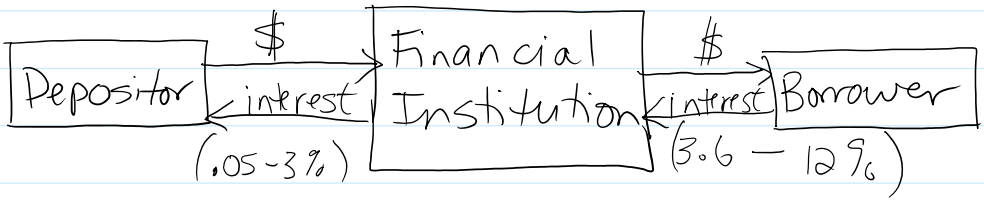
Simple + Compound Interest

Thursday, December 12, 2019 9:54 AM

What is interest?



Simple Interest ⇒ paid once.

$I = Prt$

I = interest
P = principal (amount invested)
r = rate (% per year)
t = time (year)

Maturity Date is when the term deposit is returned with interest

(Term deposit is where money is locked in for 6 months, 1 yr, or 2yr.)

Eg Invest $2000 in a term deposit at 3% for 2 years. Find interest earned.

$I = Prt$
$I = 2000(.03)(2)$
$I = 120$

$120 Interest

Eg Invest $1500 @ 2.5% for 6 months

$I = 1500(.025)(\frac{6}{12})$

$I = \$18.75$

Eg Invested @ 2.75% for $1\frac{1}{2}$ years & recieved $\$206.25$ in interest. Find the principal

$I = Prt$

$206.25 = P(.0275)(1.5)$

$\frac{206.25}{.04125} = \frac{.04125P}{.04125}$

$5000 = P$ Principal was $\$5000$

2.75%

$.02.75$

100

Try: Find the rate of interest if $\$2000$ earns $\$75$ interest after $1\frac{1}{2}$ years.

$75 = (2000)r(1.5)$

$\frac{75}{3000} = \frac{3000r}{3000}$

$.025 = r$

A = Amount → total amount of loan or invesment plus interest

$A = P + I$

$A = P + Prt$

$A = P(1 + rt)$

Eg How much would you have if you invest $\$1500$ @ 2% for 8 months.

$A = 1500\left(1 + (.02)\left(\frac{8}{12}\right)\right)$

$A = 1500(1.013\overline{3})$

$A = \$1520$

How much would I need to invest today to have $1200 after 2 years @ 3%

$$1200 = P(1 + (.03)(2))$$
$$\frac{1200}{1.06} = \frac{1.06P}{1.06}$$
$$1132.08 = P$$

We invest $1000 @ 4% for 5 years. Interest is paid at the end of each year & added to the investment.

Yr 1 $A = 1000(1 + .04)$
$A = 1040$

Yr 2: $A = 1040(1 + .04)$
or $A = 1000(1 + .04)(1 + .04)$
$A = 1000(1 + .04)^2$

⋮

Yr 5 $A = 1000(1 + .04)^5$

Compound Interest - interest is paid on principal plus earlier earned interest.

$$A = P(1 + i)^t$$

A = total amount
P = Principal
i = annual interest rate as decimal
t = time (yrs)

Eg Borrow $8000 @ 7.5% for 5

years compounded yearly.

$$A = 8000(1 + .075)^5$$
$$A = 11,485.03$$

Compounded annually → once / year
semi-annually → twice / year
quarterly → 4 x / year
monthly → 12 x / year
semi-monthly → 24 x / year
bi-weekly → 26 x / year
weekly → 52 x / year
daily → 365 x / year

Amend formula $A = P\left(1 + \frac{i}{n}\right)^{t \cdot n}$
n = # of times compounded per year

Eg Invest $5000 @ 2.5% compounded quarterly for 5 years.

$$A = 5000\left(1 + \frac{.025}{4}\right)^{5 \cdot 4}$$
$$A = 5663.54$$

What is the interest rate if $6000 is invested for 4 years, compounded monthly and earns $1,180.89 interest?

$$A = 6000 + 1180.89 = 7180.89$$

$$\frac{7180.89}{6000} = \frac{6000\left(1 + \frac{i}{12}\right)^{48}}{6000}$$

$$\sqrt[48]{1.196815} = \sqrt[48]{\left(1 + \frac{i}{12}\right)^{48}}$$

ans $\wedge \frac{1}{48}$

$1.00375\,0011 = 1 + \frac{i}{12}$

$-1 \qquad\qquad -1$

$12 \cdot .00375\,0011 = \frac{i}{12} \cdot 12$

$.045 = i$

Interest rate is 4.5%

Rule of 72 → gives the time it will take to double your investment

$$\text{Time (yrs)} = \frac{72}{\text{annual interest rate (as a percent)}}$$

eg How long will it take to double an investment if the rate is 5%

$T = \frac{72}{5} = 14.4$ years or 14 years 5 months

Eg You have \$4000 at age 20. You want \$16,000 by age 32. What interest rate do you need? Is this doable?

$4000 \times 2 = 8000$ } doubling it twice
$8000 \times 2 = 16000$ }

$32 - 20 = 12$ years.

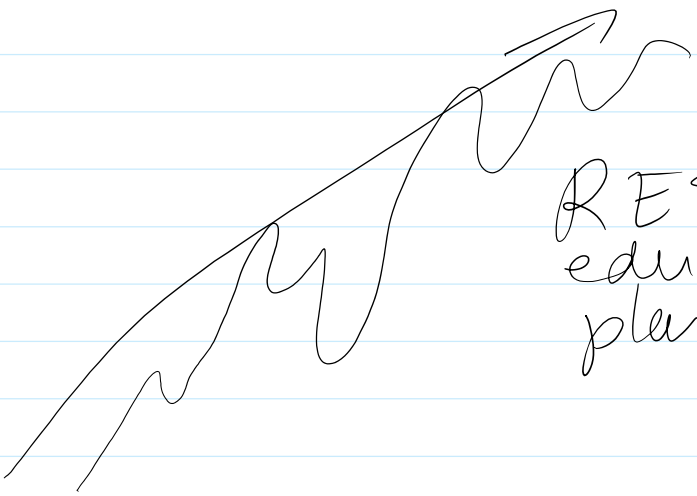
Double it in 6 years

$T = \frac{72}{i} \qquad 6 = \frac{72}{i}$

$\frac{6i}{6} = \frac{72}{6}$

$i = 12\%$

not doable, too high for investment.



RESP - Registered education savings plan

Pg 617 - 622 # 5-6, 9, 10, 16-18, 21

Pg 631 - 636 # 4-6, 8, 10-12, 14-16