. . 1)

Let the solution satisfy the following equations:

. If , what is the value of: ?

. . 2)

What is value of if satisfies the equation ?

. . 3)

What is the larger solution of:

?

. . 4)

A very important theorem in Number Theory states: If and are two integers, then there exists integers such that . With this in mind, consider the following equations.

1. **-2**:
2. **1**:
3. **4**:
4. **7**:

For each of the equations I to IV that have integer solutions , add up the bolded number in front (i.e. -2, 1, 4, 7). What is the sum of the bolded numbers?

. . 5)

What is the smallest prime number that is bigger than 333?

. . 6)

Assume that Earth has a radius of 12,000 km and that 1 km = 1.3 miles. If Ali is placed exactly at the intersection of the equator and Prime Meridian, how long will it take him to reach the North Pole if he is traveling northwest at 3 miles per hour?

Hint: the surface area and volume of a sphere with radius is and .

. . 7)

How many three digit numbers contain at least one 0?

. . 8)

What is the oblique angle (in degrees) formed by a clock’s hands if the time is 7:45PM?

. . 9)

What is the sum of the values of k that will make matrix have no inverse?

. . 10)

Triangle has the following characteristics: angle , angle , side cm. What is the exact length of side ?

. . 11)

. . 12)

If a cube has side lengths of 2 inches, what is the longest length in that can be drawn between any two corner points?

. . 13)

What is the smallest solution to the equation: ?

. . 14)

How many solutions are there to the equation: ?

. . 15)

What is the slope of line if it is perpendicular to line , which goes through the points: and ?

. . 16)

Sharifa, a huge Hurricanes fanatic, has six socks in her drawer, and the socks are either navy or burgundy. If the probability that she pulls out two navy socks in a row (without replacement) is 2/3, then what is the probability that she pulls out two burgundy socks in a row (without replacement)?

. . 17)

If the supplement of angle is nine times the length of the angle, what is half of the complement of angle ?

. . 18)

If what is

. . 19)

An economist develops a complex model for the profit of a particular business that is influenced by three parameters abbreviated *a*, *b*, and *c*, as described in the following equation:

The only constraints on the parameters are that they are all positive real numbers. For which parameter(s) will an increase *always* result in an increased profit?

. . 20)

An exponential distribution has the following characteristics: , where is a positive, real number and the rate parameter, which is also a positive real number. Further, , the survival parameter, is related to as follows. With this information, solve the following problem.

Suppose scientists discover a new element, called Awesome, that is very radioactive. Its average lifespan (i.e. survival) is 1/1,000th of a second. If the atom lives for more than 1/200th of a second, what is the probability that it lives for more than 1/100th of a second?

. . 21)

Clement the deer, Shiloh the dog, Vernon the whale, Oxy the ox, Clickbileh the gazelle, and Chantel the lizard are all in the running to be nominated “Animal of the Year.” If three of the six are to be nominated and each nomination triplet has equal probability of occurrence, what is the probability that neither Oxy nor Chantel is nominated?

. . 22)

Suppose you have 10 stacks of gold bars, each with 10 gold bars in them. The stacks are identical in appearance and weight, except that one stack of gold bars weighs 4.9 kg while the others weight 5 kg. There is a scale that you can use to weigh the bars. There are no restrictions on the how you weigh the bars (e.g. you can weigh two stacks at once, weigh one bar from one stack, mix and match bars from different stacks). What is the minimal number of uses of the scale you would need to do in order to determine which stack is lower in weight?

. . 23)

Evaluate the following expression:

.

. . 24)

A company sells teddy bears at price P. Q, the number of teddy bears the company is able to sell, is related to P by the equation Q = -P + 50. The company paid $1000 to use manufacturing equipment, and each teddy bear costs $0.50 to make. What should the value of P be for the company to achieve maximum profit? Assume all bears made are sold.

. . 25)

Consider the following expressions:

(A):

(B):

Which expression, (A) or (B), is lower in value?