

ALGEBRA TEAM ROUND

QUESTION 1

January 8, 1994

Find the largest two-digit number that is equal to four times the sum of its digits.

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QUESTION 2

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If $x * y = xy$ and $x \# y = x - y$ then find

$$[2 * (8 \# 12)] \# [(3 * 2) \# 5]$$

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QUESTION 3

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Find the sum of the reciprocals of all the factors of 24.

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QUESTION 4

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Simplify

$$\frac{8^3}{8^3} + \frac{8^4}{8^3} + \frac{8^5}{8^3} + \frac{8^6}{8^3} + \frac{8^7}{8^3} + \frac{8^8}{8^3} - \frac{8^9}{8^3}$$

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QUESTION 5

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If $\frac{a + 13b}{3a - b} = 3$, find $\frac{a^3}{b^3}$

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QUESTION 6

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How many integers belong to the solution set of

$$-3x - 9 < 2 \quad \text{and} \quad -5 < x \leq 3$$

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QUESTION 7

Richard has 15 more dimes than quarters and 10 more nickels than dimes. He has a total of \$7.95. How many coins does he have in all?

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QUESTION 8

The product of two consecutive odd positive integers added to their sum is 119. What are these two integers?

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QUESTION 9

The ratio of two integers is 5 : 2. If 10 is added to each integer, the ratio is 5 : 3. What is the product of the two original integers?

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QUESTION 10

Solve for all real values of x:

$$(x)(\sqrt{x^3}) = \frac{x^x}{x}$$

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QUESTION 11

Solve each of these equations then evaluate

(ab)^{c-d}

$$\begin{aligned} -3a + 4 &= 8a - 2 \\ (1/3)b - 3 &= 3/4 + 2b \\ 4(2c - 1) &= 3(3 - 2c) \\ 1/(1 - d) &= 14 \end{aligned}$$

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QUESTION 12

Find the area of a trapezoid bound by the graphs of $x = 6$, $y = 4$, $y = 0.5x$, and the y -axis.

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QUESTION 13

Solve: $\sqrt{x + 6} + x = 14$

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QUESTION 14

Evaluate: $(1,000,000,000,001)^2 - (999,999,999,999)^2$

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QUESTION 15

Find the value of n if the average of $3n$, $1/4$, $7/8$ and 6 is n .