

ANSWERS**Part D - Individual Questions Part 2 of 2**ANSWERS

Grade 8

Name: _____.

1.) Binary numbers are a number expressed in the base-2 numeral system, which represents numeric values using two different symbols: typically 0 (zero) and 1 (one). For example, number 5 can be represented in binary form as 101.

Counting in binary is similar to counting in any other number system. Beginning with a single digit, counting proceeds through each increment, from right to left.

The byte is a unit of digital information in computing that most commonly consists of eight bits.

decimal	binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001

Note: As with all numbering systems
most significant digits are at left,
least significant digits are at right.

How would the number 14 be represented in the binary system?

Answer:

1110

2.) A bag contains 15 units of caps to enclose the monitoring wells installed on Site. Exactly 3 units of these caps were defective.

If the technician reaches into the bag and randomly grabs one of the monitoring well caps, what is the probability that the cap selected by the technician is defective?

Answer:

1 in 5 (half marks)
20 % (full)

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3.) An engineer can determine the age of an object using the properties radioactive decay. A quantity of carbon-14 decays to half of its original amount after 5730 years regardless of how much the original quantity was. It means that every 5730 years only half as much of the carbon remains in existence. If you have 20 grams of carbon-14 then...

$$\frac{A}{A_o} = \left(\frac{1}{2}\right)^{\left(\frac{t}{T}\right)}$$

Where

A = the mass of carbon-14 at some time in the future “t”

A_o = the amount of carbon-14 at the beginning

t = the amount of time that has passed (in years)

T = the half life of carbon-14 (5730 years)

How long will it take until there is only 2.5 grams of carbon-14 left.

Hint: You could use the formula, however, you can also think of this logically using the knowledge that only half of the original mass of carbon-14 remains after 5730 years.

Answer: 17,190 yrs

4.) A chemical engineer needs to convert the pressure in a vessel from units of PSI or “pounds per square inch” to “atmospheres”. He knows that 1 atmosphere = 14.7 PSI.

If the chemical engineer knows that the required pressure in the vessel is 15 atmospheres and the actual pressure is currently 8.5 atmospheres, how much more pressure is required (in units of PSI) until the required pressure is achieved. Give your answer to one decimal place.

Answer: 95.6 PSI

5.) Simplify the following expressions:

If
s = 5 and q = -3
Simplify:
sq - q

Answer: -12

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6.) Software engineers often convert between the following units of memory capacity:

8 bits = 1 byte

1 Megabyte (symbol MB) = 1,048,576 bytes

If a software engineer writes a program that consumes 262,144 bytes of memory, what fraction of a Megabyte does the program consume?

Answer:

1/4

7.) Mechanical engineers often need to convert the length of an object from inches to millimeters.

1 inch = 25.4 millimeters (often written as 25.4 mm)

A mechanical engineer knows that a part cannot be thicker than 0.012 inches in order to fit. How much exactly is 0.012 inches in millimeters?

Answer:

0.3048 mm

8.) An aerospace engineer builds a 1:72 scale model of a glider. If the actual glider has a wing span of 14.65 meters, what is the wing span of the model (in meters)? Give your answer to four decimal places and round accordingly.

Answer:

0.2035 m

9.) What is the mean (or average) of the set of numbers shown below:

7, 9, 17, 8, 23, 14

Answer:

13

10.) Solve for x in the following equation:

$$\frac{4}{5}x + 2x - \frac{1}{2}x = 23$$

Answer:

10