



## What types of interest calculation methods does TEA support?

TEA uses the common interest formulas for simple interest, compounded interest and mortgage interest. The following are examples and additional details to provide further clarification.

### Simple Interest Calculation

The formula for simple interest is:

$$I = P \times r \times t, \text{ where}$$

I is the interest,

P is the principal,

r is the annual rate of interest, and

t is the time elapsed

$$t = x \text{ (days)} / y \text{ (days in year)}$$

## Compounded Interest Calculation

Loan balances are calculated by determining the future value of the loan. The future values are calculated using the equivalent daily interest rate  $id$ .

$$\text{FUTURE VALUE OF LOAN (fv)} = \text{LOAN AMOUNT (amt)} * (1 + id)^{\text{days}}$$

where  $id$  is derived from:

$$(1 + id)^y = 1 + \text{ian}/p)^p$$

where

$fv$  = future value of loan

$amt$  = principal balance outstanding

$days$  = cumulative days

$id$  = daily interest rate

$ian$  = annual interest rate

$y$  = number of days in year (365 or 366)

$p$  = number of times compounded in a year

daily = 365 or 366

weekly = 52

biweekly = 26

semimonthly = 24

monthly = 12

quarterly = 4

semiannually = 2

yearly = 1

the asteriks (\*) is the multiplication symbol

the forward slash (/) is the division symbol

the caret (^) is the exponent symbol

the plus (+) is the addition symbol

the minus(-) is the subtraction symbol

the equals(=) is the equality symbol

therefore

$$id = (1 + \text{ian}/p)^{(p/y)} - 1$$

and

$$\begin{aligned} \text{fv} &= \text{amt} * (1 + (1 + \text{ian}/p)^{(p/y)} - 1)^{\text{days}} \\ &= \text{amt} * (1 + \text{ian}/p)^{(p/y)^{\text{days}}} \end{aligned}$$

$$\text{INTEREST} = \text{fv} - \text{amt}$$

$$\text{Therefore INTEREST} = (\text{amt} * (1 + \text{ian}/p)^{(p/y)^{\text{days}}}) - \text{amt}$$

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## Compound Interest Formula – Example (Practical)

### Example # 1:

$$\text{INTEREST} = (\text{amt} * (1 + \text{ian}/p)^{(p/y))^{\text{days}} - \text{amt}}$$

if

$$\text{amt} = 89,635.00$$

$$\text{ian} = 7.25\% = 0.0725$$

$$p = 1$$

$$y = 365$$

$$\text{days} = 28$$

then

$$\begin{aligned}\text{INTEREST} &= (89,635.00 * ((1 + 0.0725/1)^{(1/365)})^{28}) - 89,635.00 \\ &= (89,635.00 * ((1 + 0.0725)^{(0.0027397260274)})^{28}) - 89,635.00 \\ &= (89,635.00 * (1.0725^{0.0027397260274})^{28}) - 89,635.00 \\ &= (89,635.00 * 1.00019177832^{28}) - 89,635.00 \\ &= (89,635.00 * 1.00538371825) - 89,635.00 \\ &= 90,117.5695853 - 89,635.00 \\ &= 482.5695853 \\ &= 482.57\end{aligned}$$

### Example # 2:

$$\text{INTEREST} = (\text{amt} * (1 + \text{ian}/p)^{(p/y))^{\text{days}} - \text{amt}}$$

if

$$\text{amt} = 89,635.00$$

$$\text{ian} = 7.25\% = 0.0725$$

$$p = 1$$

$$y = 365$$

$$\text{days} = 31$$

then

$$\begin{aligned}\text{INTEREST} &= (89,635.00 * ((1 + 0.0725/1)^{(1/365)})^{31}) - 89,635.00 \\ &= (89,635.00 * ((1 + 0.0725)^{(0.0027397260274)})^{31}) - 89,635.00 \\ &= (89,635.00 * (1.0725^{0.0027397260274})^{31}) - 89,635.00 \\ &= (89,635.00 * 1.00019177832^{31}) - 89,635.00 \\ &= (89,635.00 * 1.00596226156) - 89,635.00 \\ &= 90,169.4273149 - 89,635.00 \\ &= 534.4273149 \\ &= 534.43\end{aligned}$$

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## Mortgage Interest Calculation

FUTURE VALUE OF LOAN = LOAN AMOUNT + (LOAN AMOUNT \* Id \* cum. days)

where id is derived from:

$$(1 + Id)^y = (1 + Ian/p)^p$$

Id = daily interest rate

Ian = annual interest rate

y = numbers of days in year

p = number of times compounded in a year

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