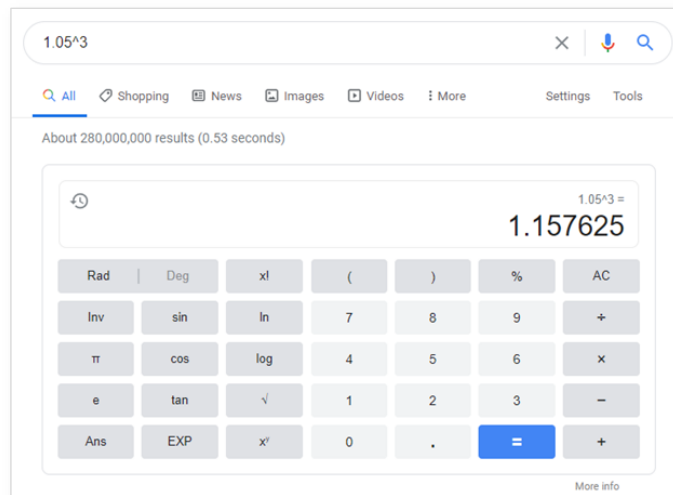


Solving Time Value Money Problems using Google Calculator

You are allowed to use a calculator in this course, and you are encouraged to use the Google calculator to solve these problems. That's right! There is a calculator built into the Google search engine. To use Google's calculator,

- Go to [Google](#).
- Type in your numbers and operations (use of equals sign is optional) and click "search." For example, to compute the value of 1.05^3 , you would type 1.05^3 into Google and click search.



Follow this guide for tips and examples of how to solve time value money problems using Google Calculator.

Solving Equation 4.11 using Google

Example problem: Compute the future value of \$100, saved for 4 years, at a 5 % interest rate, compounded annually. *Show all steps of the calculations in your post.*

Present value (PV₀): \$100

Interest rate (r): 5%

Number of years (n): 4 years

$$\text{Equation 4.11: } FV_n = PV_0 (1 + r)^n$$

The example problem looks like this:

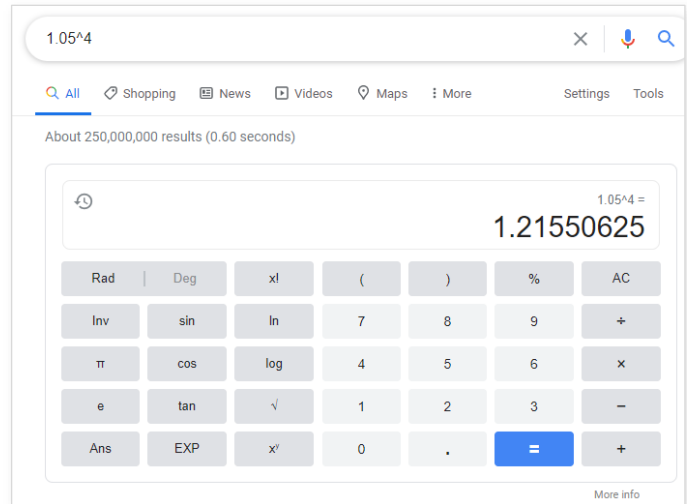
$$FV_n = \$100 (1 + 0.05)^4$$

$$FV_0 = \$100 (1.05)^4$$

Remember to use the order of operations (PEMDAS) in solving all equations.

STEP 1: In Google, first solve the portion of the equation $(1+r)^n$, the exponential equation:

In the Google search bar, type 1.05^4 and press enter, to compute the value of $(1.05)^4 = 1.2155$

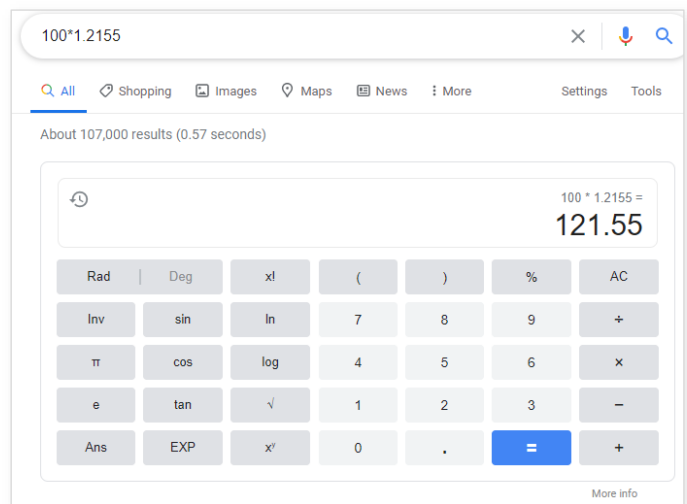


STEP 2: Now, substitute the information from Step 1 into the original equation as follows:

$$FV_n = \$100 (1.05)^4$$

$$FV_n = \$100 * 1.2155$$

To solve, type $100 * 1.2155$ into Google and press enter. You will see the result: $= 121.55$



STEP 3: In writing your discussion post, provide all steps of the problem solving like this:

$$FV = \$100 (1 + 0.05)^4$$

$$FV = \$100 (1.05)^4$$

$$FV = \$100 * 1.2155$$

$$FV = \$121.55$$

Note: You can also your answer by typing the entire equation into Google to solve it. However, this will not be sufficient for the discussion post, because you have to show the different calculation steps in your discussion post.

Solving Equation 4.14 using Google

Example problem: Compute the present value of \$100, received in 8 years, using a discount rate of 4%.
Show all steps of the calculations in your post.

Future value (FV_n): \$100

Discount rate (r): 4%

Number of years (n): 8 years

Equation 4.14: $PV_0 = FV_n (1 + r)^{-n}$ or $PV_0 = FV_n / (1 + r)^n$

The example problem looks like this:

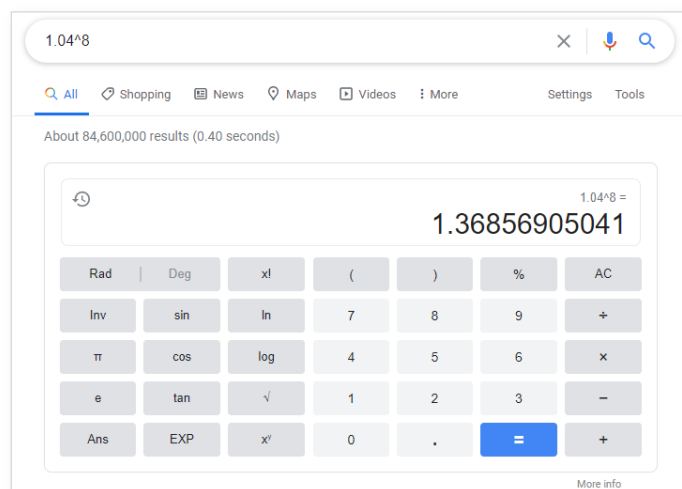
$$PV_0 = \$100 / (1 + 0.04)^8$$

$$PV_0 = \$100 / (1.04)^8$$

STEP 1: In Google, first solve the denominator of the equation $(1+r)^n$, the exponential expression:

In the Google search bar, type 1.04^8 and press enter, to compute the value of $(1.04)^8$

$$= 1.3686$$



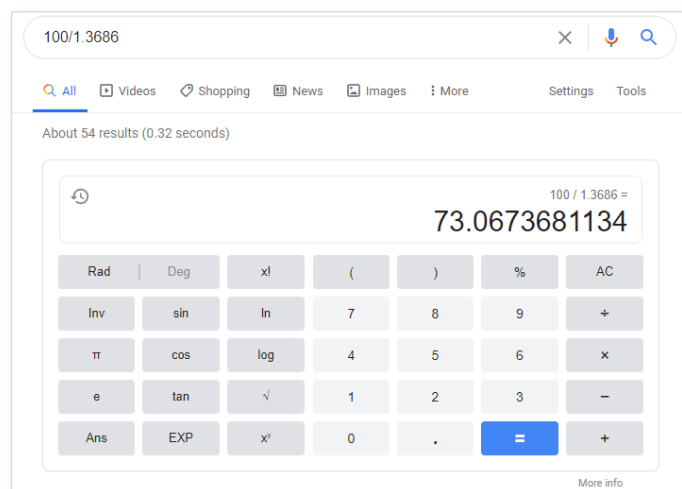
STEP 2: Now, substitute the information from Step 1 into the original equation as follows:

$$PV_0 = \$100 / (1.04)^8$$

$$PV_n = \$100 / 1.3686$$

To solve, type $100 / 1.3686$ into Google and press enter. You will see the result:

$$= 73.07$$



STEP 3: In writing your discussion post, provide all steps of the problem solving like this:

$$PV_0 = \$100 (1 + 0.04)^8$$

$$PV_0 = \$100 / (1.04)^8$$

$$PV_n = \$100 / 1.3686$$

$$PV_0 = \$73.07$$

Note: You can also your answer by typing the entire equation into Google to solve it. However, this will not be sufficient for the discussion post, because you have to show the different calculation steps in your discussion post.

Solving Equation 4.17 using Google

Example problem: Compute the future value of annual payments of \$50, paid for 3 years, using an interest rate of 3 % interest rate, (compounded). **Show all steps of the calculations in your post.**

Annual Payments: \$50

Interest rate (r): 3%

Number of years (N): 3 years

$$\text{Equation 4.17: } FV_N = CF_1 * (1+r)^{N-1} + CF_2 * (1+r)^{N-2} + \dots CF_N$$

The example problem looks like this:

$$FV_N = \$50 * (1 + 0.03)^{3-1} + \$50 * (1 + 0.03)^{3-2} + \$50$$

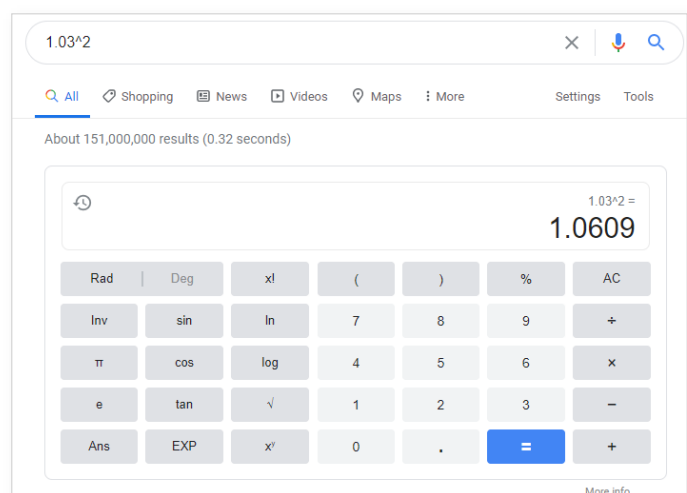
$$FV_N = \$50 * (1.03)^2 + \$50 * (1.03)^1 + \$50$$

STEP 1: First, do the subtraction of N-1; in this case, $N-1 = 3-1=2$.

Then, use Google to solve the portion of the equation $(1+r)^{N-1}$ with the exponents.

In the Google search bar, type 1.03^2 and press enter, to compute the value of $(1.03)^2$

$$= 1.061$$



STEP 2: Then, do the subtraction of N-2; in this case, N-2 = 3-2=1.

The next expression $(1+r)^{N-2}$ will be $(1+r)^1$, which is simply $(1+r)$.

STEP 3: Now, substitute the information from Step 1 and Step 2 into the original equation as follows:

$$FV_N = \$50 * (1.03)^2 + \$50 * (1.03)^1 + \$50$$

$$FV_N = 50 * 1.061 + 50 * 1.03 + 50$$

To continue, type $50*1.061$ into Google and press enter. You will see the result:

$$=53.05$$

To continue, type $50*1.03$ into Google and press enter. You will see the result:

$$= 51.50$$

STEP 4: Now, substitute the information from Step 3 into the original equation as follows:

$$FV_N = \$50 * (1.03)^2 + \$50 * (1.03)^1 + \$50$$

$$FV_N = 50 * 1.061 + 50 * 1.03 + \$50$$

$$FV_N = 53.05 + 51.50 + 50$$

You can simply add these elements together to get the solution, or use Google.

The result is \$154.55

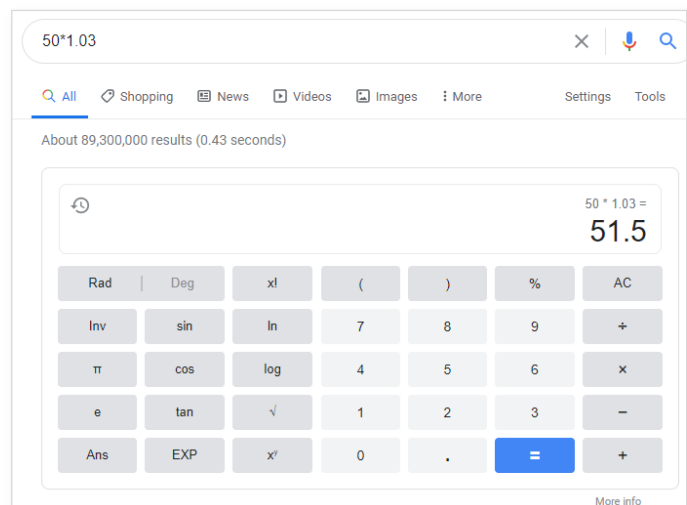
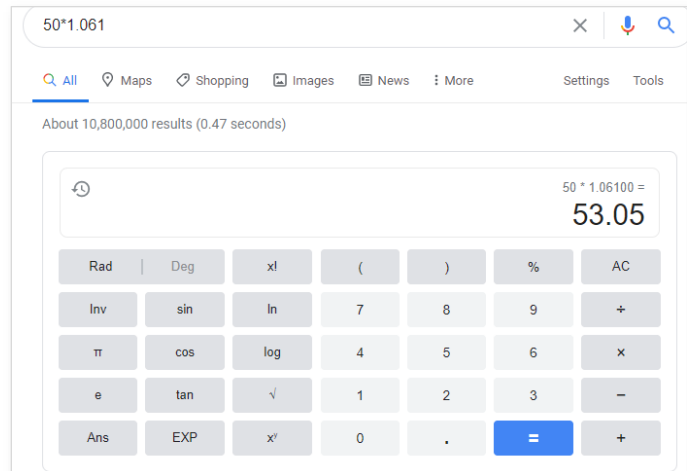
STEP 5: In writing your discussion post, provide all steps of the problem solving like this:

$$FV_N = \$50 * (1.03)^2 + \$50 * (1.03)^1 + \$50$$

$$FV_N = 50 * 1.061 + 50 * (1.03)^1 + 50$$

$$FV_N = 53.05 + 51.50 + 50$$

$$FV_N = \$154.55$$



Solving Equation 4.16 using Google

Example problem: Compute the present value of annual cash payments of \$50, paid for 5 years, using discount rate of 6% interest rate, (compounded). *Show all steps of the calculations in your post.*

Annual Payments: \$50

Discount rate (r): 6%

Number of years (N): 5 years

$$\text{Equation 4.16: } PV_0 = CF_1 / (1 + r) + CF_2 / (1 + r)^2 + CF_3 / (1 + r)^3 + \dots + CF_n / (1 + r)^n$$

The example problem looks like this:

$$PV_0 = \$50 / (1 + 0.06) + \$50 / (1 + 0.06)^2 + \$50 / (1 + 0.06)^3 + \$50 / (1 + 0.06)^4 + \$50 / (1 + 0.06)^5$$

$$PV_0 = \$50 / (1.06) + \$50 / (1.06)^2 + \$50 / (1.06)^3 + \$50 / (1.06)^4 + \$50 / (1.06)^5$$

STEP 1: In Google, first solve the portions of the equation $(1+r)^n$ with the exponents:

In the Google search bar, type 1.06^2 and press enter, to compute the value of $(1.06)^2$

= 1.12

Continue using Google to solve each exponential expression:

In the Google search bar, type 1.06^3 and press enter, to compute the value of $(1.06)^3$

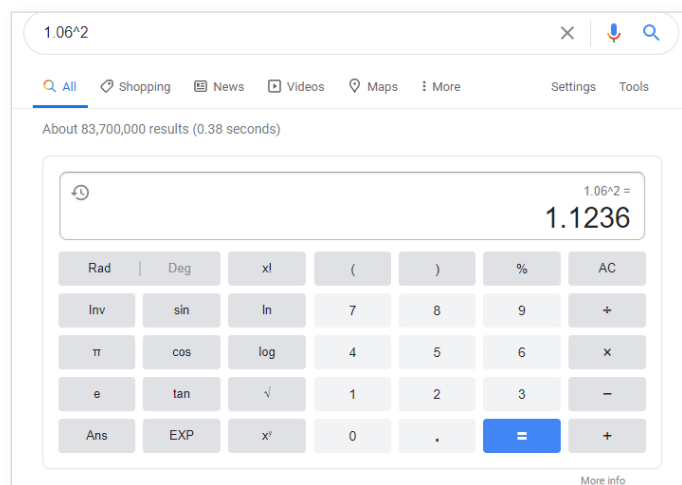
= 1.19

In the Google search bar, type 1.06^4 and press enter, to compute the value of $(1.06)^4$

= 1.26

In the Google search bar, type 1.06^5 and press enter, to compute the value of $(1.06)^5$

= 1.34



STEP 2: Now, substitute the information from Step 1 into the original equation as follows:

$$PV_0 = \$50 / (1.06) + \$50 / (1.06)^2 + \$50 / (1.06)^3 + \$50 / (1.06)^4 + \$50 / (1.06)^5$$

$$PV_0 = 50 / 1.06 + 50 / 1.12 + 50 / 1.19 + 50 / 1.26 + 50 / 1.34$$

To continue, use Google to solve the division for each element. Start with $50 / 1.06$:

Type $50 / 1.06$ into Google and press enter. You will see the result:

$$=47.17$$

Type $50 / 1.12$ into Google and press enter. You will see the result:

$$=44.64$$

Type $50 / 1.19$ into Google and press enter. You will see the result:

$$=42.02$$

Type $50 / 1.26$ into Google and press enter. You will see the result:

$$=39.68$$

Type $50 / 1.34$ into Google and press enter. You will see the result:

$$=37.31$$

STEP 3: Now, substitute the information from Step 2 into the original equation as follows:

$$PV_0 = \$50 / (1.06) + \$50 / (1.06)^2 + \$50 / (1.06)^3 + \$50 / (1.06)^4 + \$50 / (1.06)^5$$

$$PV_0 = 50 / 1.06 + 50 / 1.12 + 50 / 1.19 + 50 / 1.26 + 50 / 1.34$$

$$PV_0 = 47.17 + 44.64 + 42.02 + 39.68 + 37.31$$

Add these together to get the solution:

$$\$210.82$$

STEP 4: In writing your discussion post, provide all steps of the problem solving like this:

$$PV_0 = \$50 / (1.06) + \$50 / (1.06)^2 + \$50 / (1.06)^3 + \$50 / (1.06)^4 + \$50 / (1.06)^5$$

$$PV_0 = 50 / 1.06 + 50 / 1.12 + 50 / 1.19 + 50 / 1.26 + 50 / 1.34$$

$$PV_0 = 47.17 + 44.64 + 42.02 + 39.68 + 37.31$$

$$PV_0 = \$210.82$$

Solving Equation 4.19 using Google

Example problem: Compute the present value of a \$100 cash payment received in perpetuity, using discount rate of 4%. *Show all steps of the calculations in your post.*

Annual Payments: \$100

Discount rate (r): 4%

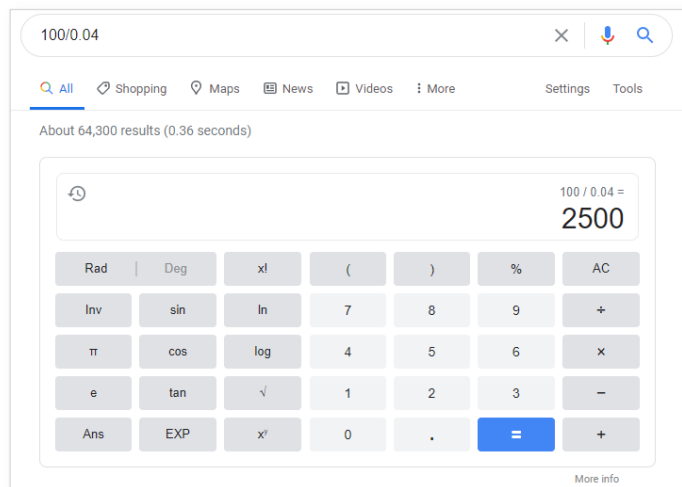
Equation 4.19: $PV_0 = CF / r$

The example problem looks like this:

$$PV_0 = 100 / 0.04$$

STEP 1: In Google, type 100/0.04 and press enter, to compute the value:

$$= 2,500$$



STEP 2: In writing your discussion post, provide all steps of the problem solving like this:

$$PV_0 = 100 / 0.04$$

$$PV_0 = \$2,500$$