WorkSHEET 1.2 Simple and compound interest

Name: _____

/50

1 If $3200 is invested for 9 months at 5% p.a., calculate: 2

(a) the amount of simple interest earned

(b) the total amount at the end of the term.

2 How long will it take to earn $500 simple interest, investing $8500 at 4.25% p.a.? 2

3 Johnny invested $60 000 in Ski International debentures. He earned 6.5% p.a. which is paid quarterly. How much interest will he earn over 5 years? 1

4	Kim has $18 000 to invest for 2 years. She has the following options: (a) A term deposit at 4.5% compounded annually. (b) Shares, paying a rate of 4.48% per annum with dividend paid quarterly. (c) A building society account, paying a return of 4.56% per annum with monthly rests. (d) A business venture with guaranteed return of 3.65% p.a. and interest paid daily. Advise Kim which option to take if all the investments are equally secure.	9

5 (a) Calculate the compound interest on a term deposit of $10 000 at the rate of 6% p.a. for 3 years when the investment is compounded

(i) annually
(ii) semi-annually
(iii) quarterly
(iv) monthly
(v) daily.

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(b) Which is the best investment option?

6	Colin invests $5000 for 5 years at 5.25% p.a. How much more would he collect at the end of the 5-year period if the money invested is compounding monthly rather than compounding annually?	2

7 The table below shows the yearly growth of an investment of $10 000 over a period of 5 years at 3.75% p.a. interest compounded annually. 5

Time (years)	0	1	2	3	4	5
Value ($)	10 000	10 375	10 764	11 168	11 587	12 021

Graph the value of the investment over time.

8 Chris invests $20 000 at 6% p.a. with interest compounding annually. 8

(a) Complete the table below to show the future value at the end of each year.

No. of years	1	2	3	4	5
Future value					

(b) Draw a graph of the future value of the investment against time.

9	An interest rate of 4.5% p.a. compounding quarterly is equivalent to what effective interest rate?	5

10 Marilyn can invest in two different funds: 5

(a) 6% p.a. simple interest

(b) 5.75% p.a. compound interest with monthly rests.

She is inclined to choose the 6% p.a. simple interest because this is a higher value. Is this a wise choice? Explain your answer.

WorkSHEET 1.2 Simple and compound interest

Name: _____

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1 If $3200 is invested for 9 months at 5% p.a., calculate: 2

(a) the amount of simple interest earned

(b) the total amount at the end of the term.

(a) $P = \$3200, \quad R = 5\%\text{ p.a.}, \quad T = \frac{9}{12}\text{ year},$

$$I = \frac{PRT}{100}$$

$$I = \frac{3200 \times 5 \times \frac{9}{12}}{100}$$

$$I = \$120$$

(b) Total amount $A = \$3200 + \$120$

$= \$3320$

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2 How long will it take to earn $500 simple interest, investing $8500 at 4.25% p.a.? 2

$I = \$500, \quad P = \$8500, \quad R = 4.25\%\text{ p.a.},$

$$T = \frac{100I}{PR}$$

$$T = \frac{100 \times 500}{8500 \times 4.25}$$

$T = 1.38$ years

$T = 1$ year 5 months (since $0.38 \times 12 \approx 5$ months)

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3 Johnny invested $60 000 in Ski International debentures. He earned 6.5% p.a. which is paid quarterly. How much interest will he earn over 5 years? 1

$P = \$60\,000, \quad R = 6.5\%\text{ p.a.}, \quad T = 5\text{ years},$

$$I = \frac{PRT}{100}$$

$$I = \frac{60\,000 \times 6.5 \times 5}{100}$$

$$I = \$19\,500$$

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4 Kim has \$18 000 to invest for 2 years. She has the following options: 9

(a) A term deposit at 4.5% compounded annually.

(b) Shares, paying a rate of 4.48% per annum with dividend paid quarterly.

(c) A building society account, paying a return of 4.56% per annum with monthly rests.

(d) A business venture with guaranteed return of 3.65% p.a. and interest paid daily.

Advise Kim which option to take if all the investments are equally secure.

(a) $A = P\left(1+\frac{R}{100\times n}\right)^{n\times T}$

$P = 18\,000, \quad R = 4.5\%, \quad n = 1, \quad T = 2$

$A = 18\,000\left(1+\frac{4.5}{100\times 1}\right)^{1\times 2}$

$A = \$19\,656.45$

(b) $P = 18\,000, \quad R = 4.48\%\text{ p.a.}, \quad n = 4, \quad T = 2$

$A = 18\,000\left(1+\frac{4.48}{100\times 4}\right)^{4\times 2}$

$= 18\,000(1+0.0112)^{8}$

$A = \$19\,677.46$

(c) $P = 18\,000, \quad R = 4.56\%\text{ p.a.}, \quad n = 12, \quad T = 2$

$A = 18\,000\left(1+\frac{4.56}{100\times 12}\right)^{12\times 2}$

$= 18\,000(1.0038)^{24}$

$A = \$19\,715.38$

(d) $A = 18\,000\left(1+\frac{3.65}{100\times 365}\right)^{365\times 2}$

$A = \$19\,363.09$

Kim would be advised to take option (c) as it is the most financially rewarding.

5 (a) Calculate the compound interest on a term deposit of \$10 000 at the rate of 6% p.a. for 3 years when the investment is compounded

(i) annually
(ii) semi-annually
(iii) quarterly
(iv) monthly
(v) daily.

(b) Which is the best investment option?

11

(a)

(i) $A = P\left(1+\frac{R}{100\times n}\right)^{n\times T}$

$P = \$10\,000,\quad R = 6\%\text{ p.a.},\quad n = 1\quad T = 3$

$A = 10\,000\left(1+\frac{6}{100\times 1}\right)^{1\times 3}$

$A = \$11\,910.16$

Compound interest $= \$11\,910.16 - \$10\,000$
$= \$1910.16$

(ii) $P = \$10\,000,\quad R = 6\%\text{ p.a.},\quad n = 2,$
$T = 3$

$A = 10\,000\left(1+\frac{6}{100\times 2}\right)^{2\times 3}$

$A = \$11940.52$

Compound interest $= \$11940.524 - \$10\,000$
$= \$1940.52$

(iii) $P = \$10\,000,\quad R = 6\%\text{ p.a.},\quad n = 4,\quad T = 3$

$A = 10\,000\left(1+\frac{6}{100\times 4}\right)^{4\times 3}$

$A = \$11956.18$

Compound interest $= \$11\,956.18 - \$10\,000$
$= \$1956.18$

(iv) $P = \$10\,000,\quad R = 6\%\text{ p.a.},\quad n = 12,\quad T = 3$

$A = 10\,000\left(1+\frac{6}{100\times 12}\right)^{12\times 3}$

$A = \$11966.81$

Compound interest $= \$11\,966.81 - \$10\,000$
$= \$1966.81$

(v) $P = \$10\,000,\quad R = 6\%\text{ p.a.},\quad n = 365,$
$T = 3$

$A = 10\,000\times\left(1+\frac{6}{100\times 365}\right)^{365\times 3}$

$A = \$11\,972.00$

Compound interest $= \$11\,972 - \$10\,000$
$= \$1972$

(b) Option (v) is the best as it gives the highest return.

6 Colin invests $5000 for 5 years at 5.25% p.a. How much more would he collect at the end of the 5-year period if the money invested is compounding monthly rather than compounding annually? 2

Compounding monthly

$P = \$5000$

$R = 5.25\%$ p.a.

$T = 5$ years

$n = 12$

$$A = P\left(1 + \frac{R}{100 \times n}\right)^{n \times T}$$

$$= 5000\left(1 + \frac{5.25}{100 \times 12}\right)^{12 \times 5}$$

$$= 5000\left(1 + \frac{5.25}{1200}\right)^{60}$$

$$= \$6497.16$$

Compounding yearly

$P = \$5000$

$R = 5.25\%$ p.a.

$T = 5$ years

$n = 1$

$$A = P\left(1 + \frac{R}{100 \times n}\right)^{n \times T}$$

$$= 5000\left(1 + \frac{5.25}{100 \times 1}\right)^{1 \times 5}$$

$$= 5000\left(1 + \frac{5.25}{100}\right)^{5}$$

$$= \$6457.74$$

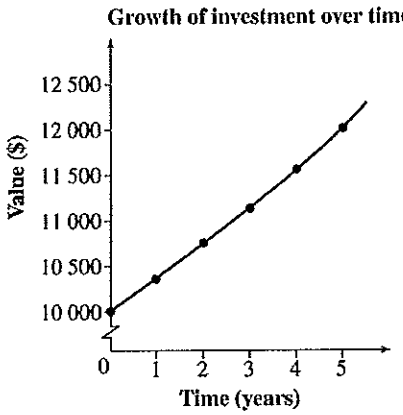
$\therefore$ Extra collected $= \$6497.16 - \$6457.74$

$= \$39.42$

7 The table below shows the yearly growth of an investment of $10 000 over a period of 5 years at 3.75% p.a. interest compounded annually. 5

Time (years)	0	1	2	3	4	5
Value ($)	10 000	10 375	10 764	11 168	11 587	12 021

Graph the value of the investment over time.



8 Chris invests $20 000 at 6% p.a. with interest compounding annually. 8

(a) Complete the table below to show the future value at the end of each year.

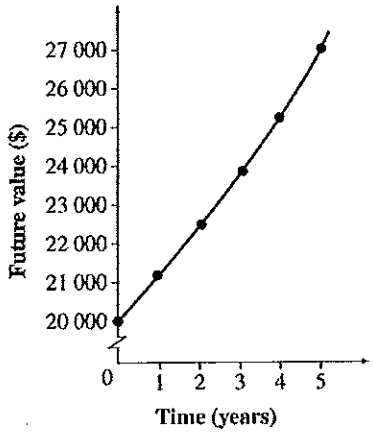
No. of years	1	2	3	4	5
Future value					

(a)

No. of years	1	2	3	4	5
Future value	$21 200	$22 472	$23 820	$25 250	$26 765

(b) Draw a graph of the future value of the investment against time.

(b)



9 An interest rate of 4.5% p.a. compounding quarterly is equivalent to what effective interest rate? 5

Let $P = \$100$

$T = 1$ year

$R = 4.5\%$ p.a.

$n = 4$

$$A = P\left(1 + \frac{R}{100 \times n}\right)^{n \times T}$$

$$= 100\left(1 + \frac{4.5}{100 \times 4}\right)^{4 \times 1}$$

$$= 100\left(1 + \frac{4.5}{400}\right)^{4}$$

$$= \$104.58$$

$$CI = A - P$$

$$= \$104.58 - 100$$

$$= \$4.58$$

$$\%\ \text{Interest} = \frac{\$4.58}{\$100} \times 100$$

$$= 4.58\%$$

So, effective interest rate is 4.58% p.a.

10 Marilyn can invest in two different funds:

(a) 6% p.a. simple interest

(b) 5.75% p.a. compound interest with monthly rests.

She is inclined to choose the 6% p.a. simple interest because this is a higher value. Is this a wise choice? Explain your answer. 5

(a) 6% p.a. simple interest is the effective interest rate.

(b) Convert the 5.75% p.a. compound interest with monthly rests to an effective simple interest rate.

Take $P = \$100$, $T = 1$ year, $n = 12$

$$A = P\left(1 + \frac{R}{100 \times n}\right)^{n \times T}$$

$$= 100\left(1 + \frac{5.75}{100 \times 12}\right)^{12 \times 1}$$

$$= 100\left(1 + \frac{5.75}{1200}\right)^{12}$$

$$= \$105.90$$

$$CI = A - P$$

$$= \$105.90 - \$100$$

$$= \$5.90$$

$$\text{Effective interest rate} = \frac{\$5.90}{\$100} \times 100$$

$$= 5.9\% \text{ p.a.}$$

The 6% simple interest is the better choice as it is higher than the 5.9% p.a. effective interest rate of 5.75% compound interest with monthly rests.