**Percents and Percent Change**

Watch the 5-minute video about black-footed ferrets at the Futures Channel. This video discusses how and why biologists at the US Fish and Wildlife Service are raising black-footed ferrets in captivity. Movie: <http://www.thefutureschannel.com/algebra/population_growth.php>

Suppose the initial (starting) black-footed ferret population in a certain area is 20 animals. As a result of the biologists’ work, the population increases by 10% per year. How would you calculate the total number of ferrets after one year? After two years? We will come back to this question after we discuss percents.

**Percents**

To perform calculations with percents, we need to change the percent into a number without the % symbol. Think about the word percent. Recognize that percent (*per cent*) means *per* *one hundred*. The operation we use to translate the word “per” into algebra is division.

32.5% means 32.5 per 100, which translates to .

1. Fill in the table below by converting numbers between different forms.

|  |  |  |
| --- | --- | --- |
| **Percent with % Symbol** | **Fraction Form** | **Decimal Form** |
| 23% |  |  |
| 58.4% |  |  |
| 4.9% |  |  |
| 0.2% |  |  |
| 256% |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  | 0.27 |
|  |  | 0.794 |
|  |  | 0.03 |
|  |  | 2.31 |

To calculate the percent *of* a number think about what operation we use to translate the word “of” into algebra. (Multiplication!)

45% of 100 = = 0.45(100) = 45

1. Write each expression as an algebraic expression and then calculate.

|  |  |  |
| --- | --- | --- |
| **Percentage** | **Algebraic Expression** | **Value** |
| 43% of 150 | 0.43∙(150) | 64.5 |
| 95.6% of 1230 |  |  |
| 5.9% of 268 |  |  |
| 0.75% of 10 |  |  |
| 120% of 900 |  |  |
| 0.06% of 810 |  |  |
| 10% of 91.2 |  |  |

1. Connecticut charges 6.35% sales tax. How much tax will you pay for phone that costs $220?
2. A new car that cost $22,650 lost 12% of its value after one year. How much value did it lose?
3. 720 seniors graduated from a certain high school and 85% of them went on to college.

How many of those seniors went on to college?

**Black-Footed Ferrets**

The initial (starting) black-footed ferret population in a certain area is 20 animals. As a result of the biologists’ work, the population increases by 10% per year.

1. Complete the chart to show how the population grows over the next five years.

|  |  |
| --- | --- |
| **Number of years** | **Ferret Population** |
| 0 | 20 |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

1. Look at the pattern in the table. Is it linear or exponential? Explain how you know. If it is linear, give the slope. If it is exponential, give the growth factor.
2. How is that numerical answer in question 7 related to the percent increase in the population each year?

**Percent Change**

We want an efficient (quick) way to calculate the new amount when we have a certain percent increase or decrease in a quantity. It is important to remember that when we have an amount that changes by a percent, *we always start with 100% of the original amount*. If the amount is increasing, then we add the percent increase to the original 100%. If the amount is decreasing, then we subtract the percent decrease from the original 100%.

***r* = the percentage rate of change (increase or decrease)**

**Percent Increase (Growth) (Original Amount)(1 + *r*) = (New Amount)**

Example: Increase 420 by 12%

(100% of 420) + (12% of 420) = 420(100% + 12%) = 420(1 + 0.12) = 420(1.12)

This means the new amount is 112% of the original amount.

**Percent Decrease (Decay) (Original Amount)(1 – *r*) = (New Amount)**

Example: Decrease 420 by 12%

(100% of 420) – (12% of 420) = 420(100% – 12%) = 420(1 – 0.12) = 420(0.88)

This means the new amount is 88% of the original amount.

***So to increase or decrease by a percent we can just use one multiplier.***

9. Write down the multiplication you use to calculate each percent change and then do it.

 a. Increase 78 by 3% b. Decrease 750 by 4%

 c. Decrease 1024 by 84.5% d. Increase 6 by 360%

 e. Carlton’s new wage is a 5% increase from his current wage of $9.80 per hour. What is his

 new wage?

 f. Marta’s computer was worth $1200 when it was new but it has lost 28% of its value. What

 is it worth now?