IN THE SUPREME COURT OF THE STATE OF NEVADA

CITY OF LAS VEGAS, A POLITICAL SUBDIVISION OF THE STATE OF NEVADA, Appellant, vs. 180 LAND CO., LLC, A NEVADA LIMITED-LIABILITY COMPANY; AND FORE STARS, LTD., A NEVADA LIMITED-LIABILITY COMPANY, Respondents.	No. 84345
180 LAND CO., LLC, A NEVADA LIMITED-LIABILITY COMPANY; AND FORE STARS, LTD., A NEVADA LIMITED-LIABILITY COMPANY, Appellants/Cross-Respondents, vs. CITY OF LAS VEGAS, A POLITICAL SUBDIVISION OF THE STATE OF NEVADA, Respondent/Cross-Appellant.	No. 84640 **AMENDED JOINT APPENDIX VOLUME 112, PART 6**

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Attorneys for City of Las Vegas

Inst #: 20211001-0002792
Fees: $42.00
RPTT: $124807.20 Ex #:
10/01/2021 01:24:02 PM
Receipt #: 4721588
Requestor:
First American Title Insu
Recorded By: ANI Pgs: 5
Debbie Conway
CLARK COUNTY RECORDER
Src: ERECORD
Ofc: ERECORD

APN: 176-19-301-018 & -019
NCS-1084097 & 1084091-A (AD)
RECORDING REQUESTED BY

First American Title Company

AND WHEN RECORDED RETURN TO and MAIL TAX STATEMENT TO:

Richmond American Homes of Nevada, Inc.
7770 S. Dean Martin Drive, Suite 308
Las Vegas, NV 89139
Attn: John Prlina

The undersigned hereby affirms that this document, including any exhibits, submitted for recording does not contain the social security number of any person or persons (Per NRS 239B.030)

SPACE ABOVE THIS LINE FOR RECORDER'S USE

GRANT, BARGAIN AND SALE DEED

FOR VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, LEWIS INVESTMENT COMPANY OF NEVADA, LLC, a Delaware limited liability company, ("**GRANTOR**") does hereby GRANT, BARGAIN and SELL to RICHMOND AMERICAN HOMES OF NEVADA, INC., a Colorado corporation, ("**GRANTEE**"), the real property situated in the City of Las Vegas, County of Clark, State of Nevada, described in **Exhibit "1"** attached hereto and incorporated herein by this reference ("**Property**") together with all and singular the tenements, heriditaments, and appurtenances thereunto belonging and in any way appertaining.

[Signature On Next Page]

Return to Property E Return to Property F

[Signature Page – Grant Bargain Sale Deed]

Date: September 28, 2021

LEWIS INVESTMENT COMPANY OF NEVADA, LLC,
a Delaware limited liability company

By: LEWIS MANAGEMENT CORP.,
a Delaware corporation - Its Sole Manager

By: Robert E Lewis
Name: Robert E. Lewis
By: Exec. VP/President Nevada Division

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of Nevada)
County of Clark)

On 9-28-2021, before me, Lisa M. Calhoun, a Notary Public, personally appeared Robert E. Lewis, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of Nevada that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature Lisa M Calhoun

Lisa M. Calhoun

[SEAL]

NOTARY PUBLIC
STATE OF NEVADA
County of Clark
LISA M. CALHOUN
Appt. No. 21-0117-01
My Appt. Expires Jan. 27, 2025

Return to Property E Return to Property F

Exhibit 1 to Grant, Bargain and Sale Deed

THE REAL PROPERTY IS SITUATED IN THE CITY OF LAS VEGAS, COUNTY OF CLARK, STATE OF NEVADA, AND IS DESCRIBED AS FOLLOWS:

BEING A PORTION OF THE EAST HALF (E1/2) OF THE SOUTHWEST QUARTER (SW1/4) OF SECTION 19, TOWNSHIP 22 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA.

LOTS 1 AND 2 AS SHOWN BY MAP THEREOF ON FILE IN FILE 124 OF PARCEL MAPS, PAGE 90 IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

APN(s): 176-19-301-018 AND 176-19-301-019

SAID GRANT BEING FURTHER SUBJECT TO:

1. Non-delinquent general and special real property taxes for the current fiscal year and all later years.
2. All assessments imposed by a duly empowered governmental entity, as of the date hereof.

Return to Property E Return to Property F

STATE OF NEVADA
DECLARATION OF VALUE

1. Assessor Parcel Number(s)
   a) 176-19-301-018
   b) 176-19-301-019
   c)
   d)

2. Type of Property
   a) [X] Vacant Land b) [ ] Single Fam. Res.
   c) [ ] Condo/Twnhse d) [ ] 2-4 Plex
   e) [ ] Apt. Bldg. f) [ ] Comm'l/Ind'l
   g) [ ] Agricultural h) [ ] Mobile Home
   i) [ ] Other

FOR RECORDERS OPTIONAL USE ONLY
Book _____ Page: _____
Date of Recording: _____
Notes: _____

3. a) Total Value/Sales Price of Property: $24,472,000.00
   b) Deed in Lieu of Foreclosure Only (value of property) ($ _____)
   c) Transfer Tax Value: $24,472,000.00
   d) Real Property Transfer Tax Due $124,807.20

4. **If Exemption Claimed:**
   a. Transfer Tax Exemption, per 375.090, Section: _____
   b. Explain reason for exemption: _____

5. Partial Interest: Percentage being transferred: 100 %

The undersigned declares and acknowledges, under penalty of perjury, pursuant to NRS 375.060 and NRS 375.110, that the information provided is correct to the best of their information and belief, and can be supported by documentation if called upon to substantiate the information provided herein. Furthermore, the parties agree that disallowance of any claimed exemption, or other determination of additional tax due, may result in a penalty of 10% of the tax due plus interest at 1% per month. Pursuant to NRS 375.030, the Buyer and Seller shall be jointly and severally liable for any additional amount owed.

Signature: [signature] Capacity: Grantor
Signature: _____ Capacity: _____

SELLER (GRANTOR) INFORMATION (REQUIRED)		BUYER (GRANTEE) INFORMATION (REQUIRED)	
Print Name:	Lewis Investment Company of Nevada, LLC	Print Name:	Richmond American Homes of Nevada, Inc.
Address:	c/o Lewis Management Corp. 5240 S. Polaris Avenue	Address:	7770 S. Dean Martin Drive, Suite 308
City:	Las Vegas	City:	Las Vegas
State:	NV Zip: 89118	State:	NV Zip: 89139

COMPANY/PERSON REQUESTING RECORDING (required if not seller or buyer)

Print Name: First American Title Insurance Company National Commercial Services
Address: 8311 W. Sunset Road, Suite 100
City: Las Vegas
File Number: NCS-1084097-HHLV ad/ ad
State: NV Zip: 89113

(AS A PUBLIC RECORD THIS FORM MAY BE RECORDED/MICROFILMED)

Return to Property E Return to Property F

APPENDICES E.2 & F.2

EXHIBIT 'A'

File No.: **NCS-1084097-HHLV**

Property: **, 176-19-301-018, 176-19-301-019, Las Vegas, NV**

A.P.N. 176-19-301-018 and 176-19-301-019

Return to Property E Return to Property F

APPENDIX G.1

Clark County Department of Aviation
Vacant Land Auction
January 16, 2018

AUCTION RESULTS

Sales Unit	Parcel Number (APN)	Acres +/-	Unit Fair Market Value	Winning Bid Amount	Winning Bidder
1	177-05-801-003 177-05-801-011 177-05-801-012 177-05-801-024 177-05-801-025 177-05-801-026 177-05-801-027	19.18	$11,500,000	NO BID	NO BID
2	177-17-202-009 177-17-203-008 177-17-203-009 177-17-203-010 177-17-203-016	8.55	$3,000,000	NO BID	NO BID
3	177-18-502-001 177-18-602-022	25.83	$11,250,000	NO BID	NO BID
4	177-30-502-007 177-30-601-003	34.81	$15,250,000	$15,250,000	Windmill Capital, Inc.

Return to Property G

Inst #: 20190422-0001220
Fees: $40.00
RPTT: $93024.00 Ex #:
04/22/2019 10:37:43 AM
Receipt #: 3689679
Requestor:
FNTG NCS (LAS VEGAS)
Recorded By: ANI Pgs: 4
DEBBIE CONWAY
CLARK COUNTY RECORDER
Src: ERECORD
Ofc: ERECORD

APN: 177-30-502-007
177-30-601-003

WHEN RECORDED, RETURN TO AND MAIL TAX STATEMENTS TO:

Pardee Homes of Nevada
4675 Teco Avenue, Suite 115
Las Vegas, NV 89118
Attention: Dan Hale
42042000 MS / 42420000F

GRANT, BARGAIN AND SALE DEED

THIS INDENTURE WITNESSETH: That **Silverado Land Partners, LLC**, a Nevada limited liability company, in consideration of Ten Dollars ($10.00), the receipt of which is hereby acknowledged, does hereby grant, bargain and sell to **Pardee Homes of Nevada**, a Nevada corporation, all that real property situated in the County of Clark, State of Nevada, bounded and described on Schedule 1 attached hereto and incorporated herein by this reference.

Subject to current taxes and all covenants, conditions, restrictions, reservations, easements and declarations or other matters of record as of the date hereof.

Together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining.

Grantor:

SILVERADO LAND PARTNERS, LLC
a Nevada limited liability company

By: Windmill Capital, Inc.
a Nevada corporation
its manager

By: Faramarz Yousefzadeh, its president

Faramarz Yousefzadeh

Return to Property G

APPENDIX G.2

STATE OF NEVADA)
)ss
COUNTY OF Clark)

This instrument was acknowledged before me on 15 April 2019, by Faramarz Yousefzadeh as president of Windmill Capital, Inc., a Nevada corporation the manager of Silverado Land Partners, LLC, a Nevada limited liability company.

[Seal]

M. PAPPAS
Notary Public State of Nevada
No. 17-4139-1
My Appt. Exp. March 1, 2020

NOTARY PUBLIC

My Commission Expires: March 1, 2020

M. Pappas
No. 17-4139-1

Return to Property G

APPENDIX G.2

Schedule 1

Legal Description of the Property

All that certain real property situated in the County of Clark, State of Nevada, described as follows:

PARCEL 1: (APN 177-30-502-007)

Section 30, Township 22 South, Range 61 East. M.D.M.

The Southeast Quarter (SE ¼) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼);

The North Half (N ½) of the Southwest Quarter (SW ¼) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼);

The East Half (E ½) of the Southeast Quarter (SE ¼) of the Northwest Quarter (NW ¼) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼);

The South Half (S ½) of the Northeast Quarter (NE ¼) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼);

The East Half (E ½) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼);

The West Half (W ½) of the Southwest Quarter (SW ¼) of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼) of the Northeast Quarter (NE ¼);

The West Half (W ½) of the Northwest Quarter (NW ¼) of the Southwest Quarter (SW ¼) of the Northeast Quarter (NE ¼) of the Northeast Quarter (NE ¼);

Excepting therefrom that portion described in that certain Dedication for roadway and drainage purposes by Clark County, recorded October 9, 2008, in Book 20081009 as Document No. 03114, of Official Records.

PARCEL 2: (APN 177-30-601-003)

Section 30, Township 22 South, Range 61 East, M.D.M.

The North Half (N ½) of the North Half (N ½) of the Southwest Quarter (SW ¼) of the Northeast Quarter (NE ¼).

Return to Property G

APPENDIX G.2

STATE OF NEVADA
DECLARATION OF VALUE FORM

1. Assessor Parcel Number(s) ☐
   a) 177-30-502-007
   b) 177-30-601-003
   c) _____
   d) _____
2. Type of Property:
   a) ☒ Vacant Land b) ☐ Single Fam. Res.
   c) ☐ Condo/Twnhse d) ☐ 2-4 Plex
   e) ☐ Apt. Bldg. f) ☐ Comm'l/Ind'l
   g) ☐ Agricultural h) ☐ Mobile Home
   i) ☐ Other ___

FOR RECORDER'S OPTIONAL USE ONLY
Document/Instrument #_____
Book:_____ Page:_____
Date of Recording:_____
Notes: _____

3. Total Value/Sales Price of Property: $18,240,000.00
   Deed in Lieu of Foreclosure Only (value of property): (0.00)
   Transfer Tax Value: $18,240,000.00
   Real Property Transfer Tax Due: $93,024.00
4. **If Exemption Claimed:**
   a. Transfer Tax Exemption, per NRS 375.090, Section: ____
   b. Explain Reason for Exemption: ___
5. Partial Interest: Percentage being transferred: ___%

The undersigned Seller/(Grantor)/Buyer (Grantee), declares and acknowledges, under penalty of perjury, pursuant to NRS 375.060 and NRS 375.110, that the information provided is correct to the best of their information and belief, and can be supported by documentation if called upon to substantiate the information provided herein. Furthermore, the parties agree that disallowance of any claimed exemption, or other determination of additional tax due, may result in a penalty of 10% of the tax due plus interest at 1% per month.

Pursuant to NRS 375.030, the Buyer and Seller shall be jointly and severally liable for any additional amount owed.

Signature_____ **Capacity** Grantor
Signature Dan Hale **Capacity** Grantee by its vice president

SELLER (GRANTOR) INFORMATION (REQUIRED)		BUYER (GRANTEE) INFORMATION (REQUIRED)	
Print Name	Silverado Land Partners, LLC	Print Name:	Pardee Homes of Nevada
Address:	PO Box 49272	Address:	4675 Teco Avenue, Suite 115
City, St., Zip:	Los Angeles, CA 90049	City, St., Zip:	Las Vegas, NV 89118

COMPANY REQUESTING RECORDING

Print Name: Fidelity National Title Group
Address: 8363 W Sunset Road, Suite 100
City/State/Zip: Las Vegas, NV 89113

Escrow #:42042000-420

AS A PUBLIC RECORD THIS FORM MAY BE RECORDED/MICROFILMED

Return to Property G

APPENDIX H

Inst #: 20160722-0001227
Fees: $19.00 N/C Fee: $25.00
RPTT: $2295.00 Ex: #
07/22/2016 10:05:54 AM
Receipt #: 2824965
Requestor:
FIRST AMERICAN TITLE NCS LA
Recorded By: OSA Pgs: 4
DEBBIE CONWAY
CLARK COUNTY RECORDER

APN: 176-19-301-012
First American Title Insurance Company of Nevada
Escrow No.: NCS-800523-HHLV

RECORDING REQUESTED BY
AND
WHEN RECORDED RETURN TO and MAIL TAX STATEMENT TO:

Lewis Investment Company of Nevada, LLC
c/o Lewis Management Corp.
Attention: Manny Pattni
5240 Polaris Avenue
PO Box 19297
Las Vegas, Nevada 89132

SPACE ABOVE THIS LINE FOR RECORDER'S USE

GRANT BARGAIN AND SALE DEED

THE UNDERSIGNED GRANTOR(S) DECLARE(S): SEE SEPARATE STATEMENT REGARDING DOCUMENTARY TRANSFER

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, HOPE S. EISENBERG, formerly known as HOPE S. WEISSMAN ("**Grantor**") does hereby GRANT, BARGAIN AND SELL to LEWIS INVESTMENT COMPANY OF NEVADA, LLC, a Delaware limited liability company ("**Grantee**"), the real property situated in the County of Clark, Nevada, as more particularly set forth on **Exhibit "A"** attached hereto and incorporated herein by this reference, together with all tenements, hereditaments, and appurtenances, including easements, water rights and mineral rights, if any, thereto belonging or appertaining, and any reversions, remainders, rents, issues, or profits thereof

Date: July 20, 2016

"**Grantor**"

HOPE S. EISENBERG,
formerly known as HOPE S. WEISSMAN

By: Hope S. Eisenberg
Hope S. Eisenberg (f/k/a Weissman)

Return to Methodology

APPENDIX H

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT **CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
County of San Francisco)

On July 20, 2016 (Date) before me, Quyen T. Vidal (Notary) (Here Insert Name and Title of the Officer)

personally appeared Hope S. Eisenberg (Name(s) of Signer(s))

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he~~/she/~~they~~ executed the same in ~~his~~/her/~~their~~ authorized capacity(~~ies~~), and that by ~~his~~/her/~~their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

QUYEN T. VIDAL
Commission # 2052276
Notary Public - California
Alameda County
My Comm. Expires Dec 17, 2017

Signature Quyen T. Vidal (Signature of Notary Public)

Quyen T. Vidal
2052276
Expires Dec 17, 2017

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document
Title or Type of Document: Grant Bargain & Sale Deed Document Date: July 20, 2016
Number of Pages: 3 Signer(s) Other Than Named Above: None

Capacity(ies) Claimed by Signer(s)

Signer's Name: Hope S. Eisenberg	Signer's Name:
☐ Corporate Officer — Title(s):	☐ Corporate Officer — Title(s):
☐ Partner — ☐ Limited ☐ General	☐ Partner — ☐ Limited ☐ General
☒ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other:	☐ Other:
Signer Is Representing:	Signer Is Representing:

Return to Methodology

APPENDIX H

Exhibit A to Grant Bargain Sale Deed

REAL PROPERTY IN THE CITY OF LAS VEGAS, COUNTY OF CLARK, STATE OF NEVADA, DESCRIBED AS FOLLOWS:

THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION NINETEEN, TOWNSHIP TWENTY-TWO SOUTH, RANGE SIXTY EAST, MOUNT DIABLO BASE MERIDIAN.

APN's: 176-19-301-012

Return to Methodology

STATE OF NEVADA
DECLARATION OF VALUE

1. Assessor Parcel Number(s)
   a) 176-19-301-012
   b)
   c)
   d)

2. Type of Property
   a) [x] Vacant Land b) [ ] Single Fam. Res.
   c) [ ] Condo/Twnhse d) [ ] 2-4 Plex
   e) [ ] Apt. Bldg. f) [ ] Comm'l/Ind'l
   g) [ ] Agricultural h) [ ] Mobile Home
   i) [ ] Other

FOR RECORDERS OPTIONAL USE
Book _____ Page: _____
Date of Recording: _____
Notes: _____

3. a) Total Value/Sales Price of Property: $450,000.00
   b) Deed in Lieu of Foreclosure Only (value of ($))
   c) Transfer Tax Value $450,000.00
   d) Real Property Transfer Tax Due $2,295.00

4. **If Exemption Claimed:**
   a. Transfer Tax Exemption, per 375.090, Section:
   b. Explain reason for exemption:

5. Partial Interest: Percentage being transferred: 100 %

The undersigned declares and acknowledges, under penalty of perjury, pursuant to NRS 375.060 and NRS 375.110, that the information provided is correct to the best of their information and belief, and can be supported by documentation if called upon to substantiate the information provided herein. Furthermore, the parties agree that disallowance of any claimed exemption, or other determination of additional tax due, may result in a penalty of 10% of the tax due plus interest at 1% per month. Pursuant to NRS 375.030, the Buyer and Seller shall be jointly and severally liable for any additional amount owed.

Signature: _____ Capacity: _____
Signature: _____ Capacity: Agent

SELLER (GRANTOR) INFORMATION (REQUIRED)	BUYER (GRANTEE) INFORMATION (REQUIRED)
Print Name: Hope S. Eisenberg	Print Name: Lewis Investment Company of Nevada, LLC
Address: 455 Vallejo Street	Address: 5240 Polaris Avenue, PO Box 19297
City: San Francisco	City: Las Vegas
State: CA Zip: 94133	State: NV Zip: 89132

COMPANY/PERSON REQUESTING RECORDING (required if not seller or buyer)

Print Name: First American Title Insurance Company National Commercial Services
File Number: NCS-800523-HHLV ad/ad
Address: 2500 Paseo Verde Parkway, #120
City: Henderson State: NV Zip: 89074

(AS A PUBLIC RECORD THIS FORM MAY BE RECORDED/MICROFILMED)

Return to Methodology

APPENDIX H

Inst #: 20170126-0003395
Fees: $20.00 N/C Fee: $25.00
RPTT: $72420.00 Ex: #
01/26/2017 01:29:44 PM
Receipt #: 2993957
Requestor:
FIRST AMERICAN TITLE NCS LA
Recorded By: RNS Pgs: 5
DEBBIE CONWAY
CLARK COUNTY RECORDER

APN# PTN 176-19-401-016

Recording Requested by:
Name: First American Title Insurance Company National Commercial Services

When Recorded Mail to: Lewis Investment Company of Nevada
Mail Tax Statements To: 5240 S. Polaris Ave.
Las Vegas, NV 89118

Order Number: NCS-772928-11-HHLV

PATENT
(Title of Document)

Return to Methodology

Exhibit 2A

20296

DECLARATION OF WILLIAM LENHART

I, William Lenhart,, declare under penalty of perjury as follows:

1. I am the Managing Member of Sunbelt Development & Realty Partners, LLC, a real estate brokerage company with an emphasis on land that acts as an intermediary for buyers and sellers. My professional qualifications are attached hereto.

2. I make this Declaration based on personal knowledge, except where stated to be upon information and belief, and as to that information, I believe it to be true. If called upon to testify to the contents of this Declaration, I am legally competent to do so in a court of law.

3. I have submitted a report to 180 Land Co LLC, which provides the rate of return a real estate market participant in Las Vegas would obtain during the period from 2016 through 2021. That report concludes that an investor that invested $34,135,000 in vacant residential land in the southwest sector of Las Vegas in 2016 and resold in 2021, would reasonably expect a compounded average annual rate or return of 25-27%. That report consists of 10 pages, with 40 pages of back up documents. A true and correct copy of that report is attached as Exhibit 2 to Plaintiff Landowners' Motion to Determine Prejudgment Interest.

4. The methodology used in that report to research, compile, and analyze the data to arrive at the rate of appreciation is a methodology that I have used in the past and is relevant and reliable in my field of expertise.

Executed this 8th day of December, 2021.

WILLIAM LENHART

Exhibit 3

Initial balance	34,135,000 $
Interest rate	23 %
Term	4 yrs 6 mos
Compounding frequency	yearly (1/Yr)

Additional deposits

How often? never

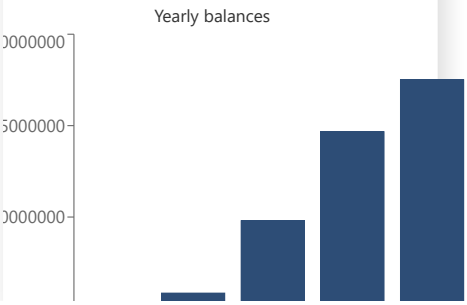
Results

The **final balance** is **$86,650,866.9**.

The **total compound interest** is **$52,515,866.9**.

Balances

Represent bar graph



Compound Interest Calculator

By Tomasz Jedynak, PhD and Tibor Pal, PhD candidate

Last updated: Nov 02, 2020

Table of contents:

This compound interest calculator is a tool to help you estimate how much money you will earn on your deposit. In order to make smart financial decisions, you need to be able to foresee the final result. That's why it's worth knowing how to calculate compound interest. The most common real-life application of the compound interest formula is a regular savings calculation.

Read on to find answers to the following questions:

- What is the interest rate definition?
- What is the compound interest definition and what is the compound interest formula?

- What is a difference between simple and compound interest rates?
- How to calculate compound interest?
- What are the most common compounding frequencies?

You may also want to check our student loan calculator where you can make a projection on your expenses and study the effect of different student loan options on your budget.

Interest rate definition

In finance, interest rate is defined as the **amount charged by a lender to a borrower for the use of an asset**. So, for the borrower the interest rate is the cost of the debt, while for the lender it is the rate of return.

Note that in the case where you make a deposit into a bank (e.g., put money in your savings account), you have, from a financial perspective, lent money to the bank. In such a case the interest rate reflects your profit.

The interest rate is commonly expressed as a percentage of the principal amount (outstanding loan or value of deposit). Usually, it is presented on an annual basis, which is known as the annual percentage yield (APY) or effective annual rate (EAR).

What is the compound interest definition?

Generally, compound interest is defined as **interest that is earned not solely on the initial amount invested but also on any further interest**. In other words, compound interest is the interest on both the initial principal *and* the interest which has been accumulated on this principle so far. This concept of adding a carrying charge makes a deposit or loan grow at a faster rate.

You can use the compound interest equation to find the value of an investment after a specified period of time, or to estimate the rate you have earned when buying and selling some investments. It also allows you to answer some other questions such as how long it will take to double your investment.

We will answer these questions in the examples below.

Simple vs. compound interest

You should know that simple interest is something different than the **compound interest**. It is calculated only on the initial sum of money. On the other hand, compound interest is the interest on the initial principal plus the interest which has been accumulated.

Compounding frequency

Most financial advisors will tell you that the compound frequency is the compounding periods in a year. But if you are not sure what compounding is, this definition will be meaningless to you... To understand this term you should know that compounding frequency is an answer to the question *How often is the interest added to the principal each year?* In other words, **compounding frequency is the time period after which the interest will be calculated on top of the initial amount**.

For example:

- **annual (1/Yr)** compounding has a compounding frequency of **one**,
- **quarterly (4/Yr)** compounding has a compounding frequency of **four**,
- **monthly (12/Yr)** compounding has a compounding frequency of **twelve**.

Note that the greater the compounding frequency is, the greater the final balance. However, even when the frequency is unusually high, the final value can't rise above a particular limit. To understand the math behind this, check out our natural logarithm calculator.

As the main focus of the calculator is the compounding mechanism, we designed a chart where you can follow the progress of the annual interest balances visually. If you choose a higher than yearly compounding frequency, the diagram will display the resulting extra or *additional part of interest gained over yearly*

compounding by the higher frequency. Thus, in this way, you can easily observe the real power of compounding.

Compound interest formula

The compound interest formula is an equation that lets you estimate how much you will earn with your savings account. It's quite complex because it takes into consideration not only the annual interest rate and the number of years but also the number of times the interest is compounded per year.

The formula for annual compound interest is as follows:

$$FV = P\ (1+\ r/m)^{mt}$$

Where:

- FV - the future value of the investment, in our calculator it is the **final balance**
- P - the **initial balance** (the value of the investment)
- r - the annual **interest rate** (in decimal)
- m - the number of times the interest is compounded per year (**compounding frequency**)
- t - the **numbers of years** the money is invested for

It is worth knowing that when the compounding period is one ($m = 1$) then the interest rate (r) is call the CAGR (compound annual growth rate).

How to calculate compound interest

Actually, you don't need to memorize the compound interest formula from the previous section to estimate the future value of your investment. In fact, you don't even need to know how to calculate compound interest! Thanks to our compound interest calculator you can do it in just a few seconds, whenever and wherever you want. (NB: Have you already tried the mobile version of our calculators?)

With our smart calculator, all you need to calculate the future value of your investment is to fill the appropriate fields:

- **Main properties**

1. **Initial balance** - the amount of money you are going to invest or deposit.
2. **Interest rate** – the interest rate expressed on a yearly basis.
3. **Term** – the time frame you are going to invest money.
4. **Compound frequency** – in this field, you should select how often the compounding applies to your balance. Usually, the interest added to the principal balance daily, weekly, monthly, quarterly, semi-annually, or yearly. But you may set it as continuous compounding as well, which is the theoretical limit for the compounding frequency. In this case, the number of periods when compounding occurs is infinite.

- **Additional deposits**

1. **How much** - the amount you are planning to deposit on the account.
2. **How often** - you can choose the frequency of the additional deposit here.
3. **When** - you should select the timing of the transaction of the additional deposit. More specifically, you may place the money to the account *at the beginning* or *at the end* of the periods.
4. **Growth rate of deposit** - this option allows you to set a growth rate of the additional deposit. This option can be particularly useful in the long term when your income possibly increases due, for example, to inflation and/or promotions.

That's it! In a flash, our compound interest calculator makes all necessary computations for you and gives you the results.

The two main results are:

- the **final balance**, that is the total amount of money you will receive after the specified period, and
- the **total interest**, which is the total compounded interest payment.

In case you set the additional deposit field, we gave you the results for the **compounded initial balance** and **compounded additional balance**.

Besides, we also show you their contribution to the total interest amount, namely, **interest on the initial balance** and **interest on the additional deposit**.

Compound interest examples

- *Do you want to understand the compound interest equation?*
- *Are you curious about the fine details of how to calculate the compound interest rate?*
- *Are you wondering how our calculator works?*
- *Do you need to know how to interpret the results of compound interest calculation?*
- *Are you interested in all possible uses of the compound interest formula?*

The following examples are there to try and help you answer these questions. We believe that after studying them, you won't have any trouble with the understanding and practical implementation of compound interest.

Example 1 – basic calculation of the value of an investment

The first example is the simplest, in which we calculate the future value of an initial investment.

Question

You invest $10,000 for 10 years at the annual interest rate of 5%. The interest rate is compounded yearly. What will be the value of your investment after 10 years?

Solution

Firstly let's determine what values are given, and what we need to find. We know that you are going to invest `$10,000` - this is your initial balance `P`, and the number of years you are going to invest money is `10`. Moreover, the interest rate `r` is equal to `5%`, and the interest is compounded on a yearly basis, so the `m` in the compound interest formula is equal to `1`.

We want to calculate the amount of money you will receive from this investment, that is, we want to find the future value `FV` of your investment.

To count it, we need to plug in the appropriate numbers into the compound interest formula:

```
FV = 10,000 * (1 + 0.05/1) ^ (10*1) = 10,000 * 1.628895 = 16,288.95
```

Answer

The value of your investment after 10 years will be $16,288.95.

Your profit will be `FV - P`. It is `$16,288.95 - $10,000.00 = $6,288.95`.

Note that when doing calculations you must be very careful with your rounding. You shouldn't do too much until the very end. Otherwise, your answer may be incorrect. The accuracy is dependent on the values you are computing. For standard calculations, six digits after the decimal point should be enough.

Example 2 - complex calculation of the value of an investment

In the second example, we calculate the future value of an initial investment in which interest is compounded monthly.

Question

You invest $10,000 at the annual interest rate of 5%. The interest rate is compounded monthly. What will be the value of your investment after 10 years?

Solution

Like in the first example, we should determine the values first. The initial balance `P` is `$10,000`, the number of years you are going to invest money is `10`, the interest rate `r` is equal to `5%`, and the compounding frequency `m` is `12`. We need to obtain the future value `FV` of the investment.

Let's plug in the appropriate numbers in the compound interest formula:

```
FV = 10,000 * (1 + 0.05/12) ^ (10*12) = 10,000 * 1.004167 ^ 120 = 10,000 * 1.647009 = 16,470.09
```

Answer

The value of your investment after 10 years will be $16,470.09.

Your profit will be `FV - P`. It is `$16,470.09 - $10,000.00 = $6,470.09`.

Did you notice that this example is quite similar to the first one? Actually, the only difference is the compounding frequency. Note that, only thanks to more

frequent compounding this time you will earn $181.14 more during the same period! (`$6,470.09 - $6,288.95 = $181.14`)

Example 3 - Calculating the interest rate of an investment using the compound interest formula

Now, let's try a different type of question that can be answered using the compound interest formula. This time, some basic algebra transformations will be required. In this example, we will consider a situation in which we know the initial balance, final balance, number of years and compounding frequency but we are asked to calculate the interest rate. This type of calculation may be applied in a situation where you want to determine the rate earned when buying and selling an asset (e.g., property) which you are using as an investment.

Data and question

You bought an original painting for $2,000. Six years later, you sold this painting for $3,000. Assuming that the painting is viewed as an investment, what annual rate did you earn?

Solution

Firstly, let's determine the given values. The initial balance `P` is `$2,000` and final balance `FV` is `$3,000`. The time horizon of the investment `6` years and the frequency of the computing is `1`. This time, we need to compute the interest rate `r`.

Let's try to plug this numbers in the basic compound interest formula:

```
3,000 = 2,000 * (1 + r/1) ^ (6*1)
```

So:

```
3,000 = 2,000 * (1 + r) ^ (6)
```

We can solve this equation using the following steps:
Divide both sides by 2000

```
3,000 / 2,000= (1 + r) ^ (6)
```

Raise both sides to the 1/6th power

```
(3,000 / 2,000) ^ (1 / 6) = (1 + r)
```

Subtract 1 from both sides

```
(3,000 / 2,000) ^ (1 / 6) − 1 = r
```

Finally solve for r

```
r = 1.5 ^ 0.166667 − 1 = 1.069913 - 1 = 0.069913 = 6.9913%
```

Answer

In this example you earned $1,000 out of the initial investment of $2,000 within the six years, meaning that your annual rate was equal to 6.9913%.

As you can see this time, the formula is not very simple and requires a lot of calculations. That's why it's worth testing our compound interest calculator, which solves the same equations in an instant, saving you time and effort.

Example 4 - Calculating the doubling time of an investment using the compound interest formula

Have you ever wondered how many years it will take for your investment to double its value? Besides its other capabilities, our calculator can help you to answer this question. To understand how it does it, let's take a look at the following example.

Data and question

You put $1,000 on your saving account. Assuming that the interest rate is equal to 4% and it is compounded yearly. Find the number of years after which the initial balance will double.

Solution

The given values are as follows: the initial balance `P` is `$1,000` and final balance `FV` is `2 * $1,000 = $2,000`, and the interest rate `r` is 4%. The frequency of the computing is `1`. The time horizon of the investment `t` is unknown.

Let's start with the basic compound interest equation:

```
FV = P (1 + r/m)^mt
```

Knowing that `m = 1`, `r = 4%, and 'FV = 2 * P` we can write

```
2P = P (1 + 0.04) ^ t
```

Which could be written as

```
2P = P (1.04) ^ t
```

Divide both sides by P (P mustn't be 0!)

```
2 = 1.04 ^ t
```

To solve for t, you need take the natural log (ln), of both sides:

```
ln(2) = t * ln(1.04)
```

So

```
t = ln(2) / ln(1.04) = 0.693147 / 0.039221 = 17.67
```

Answer

In our example it takes 18 years (18 is the nearest integer that is higher than 17.67) to double the initial investment.

Have you noticed that in the above solution we didn't even need to know the initial and final balances of the investment? It is thanks to the simplification we made in the third step (*Divide both sides by P*). However, when using our compound interest rate calculator, you will need to provide this information in the appropriate fields. Don't worry if you just want to find the time in which the given interest rate would double your investment, just type in any numbers (for example `1` and `2`).

It is also worth knowing that exactly the same calculations may be used to compute when the investment would triple (or multiply by any number in fact). All you need to do is just use a different multiple of P in the second step of the above example. You can also do it with our calculator.

Compound interest table

Compound interest tables were used everyday, before the era of calculators, personal computers, spreadsheets, and unbelievable solutions provided by Omni Calculator 😂. The tables were designed to make the financial calculations simpler and faster (yes, really...). They are included in many older financial textbooks as an appendix.

Below, you can see what a compound interest table looks like.

Using the data provided in the compound interest table you can calculate the final balance of your investment. All you need to know is that the column **compound amount factor** shows the value of the factor `(1 + r)^t` for the respective interest rate (first row) and `t` (first column). So to calculate the final balance of the investment you need to multiply the initial balance by the appropriate value from the table.

Note that the values from the column **Present worth factor** are used to compute the present value of the investment when you know its future value.

Obviously, this is only a basic example of a compound interest table. In fact, they are usually much, much larger, as they contain more periods `t` various interest rates `r` and different compounding frequencies `m`... You had to flip through dozens of pages to find the appropriate value of compound amount factor or present worth factor.

With your new knowledge of how the world of financial calculations looked before Omni Calculator, do you enjoy our tool? Why not share it with your friends? Let them know about Omni! If you want to be financially smart, you can also try our other finance calculators.

Additional Information

Now that you know how to calculate compound interest, it's high time you found other applications to help you make the greatest profit from your investments:

To compare bank offers which have different compounding periods, we need to calculate the Annual Percentage Yield, also called Effective Annual Rate (EAR). This value tells us how much profit we will earn within a year. The most comfortable way to figure it out is using the APY calculator, which estimates the EAR from the interest rate and compounding frequency.

If you want to find out how long it would take for something to increase by n%, you can use our rule of 72 calculator. This tool enables you to check how much time you need to double your investment even quicker than the compound interest rate calculator.

You may also be interested in the credit card payoff calculator, which allows you to estimate how long it will take until you are completely debt-free.

Another interesting calculator is our cap rate calculator which determines the rate of return on your real estate property purchase.

We also suggest you try the lease calculator which helps you determine the monthly and total payments for a lease.

If you're looking to finance the purchase of a new recreational vehicle (RV), our RV loan calculator makes it simple to work out what the best deal will be for you.

The depreciation calculator enables you to use three different methods to estimate how fast the value of your asset decreases over time.

And finally, why not to try our dream come true calculator.
which answers the question: how long do you have to save to afford your dream?

Tomasz Jedynak, PhD and Tibor Pal, PhD candidate

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Exhibit 4

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Compound Interest Calculator

Compound Interest Calculator

Calculate: Total P+I (A)

Using the formula $A = P(1 + r/n)^{nt}$

Principal (P): $ 34,135,000.00

Annual Rate (R): % 23

Compound (n): Annually (1/Yr)

Time (t in years): 4.5
ex. 1.5 yr = 18 mo

Clear Calculate

Answer:

A = $86,650,866.24

A = P + I where
P (principal) = $34,135,000.00
I (interest) = $52,515,866.24

Calculation Steps:

First, convert R as a percent to r as a decimal
r = R/100
r = 23/100
r = 0.23 rate per year,

Then solve the equation for A
$A = P(1 + r/n)^{nt}$
$A = 34,135,000.00(1 + 0.23/1)^{(1)(4.5)}$
$A = 34,135,000.00(1 + 0.23)^{(4.5)}$
A = $86,650,866.24

Summary:
The total amount accrued, principal plus interest, with compound interest on a principal of $34,135,000.00 at a rate of 23% per year compounded 1 times per year over 4.5 years is $86,650,866.24.

Send me your comments.

Share this Answer Link: help
Paste this link in email, text or social media.

Calculator Use

The compound interest calculator lets you see how your money can grow using interest compounding.

Calculate compound interest on an investment, 401K or savings account with annual, quarterly, daily or continuous compounding.

We provide answers to your compound interest calculations and show you the steps to find the answer. You can also experiment with the calculator to see how different interest rates or loan lengths can affect how much you'll pay in compounded interest on a loan.

Read further below for additional compound interest formulas to find principal, interest rates or final investment value. We also show you how to calculate continuous compounding with the formula A = Pe^rt.

The Compound Interest Formula

This calculator uses the compound interest formula to find principal plus interest. It uses this same formula to solve for principal, rate or time given the other known values. You can also use this formula to set up a compound interest calculator in Excel®[1].

$$A = P(1 + r/n)^{nt}$$

In the formula

- A = Accrued amount (principal + interest)

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https://www.calculatorsoup.com/calculators/financial/compound-interest-calculator.php?given_data=find_A&P=34%2C135%2C000.00&R=23&n=1&t=4.5&given_data_last=find_A&action=solve

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- P = Principal amount
- r = Annual nominal interest rate as a decimal
- R = Annual nominal interest rate as a percent
- r = R/100
- n = number of compounding periods per unit of time
- t = time in decimal years; e.g., 6 months is calculated as 0.5 years. Divide your partial year number of months by 12 to get the decimal years.
- I = Interest amount
- ln = natural logarithm, used in formulas below

Compound Interest Formulas Used in This Calculator

The basic compound interest formula $A = P(1 + r/n)^{nt}$ can be used to find any of the other variables. The tables below show the compound interest formula rewritten so the unknown variable is isolated on the left side of the equation.

Compound Interest Formulas

Calculation	Formula
Calculate accrued amount Principal + Interest	$A = P(1 + r/n)^{nt}$
Calculate principal amount Solve for P in terms of A	$P = A / (1 + r/n)^{nt}$
Calculate principal amount Solve for P in terms of I	$P = I / ((1 + r/n)^{nt} - 1)$
Calculate rate of interest As a decimal	$r = n((A/P)^{1/nt} - 1)$
Calculate rate of interest As a percent	$R = r * 100$
Calculate time Solve for t *ln is the natural logarithm*	$t = \ln(A/P) / n(\ln(1 + r/n))$, then also $t = (\ln(A) - \ln(P)) / n(\ln(1 + r/n))$

Formulas where n = 1
(compounded once per period or unit t)

Calculation	Formula
Calculate accrued amount Principal + Interest	$A = P(1 + r)^{t}$
Calculate principal amount	$P = A / (1 + r)^{t}$

Solve for P in terms of A	
Calculate principal amount Solve for P in terms of I	$P = I / ((1 + r)^t - 1)$
Calculate rate of interest As a decimal	$r = (A/P)^{1/t} - 1$
Calculate rate of interest As a percent	$R = r * 100$
Calculate time Solve for t *ln is the natural logarithm*	$t = \ln(A/P) / \ln(1 + r)$, then also $t = (\ln(A) - \ln(P)) / \ln(1 + r)$

Continuous Compounding Formulas
(n → ∞)

Calculation	Formula
Calculate accrued amount Principal + Interest	$A = Pe^{rt}$
Calculate principal amount Solve for P in terms of A	$P = A / e^{rt}$
Calculate principal amount Solve for P in terms of I	$P = I / (e^{rt} - 1)$
Calculate rate of interest As a decimal *ln is the natural logarithm*	$r = \ln(A/P) / t$
Calculate rate of interest As a percent	$R = r * 100$
Calculate time Solve for t *ln is the natural logarithm*	$t = \ln(A/P) / r$

How to Use the Compound Interest Calculator: Example

Say you have an investment account that increased from $30,000 to $33,000 over 30 months. If your local bank offers a savings account with daily compounding (365 times per year), what annual interest rate do you need to get to match the rate of return in your investment account?

In the calculator above select "Calculate Rate (R)". The calculator will use the equations: $r = n((A/P)^{1/nt} - 1)$ and $R = r*100$.

Enter:

- Total P+I (A): $33,000
- Principal (P): $30,000
- Compound (n): Daily (365)
- Time (t in years): 2.5 years (30 months equals 2.5 years)

Showing the work with the formula $r = n((A/P)^{1/nt} - 1)$:

$$r = 365\left(\left(\frac{33,000}{30,000}\right)^{\frac{1}{365\times 2.5}} - 1\right)$$

$$r = 365(1.1^{\frac{1}{912.5}} - 1)$$

$$r = 365(1.1^{0.00109589} - 1)$$

$$r = 365(1.00010445 - 1)$$

$$r = 365(0.00010445)$$

$$r = 0.03812605$$

$$R = r \times 100 = 0.03812605 \times 100 = 3.813\%$$

Your Answer: R = 3.813% per year

So you'd need to put $30,000 into a savings account that pays a **rate of 3.813% per year** and compounds interest daily in order to get the same return as the investment account.

How to Derive A = Pe^{rt} the Continuous Compound Interest Formula

A common definition of the constant *e* is that:

$$e = \lim_{m\to\infty}\left(1 + \frac{1}{m}\right)^m$$

With continuous compounding, the number of times compounding occurs per period approaches infinity or n → ∞. Then using our original equation to solve for A as n → ∞ we want to solve:

$$A = P(1 + \frac{r}{n})^{nt}$$

$$A = P\left(\lim_{n\to\infty}\left(1 + \frac{r}{n}\right)^{nt}\right)$$

This equation looks a little like the equation for *e*. To make it look more similar so we can do a substitution we introduce a variable m such that m = n/r then we also have n = mr. Note that as n approaches infinity so does m.

Replacing n in our equation with mr and cancelling r in the numerator of r/n we get:

$$A = P\left(\lim_{m\to\infty}\left(1 + \frac{1}{m}\right)^{mrt}\right)$$

Rearranging the exponents we can write:

$$A = P\left(\lim_{m\to\infty}\left(1+\frac{1}{m}\right)^{m}\right)^{rt}$$

Substituting in *e* from our definition above:

$$A = P(e)^{rt}$$

And finally you have your continuous compounding formula.

$$A = Pe^{rt}$$

Further Reading

Tree of Math: Continuous Compounding

Wikipedia: Compound Interest

[1]Excel® is a registered trademark of Microsoft Corporation

Cite this content, page or calculator as:

Furey, Edward "Compound Interest Calculator" at https://www.calculatorsoup.com/calculators/financial/compound-interest-calculator.php from CalculatorSoup, *https://www.calculatorsoup.com* - Online Calculators

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Exhibit 5

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Interest Calculator

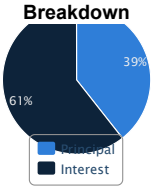
Starting Principal	34135000
Annual Contribution	0
Monthly Contribution	0
Contribute at the ◯ beginning ◯ end of each compounding period	
Interest Rate	23
Compound	annually
After	4.5 years
Tax Rate	0
Inflation Rate	0

Calculate

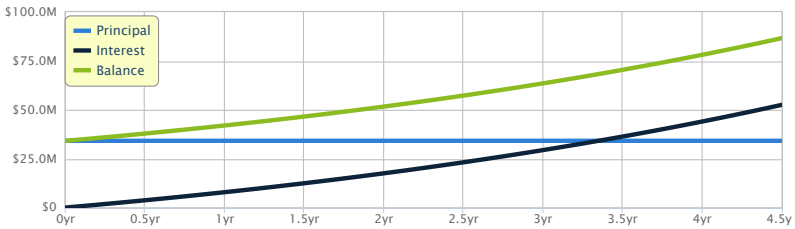
Results

End Balance	**$86,650,866.24**
Total Principal	$34,135,000.00
Total Interest	$52,515,866.24

Breakdown



Balance Accumulation Graph



Annual Schedule

Annual Schedule | Monthly Schedule

	start principal	start balance	interest	tax	end balance	end principal
1	$34,135,000.00	$34,135,000.00	$7,851,050.00	$0.00	$41,986,050.00	$34,135,000.00
2	$34,135,000.00	$41,986,050.00	$9,656,791.50	$0.00	$51,642,841.50	$34,135,000.00
3	$34,135,000.00	$51,642,841.50	$11,877,853.53	$0.00	$63,520,695.05	$34,135,000.00
4	$34,135,000.00	$63,520,695.05	$14,609,759.85	$0.00	$78,130,454.91	$34,135,000.00
5	$34,135,000.00	$78,130,454.91	$8,520,411.33	$0.00	$86,650,866.24	$34,135,000.00

Related

Investment Calculator | Average Return Calculator | ROI Calculator

Interest is the compensation paid by the borrower to the lender for the use of money as a percent or an amount. The concept of interest is the backbone behind most financial instruments in the world.

There are two distinct methods of accumulating interest, categorized into simple interest or compound interest.

Simple Interest

The following is a basic example of how interest works. Derek would like to borrow $100 (usually called the principal) from the bank for one year. The bank wants 10% interest on it. To calculate interest:

$$\$100 \times 10\% = \$10$$

This interest is added to the principal, and the sum becomes Derek's required repayment to the bank one year later.

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$$\$100 + \$10 = \$110$$

Derek owes the bank $110 a year later, $100 for the principal and $10 as interest.

Let's assume that Derek wanted to borrow $100 for two years instead of one, and the bank calculates interest annually. He would simply be charged the interest rate twice, once at the end of each year.

$$\$100 + \$10(\text{year 1}) + \$10(\text{year 2}) = \$120$$

Derek owes the bank $120 two years later, $100 for the principal and $20 as interest.

The formula to calculate simple interest is:

$$\text{interest} = \text{principal} \times \text{interest rate} \times \text{term}$$

When more complicated frequencies of applying interest are involved, such as monthly or daily, use the formula:

$$\text{interest} = \text{principal} \times \text{interest rate} \times \frac{\text{term}}{\text{frequency}}$$

However, simple interest is very seldom used in the real world. Even when people use the everyday word 'interest,' they are usually referring to interest that compounds.

Compound Interest

Compounding interest requires more than one period, so let's go back to the example of Derek borrowing $100 from the bank for two years at a 10% interest rate. For the first year, we calculate interest as usual.

$$\$100 \times 10\% = \$10$$

This interest is added to the principal, and the sum becomes Derek's required repayment to the bank for that present time.

$$\$100 + \$10 = \$110$$

However, the year ends, and in comes another period. For compounding interest, rather than the original amount, the principal + any interest accumulated since is used. In Derek's case:

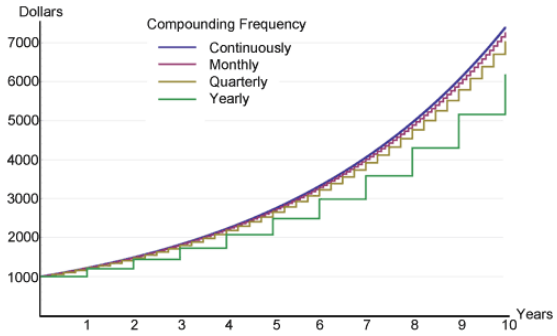
$$\$110 \times 10\% = \$11$$

Derek's interest charge at the end of year 2 is $11. This is added to what is owed after year 1:

$$\$110 + \$11 = \$121$$

When the loan ends, the bank collects $121 from Derek instead of $120 if it were calculated using simple interest instead. This is because interest is also earned on interest.

The more frequently interest is compounded within a time period, the higher the interest will be earned on an original principal. The following is a graph showing just that, a $1,000 investment at various compounding frequencies earning 20% interest.



There is little difference during the beginning between all frequencies, but over time they slowly start to diverge. This is the power of compound interest everyone likes to talk about, illustrated in a concise graph. The continuous compound will always have the highest return due to its use of the mathematical limit of the frequency of compounding that can occur within a specified time period.

The Rule of 72

Anyone who wants to estimate compound interest in their head may find the rule of 72 very useful. Not for exact calculations as given by financial calculators, but to get ideas for ballpark figures. It states that in order to find the number of years (n) required to double a certain amount of money with any interest rate, simply divide 72 by that same rate.

Example: How long would it take to double $1,000 with an 8% interest rate?

$$n = \frac{72}{8} = 9$$

It will take 9 years for the $1,000 to become $2,000 at 8% interest. This formula works best for interest rates between 6 and 10%, but it should also work reasonably well for anything below 20%.

Fixed vs. Floating Interest Rate

The interest rate of a loan or savings can be "fixed" or "floating." Floating rate loans or savings are normally based on some reference rate, such as the U.S. Federal Reserve (Fed) funds rate or the LIBOR (London Interbank Offered Rate). Normally, the loan rate is a little higher, and the savings rate is a little lower than the reference rate. The difference goes to the profit of the bank. Both the Fed rate and LIBOR are short-term inter-bank interest rates, but the Fed rate is the main tool that the Federal Reserve uses to influence the supply of money in the U.S. economy. LIBOR is a commercial rate calculated from prevailing interest rates between highly credit-worthy institutions. Our Interest Calculator deals with fixed interest rates only.

Contributions

Our Interest Calculator above allows periodic deposits/contributions. This is useful for those who have the habit of saving a certain amount periodically. An important distinction to make regarding contributions is whether they occur at the beginning or end of compounding periods. Periodic payments that occur at the end have one less interest period total per contribution.

Tax Rate

Some forms of interest income are subject to taxes, including bonds, savings, and certificate of deposits(CDs). In the U.S., corporate bonds are almost always taxed. Certain types are fully taxed while others are partially taxed; for example, while interest earned on U.S. federal treasury bonds may be taxed at the federal level, they are generally exempt at the state and local level. Taxes can have very big impacts on the end balance. For example, if Derek saves $100 at 6% for 20 years, he will get:

$$\$100 \times (1 + 6\%)^{20} = \$320.71$$

This is tax-free. However, if Derek has a marginal tax rate of 25%, he will end up with $239.78 only because the tax rate of 25% applies to each compounding period.

Inflation Rate

Inflation is defined as a sustained increase in the prices of goods and services over time. As a result, a fixed amount of money will relatively afford less in the future. The average inflation rate in the U.S. in the past 100 years has hovered around 3%. As a tool of comparison, the average annual return rate of the S&P 500 (Standard & Poor's) index in the United States is around 10% in the same period. Please refer to our Inflation Calculator for more detailed information about inflation.

For our Interest Calculator, leave the inflation rate at 0 for quick, generalized results. But for real and accurate numbers, it is possible to input figures in order to account for inflation.

Tax and inflation combined make it hard to grow the real value of money. For example, in the United States, the middle class has a marginal tax rate of around 25%, and the average inflation rate is 3%. To maintain the value of the money, a stable interest rate or investment return rate of 4% or above needs to be earned, and this is not easy to achieve.

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Exhibit 6

20322

Initial balance	86650866.9 $
Interest rate	23 %
Term	1 yrs 0 mos
Compounding frequency	yearly (1/Yr)

Additional deposits

How often? never

Results

The **final balance** is **$106,580,566.47**.

The **total compound interest** is **$19,929,699.57**.

Balances

Represent bar graph

Monthly balances

Compound Interest Calculator

By Tomasz Jedynak, PhD and Tibor Pal, PhD candidate

Last updated: Nov 02, 2020

Table of contents:

This compound interest calculator is a tool to help you estimate how much money you will earn on your deposit. In order to make smart financial decisions, you need to be able to

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20323

foresee the final result. That's why it's worth knowing how to calculate compound interest. The most common real-life application of the compound interest formula is a regular savings calculation.

Read on to find answers to the following questions:

- What is the interest rate definition?
- What is the compound interest definition and what is the compound interest formula?
- What is a difference between simple and compound interest rates?
- How to calculate compound interest?
- What are the most common compounding frequencies?

You may also want to check our student loan calculator where you can make a projection on your expenses and study the effect of different student loan options on your budget.

Interest rate definition

In finance, interest rate is defined as the **amount charged by a lender to a borrower for the use of an asset**. So, for the borrower the interest rate is the cost of the debt, while for the lender it is the rate of return.

Note that in the case where you make a deposit into a bank (e.g., put money in your savings account), you have, from a financial perspective, lent money to the bank. In such a case the interest rate reflects your profit.

The interest rate is commonly expressed as a percentage of the principal amount (outstanding loan or value of deposit). Usually, it is presented on an annual basis, which is known as the annual percentage yield (APY) or effective annual rate (EAR).

What is the compound interest definition?

Generally, compound interest is defined as **interest that is earned not solely on the initial amount invested but also on any further interest**. In other words, compound interest is the interest on both the initial principal *and* the interest which has been accumulated on this principle so far. This concept of adding a carrying charge makes a deposit or loan grow at a faster rate.

You can use the compound interest equation to find the value of an investment after a specified period of time, or to estimate the rate you have earned when buying and selling some investments. It also allows you to answer some other questions such as how long it will take to double your investment.

We will answer these questions in the examples below.

Simple vs. compound interest

You should know that simple interest is something different than the **compound interest**. It is calculated only on the initial sum of money. On the other hand, compound

interest is the interest on the initial principal plus the interest which has been accumulated.

Compounding frequency

Most financial advisors will tell you that the compound frequency is the compounding periods in a year. But if you are not sure what compounding is, this definition will be meaningless to you... To understand this term you should know that compounding frequency is an answer to the question *How often is the interest added to the principal each year?* In other words, **compounding frequency is the time period after which the interest will be calculated on top of the initial amount**.

For example:

- **annual (1/Yr)** compounding has a compounding frequency of **one**,
- **quarterly (4/Yr)** compounding has a compounding frequency of **four**,
- **monthly (12/Yr)** compounding has a compounding frequency of **twelve**.

Note that the greater the compounding frequency is, the greater the final balance. However, even when the frequency is unusually high, the final value can't rise above a particular limit. To understand the math behind this, check out our natural logarithm calculator.

As the main focus of the calculator is the compounding mechanism, we designed a chart where you can follow the progress of the annual interest balances visually. If you choose a higher than yearly compounding frequency, the diagram will display the resulting extra or *additional part of interest gained over yearly compounding by the higher frequency*. Thus, in this way, you can easily observe the real power of compounding.

Compound interest formula

The compound interest formula is an equation that lets you estimate how much you will earn with your savings account. It's quite complex because it takes into consideration not only the annual interest rate and the number of years but also the number of times the interest is compounded per year.

The formula for annual compound interest is as follows:

```
FV = P (1+ r/m)^mt
```

Where:

- FV - the future value of the investment, in our calculator it is the **final balance**
- P - the **initial balance** (the value of the investment)
- r - the annual **interest rate** (in decimal)
- m - the number of times the interest is compounded per year (**compounding frequency**)
- t - the **numbers of years** the money is invested for

It is worth knowing that when the compounding period is one (`m = 1`) then the interest rate (`r`) is call the CAGR (compound annual growth rate).

How to calculate compound interest

Actually, you don't need to memorize the compound interest formula from the previous section to estimate the future value of your investment. In fact, you don't even need to know how to calculate compound interest! Thanks to our compound interest calculator

you can do it in just a few seconds, whenever and wherever you want. (NB: Have you already tried the mobile version of our calculators?)

With our smart calculator, all you need to calculate the future value of your investment is to fill the appropriate fields:

- **Main properties**

1. **Initial balance** - the amount of money you are going to invest or deposit.
2. **Interest rate** – the interest rate expressed on a yearly basis.
3. **Term** – the time frame you are going to invest money.
4. **Compound frequency** – in this field, you should select how often the compounding applies to your balance. Usually, the interest added to the principal balance daily, weekly, monthly, quarterly, semi-annually, or yearly. But you may set it as continuous compounding as well, which is the theoretical limit for the compounding frequency. In this case, the number of periods when compounding occurs is infinite.

- **Additional deposits**

1. **How much** - the amount you are planning to deposit on the account.
2. **How often** - you can choose the frequency of the additional deposit here.
3. **When** - you should select the timing of the transaction of the additional deposit. More specifically, you may place the money to the account *at the beginning* or *at the end* of the periods.
4. **Growth rate of deposit** - this option allows you to set a growth rate of the additional deposit. This option can be particularly useful in the long term when your income possibly increases due, for example, to inflation and/or promotions.

That's it! In a flash, our compound interest calculator makes all necessary computations for you and gives you the results.

The two main results are:

- the **final balance**, that is the total amount of money you will receive after the specified period, and
- the **total interest**, which is the total compounded interest payment.

In case you set the additional deposit field, we gave you the results for the **compounded initial balance** and **compounded additional balance**.

Besides, we also show you their contribution to the total interest amount, namely, **interest on the initial balance** and **interest on the additional deposit**.

Compound interest examples

- *Do you want to understand the compound interest equation?*
- *Are you curious about the fine details of how to calculate the compound interest rate?*
- *Are you wondering how our calculator works?*
- *Do you need to know how to interpret the results of compound interest calculation?*
- *Are you interested in all possible uses of the compound interest formula?*

The following examples are there to try and help you answer these questions. We believe that after studying them, you won't have any trouble with the understanding and practical implementation of compound interest.

Example 1 – basic calculation of the value of an investment

The first example is the simplest, in which we calculate the future value of an initial investment.

Question

You invest $10,000 for 10 years at the annual interest rate of 5%. The interest rate is compounded yearly. What will be the value of your investment after 10 years?

Solution

Firstly let's determine what values are given, and what we need to find. We know that you are going to invest `$10,000` - this is your initial balance `P`, and the number of years you are going to invest money is `10`. Moreover, the interest rate `r` is equal to `5%`, and the interest is compounded on a yearly basis, so the `m` in the compound interest formula is equal to `1`.

We want to calculate the amount of money you will receive from this investment, that is, we want to find the future value `FV` of your investment.

To count it, we need to plug in the appropriate numbers into the compound interest formula:

```
FV = 10,000 * (1 + 0.05/1) ^ (10*1) = 10,000 * 1.628895 = 16,288.95
```

Answer

The value of your investment after 10 years will be $16,288.95.

Your profit will be `FV - P`. It is `$16,288.95 - $10,000.00 = $6,288.95`.

Note that when doing calculations you must be very careful with your rounding. You shouldn't do too much until the very end. Otherwise, your answer may be incorrect. The accuracy is dependent on the values you are computing. For standard calculations, six digits after the decimal point should be enough.

Example 2 - complex calculation of the value of an investment

In the second example, we calculate the future value of an initial investment in which interest is compounded monthly.

Question

You invest $10,000 at the annual interest rate of 5%. The interest rate is compounded monthly. What will be the value of your investment after 10 years?

Solution

Like in the first example, we should determine the values first. The initial balance `P` is `$10,000`, the number of years you are going to invest money is `10`, the interest rate `r` is equal to `5%`, and the compounding frequency `m` is `12`. We need to obtain the future value `FV` of the investment.

Let's plug in the appropriate numbers in the compound interest formula:

```
FV = 10,000 * (1 + 0.05/12) ^ (10*12)
= 10,000 * 1.004167 ^ 120 = 10,000 *
1.647009 = 16,470.09
```

Answer

The value of your investment after 10 years will be $16,470.09.

Your profit will be `FV - P`. It is `$16,470.09 - $10,000.00 = $6,470.09`.

Did you notice that this example is quite similar to the first one? Actually, the only difference is the compounding frequency. Note that, only thanks to more frequent compounding this time you will earn $181.14 more during the same period! (`$6,470.09 - $6,288.95 = $181.14`)

Example 3 - Calculating the interest rate of an investment using the compound interest formula

Now, let's try a different type of question that can be answered using the compound interest formula. This time, some basic algebra transformations will be required. In this example, we will consider a situation in which we know the initial balance, final balance, number of years and compounding frequency but we are asked to calculate the interest rate. This type of calculation may be applied in a situation where you want to determine the rate earned when buying and selling an asset (e.g., property) which you are using as an investment.

Data and question

You bought an original painting for $2,000. Six years later, you sold this painting for $3,000. Assuming that the painting is viewed as an investment, what annual rate did you earn?

Solution

Firstly, let's determine the given values. The initial balance `P` is `$2,000` and final balance `FV` is `$3,000`. The time horizon of the investment `6` years and the frequency of the computing is `1`. This time, we need to compute the interest rate `r`.

Let's try to plug this numbers in the basic compound interest formula:

```
3,000 = 2,000 * (1 + r/1) ^ (6*1)
```

So:

```
3,000 = 2,000 * (1 + r) ^ (6)
```

We can solve this equation using the following steps:
Divide both sides by 2000

```
3,000 / 2,000= (1 + r) ^ (6)
```

Raise both sides to the 1/6th power

```
(3,000 / 2,000) ^ (1 / 6) = (1 + r)
```

Subtract 1 from both sides

```
(3,000 / 2,000) ^ (1 / 6) – 1 = r
```

Finally solve for r

```
r = 1.5 ^ 0.166667 – 1 = 1.069913 - 1
= 0.069913 = 6.9913%
```

Answer

In this example you earned $1,000 out of the initial investment of $2,000 within the six years, meaning that your annual rate was equal to 6.9913%.

As you can see this time, the formula is not very simple and requires a lot of calculations. That's why it's worth testing our compound interest calculator, which solves the same equations in an instant, saving you time and effort.

Example 4 - Calculating the doubling time of an investment using the compound interest formula

Have you ever wondered how many years it will take for your investment to double its value? Besides its other capabilities, our calculator can

help you to answer this question. To understand how it does it, let's take a look at the following example.

Data and question

You put $1,000 on your saving account. Assuming that the interest rate is equal to 4% and it is compounded yearly. Find the number of years after which the initial balance will double.

Solution

The given values are as follows: the initial balance `P` is `$1,000` and final balance `FV` is `2 * $1,000 = $2,000`, and the interest rate `r` is 4%. The frequency of the computing is `1`. The time horizon of the investment `t` is unknown.

Let's start with the basic compound interest equation:

```
FV = P (1 + r/m)^mt
```

Knowing that `m = 1`, `r = 4%, and 'FV = 2 * P` we can write

```
2P = P (1 + 0.04) ^ t
```

Which could be written as

```
2P = P (1.04) ^ t
```

Divide both sides by P (P mustn't be 0!)

```
2 = 1.04 ^ t
```

To solve for t, you need take the natural log (ln), of both sides:

```
ln(2) = t * ln(1.04)
```

So

```
t = ln(2) / ln(1.04) = 0.693147 / 0.039221 = 17.67
```

Answer

In our example it takes 18 years (18 is the nearest integer that is higher than 17.67) to double the initial investment.

Have you noticed that in the above solution we didn't even need to know the initial and final balances of the investment? It is thanks to the simplification we made in the third step (*Divide both sides by P*). However, when using our compound interest rate calculator, you will need to provide this information in the appropriate fields. Don't worry if you just want to find the time in which the given interest rate would double your investment, just type in any numbers (for example `1` and `2`).

It is also worth knowing that exactly the same calculations may be used to compute when the investment would triple (or multiply by any number in fact). All you need to do is just use a different multiple of P in the second step of the above example. You can also do it with our calculator.

Compound interest table

Compound interest tables were used everyday, before the era of calculators, personal computers, spreadsheets, and unbelievable solutions provided by Omni Calculator 😂. The tables were designed to make the financial calculations simpler and faster (yes, really...). They are included in many older financial textbooks as an appendix.

Below, you can see what a compound interest table looks like.

Using the data provided in the compound interest table you can calculate the final balance of your investment. All you need to know is that the column **compound amount**

factor shows the value of the factor `(1 + r)^t` for the respective interest rate (first row) and t (first column). So to calculate the final balance of the investment you need to multiply the initial balance by the appropriate value from the table.

Note that the values from the column **Present worth factor** are used to compute the present value of the investment when you know its future value.

Obviously, this is only a basic example of a compound interest table. In fact, they are usually much, much larger, as they contain more periods `t` various interest rates `r` and different compounding frequencies `m` ... You had to flip through dozens of pages to find the appropriate value of compound amount factor or present worth factor.

With your new knowledge of how the world of financial calculations looked before Omni Calculator, do you enjoy our tool? Why not share it with your friends? Let them know about Omni! If you want to be financially smart, you can also try our other finance calculators.

Additional Information

Now that you know how to calculate compound interest, it's high time you found other applications to help you make the greatest profit from your investments:

To compare bank offers which have different compounding periods, we need to calculate the Annual Percentage Yield, also called Effective Annual Rate (EAR). This value tells us how much profit we will earn within a year. The most comfortable way to figure it out is using the APY calculator, which estimates the EAR from the interest rate and compounding frequency.

If you want to find out how long it would take for something to increase by n%, you can use our rule of 72 calculator. This tool enables you to check how much time you need to double your investment even quicker than the compound interest rate calculator.

You may also be interested in the credit card payoff calculator, which allows you to estimate how long it will take until you are completely debt-free.

Another interesting calculator is our cap rate calculator which determines the rate of return on your real estate property purchase.

We also suggest you try the lease calculator which helps you determine the monthly and total payments for a lease.

If you're looking to finance the purchase of a new recreational vehicle (RV), our RV loan calculator makes it simple to work out what the best deal will be for you.

The depreciation calculator enables you to use three different methods to estimate how fast the value of your asset decreases over time.

And finally, why not to try our dream come true calculator.
which answers the question: how long do you have to save to afford your dream?

Tomasz Jedynak, PhD and Tibor Pal, PhD candidate

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Bond Price Calculator →

Real interest rate

Real interest rate calculator helps you to find out the real, inflation-adjusted cost of borrowing and the real yield to the lender or to an investor.

Real Interest Rate Calculator →

Test grade

With this test grade calculator you'll easily find out the test percentage score and grade.

Test Grade Calculator →

Other finance calculators

Omni Calculator

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20339

Exhibit 7

20340

Initial balance	106580566.47 $
Interest rate	23 %
Term	1 yrs 0 mos
Compounding frequency	yearly (1/Yr)

Additional deposits

How often? never

Results

The **final balance** is $131,094,096.98.

The **total compound interest** is $24,513,530.51.

Balances

Represent bar graph

Monthly balances

Compound Interest Calculator

By Tomasz Jedynak, PhD and Tibor Pal, PhD candidate

Last updated: Nov 02, 2020

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20341

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The formula for annual compound interest is as follows:

```
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```

Where:

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- P - the **initial balance** (the value of the investment)
- r - the annual **interest rate** (in decimal)
- m - the number of times the interest is compounded per year (**compounding frequency**)
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It is worth knowing that when the compounding period is one (`m = 1`) then the interest rate (`r`) is call the CAGR (compound annual growth rate).

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The first example is the simplest, in which we calculate the future value of an initial investment.

Question

You invest $10,000 for 10 years at the annual interest rate of 5%. The interest rate is compounded yearly. What will be the value of your investment after 10 years?

Solution

Firstly let's determine what values are given, and what we need to find. We know that you are going to invest `$10,000` - this is your initial balance `P`, and the number of years you are going to invest money is `10`. Moreover, the interest rate `r` is equal to `5%`, and the interest is compounded on a yearly basis, so the `m` in the compound interest formula is equal to `1`.

We want to calculate the amount of money you will receive from this investment, that is, we want to find the future value `FV` of your investment.

To count it, we need to plug in the appropriate numbers into the compound interest formula:

```
FV = 10,000 * (1 + 0.05/1) ^ (10*1) = 10,000 * 1.628895 = 16,288.95
```

Answer

The value of your investment after 10 years will be $16,288.95.

Your profit will be `FV - P`. It is `$16,288.95 - $10,000.00 = $6,288.95`.

Note that when doing calculations you must be very careful with your rounding. You shouldn't do too much until the very end. Otherwise, your answer may be incorrect. The accuracy is dependent on the values you are computing. For standard calculations, six digits after the decimal point should be enough.

Example 2 - complex calculation of the value of an investment

In the second example, we calculate the future value of an initial investment in which interest is compounded monthly.

Question

You invest $10,000 at the annual interest rate of 5%. The interest rate is compounded monthly. What will be the value of your investment after 10 years?

Solution

Like in the first example, we should determine the values first. The initial balance `P` is `$10,000`, the number of years you are going to invest money is `10`, the interest rate `r` is equal to `5%`, and the compounding frequency `m` is `12`. We need to obtain the future value `FV` of the investment.

Let's plug in the appropriate numbers in the compound interest formula:

```
FV = 10,000 * (1 + 0.05/12) ^ (10*12)
= 10,000 * 1.004167 ^ 120 = 10,000 *
1.647009 = 16,470.09
```

Answer

The value of your investment after 10 years will be $16,470.09.

Your profit will be `FV - P`. It is `$16,470.09 - $10,000.00 = $6,470.09`.

Did you notice that this example is quite similar to the first one? Actually, the only difference is the compounding frequency. Note that, only thanks to more frequent compounding this time you will earn $181.14 more during the same period! (`$6,470.09 - $6,288.95 = $181.14`)

Example 3 - Calculating the interest rate of an investment using the compound interest formula

Now, let's try a different type of question that can be answered using the compound interest formula. This time, some basic algebra transformations will be required. In this example, we will consider a situation in which we know the initial balance, final balance, number of years and compounding frequency but we are asked to calculate the interest rate. This type of calculation may be applied in a situation where you want to determine the rate earned when buying and selling an asset (e.g., property) which you are using as an investment.

Data and question

You bought an original painting for $2,000. Six years later, you sold this painting for $3,000. Assuming that the painting is viewed as an investment, what annual rate did you earn?

Solution

Firstly, let's determine the given values. The initial balance `P` is `$2,000` and final balance `FV` is `$3,000`. The time horizon of the investment `6` years and the frequency of the computing is `1`. This time, we need to compute the interest rate `r`.

Let's try to plug this numbers in the basic compound interest formula:

```
3,000 = 2,000 * (1 + r/1) ^ (6*1)
```

So:

```
3,000 = 2,000 * (1 + r) ^ (6)
```

We can solve this equation using the following steps:
Divide both sides by 2000

```
3,000 / 2,000= (1 + r) ^ (6)
```

Raise both sides to the 1/6th power

```
(3,000 / 2,000) ^ (1 / 6) = (1 + r)
```

Subtract 1 from both sides

```
(3,000 / 2,000) ^ (1 / 6) – 1 = r
```

Finally solve for r

```
r = 1.5 ^ 0.166667 – 1 = 1.069913 - 1
= 0.069913 = 6.9913%
```

Answer

In this example you earned $1,000 out of the initial investment of $2,000 within the six years, meaning that your annual rate was equal to 6.9913%.

As you can see this time, the formula is not very simple and requires a lot of calculations. That's why it's worth testing our compound interest calculator, which solves the same equations in an instant, saving you time and effort.

Example 4 - Calculating the doubling time of an investment using the compound interest formula

Have you ever wondered how many years it will take for your investment to double its value? Besides its other capabilities, our calculator can

help you to answer this question. To understand how it does it, let's take a look at the following example.

Data and question

You put $1,000 on your saving account. Assuming that the interest rate is equal to 4% and it is compounded yearly. Find the number of years after which the initial balance will double.

Solution

The given values are as follows: the initial balance `P` is `$1,000` and final balance `FV` is `2 * $1,000 = $2,000`, and the interest rate `r` is 4%. The frequency of the computing is `1`. The time horizon of the investment `t` is unknown.

Let's start with the basic compound interest equation:

```
FV = P (1 + r/m)^mt
```

Knowing that `m = 1`, `r = 4%, and 'FV = 2 * P` we can write

```
2P = P (1 + 0.04) ^ t
```

Which could be written as

```
2P = P (1.04) ^ t
```

Divide both sides by P (P mustn't be 0!)

```
2 = 1.04 ^ t
```

To solve for t, you need take the natural log (ln), of both sides:

```
ln(2) = t * ln(1.04)
```

So

```
t = ln(2) / ln(1.04) = 0.693147 / 0.039221 = 17.67
```

Answer

In our example it takes 18 years (18 is the nearest integer that is higher than 17.67) to double the initial investment.

Have you noticed that in the above solution we didn't even need to know the initial and final balances of the investment? It is thanks to the simplification we made in the third step (*Divide both sides by P*). However, when using our compound interest rate calculator, you will need to provide this information in the appropriate fields. Don't worry if you just want to find the time in which the given interest rate would double your investment, just type in any numbers (for example `1` and `2`).

It is also worth knowing that exactly the same calculations may be used to compute when the investment would triple (or multiply by any number in fact). All you need to do is just use a different multiple of P in the second step of the above example. You can also do it with our calculator.

Compound interest table

Compound interest tables were used everyday, before the era of calculators, personal computers, spreadsheets, and unbelievable solutions provided by Omni Calculator 😂. The tables were designed to make the financial calculations simpler and faster (yes, really...). They are included in many older financial textbooks as an appendix.

Below, you can see what a compound interest table looks like.

Using the data provided in the compound interest table you can calculate the final balance of your investment. All you need to know is that the column **compound amount**

factor shows the value of the factor `(1 + r)^t` for the respective interest rate (first row) and t (first column). So to calculate the final balance of the investment you need to multiply the initial balance by the appropriate value from the table.

Note that the values from the column **Present worth factor** are used to compute the present value of the investment when you know its future value.

Obviously, this is only a basic example of a compound interest table. In fact, they are usually much, much larger, as they contain more periods `t` various interest rates `r` and different compounding frequencies `m` ... You had to flip through dozens of pages to find the appropriate value of compound amount factor or present worth factor.

With your new knowledge of how the world of financial calculations looked before Omni Calculator, do you enjoy our tool? Why not share it with your friends? Let them know about Omni! If you want to be financially smart, you can also try our other finance calculators.

Additional Information

Now that you know how to calculate compound interest, it's high time you found other applications to help you make the greatest profit from your investments:

To compare bank offers which have different compounding periods, we need to calculate the Annual Percentage Yield, also called Effective Annual Rate (EAR). This value tells us how much profit we will earn within a year. The most comfortable way to figure it out is using the APY calculator, which estimates the EAR from the interest rate and compounding frequency.

If you want to find out how long it would take for something to increase by n%, you can use our rule of 72 calculator. This tool enables you to check how much time you need to double your investment even quicker than the compound interest rate calculator.

You may also be interested in the credit card payoff calculator, which allows you to estimate how long it will take until you are completely debt-free.

Another interesting calculator is our cap rate calculator which determines the rate of return on your real estate property purchase.

We also suggest you try the lease calculator which helps you determine the monthly and total payments for a lease.

If you're looking to finance the purchase of a new recreational vehicle (RV), our RV loan calculator makes it simple to work out what the best deal will be for you.

The depreciation calculator enables you to use three different methods to estimate how fast the value of your asset decreases over time.

And finally, why not to try our dream come true calculator.
which answers the question: how long do you have to save to afford your dream?

Tomasz Jedynak, PhD and Tibor Pal, PhD candidate

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