Difficult Problem Solving Questions

Birthday Probability

If there are 85 students in a statistics class and we assume that there are 365 days in a year, what is the probability that at least two students in the class have the same birthday (assuming birthdays are distributed independently)?

A) $\frac{85}{365} * \frac{84}{364}$

B) $\frac{1}{365} * \frac{1}{364}$

C) $1 - \frac{85!}{365!}$

D) $1 - \frac{365!}{280!\,(365^{85})}$

E) $1 - \frac{85!}{365^{85}}$

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679 Units Digit Remainder

What is the units digit of $6^{15} - 7^4 - 9^3$?

A) 8
B) 7
C) 6
D) 5
E) 4

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Xponential Mystery

If x is a positive integer and z is a non-negative integer such that $(2,066)^z$ is a divisor of 3,176,793, what is the value of $z^x - x^z$?

A) -81
B) -1
C) 0
D) 1
E) It Cannot Be Determined

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3Z Powers

If $(243^{9 + 18z})(81^{-18z})(27^{15 - 9z}) = 1$, what is the value of z?

A) -27
B) -10
C) 0
D) 10
E) 27

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PZ Remainder

z is a positive integer and multiple of 2; $p = 4^z$, what is the remainder when p is divided by 10?

A) 10
B) 6
C) 4
D) 0
E) It Cannot Be Determined

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Class Survey

Walking across campus, a student interviewed a group of students. 25% of the students took a finance class last semester, 50% took a marketing class last semester, and 40% took neither a finance nor a marketing class last semester. What percent of the students in the group took both a finance and a marketing class?

A) 60%
B) 50%
C) 25%
D) 15%
E) 10%

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Substance Ratios

The ratio of a compound, by weight, consisting only of substances x, y, and z is 4:6:10, respectively. Due to a dramatic increase in the surrounding temperature, the composition of the compound is changed such that the ratio of x to y is halved and the ratio of x to z is tripled. In the changed compound, if the total weight is 58 lbs, how much does substance x weigh?

A) 48
B) 36
C) 24
D) 12
E) 10

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Computer Game Sales

Computer Games Plus needs to get rid of its copies of an old computer game. If it lowers the cost of the old computer game by $5 dollars, it can increase sales of the old computer game by 10 units and still generate exactly $100 of revenue from the old game. How many units of the old computer game did Computer Games Plus sell after implementing the new selling strategy?

A) 10
B) 15
C) 20
D) 30
E) 50

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Consecutive Integers

x, y, and z are consecutive positive integers such that $x < y < z$; which of the following must be true?

1. xyz is divisible by 6
2. $(z-x)(y-x+1)=4$
3. xy is odd

A) I only

B) II only

C) III only

D) I and II only

E) I, II, and III

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Manufacturing Hours

At a local appliance manufacturing facility, the workers received a 20% hourly pay raise due to extraordinary performance. If one worker decided to reduce the number of hours that he worked so that his overall pay would remain unchanged, by approximately what percent would he reduce the number of hours that he worked?

A) 83%
B) 80%
C) 20%
D) 17%
E) 12%

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