Applications of Solving Equations of Other Kinds

UNIT 4 SOLVING OTHER KINDS OF EQUATIONS | PROBLEM SET 3

1. QUADRATIC EQUATION: The height h, measured in feet, of an object dropped from the top of a 144 meter high tower after elapsed time t, measured in seconds, can be determined by the formula $h = 144 - \frac{1}{2}(32)t^2$. For how many seconds will the object be in free fall before it hits the ground?
2. QUADRATIC EQUATION: A potted plant falls from a windowsill that is 490 meters above the ground. The height h, measured in meters, of the plant after elapsed time t, measured in seconds, can be determined by the formula $h = 490 - \frac{1}{2}(9.8)t^2$. How long will it take (in seconds) for the plant to hit the ground?
3. CUBIC EQUATION: A hot air balloon is ascending quickly such that the altitude a of the balloon above the ground, measured in feet, after elapsed time m, measure in minutes, can be determined by the formula $a = 3(m + 1)^3$. How many minutes have elapsed when the balloon first reaches an altitude of 648 feet?
4. CUBIC EQUATION: A hot air balloon is descending quickly such that the altitude a of the balloon above the ground, measured in feet, after elapsed time m, measured in minutes, can be determined by the formula $a = 900 - 2(m - 2)^3$. How long will it take for the balloon to descend to an altitude of 650 feet?
5. RADICAL EQUATION: A population of sewer rats is steadily growing beneath the streets of New York City. The population p, measure in number of rats, at the end of the year y can be determined by the formula $p = 100 + 500\sqrt{x - 2000}$. At the end of what calendar year is the rat population projected to be 4,600 rats?
6. RADICAL EQUATION: A population of endangered swamp rabbits is decreasing such that the population p, measured in number of rabbits, at the end of the year y can be determined by the formula $p = \frac{2000}{\sqrt[3]{y-2000}}$. At the end of what calendar year is the rabbit population projected to be 250 rabbits?
7. EXPONENTIAL EQUATION: An initial amount of 20 milligrams of a radioactive isotope is decaying such that the mass of the isotope is halved every 4 hours. The mass of the isotope m, measured in milligrams, after elapsed time h, measured in hours, can be modeled by the formula $m = 20 \cdot 2^{(-0.25h)}$. After how many hours will the mass of the isotope have decayed to 1.25 milligrams?
8. EXPONENTIAL EQUATION: An initial amount of 20 milligrams of bacteria is allowed to grow in a laboratory such that the mass of the bacteria triples every ten hours. The mass of the bacteria m, measured in milligrams, after elapsed time h, measured in hours, can be modeled by the formula $m = 20 \cdot 3^{(0.1h)}$. After how many hours will the mass of the bacteria grown to be 540 milligrams?
9. ABSOLUTE VALUE EQUATION: If point A is located at 5 and point B is located at 12 on the same number line then the distance between the two points can be expressed as $|12 - 5|$ or $|5 - 12|$, both of which are equal to 7 units. Let x represent the location of a third point, named point C, so that the distance between points B and C is $|x - 12|$. If it is known that the distance between points B and C is exactly 4 units, then what are the two possible locations of point C?
10. ABSOLUTE VALUE EQUATION: It point A is located at 5 and x represents the location of point D then the equation $|5 - x| = 6$ allows us to conclude that the distance between point A and point D is six units. What are the two possible locations of point D?