NOTES: Exponential word problems

PERCENTS

$$y = P(1 \pm \%)^x$$

P: PRINCIPLE (OR STARTING) AMOUNT

± USE + FOR INCREASING (APPRECIATING) USE − FOR DECREASING (DEPRECIATING)

%: % CHANGE WRITTEN IN DECIMAL FORM

We call (1 + %) THE GROWTH RATE (BECAUSE IT IS b bigger than 1!) ☺

We call (1 - %) THE DECAY RATE (BECAUSE IT IS b less than 1!) ☺

Converting % into decimal practice

In an equation, a percent must always be written in "DECIMAL FORM". A percent is always a number out of 100. So if we want to convert a percent into a decimal we DIVIDE BY 100.

Convert the following percents into decimal form

14% = $\frac{14}{100}$ = .14	4% = $\frac{4}{100}$ = .04	5% = $\frac{5}{100}$ = .05
1.34% $\frac{1.34}{100}$ = .0134	0.6%= $\frac{0.6}{100}$ = .006	50% $\frac{50}{100}$ = .5

Example 1:

It costs $400 to buy a football autographed by Falcon's quarterback Matt Ryan. It is expected increase in value 4% per year. How much do you expect it to be worth in 5 years?

4% = $\frac{4}{100}$ = .04

$y = 400(1 + .04)^x$

$y = 400(1.04)^x$ ← THIS IS OUR FORMULA

1.04 REPRESENTS THE GROWTH RATE

TO SOLVE THE EXAMPLE IN 5 YEARS PLUG IN 5 FOR x

$y = 400(1.04)^5$ PUT INTO CALCULATOR

$= \$486.66$ IN 5 YEARS

Example 2:

A new iPad costs $650. It is expected to decrease in value 15% each year. How much do you expect it to be worth in 3 years?

$\frac{15}{100} = .15$

0.85 REPRESENTS THE DECAY RATE

$y = 650(1 - .15)^x$

$y = 650(0.85)^x$ ← FORMULA

AFTER 3 YEARS.... $y = 650(.85)^3$

$= \$399.18$

Example 3:

A house in my neighborhood is for sale for $150,000. It is expected to increase in value 1.2% per year. How much do you expect the house to be worth in 15 years?

$y = 150{,}000(1 + .012)^x$

$y = 150{,}000(1.012)^x$

$y = 150{,}000(1.012)^{15}$

$= \$179{,}390.30$

Part b: How much money did the house increase in value in over the 15 years?

179,390.30 (after 15 years) − 150,000 (original amount) =

THE HOUSE INCREASED IN VALUE BY $29,390.30

Example 4:

A brand new Jeep Wrangler cost $29,000. It is expected to decrease in value 12% per year. How much do you expect it to be worth in 7 years?

$y = 29000(1 - .12)^x$

$y = 29000(.88)^x$

$y = 29000(.88)^7$

$= \$11{,}851.59$

Part b: How much did the car lose in value over 7 years?

11,851.89 (after 7 years) − 29,000 (original amount) = −17,148.41

THE CAR LOST $17,148.41 IN VALUE OVER 7 YEARS