**Part 1 – Exponential Growth**

The exponential function can be used as a model to solve problems involving exponential growth.

where:

*a* =

r=

n=

**Ex1.** The population of a small town increases by 3% every year. Its population in 1996 was 1250.

**a)** Find an expression to represent the population of the town *n* years after 1996.

**b)** Determine the population in the year 2017.

**c)** In what year will the population reach 3000 people?

**EXPONENTIAL DOUBLING**

Bacterial and viral cultures are examples of substances that grow at a rate which is exponential in nature – they \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ over a given period of time.

In general, these cultures grow according to the following exponential equation:

where *A* is the total amount or number

ais the inital amount or number

*t* is the elapsed time

*d* is the doubling time

**Ex1.** One bacterium divides into two bacteria every 5 days. Initially, there are 15 bacteria. How many bacteria will there be in 30 days?

**Ex2.** A bacterial culture starts with 3000 bacteria and grows to a population of 12 000 after 3 hours.

**a)** Find the doubling period.

**b)** Find an expression to represent the population after *t* hours.

**c)** Determine the number of bacteria after 8 hours.

**Exponential Growth Practice**

1. The population of a city is 810 000. If it is increasing by 4% per year, estimate the population in four years.
2. A painting, purchased for $10 000 in 1990, increased in value by 8% per year. Find the value of the painting in the year 2000.
3. A river is stocked with 5000 salmon. The population of salmon increases by 7% per year.
   1. Write an expression for the population t years after the salmon were put into the river.
   2. What will the population be in 3 years? 15 years?
   3. How many years does it take for the salmon population to double?
4. A house was bought 6 years ago for $175 000. If real-estate values have been increasing at the rate of 4% per year, what is the value of the house now?
5. If a bacteria population doubles in 5 d,
   1. When will it be 16 times as large?
   2. When was it ½ of its present population?
   3. When was it ¼ of its present population?
   4. When was it 1/32 of its present population?
6. The population of a city was estimated to be 125 000 in 1930 and 500 000 in 1998.
   1. Estimate the population of the city in 2020.
   2. If the population continues to grow at the same rate, when will the population reach 1 million? (in what year)