On the number line, which of the following specifies the set of all numbers $x$ such that $|x-3| + |x-4| < 2$ ?

- $1 < x < 6$
- $1.5 < x < 5.5$
- $2 < x < 5$
- $2.5 < x < 4.5$
- $3 < x < 4$

For the rental of a certain type of car, Rental Agency R charges a fee of $30 per day plus a fee of $0.20 for each mile traveled in excess of 100 miles per day. For the rental of the same type of car, Rental Agency S charges a fee of $65 per day with free unlimited mileage. If a car of this type is to be rented for 3 days and will be driven the same number of miles each day, for what total number of miles will the cost of renting the car from Rental Agency R be the same as the cost of renting the car from Rental Agency S ?

- 352
- 405
- 525
- 750
- 825

| Blood type | Rh+ | Rh− | Total |
|---|---|---|---|
| A | 34 | 7 | 41 |
| B | 8 | 3 | 11 |
| O | 38 | 6 | 44 |
| AB | 3 | 1 | 4 |
| Total | 83 | 17 | 100 |

The table above represents 100 people grouped by their blood types. The table also shows, for each blood type, the number of people who have a negative Rh factor (Rh−) and the number of people who have a positive Rh factor (Rh+). If 1 person is chosen at random from this group of 100 people, what is the probability that the person chosen has blood type AB or has a negative Rh factor?

- 0.04
- 0.19
- 0.20
- 0.21
- 0.99

If $S$ is the sum of all the numbers of the form $\frac{1}{n}$, where $n$ is an integer from 33 to 64, inclusive, then $S$ lies in which of the following intervals?

- $0 < S < \frac{1}{64}$
- $\frac{1}{64} < S < \frac{1}{32}$
- $\frac{1}{32} < S < \frac{1}{2}$
- $\frac{1}{2} < S < 1$
- $1 < S < 2$

The value of $\left(\sqrt{(8!)} + \sqrt{(9!)}\right)^2$ is an integer. What is the greatest integer $n$ such that $2^n$ is a factor of $\left(\sqrt{(8!)} + \sqrt{(9!)}\right)^2$ ?

- 3
- 6
- 8
- 11
- 14

Bob expected to spend a total of $9.00 to buy a given amount of pasta salad at a fixed price per pound. However, the price of the salad was $0.20 more per pound than Bob had expected. Consequently, he spent $9.00 and bought $\frac{1}{2}$ pound less of the salad. How much did Bob spend per pound for the salad?

- $1.80
- $1.85
- $1.90
- $1.95
- $2.00

The nearest star outside our solar system is approximately $4 \times 10^{13}$ kilometers (km) from Earth and our moon is approximately 380,000 km from Earth. If these distances were scaled down so that the distance from Earth to our moon was represented by 1 centimeter, then which of the following is closest to the scaled down distance, in kilometers, from Earth to the nearest star outside our solar system?

- 10
- 100
- 1,000
- 100,000
- 1,000,000

For each positive integer $k$, let $a_k = 7k$. Which of the following is the greatest value of $n$ such that $10^n$ divides $(a_1)(a_2)(a_3)...(a_{28})$ ?

- 7
- 6
- 5
- 4
- 3

Next year, if Company Q produces $x$ units of a certain product and sells $y$ units of this product, its total profit, in dollars, from this product will be $10y - 4x$. If $x$ and $y$ are related by the equation $y = rx$ and if Company Q's average (arithmetic mean) profit per item produced next year must be at least $4.50, what is the least possible value of $r$ ?

- 0.65
- 0.70
- 0.75
- 0.80
- 0.85

On June 8, 2008, a computer set a speed record by completing arithmetic operations at a rate of approximately $1.026 \times 10^{15}$ operations per second. At this rate, which of the following is closest to the fraction of an hour it would take this computer to complete 1 million mega-operations, if 1 mega-operation is defined to be 1 million arithmetic operations?

- $3 \times 10^{-13}$
- $6 \times 10^{-13}$
- $4 \times 10^{-10}$
- $3 \times 10^{-7}$
- $3 \times 10^{-1}$

A certain wire with a constant mass-to-length ratio has a mass of $x$ grams per $y$ centimeters of its length. Which of the following is the mass of this wire, in kilograms, per meter of length?

- $\frac{x}{y}$
- $\frac{10x}{y}$
- $\frac{x}{10y}$
- $\frac{100x}{y}$
- $\frac{x}{100y}$

Let $p$ and $q$ each represent a digit from 0 through 9 and let $pq$ represent a 2-digit positive prime number such that $20 < pq < 99$. For example, if $p = 2$ and $q = 3$, then the 2-digit prime number $pq$ is 23. If the 2-digit integer $qp$ is 27 greater than $pq$, what is the sum of the digits $p$ and $q$ ?

- 5
- 7
- 9
- 11
- 13

Last year a company produced millions of widgets each week. Last year the ratio of the number of defective widgets to the number of widgets produced was $\frac{1}{4}$ for the first week, $\frac{1}{8}$ for the second week, $\frac{1}{16}$ for the third week, and so on for 19 weeks, where the ratio for each week after the first week was half of the ratio for the preceding week. If last year the ratio of the number of defective widgets to the number of widgets produced was $d$ for the 19th week, then $d$ satisfies which of the following inequalities?

- $d < \frac{1}{1,000,000}$
- $\frac{1}{1,000,000} \leq d < \frac{1}{100,000}$
- $\frac{1}{100,000} \leq d < \frac{1}{10,000}$
- $\frac{1}{10,000} \leq d < \frac{1}{1,000}$
- $d \geq \frac{1}{1,000}$

Step 1: Assign a value for $x$ and a value for $y$.

Step 2: If $x < y$, then go to step 5; otherwise, go to step 3.

Step 3: Divide $x$ by 2 and set the result to be the new value of $x$.

Step 4: Go to step 2.

Step 5: Write the value of $x$.

Step 6: End

If the algorithm above is applied, assigning 100 as the value of $x$ and 3 as the value of $y$, how many times is step 2 performed before step 5 is reached?

- Three
- Four
- Five
- Six
- Seven

In a class of 100 students, more students were born in October than in any other month. What is the least possible number of students who were born in October?

- 8
- 9
- 10
- 11
- 12

A lottery box contains 8,000 tickets, each of which is red or blue or green. The box contains twice as many blue tickets as red tickets. The number of green tickets is 20 more than the number of red and blue tickets combined. Which of the following is the best approximation to the probability that the first ticket randomly drawn from the box will be blue?

- $\frac{1}{3}$
- $\frac{1}{4}$
- $\frac{1}{5}$
- $\frac{1}{6}$
- $\frac{1}{8}$

Of the 45 households in a certain neighborhood, 28 subscribe to Newspaper Q, 17 subscribe to Newspaper R, 12 subscribe to Newspaper S, 7 subscribe to both Q and R, 8 subscribe to both Q and S, and 9 subscribe to both R and S. The number of households who subscribe to all three newspapers is equal to the number of households who subscribe to none of the three newspapers. If 39 of the households subscribe to at least one of the three newspapers, how many households subscribe to only one of the newspapers?

- 15
- 21
- 27
- 33
- 36

If $m$ is a positive integer and $f$ and $g$ are factors of $m$, which of the following must be an integer?

I. $\frac{m}{f+g}$

II. $\frac{m}{fg}$

III. $\frac{f}{g}$

- None
- I only
- II only
- II and III only
- I, II, and III

The ten children in a certain group contributed a total of 28 pieces of clothing to a charity. If the range of the numbers of pieces of clothing contributed by the ten children was 2, which of the following could be the number of children in the group who contributed 3 pieces of clothing each?

I. 0
II. 5
III. 9

- II only
- III only
- I and II only
- I and III only
- I, II, and III

Hans invested $10,000 at an annual interest rate of $x$ percent, compounded annually. If the annual interest rate of $x$ percent had been compounded semiannually, how much more interest, in dollars, would he have earned on his $10,000 investment for the first year in terms of $x$ ?

- $50x$
- $100x$
- $100x + \frac{x^2}{4}$
- $\frac{x^2}{2}$
- $\frac{x^2}{4}$

Last year the price of a blouse in February was 15 percent less than the original price of $60 and the price of the blouse in March was 6 percent greater than its price in February. What percent greater, or less, than the original price was the price of the blouse in March?

- 0.9% greater
- 8.1% greater
- 9.0% greater
- 9.0% less
- 9.9% less

A bar over a sequence of digits in a decimal indicates that the sequence repeats indefinitely. If $\frac{m}{n} = 0.\overline{36}$, where $m$ and $n$ are positive integers, what is the least possible value of $m$ ?

- 3
- 4
- 7
- 13
- 22

If $x = \sqrt[4]{x^3 + 6x^2}$, what is the sum of all possible values of $x$?

- $-2$
- $0$
- $1$
- $3$
- $5$

A chef visited a market to purchase some eggs and paid $12 for them. However, as the eggs were smaller than expected, the chef convinced the seller to add two more eggs to the purchase, free of cost. As a result of this, the price per dozen of eggs decreased by one dollar. How many eggs did the chef purchase at the market, including the two free eggs?

- 8
- 12
- 15
- 16
- 18

Of the vehicles (cars and trucks) for sale at a certain dealership, 48 percent are cars that have 4 doors. If 80 percent of the cars for sale at the dealership have 4 doors, what percent of the vehicles are cars that do not have 4 doors?

- 12%
- 20%
- 24%
- 32%
- 40%

If $x = (0.0753)(1{,}856)$, then $x$ satisfies which of the following inequalities?

- $x \leq 1$
- $1 < x \leq 10$
- $10 < x \leq 100$
- $100 < x \leq 1{,}000$
- $1{,}000 < x \leq 10{,}000$

If $m$ is the tens digit of the sum of the two-digit positive integers $kr$ and $ms$, where $k$, $m$, $r$, and $s$ are the digits of the integers, which of the following must be true?

I. $k = 9$
II. $m < 9$
III. $r + s > 9$

- II only
- III only
- I and II only
- I and III only
- I, II, and III

If $x$, $y$, and $z$ are positive integers such that $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$, which of the following could be the value of $x + y + z$?

I. 7
II. 9
III. 11

- I only
- II only
- III only
- I and II
- II and III

Throughout last week, water was leaking from a certain tank at a constant rate of $\frac{1}{4}$ gallon per hour, and 14 gallons of water were added to the tank every day at 1 o'clock in the afternoon. If there were $32\frac{3}{4}$ gallons of water in the tank at 2 o'clock last Tuesday afternoon, at what time last week were there $46\frac{3}{4}$ gallons of water in the tank?

- 2 o'clock Wednesday afternoon
- 1 o'clock Thursday morning
- 6 o'clock Thursday morning
- 10 o'clock Thursday evening
- 2 o'clock Friday morning

The sum and product of $k$ positive integers are 12 and 81, respectively. If the $k$ positive integers are all equal to each other, what is the value of $k$?

- 9
- 6
- 5
- 4
- 3

An intensive effort was made to expand the database of alumni names for a certain high school. The number of names in the database increased by 1,300 percent of the original number of 1,500 names. How many names were in the expanded database?

- 1,950
- 2,800
- 16,300
- 19,500
- 21,000

If $m$ is the tens digit of the sum of the two-digit positive integers $kr$ and $ms$, where $k$, $m$, $r$, and $s$ are the digits of the integers, which of the following must be true?

I. $k = 9$

II. $m < 9$

III. $r + s > 9$

- II only
- III only
- I and II only
- I and III only
- I, II, and III

Candle A and Candle B have equal heights but different volumes. While the candles are burning, the height of each candle decreases at its own individual constant rate, with Candle A taking a total of $t$ minutes to completely burn down and Candle B taking a total of $2t$ minutes to completely burn down. If both candles begin burning at the same time, in terms of $t$, how many minutes will it take for Candle B's height to be twice Candle A's height?

- $\frac{1}{4}t$
- $\frac{1}{3}t$
- $\frac{2}{3}t$
- $\frac{3}{4}t$
- $t$

Throughout last week, water was leaking from a certain tank at a constant rate of $\frac{1}{4}$ gallon per hour, and 14 gallons of water were added to the tank every day at 1 o'clock in the afternoon. If there were 32 $\frac{3}{4}$ gallons of water in the tank at 2 o'clock last Tuesday afternoon, at what time last week were there 46 $\frac{3}{4}$ gallons of water in the tank?

- 2 o'clock Wednesday afternoon
- 1 o'clock Thursday morning
- 6 o'clock Thursday morning
- 10 o'clock Thursday evening
- 2 o'clock Friday morning

If $x$, $y$, and $z$ are positive integers such that $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$, which of the following could be the value of $x + y + z$?

I. 7

II. 9

III. 11

- I only
- II only
- III only
- I and II
- II and III

The permutation function $P$ is defined by the formula

$$P(n,r) = \frac{n!}{(n-r)!}$$

where $n$ and $r$ are positive integers. What is the least value of $r$ for which $P(10, r) > 1{,}000$ ?

- 1
- 2
- 3
- 4
- 5

The sum and product of $k$ positive integers are 12 and 81, respectively. If the $k$ positive integers are all equal to each other, what is the value of $k$ ?

- 9
- 6
- 5
- 4
- 3