The current population of a town is 10,000. If the population, P, increases by 20% each year, which equation could be used to find the population after t years?

Solution:

For answer to this question we need to use the compound interest formula

$$P = P_0(1 + i)^n$$

Where P_0-start population, i-is the effective interest rate per period, and n-represents the number of periods.

In our task $P_0 = 10{,}000$, i = 0.2 and n = t.

At last we have:

$$P(t) = 10{,}000 * (1.2)^t$$

Answer: $P(t) = 10{,}000 * (1.2)^t$

Remark

In real it is all well-known formula. You can read about Compound interest in WIKI
http://en.wikipedia.org/wiki/Compound_interest

If you need a mathematical proof let's look at the interest for a couple of years

To find a formula for future value, we'll write PV for your starting principal, and r for the rate of return expressed as a decimal. (So if the interest rate is 10%, r equals 0.1).
Your balance will grow according to the following

Now PV

First year $PV + r * PV$

Second year $(PV + r * PV) + r * (P + r * PV)$

This starts to get messy in a hurry. But you can simplify it by noticing that you can keep pulling out factors of $(1 + r)$ from each line. If you do that, the balances collapse to a simple pattern:

Now P

First year $PV + r * PV = PV * (1 + r)$

Second year $(PV + r * PV) + r * (PV + r * PV) = (PV + r * PV)(1 + r) =$
$PV(1 + r)(1 + r) = PV(1 + r)^2$

And so on.

If you follow this pattern out for Y years, you get the general formula for future value:

$$FV = PV * (1 + r)^t$$