Simple Interest

COURSE TEACHING ASSISTANTS

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Rules

1 Simple interest

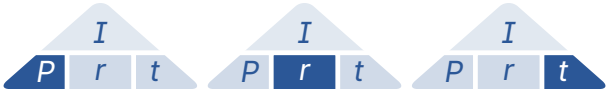
sum, amount or became means S · I = S − P

$$I = P \times r \times t$$

interest · principal · rate · time

$$S = P + I$$

sum



$$P = \frac{I}{r \times t} \qquad r = \frac{I}{P \times t} \qquad t = \frac{I}{P \times r}$$

2 Count the days

skip the first day, count the last

Days in each month *31, except the blue ones*

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28·29	31	30	31	30	31	31	30	31	30	31

Leap year? *divide the year by 4*

2020 ÷ 4 = 505 ↙ no fraction: leap year, **366 days**

2022 ÷ 4 = 505.5 ↙ fraction: simple year, **365 days**

3 Commercial and exact

$I_c : I_e = 73 : 72$ · the difference is 1 part

	Normal way	One of them given	Difference given
Commercial the default	$I_c = P \times r \times \frac{\text{days}}{360}$	$I_c = I_e \times \frac{73}{72}$	$I_c = (I_c - I_e) \times 73$
Exact 366 in a leap year	$I_e = P \times r \times \frac{\text{days}}{365}$	$I_e = I_c \times \frac{72}{73}$	$I_e = (I_c - I_e) \times 72$

4 Make *r* yearly

no type? it is already yearly

Monthly	Every 2 months	Quarterly	Every 4 months	Semi-annual
× 12	× 6	× 4	× 3	× 2

Q1

Find the number of days from 13/1/2022 to 24/6/2022.

Solution

Days in each month

Jan 31 − 13 = 18, Feb 28, Mar 31, Apr 30, May 31, Jun 24

Days = 18 + 28 + 31 + 30 + 31 + 24 = 162 days

Q2

Find the number of days from 22/1/2020 to 15/8/2020.

Solution

Days in each month

2020 is divisible by 4: a leap year, so Feb has 29 days.

Jan 31 − 22 = 9, Feb 29, Mar 31, Apr 30, May 31, Jun 30, Jul 31, Aug 15

Days = 9 + 29 + 31 + 30 + 31 + 30 + 31 + 15 = 206 days

Q3

Ahmed deposited \$100,000 in a bank at a simple interest rate of 12% annually. Calculate the interest and the sum at the end of:

a) 2 years

b) 1.5 years

c) 9 months

d) 15 months

e) 135 days, commercial interest

f) 180 days, exact interest

Solution

Given: $P = \$100{,}000$, $r = 12\% = 0.12$

Use: $I = P \times r \times t$ and $S = P + I$

Part	Time	t in years	Interest I	Sum S
a)	2 years	2	24,000	124,000
b)	1.5 years	1.5	18,000	118,000
c)	9 months	$\frac{9}{12}$	9,000	109,000
d)	15 months	$\frac{15}{12}$	15,000	115,000
e)	135 days, commercial	$\frac{135}{360}$	4,500	104,500
f)	180 days, exact	$\frac{180}{365}$	5,917.81	105,917.81

e) commercial: days ÷ 360 *f) exact, no year given: days ÷ 365*

Q4

Nahla deposited \$50,000 in a bank at a simple interest rate of 12% annually. After a certain period, the sum became \$53,000. Find this period.

Solution

Given: $P = \$50{,}000,\ r = 12\%,\ S = \$53{,}000$

First, find the interest

$$I = S - P$$

$$= 53{,}000 - 50{,}000 = \boxed{3{,}000}$$

Then, find the time

$$t = \frac{I}{P \times r}$$

from the first step

$$= \frac{3{,}000}{50{,}000 \times 0.12} = 0.5 \text{ year} = \boxed{6 \text{ months}}$$

Q5

Find the rate of interest if the principal is \$500, the time is 2 months and the interest is \$12.5.

Solution

Given: $P = \$500,\ t = \frac{2}{12},\ I = \$12.5$

$$r = \frac{I}{P \times t}$$

$$= \frac{12.5}{500 \times \frac{2}{12}} = 0.15 = \boxed{15\%}$$

Q6

On 5 Feb. 2022 a person deposited \$72,000 in a bank at a simple interest rate of 15% annually. Compute the interest amount on 10 Aug. 2022.

Solution

Given: $P = \$72{,}000$, $r = 15\% = 0.15$ *commercial, days ÷ 360*

First, count the days

Feb 28 − 5 = 23, Mar 31, Apr 30, May 31,
Jun 30, Jul 31, Aug 10

$$\text{Days} = 23 + 31 + 30 + 31 + 30 + 31 + 10 = 186$$

Then, the interest *from the first step*

$$I = 72{,}000 \times 0.15 \times \frac{186}{360} = 5{,}580$$

Q7

Compute the commercial interest and the exact interest for \$7,300 deposited in a bank at 12% annually for 60 days, knowing that the deposit was in the year 2020.

Solution

Given: $P = \$7{,}300$, $r = 12\% = 0.12$, 60 days

Commercial interest

$$I_c = 7{,}300 \times 0.12 \times \frac{60}{360} = 146$$

Exact interest *2020 is divisible by 4: a leap year, days ÷ 366*

$$I_e = 7{,}300 \times 0.12 \times \frac{60}{366} = 143.61$$

Q8

If the commercial interest for a certain sum of money, for a certain period and at a certain rate, is \$36.5, compute the exact interest.

Solution

$$I_e = \frac{72}{73} I_c$$
$$= \frac{72}{73} \times 36.5 = 36$$

Q9

If the exact interest for a certain sum of money, for a certain period and at a certain rate, is \$300, compute the commercial interest.

Solution

$$I_c = \frac{73}{72} I_e$$
$$= \frac{73}{72} \times 300 = 304.17$$

Q10

If the difference between the commercial and exact interest for a certain sum of money, for a certain period and at a certain rate, is \$50, calculate the commercial and exact interest.

Solution

Given: $I_c - I_e = 50$

$$I_c = 73\,(I_c - I_e) = 73 \times 50 = 3{,}650$$

$$I_e = 72\,(I_c - I_e) = 72 \times 50 = 3{,}600$$

Q11

If the difference between the commercial and exact interest for a certain sum of money, for a period of 144 days at a rate of 15% annually, is \$6, find the commercial and exact interest and the money invested.

Solution

Given: $t = 144$ days, $r = 15\%$, $I_c - I_e = 6$

The two interests

$$I_c = 73\,(I_c - I_e) = 73 \times 6 = 438$$

$$I_e = 72\,(I_c - I_e) = 72 \times 6 = 432$$

The money invested *use $I_c = 438$, days ÷ 360*

$$P = \frac{I_c}{r \times t}$$

$$= \frac{438}{0.15 \times \frac{144}{360}} = \frac{438}{0.06} = 7{,}300$$

Q12 Extra

Find the principal in each case:

a) The interest is \$1,800 for 9 months at 8% annually.

b) The commercial interest is \$450 for 120 days at 9% annually.

Solution

Given: $P = \dfrac{I}{r \times t}$

a) *9 months at 8%*

$$P = \frac{1{,}800}{0.08 \times \frac{9}{12}} = \frac{1{,}800}{0.06} = 30{,}000$$

b) *120 days at 9%* *commercial: days ÷ 360*

$$P = \frac{450}{0.09 \times \frac{120}{360}} = \frac{450}{0.03} = 15{,}000$$

Q13 Extra

Find the interest on each deposit:

a) \$12,000 at 1% monthly for 5 months

b) \$8,000 at 2% quarterly for 9 months

c) \$9,000 at 1.5% every 2 months for 10 months

d) \$5,000 at 3% semi-annually for 1.5 years

Solution

Given: *Turn r into a rate per year first, then use $I = P \times r \times t$*

Part	P	r per year	t	Interest I
a)	12,000	1% × 12 = 12%	$\frac{5}{12}$	600
b)	8,000	2% × 4 = 8%	$\frac{9}{12}$	480
c)	9,000	1.5% × 6 = 9%	$\frac{10}{12}$	675
d)	5,000	3% × 2 = 6%	1.5	450

Q14 Extra

$15,600 is deposited for 26 weeks at 10% annually. Find the interest and the sum at the end of the period.

Solution

Given: $P = \$15{,}600$, $r = 10\%$, $t = \frac{26}{52}$

$$I = 15{,}600 \times 0.10 \times \frac{26}{52} = 780$$

$$S = 15{,}600 + 780 = 16{,}380$$

Q15 Extra

A deposit of $20,000 became $20,600 after 26 weeks. Find the annual rate of interest.

Solution

Given: $P = \$20{,}000$, $S = \$20{,}600$, $t = \frac{26}{52}$

First, find the interest

$$I = S - P$$

$$= 20{,}600 - 20{,}000 = 600$$

Then, find the rate

from the first step

$$r = \frac{I}{P \times t}$$

$$= \frac{600}{20{,}000 \times \frac{26}{52}} = \frac{600}{10{,}000} = 0.06 = 6\%$$