqrt{x + 11}} + \sqrt{x - \sqrt{x + 11}} = 4.$$

3. _____

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Trigonometry and Complex Numbers

1) Let $a = 3 + 4i$ and $b = 12 - 5i$. In $a + bi$ form, what is the value of $a^2 + 3b + 2$?

1. _____

2) Two rays with common endpoint O form a 30° angle. Point A lies on one ray, point B on the other ray, and $\overline{AB} = 1$. What is the maximum possible length of \overline{OB} ?

2. _____

3) How many triangles have area 10 and vertices $(-5,0)$, $(5,0)$, and $(5 \cos(\theta), 5 \sin(\theta))$ for some angle θ ?

3. _____

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Precalculus

1) Let $f(x) = 2x - 4$. What is $f^{-1}(f^{-1}(f(f^{-1}(2))))$?

1. _____

2) Suppose the ordered pair (x, y) satisfies $\frac{\log_{10}(xy)}{\log_{10}(\frac{x}{y})} = \frac{1}{2}$. If y is increased by 50%, by what fraction must x be multiplied to keep this equation true?

2. _____

3) Find the largest value of x for which $x^2 + y^2 = x + y$ has a solution, if x and y are real.

3. _____

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Team Round

1) The LCM of a pair of positive integers is 504, and the GCF of the numbers is 6. One of the numbers is 12. What is the other number?

1) _____

2) A town's population increased by 1200 people, and then this new population decreased by 11%. The town now had 32 less people than it did before the 1200 increase. What was the original population?

2) _____

3) A circle is inscribed in a large square and circumscribed about a smaller square. The area of the larger square is 8 square meters. What is the area of the smaller square?

3) _____

4) Find the value of $a^3b^7c^{14}$ given that $a^3b^2c = 108$ and $a^2b^3c^5 = 240$.

4) _____

5) If $\sin(x) = 3\cos(x)$, then what is $(\sin(x))(\cos(x))$?

5) _____

6) Find all t such that $2 \log_3(1 - 5t) = \log_3(2t + 5) + 2$.

6) _____