Algebra 2 CC Name _____
Half-Life & Doubling

1.) A certain pain reliever is taken in 220 mg dosages and has a **half-life** of 12 hours.

Let A represent the amount of pain reliever in milligrams remaining in the body after t hours.

a. Write an equation that will model this situation.

$y = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$

$y = 9\left(\frac{1}{2}\right)^{\frac{t}{H}}$

$A = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$

b. What amount of pain reliever in milligrams remains in the body after 10 hours? [Round to the nearest tenth of a milligram.]

$A = 220\left(\frac{1}{2}\right)^{\frac{10}{12}}$

$A = 123.5$

2.) A patient is given 20 milligrams of Iodine-131. Iodine-131 is a radioactive isotope used in the treatment of thyroid conditions. Iodine-131 will naturally get removed from the body after an extended period of time. For most patients, **half** of the radioactive isotope will leave the body every **8 days**. Let I represent the amount of Iodine-131 remaining in the body after t days.

a. Write an equation that will model this situation.

$$y = 20\left(\frac{1}{2}\right)^{\frac{t}{8}}$$

b. What is the rate of decay **per day**? [Round to the nearest tenth of a percent]

$$y = 20\left(\frac{1}{2}^{\frac{1}{8}}\right)^{t}$$

$$y = 20(.917)^{t}$$

$1 - r = .917$

$-r = -.083$

$r = .083$

8.3%

3.) A population of rabbits **doubles** every **60 days**. The initial population of rabbits in a park is 10.

Let t represents the time, in days, and $P(t)$ represent the population of rabbits with respect to time.

a. Write an equation that will model this situation.

$$P(t) = 10(2)^{\frac{t}{60}}$$

b. What is the population of rabbits after 1 **year**? [Round to the nearest rabbit]

1 year = 365 days

$$P(t) = 10(2)^{\frac{365}{60}}$$

$P(t) = 678$

4.) A population of 5000 minnows **doubles** every 200 days.

Let t represent the time, in days, and $P(t)$ represent the population of minnows with respect to time.

a. Write an equation that will model this situation.

$$P(t) = 5000\left(2\right)^{\frac{t}{200}}$$

b. What is the population of minnows after 500 days? [Round to the nearest minnow]

$$P(t) = 5000\left(2\right)^{\frac{500}{200}}$$

$$P(t) = 28{,}284$$

5.) Sodium iodide – 131, used to treat certain medical conditions, has a half-life of 1.8 hours. The data table below shows the amount of sodium iodide – 131, rounded to the nearest thousandth, as the dose fades over time.

Number of Half Lives	1	2	3	4	5
Amount of Sodium Iodide-131	139.000	69.500	34.750	17.375	8.688

$$y = a\left(\frac{1}{2}\right)^{\frac{t}{H}}$$

$$y = 278\left(\frac{1}{2}\right)^{\frac{t}{1.8}}$$

What approximate amount of sodium iodide – 131 will remain in the body after 18 hours?

(a) 0.001 (b) 0.136 (c) 0.271 (d) 0.543

$$y = 278\left(\frac{1}{2}\right)^{\frac{18}{1.8}}$$