Simple Interest Worksheet

Key

1) a) The formula for simple interest is: $I = Prt$

b) Rearrange this formula to find:

i) Time: $t = \frac{I}{Pr}$

ii) The interest rate: $r = \frac{I}{Pt} \times 100\%$

iii) The Principal: $P = \frac{I}{rt}$

Answer each of the following...

2) If Michael invests $2000 in the bank at a rate of 5.5% for 6 years how much interest will he make?

$I = 2000(0.055)(6)$

$I = \$660$

3) Kelsey takes out a loan for $6000 to start a business after high school. The bank charges her 8% interest for the loan. After 5 years how much interest will be added on to the loan? $I = 6000(0.08)(5)$

$I = \$2400$

4) Jessie invests $3345 in the stock market. Over the 3 years she has this invested she gets an average return of 7.8%. How much will her investment be worth after the 3 years? $A = 3345 + 3345(0.078)(3)$

$A = \$4127.73$

5) Scott takes gets a student loan to go to college after high school. If he pays $750 in interest at a rate of 3%, how much must the loan have been for originally?

OMIT

6) Taylor has just won $4,250 from the 50/50 at the Sea Dog's game and decides to invest all of it. If he makes $1275 with a 5% interest rate, how long must he have had the money invested? $t = \frac{1275}{4250(0.05)}$

$t = 6$ years

7) At what rate would you need to invest $12000 and make $2880 after 8 years?

$r = \frac{2880}{12000(8)} \times 100\%$

$r = 3\%$

8) What will the total value of an investment of $5000 be if it has an interest rate of 7% and is invested for 20 years? $A = 5000 + 5000(0.07)(20)$

$A = \$12000$

9) Morgan has an investment worth $130,000 dollars after 20 years. If his original investment was for $50,000 what must the interest rate have been?

$I = 130000 - 50000$

$I = 80000$

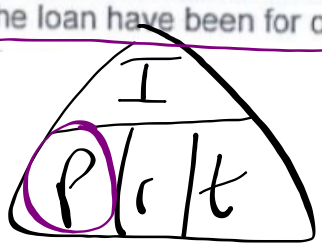
$r = \frac{80000}{50000(20)} \times 100\%$

$r = 8\%$

5) Scott takes gets a student loan to go to college after high school. If he pays $750 in interest at a rate of 3%, how much must the loan have been for originally?

$I = Prt$

$\frac{I}{rt} = \frac{Prt}{rt}$



Assume $t = 1$

$P = \frac{750}{0.03 \times 1}$

$P = \$25000$

10. Shaun has been looking at houses. He has $10 000 that he wants to invest, hoping that he can end up with $15 000 to make a down payment on a house. He has an opportunity to invest at 6.5% simple interest, paid annually. How long will it take before Shaun can make a down payment of $15 000?

$P = 10000$
$A = 15000$
$r = 0.065$

$I = A - P$
$I = 5000$

$t = \frac{I}{Pr}$

$= \frac{5000}{10000(0.065)}$

$t = 7.69$ yrs

$t = 8$ yrs

11. A bank is offering a simple interest rate of 3.2% for a guaranteed investment certificate with a 5-year term.

a) What principal would you need to invest if you wanted to have $20 000 at the end of the term?

b) How long would it take for the value of the GIC to be $25 000?

$r = 3.2$

$r = 0.032$

$t = 5$ yrs

$P = ?$

$A = 20000$

$I = Prt$ $\quad P = \frac{I}{rt}$

$A = P + I \rightarrow A = P + Prt \rightarrow A = P(1 + rt)$ *

$\frac{A}{(1+rt)} = \frac{P(1+rt)}{(1+rt)}$

$\frac{20000}{(1+0.032\times5)} = P$

20000/(1+0.032*5)
17241.37931

$= P$

$P = \$17241.38$

8.3 Compound Interest: Future Value

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

GOAL

Determine the future value of an investment that earns compound interest.

Terminology Tango

Click on the picture to verify the match.

daily	365 times a year
bi-weekly	26 times a year
semi-annually	twice a year
weekly	52 times a year
monthly	twelve times a year
quarterly	four times a year
annually	once a year

COMPOUND Interest

Interest is added to the principal periodically throughout the year. New interest may be paid on the principal plus the interest. The interest rate is stated per annum and is divided by the number of **compounding periods**.

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

$$I = A - P$$

A = final value of the investment ...(principal + interest)
P = principal
r = annual interest rate
n = number of compounding periods in a year
t = term of the investment or loan in number of years

EXAMPLE #1: If $1000 is invested at 8 %/a compounded semi-annually for 2 years, how much will the investment be worth?

Using the simple interest formula...

I = 1000(0.08)(6/12)
= $40 (after 1st interest period)

New principal = 1000 + 40
= $1040

I = 1040(0.08)(6/12)
= $41.60 (after 2nd interest period)

New Principal = 1040 + 41.60
= $1081.60

I = 1081.60(0.08)(6/12)
= $43.26 (after 3rd interest period)

New Principal = 1081.60 + 43.26
= $1124.86

I = 1124.86(0.08)(6/12)
= $44.99 (after 4th interest period)

New Principal = 1124.86 + 44.99
= $1169.85

Compound Interest Formula...

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

SAME ANSWER?

EXAMPLE #2:

Calculate the final value of an initial investment of $6000.00. Interest is paid at 4% per annum, compounded semi-annually, for three years.

A = final value of the investment ...(principal + interest)
P = principal
r = annual interest rate
n = number of compounding periods in a year
t = term of the investment or loan in number of years

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

$$A = 6000\left(1 + \frac{0.04}{2}\right)^{(2)(3)}$$

```
                18727.2
6000(1+0.04/2)^6

             6756.974516
6000(1+0.04/2)^(
2*3)
             6756.974516
```

EX #3: Maggie invests $30 000 at 10% /a compounded quarterly for 20 years. Determine...

a) How much will this investment be worth?

b) How much interest did you earn?

a) $A =$

```
30000(1+0.10/4)^
80
      216287.0345
```

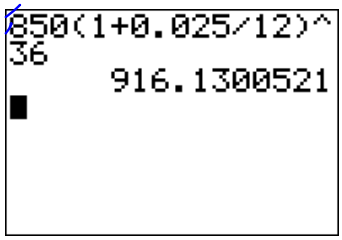
b) $I =$

```
30000(1+0.10/4)^
80
      216287.0345
Ans-30000
      186287.0345
```

EXAMPLE #4...

A keen MVHS student wants to save some money from their summer employment. They decide to take out a Canada Savings Bond which pays 2.5 % interest per year compounded monthly. If the student invests $850 into the bond, how much interest will they earn if they don't touch the money for 3 years?

A



$I = 916.13 - 850$

$I = \$66.13$

HOMEWORK...

p. 457: #1, 2

p. 468: #2, 6, 7

Simple

$I = Prt$

&

$A = P + I$

$A = P + Prt$

$A = P(1 + rt)$

Compound

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

$$I = A - P$$