3.1. Simple Interest

Wednesday, January 24, 2018 12:24 PM

Goals: (1) Understand the Simple Interest Formula

(2) Solve applications using this formula.

$$I = P \cdot R \cdot t$$

I : interest earned or to be paid

P : principal (amount invested or borrowed)

R : interest rate (in decimals)

t : time (in years)

E.g. Borrow $100. Simple interest. Interest Rate is 3% annually. Pay back money in 5 years.

$$I = P \cdot R \cdot t = \$100 \cdot (0.03) \cdot 5$$

$$= \$15$$

(annual)

E.g. $I = P \cdot R \cdot t$

$P = \$100$; $R = 10\% = 0.1$

$t = 6$ months $= 0.5$ year.

Find I? $I = \$100 \cdot (0.1) \cdot (0.5)$

$I = \$5$

E.g. $I = P \cdot R \cdot t$

$I = \$100$, $R = 10\% = 0.1$; $t = 6$ months $= 0.5$ years

Find P?

$I = P \cdot R \cdot t$ $\xrightarrow{\text{Divide both sides by } R \cdot t}$ $P = \dfrac{I}{R \cdot t}$

$$P = \frac{\$100}{(0.1) \cdot (0.5)} = \$2000$$

E.g. $P = \$100$; $R = 5\% = 0.05$; $t = 3$ years.

Total amount to be paid back after 3 years.

$$= \text{Principal} + \text{Interest}$$

$$= \$100 + \$100 \cdot (0.05) \cdot (3)$$

$$= \$115$$

→ Future Value

Formula for Future Value:

$$A = P + I$$

$$= P \cdot 1 + P \cdot R \cdot t$$

$$= P(1 + R \cdot t)$$

$$\boxed{A = P(1 + Rt)}$$

→ future amount or future value.

E.g $P = \$5100$

$t = 3$ months

$A = \$5227.5$

Find $R = ?$ 10%

$$\boxed{A = P(1 + Rt)}$$

$$5227.5 = 5100 \cdot (1 + 0.25R)$$

$$5227.5 = 5100 + 1275R$$

$$-5100 \qquad -5100$$

$$127.5 = 1275R \rightarrow R = 0.1 \rightarrow \boxed{10\%}$$

2nd

$$\frac{A}{P} = 1 + Rt \; ; \; \frac{A}{P} - 1 = Rt$$

$$R = \frac{\frac{A}{P} - 1}{t} = \frac{\frac{5227.5}{5100} - 1}{0.25} = 0.1$$


t
0.25

Application:

Commercial for a loan company.

You only need to pay 24 cents ($0.24) per day for $500 borrowed.

You borrow $1225 for 118 days.

(1) What is the amount that you need to repay?

(2) What annual interest rate they are actually charging?

$$\text{Interest to be paid} = \frac{\$1225}{\$500} \cdot (0.24) \cdot (118)$$

$$= \$69.38 \leftarrow \text{interest}$$

$$\text{Total amount to be paid} = \$1225 + \$69.38$$

$$= \boxed{\$1294.38}$$

$$A = P(1 + Rt)$$

$$1294.38 = 1225 \cdot \left(1 + R \cdot \frac{118}{360}\right)$$

$$\frac{1294.38}{1225} = 1 + R \cdot \frac{118}{360}$$

$$\frac{1294.38}{1225} - 1 = R \cdot \frac{118}{360}$$

$$R = \frac{\frac{1294.38}{1225} - 1}{\frac{118}{360}} \approx 0.173$$

$$\boxed{17.3\%}$$