1. The available landfill volume in the U.S. has been decreasing 5.8% each year. In 2010 there was a total of 240 million cubic yards of available landfill. In how many years, to the nearest hundredth, will the available landfill first fall below 100 million cubic yards?

2. The population of a city is increasing 6.4% every five years. If the population of the city in 2001 was 250,000 find the number of years it will take to reach 400,000. Round to the nearest hundredth.

3. The table below shows how the population of a city has been consistently changing each year. Use this data to find the number of years from 2017, to the nearest hundredth, it will take for the population to reach 300,000.

Year	Population
2015	125,000
2016	130,000
2017	135,200

4. Allie has three fewer than twice the number of coins that Jonathan has. If Jonathan gave 2 coins to Allie, she would have three times as many coins as he would. How many coins does Allie have?
A. 2   B. 3   C. 5   D. 7   E. 9

1

1. The available landfill volume in the U.S. has been decreasing 5.8% each year. In 2010 there was a total of 240 million cubic yards of available landfill. In how many years, to the nearest hundredth, will the available landfill first fall below 100 million cubic yards?

$$100 - 5.8 = 94.2\%$$

$$\frac{100}{240} = \frac{240(.942)^x}{240}$$

$$\frac{100}{240} = .942^x$$

$$\log_{.942}\left(\frac{100}{240}\right) = X$$

$$\frac{\log\left(\frac{100}{240}\right)}{\log .942} = X$$

$$\boxed{X = 14.65 \text{ yrs}}$$

2. The population of a city is increasing 6.4% every five years. If the population of the city in 2001 was 250,000 find the number of years it will take to reach 400,000. Round to the nearest hundredth.

$$100 + 6.4 = 106.4\%$$

$$\frac{250,000(1.064)^x}{250,000} = \frac{400,000}{250,000}$$

$$1.064^x = 1.6$$

$$\log_{1.064}(1.6) = X$$

$$\frac{\log 1.6}{\log 1.064} = X \quad \leftarrow \quad \# 5 \text{ yr periods}$$

$$X = 7.576\cdots$$
$$\times 5$$
$$\boxed{37.88 \text{ yrs}}$$

3. The table below shows how the population of a city has been consistently changing each year. Use this data to find the number of years from 2017, to the nearest hundredth, it will take for the population to reach 300,000.

Year	Population
2015	125,000
2016	130,000
2017	135,200

$$\frac{130,000}{125,000} = 1.04$$

$$\frac{135,200}{130,000} = 1.04$$

> 4% increase each year.

EQ: $300,000 = 135,200(1.04)^x$

$x = \#$ yrs since 2017

$$X = \frac{\log\left(\frac{300,000}{135,200}\right)}{\log 1.04}$$

$$\boxed{X = 20.32 \text{ yrs}}$$

$$1.04^x = \frac{300,000}{135,200}$$

$$\log_{1.04}\left(\frac{300,000}{135,200}\right) = X$$

4. Allie has three fewer than twice the number of coins that Jonathan has. If Jonathan gave 2 coins to Allie, she would have three times as many coins as he would. How many coins does Allie have?

A. 2   B. 3   C. 5   Ⓓ. 7   E. 9

A = # coins Allie has now
J = # coins Jonathan has now

$A = 2J - 3$

$A + 2 = 3(J - 2) \rightarrow A + 2 = 3J - 6$

$(2J - 3) + 2 = 3J - 6$

$2J - 1 = 3J - 6$

$5 = J$

$A = 2(5) - 3$

$A = 7$

1