Question 1:

A jar contains 30 grams of a salt mixture. 15% of the mixture is salt. The remainder is water.

A = the grams of pure water that must be added to make the mixture 5% salt.

B = the grams of pure salt that must be added to make the mixture 20% salt.

C = the grams of pure water that must evaporate, leaving the amount of salt unchanged, to make the mixture 20% salt.

If 8.5 grams of water and 1.5 more grams of salt are added to the mixture, then the new mixture is **D**% salt.

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Question 2:

$2\sqrt{5} + 3\sqrt{125} = A\sqrt{B}$ in simplest radical form $\sqrt{24} + 4\sqrt{6} = C\sqrt{24}$

$\sqrt{12} + \sqrt{48} = D\sqrt{27}$

Solve for A, B, C, and D.

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Solve for A, B, C, and D.

Question 3:

Answer the following about the equation $y = ax + b$ which contains the points (1,2) and (2,7).

A = the value of a

B = the value of b

The lines $y = 9x - 2$ and $2y = 4x + 3$ intersect at (**C, D**) where C=x and D=y.

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Question 4:

It is 12:00 midnight and your test writer is really tired. She finally calls some help from her two goons, Sam and Eric. If your test writer can write 6 questions per hour and her two goons (Sam and Eric) can each write 2 questions per hour, answer the following questions.

A: the number of hours it will take for the test writing crew (writer with Sam and Eric) to write 3 individual tests with 30 questions each, assuming each question takes the same amount of time to write.

B: the positive difference (in hours) in the amount of time it takes the test writer to write a complete individual test (30 questions) and the amount of time it will take both of her goons working together to finish the same 30 question test.

If the whole crew works on writing one individual test (30 questions) at 12:00 midnight for an hour, after which Eric goes to sleep leaving the other two to finish, then the time the test will be finished is **C:D** AM (a TIME), where C is a one digit number corresponding to the hour and D is a one or two digit number (disregarding **only leading** zeroes if any) corresponding to the minute.

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Question 5:

A: The value of $20^2 - 19^2$

B: The value of $(20 - 19)^{2019}$

C: The value of $(20 + 19)^{20-19}$

D: The value of $20^4 - 19^4$

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Question 5:

A: The value of $20^2 - 19^2$

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Question 6:

Let the function $f(x) = x^3 - x$.

A: The value of $f(18)$

B: The value of $f(19)$

C: For all positive integers $x > 1$, $f(x)$ will always be divisible by a positive integer n. Let C be the greatest possible value of n.

D: The greatest prime factor of $f(16)$

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Question 7:

Let R be the point (3,4) and let S be the point $(2x + 3, x - 1)$.

A: The distance from R to the origin

B: The slope of the line passing through both R and S if $x = -5$.

C: The slope of the perpendicular bisector of RS if $x = 4$.

D: If x is the smallest positive square integer, the distance between R and S is D.

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D: If x is the smallest positive square integer, the distance between R and S is D.

Question 8:

Find the number of unique real solutions to each of the following equations of x:

A: $(x-3)^2 = (x+3)^2$

B: $\sqrt{4-x}+\sqrt{x-4} = 4$

C: $x^2 - 6x + 27 = 18$

D: $|x-2| - |2-x| = 3$

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Question 9:

Let A = 1028(1029) - (1030)(1027)

Let B be the number of times the graph of $y = 3x^2 + 6x - 3$ intersects the x-axis.

Let C = $\frac{5^{70}+5^{69}}{5^{70}-5^{69}}$.

Let D = $\sqrt{x^2}$ if $x = -3$.

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Question 10:

Consider the integers 1 through 59, inclusive.

A: the number of integers from 1 through 59 inclusive.

B: the mean of the set of integers from 1 through 59 inclusive

C: Two distinct numbers that sum to 60 are picked from the set. Compute the maximum possible value of the product of the two numbers.

D: Two distinct numbers that sum to 60 are picked from the set. Compute the minimum possible value of the product of the two numbers.

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D: Two distinct numbers that sum to 60 are picked from the set. Compute the minimum possible value of the product of the two numbers.

Question 11:

Rick has $7.20 in pennies and nickels. If he has an equal number of each type of coin, let **A** be the number of nickels he has and let **B** be the total number of nickels he has if he exchanges all of his pennies for nickels.

Aaron also has $7.20, but in dimes and quarters. If he has 45 coins in total, let **C** be the number of dimes he has and let **D** be the number of quarters he has.

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Question 11:

Rick has $7.20 in pennies and nickels. If he has an equal number of each type of coin, let **A** be the number of nickels he has and let **B** be the total number of nickels he has if he exchanges all of his pennies for nickels.

Aaron also has $7.20, but in dimes and quarters. If he has 45 coins in total, let **C** be the number of dimes he has and let **D** be the number of quarters he has.

Question 12:

Answer the following questions about exponents:

A = the solution for y if the equation $x^{12} = x^{y} \cdot x^{7}$ is true where defined.

B = the solution for y if the equation $x^{12} = (x^{y})^{3}$ is true where defined.

C = the solution for y if the equation $\frac{1}{4} \cdot 8^{2y} = 2^{34}$.

D = the sum of the real solutions x to the equation $2^{x^2-7x} = 256$

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Question 13:

A = the positive root of $x^2 + x - 12 = 0$.

B = the ordinate of the y-intercept of $3x + 4y = -16$.

C = $f(-3)$ if $f(x) = x^3 - x^2$.

D = $\frac{x}{y}$ if $\frac{x-2y}{x+y} = \frac{2}{3}$.

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Question 14:

A: the sum of the first 100 positive integers

B: the sum of the first 10 positive multiples of 5.

C: the sum of the first 5 positive multiples of 10.

D: The product of the least 10 non-negative integers.

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Question 14:

A: the sum of the first 100 positive integers

B: the sum of the first 10 positive multiples of 5.

C: the sum of the first 5 positive multiples of 10.

D: The product of the least 10 non-negative integers.