

Name: _____

Finance Practice – Simple and Compound Interest

1. Char invested \$4000 at a simple interest rate of 2.3%.

a) What is the value of her investment after 5 years?

$$I = 4000 \times 0.023 \times 5 \\ = \$460$$

$$A = 4000 + 460 = \boxed{\$4460}$$

b) What is its value after 10 years?

$$4000 \times 0.023 \times 10$$

$$= \$920 \text{ (Interest would double)}$$

$$A = \boxed{\$4920}$$

2. A \$12000 Canada Savings Bond has a term of 10 years. What interest rate is needed for the future value of the CSB to be \$15,000 at its maturity?

$$\text{Interest earned: } 15000 - 12000 = 3000$$

$$3000 = 12000 \times 10 \times r$$

$$\frac{3000}{120000} = \frac{120000 \times r}{120000}$$

$$r = 0.025 \text{ or } 2.5\%$$

3. Suppose that the interest rate from #2 was increased by 1%. What would be the future value of the CSB at maturity?

$$I = 12000 \times 10 \times 0.035 \\ = \$4200$$

$$A = \$16200$$

4. a) Predict which investment will earn the greater amount of interest over 5 years. Explain your prediction and then verify it.

A. \$1000 in a simple interest investment at 6% paid semi-annually

B. \$1000 in a simple interest investment at 6% paid monthly.

They will both earn the same interest

$$A: 1000 \times 0.06 \times 0.5 = \$30 / 6 \text{ months} \times 10 = \$300$$

$$B: 1000 \times 0.06 \times \frac{1}{12} = \$5 / \text{month} \times 60 = \$300$$

b) Is there an advantage if simple interest is paid more often? Explain.

No, you will earn the same amount no matter how frequently it's paid.

c) Why might someone choose investment B over investment A?

If you need the \$ sooner, you may want interest paid monthly (every month there'd be more \$ in the account versus every year)

5. A bank is offering a simple interest rate of 3.2% for a guaranteed investment certificate with a 5-year term. What principal would you need to invest if you wanted to have \$20,000 at the end of the term?

$$20\,000 = P \times 0.032 \times 5$$

$$\frac{20\,000}{0.16} = \frac{P \times 0.16}{0.16}$$

$$\boxed{\$125\,000 = P}$$

6. At the beginning of each year, Graham purchases a \$1000 Canada Savings Bond with a simple interest rate of 3.8%. After 5 years, what is the total value of the CSB?

$$\text{year 1: } 1000 \times 0.038 \times 1 \\ = \$38 \quad A = \$1038$$

$$\text{year 3: } 3115.44 \times 0.038 \times 1 \\ = \$118.39 \quad A = \$3233.83$$

$$\text{year 2: } 2038 \times 0.038 \times 1 \\ = 77.44 \quad A = \$2115.44$$

$$\text{year 4: } 4233.83 \times 0.038 \times 1 \\ = \cancel{\$160.89} \quad A = \cancel{\$4394.72} \\ = 160.89 \quad \$4594.72$$

$$\text{year 5: } 5394.72 \times 0.038 \times 1 \\ = \cancel{\$205} \quad A = \$5599.72$$

7. Sydney wants to open a savings account. He has \$6500 to deposit. He intends to keep the account for 4 years and then use the money to rebuild the engine of his car. Which account should he choose? Justify your choice.

A. 5.1% simple interest, paid weekly

B. 4.8% compound interest, paid annually

$$A: 6500 \times 0.051 \times 4 \\ = \$1326 \quad A = \$7826$$

$$B: 6500 (1 + 0.048)^4 \\ = \$7840.77$$

He should choose account B.

8. Trust funds are investments that are set up for a specific purpose. A local business invested \$250,000 in a charitable trust fund so that a school can offer scholarships. The interest rate is 3.8%, compounded semi-annually. Only the interest earned can be used to provide the scholarships. How much is available from the trust fund for scholarships each year?

$$P = 250\,000 \quad r = 0.038 \quad n = 2$$

$$A = 250\,000 \left(1 + \frac{0.038}{2}\right)^2$$

$$= 259\,590.25$$

$$I = A - P$$

$$I = 259\,590.25 - 250\,000$$

$$= \boxed{\$9\,590.25}$$

9. Sasha predicts that she will need \$24,000 to remodel her carpentry workshop in 6 years. She has found three investment options to consider:

- Option 1: 4.80%, compounded annually
- Option 2: 4.75%, compounded semi-annually
- Option 3: 4.70%, compounded quarterly

Find ~~how~~ the principle she would need to invest for each option. Compare the rates of return for these three options and decide which option she should choose and why.

option 1:

$$24\,000 = P(1 + 0.048)^6$$

$$\frac{24\,000}{(1.048)^6} = \frac{P(1.048)^6}{(1.048)^6}$$

$$\boxed{\$18\,115.22 = P}$$

option 2:

$$24\,000 = P \left(1 + \frac{0.0475}{2}\right)^{12}$$

$$\frac{24\,000}{(1.02375)^{12}} = \frac{P(1.02375)^{12}}{(1.02375)^{12}}$$

$$\boxed{\$18\,108.57 = P}$$

option 3:

$$24\,000 = P \left(1 + \frac{0.047}{4}\right)^{24}$$

$$\frac{24\,000}{(1.01175)^{24}} = \frac{P(1.01175)^{24}}{(1.01175)^{24}}$$

$$\boxed{\$18\,132.35 = P}$$

she should choose option B because she needs less principle.

10. Solomon bought a \$40,000 corporate bond (an investment in the form of a loan to a company that earns interest). The bond earns 4.8% compounded semi-annually. After 4 years, the interest rate changed to 6%, compounded annually. Determine the value of Solomon's investment after 6 years.

$$4.8\% : A = 40\,000 \left(1 + \frac{0.048}{2}\right)^8$$

$$A = 40\,000 (1.024)^8$$

$$A = \$48\,357.03$$

$$6\% : A = 48\,357.03 (1 + 0.06)^2$$

$$A = 48\,357.03 (1.06)^2$$

$$\boxed{A = \$54\,333.96}$$

11. Franco invested money at 6.9%, compounded annually, while David invested money at 6.9% compounded monthly. After 30 years, each investment is worth \$25,000. Who made the greater original investment, and by how much was it greater?

Franco:

$$25\,000 = P(1 + 0.069)^{30}$$

$$\frac{25\,000}{(1.069)^{30}} = \frac{P(1.069)^{30}}{(1.069)^{30}}$$

$$\boxed{\$3\,377.60 = P}$$

David:

$$25\,000 = P \left(1 + \frac{0.069}{12}\right)^{30 \times 12}$$

$$\frac{25\,000}{(1.00575)^{360}} = \frac{P(1.00575)^{360}}{(1.00575)^{360}}$$

$$\boxed{\$3\,173.40 = P}$$

Franco made the greater original investment by \$204.20.

12. This year and on subsequent alternating years, Terry plans to invest \$900 in a savings account that earns 11.2%, compounded quarterly. What is the value of his savings immediately after he has made his fourth investment?

Investment #1

years 1 & 2:
 $A = 900 \left(1 + \frac{0.112}{4}\right)^8$
 $= 900(1.028)^8$
 $= \$1122.50$

Investment #2
years 3 & 4

$$A = 2022.50 \left(1 + \frac{0.112}{4}\right)^8$$

$$= 2022.50(1.028)^8$$

$$= \$2522.51$$

Investment #3:
years 5 & 6

$$A = 3422.51(1.028)^8$$

$$= \$4268.64$$

Investment #4:
years 7 & 8

$$4268.64 + 900 = \$5168.64$$

13. What annual interest rate, compounded quarterly would enable an investment to triple every 12 years? Round your answer to two decimal places.

let's use a principle of \$1000 and a final amount of \$3000

$$3000 = 1000 \left(1 + \frac{r}{4}\right)^{12 \times 4}$$

$$\frac{3000}{1000} = \frac{1000 \left(1 + \frac{r}{4}\right)^{48}}{1000}$$

$$3 = \left(1 + \frac{r}{4}\right)^{48}$$

$$\sqrt[48]{3} = 1 + \frac{r}{4}$$

$$\sqrt[48]{3} - 1 = \frac{r}{4}$$

$$\left(\sqrt[48]{3} - 1\right) \times 4 = r$$

$$0.0926 = r$$

or 9.26%

14. Determine the unknown values in the following table:

Regular Payment (\$) (PMT)	Interest Rate (%) (I%)	Compounding and Payment Frequency (P/Y, C/Y)	Term (years) (multiply by C/Y to find N)	Future Value (\$) (FV)
100	? 2.68%	Monthly	6	7800.61
250 ?	3.5	Semi-annually	7	3927.38
20 000	4.75	quarterly	?	1 080 978.04

Remember that these are entered as negative.

use PV = 0 for all calculations.

N = 42
Divide by 4 to solve for # years.
42 ÷ 4 = 10.5 years.

15. Zoey deposited the same amount of money at the end of each month for 2 years in a savings account that earned 6% interest, compounded monthly. She ended up with \$5000. How much did Zoey deposit each month?

N = 2 × 12 = 24 PMT = ? PMT = \$-196.60
 I% = 6 FV = 5000
 PV = 0 P/Y = 12
 C/Y = 12

16. What interest rate, compounded monthly, is required to make monthly payments of \$500 grow to \$35000 in 5 years?

N = 12 × 5 = 60 PMT = -500 I = 6.13%
 I% = ? FV = 35000
 PV = 0 P/Y = 12
 C/Y = 12

17. For two years, Trey deposited \$600 at the end of every 3 months into an investment that earned 3.6%, compounded quarterly. Over the same 2 years, Sam deposited \$2400 annually into an investment that earned 3.8%, compounded annually. Whose investment is worth more and by how much?

Trey:

$$N = 2 \times 4 = 8 \quad P/Y = 4$$

$$I = 3.6 \quad C/Y = 4$$

$$PV = 0 \quad FV = \$4953.95$$

$$PMT = -600$$

$$FV = ?$$

Sam:

$$N = 2 \quad P/Y = 1$$

$$I = 3.8 \quad C/Y = 1$$

$$PV = 0 \quad FV = \$4891.2$$

$$PMT = -2400$$

$$FV = ?$$

Trey's is worth \$62.75 more than Sam's.

18. Farah bought a computer for \$5000. She plans to sell this computer and buy a new one with upgraded hardware, also for \$5000, in two years. In two years, her current computer will be worth about 25% of its original value. Farah started saving for her next computer by investing at the end of each month in an account that earns 3.6%, compounded monthly. How much should each payment be, so that she can pay cash for her next computer in 2 years?

$$0.25(5000) = \$1250$$

$$5000 - 1250 = \$3750 \leftarrow \text{amount Farah will need in 2 years for new computer.}$$

$$N = 24$$

$$I = 3.6$$

$$PV = 0$$

$$PMT = ?$$

$$FV = 3750$$

$$P/Y = 12$$

$$C/Y = 12$$

$$PMT = -150.93$$

Farah will need to save \$150.93 every month.