

NAME _____

SCHOOL _____

2008 Middle School Math Festival

Team Round: Algebra

Unless stated in the problem, answers will be written as an integer or an exact decimal (i.e. do not round). Any problems requiring a common fraction or mixed number for the answer will always require the fractional part to be in lowest terms.

1. As of March 17, 2008, the exchange rate was:

$$1 \text{ US dollar} = 7.09 \text{ Chinese Yuan} = 0.64 \text{ Euros} = 31.35 \text{ Thai Baht}$$

Convert 9.6 Euros into Dollars, Yuan, and Baht.

What is the sum of the four monetary values, rounded to the nearest hundredth?

2. $f(x) = -13.9x$ Calculate $g(f(3)) - f(g(-\frac{1}{2}))$. Write the answer as a decimal.
 $g(x) = -8x - 3$

3. The circumference of the Earth is approximately 40,000 km. Calculate the Earth's radius, rounded to the nearest hundred. A geosynchronous satellite orbits the Earth approximately 36,000 km above the Earth's surface and completes one orbit in 24 hours. Calculate the satellite's speed, in kilometers per second, to the nearest tenth. Hint: the speed equals the distance traveled (circumference of the orbit) divided by the time to complete one orbit.

4. George is 20 years younger than twice Jan's age. Susan is 2 years older than half George's age. The sum of their ages is 112. Calculate the positive difference between the oldest and youngest ages and then add the middle age.

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5. Find the sixth term of each of the following four sequences. What is the product of the four values? Write the answer as a decimal rounded to the nearest tenth.

$$0.5, \frac{1}{3}, \frac{1}{6}, 0, \dots$$

$$A(n) = -2 + (n - 2)(-1.6)$$

$$17.6, -8.8, 4.4, -2.2, \dots$$

$$B(n) = \frac{1}{9}(-3)^{n-1}$$

6. A = the slope of the line containing the points $(3, -7)$ and $(-4, 3)$
 B = the slope of a line parallel to the line $3x - 5y = 10$
 C = the slope of a line perpendicular to the line $5x + 2y = 25$

Calculate the sum of $A + B + C$. Write the answer as a common fraction in lowest terms.

7. You have 12 coins, comprised of only nickels and quarters, which total \$1.20. Let N equal the number of nickels and Q equal the number of quarters. A boat travels 12 miles downstream (with the current) in two hours but going against the same current (upstream) it takes the boat 3 hours to return to the starting point. Let B equal the speed of the boat with no current and C equal the speed of the current. Calculate $\frac{BC}{NQ}$.

Write the answer as a common fraction in lowest terms.

8. For $x = -2$, calculate $A - B \div C \div D$.

Write your answer as a common fraction in lowest terms.

$$A = \left(\frac{3}{5}\right)^x$$

$$B = \frac{1}{2}(-3)^x$$

$$C = \left(-\frac{1}{3}\right)^x$$

$$D = -\frac{1}{9}(3)^x$$

9. Calculate $(Q + R)ST$. Write the answer as a decimal rounded to the nearest integer.

Q, R = the two solutions to the equation $10x^2 - x = 3$.

(S, T) = the x and y coordinates for the vertex of the same equation.

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10. For the following two coordinate points, $(8.3, -9.4)$ and $(-3.7, 6.6)$, calculate the sum of L , M , and N .

L = the distance between the two points (to the nearest tenth)

(M, N) = x - and y - coordinates of the midpoint of the two points

11. A rectangular prism has a length of 2, a width of 8, and a height of 12. There are six faces. Calculate the exact length of the sum of the diagonals of all six faces. The answer must be written in simplest radical form.

12. A right triangle FGH has sides of length $FH = 28$, $GH = 52.5$, and $FG = 59.5$.

Calculate $\frac{\sin F + \cos F}{\tan F}$. Write the answer as a common fraction in lowest terms.

13. Calculate $\frac{FG}{H}$ where $F = 16\frac{2}{3}\%$ of 240; $8 = G\%$ of 12.5; $19 = 95\%$ of H

14. Calculate $A + B + C + D$. Write the answer as a common fraction in lowest terms.

A, B are the two solutions to $|4k - 2| = 11$

C, D are the two solutions to $|3c + 1| - 4 = 13$

15. A bag of marbles contains 3 red, 4 blue, 5 white, 2 black marbles, and 1 orange marble. Calculate $\frac{P + Q}{R}$.

P = probability of randomly selecting one marble and it is **NOT** white.

Q = probability of randomly selecting one marble and it is red or blue.

R = probability of randomly selecting two marbles (at the same time) and one is black and one is orange