

## FINANCE MATHS - WORKSHEET 1

### Exercise 11.2

- 1 If \$1000 is invested at 12% p.a. how much will it be worth after one year if interest is compounded  
a) yearly                      b) half yearly                      c) quarterly                      d) monthly                      e) weekly
- 2 a) Find the difference between the annually compound interest and simple interest from an investment of \$5000 at 8% p.a. for 10 years.  
b) What is the equivalent simple interest rate to earn this compound interest ?
- 3 Repeat question 2 if interest is compounded monthly.
- 4 What sum of money would accumulate to \$10000 in 15 years  
a) at simple interest of 15% p.a.                      b) at monthly compound interest of 15% p.a.
- 5 In how many years will a sum of money double itself if it is invested at  
a) 12% p.a. simple interest                      b) 12% p.a. interest compounded yearly  
c) 12% p.a. interest compounded monthly                      d) 12% p.a. interest compounded fortnightly
- 6 In how many years will a sum of money treble itself if it is invested at  
a) 15% p.a. simple interest                      b) 15% p.a. interest compounded yearly  
c) 8% p.a. simple interest                      d) 8% p.a. interest compounded monthly.
- 7 At what rate of interest will a sum of money double itself in ten years, if interest is compounded monthly ?
- 8 An investor bought some stocks at \$1.00 per share five years ago. Today each share is worth \$2.50. What annual rate of interest is this investment equivalent to ?
- 9 A family paid \$20000 for a house ten years ago. If this house is worth \$85000 today what annual rate of interest is this investment equivalent to ?
- 10 The price of a new car is \$15000. If the value of the car depreciates at a constant rate of 18% p.a., how much will it be worth in 5 years time?
- 11 a) An IBM computer was bought five years ago for \$3500. Today it is worth \$300. Find the annual rate of depreciation.  
b) If this rate is remained for the next five years, how much will the computer be worth ?
- 12 John and Sally were married recently and wanted to buy a house costing \$80000. They planned to save for six years for a good deposit for one of those houses. If inflation for the six years persists at 12%, how much will be the cost of the very house that John and Sally wanted to buy ?
- 13 The inflation rate in Australia in 1995 was 5% p.a. If this rate is maintained for the next three years, how much will a 2-litre milk bottle in 1998 cost if it cost \$2.10 in 1995?
- 14 a) Ann is going to inherit \$10000 from her grand mother in 4 years. What is the present value of this amount if the current inflation rate is 9% p.a. ? (i.e. How much is the current value of this amount ?)  
b) Teresia is the recipient of the school scholarship which will pay her \$200 each year for the next three years, the first payment is to be paid one year from now. If the current interest rate is 10% p.a., what is the present value of her scholarship ?
- § 15 Alan's parent has placed four equal quarterly deposits of \$300 each into his bank account last year, the last one was made three months ago. If the bank pays 9% p.a. interest compounded monthly, how much is his investment worth now?
- § 16 A farmer signed a loan contract in which he is due to pay five annual instalments of \$3000 each, the first one is due one year from now. Interest is calculated at 10% p.a.
- a) Calculate the amount of the loan. \_\_\_\_\_
- b) If he is able to pay off the loan sooner in two years, how much must be repaid to satisfy it? \_\_\_\_\_

## Exercise 11.2

1  $P = 1000$

$r = 0.12$

(a)  $A = 1000 \times 1.12 = \$1120$  ✓

(b)  $r = 0.06$

$A = 1000 (1.06)^2$

$= \$1123.60$  ✓

(c)  $r = 0.03$

$A = 1000 (1.03)^4$

$= \$1125.51$  ✓

(d)  $r = 0.01$

$A = 1000 (1.01)^{12}$

$= \$1126.83$  ✓

(e)  $r = \frac{0.12}{52}$

$A = 1000 (1+r)^{52} = \$1127.34$  ✓

2. (a)  $P = 5000$

$R = 1.08$

$\therefore SI = 5000 \times 0.08 \times 10$

$= \$4000$  ✓

Amount  $I = 5000 (1.08)^{10} = \$10794.62$

$\therefore 10794.62 - 5000 = \$5794.62$  ✓

$\therefore$  diff:  $CI - SI = \$1794.62$  ✓

(b)  $5794.62 = 50000 r$

$r = 0.1158$  ✓

$\therefore$  i rate is 11.59% (to 2dp) pa

3. (a)  $P = 5000$

$r = 0.006$

$SI = 5000 \times 12 \times 10 \times 0.006$

$= \$4000$

Amount  $I = 5000 (1.006)^{120}$

$= \$11098.20$  ✓

$CI = \$6098.20$   $\therefore$  diff  $= \$2098.20$

(b)  $6098.20 = 5000 \times 1.20 \times r$

$r = 0.010$  ✓

$\therefore$  i rate is 12.2% pa (1dp)

Qu 4 (a)  $10000 = P + P(0.15)(15)$

$10000 = P(1 + 15(0.15))$

$P = \frac{10000}{1.225} = \$8162.92$  ✓

(b)  $R = 1.0125$

$10000 = P \cdot (1.0125)^{180}$

$P = \$1068.50$  ✓

Qu 5 (a) let  $P$  be sum of money

$P = P \cdot (0.12)^n$

$n = \frac{1}{0.12}$

$= 8\frac{1}{3}$  yrs ✓

(b)  $2P = P(1.12)^n$

$2 = 1.12^n$  ✓

$n = \frac{\ln 2}{\ln 1.12} = 6.1$  yrs ✓

(c)  $2P = P(1.01)^n$

$n = \frac{\ln 2}{\ln 1.01} = 69.66$  months ✓

$= 5.8$  yrs ✓

(d)  $n = \ln 2$

$\ln \left(1 + \frac{0.12}{26}\right)$

$= 150.528$  fortnights

$= 5.8$  yrs ✓

Qu 6 (a)  $3P = PRN$

$n = \frac{3}{0.15} = 20$  yrs ✓

(b)  $3P = P(1.015)^n$

$n = \frac{\ln 3}{\ln 1.015} = 7.86$  yrs ✓

Qu7 Let sum be P,  $i = R$ ,  $n = 120$

$$\therefore 2P = P \left(1 + \frac{R}{12}\right)^{120}$$

$$\ln 2 = 120 \ln \left(1 + \frac{R}{12}\right)$$

$$e^{\frac{1}{120} \ln 2} = 1 + \frac{R}{12}$$

$$12 \left(e^{\frac{1}{120} \ln 2} - 1\right) = R$$

$2^{\frac{1}{120}}$

$$R = 6.95\% \text{ pa}$$

Qu8

$$2.50 = 100(1+R)^5$$

$$R = \left(\frac{2.50}{100}\right)^{\frac{1}{5}} - 1$$

$$= 20.11\% \text{ pa}$$

Qu9

$$85000 = 20000(1+R)^{10}$$

$$4.25^{\frac{1}{10}} - 1 = R$$

$$R = 15.57\% \text{ pa}$$

Qu10

$$A = 15000(1-0.18)^5$$

$$= \$5561.10$$

Qu11 (a)  $300 = 3500(1-R)^5$

$$R = -\left(\frac{3}{35}\right)^{\frac{1}{5}} + 1$$

$$= 38.82\%$$

(b)  $A = 3500(0.6118)^{10}$

$$= \$25.71$$

2%/year

Qu12

$$A = 80000(1.12)^6$$

$$= \$157905.81$$

Qu13

$$A = 2.1 \times 1.05^3$$

$$= \$2.43$$

Qu14

(a)  $10000 = P(1.09)^4$

$$P = \$7084.25$$

(b)  $200 \times 1.10^2 + 200 \times 1.1^3 + \dots$

$$200 \times 1.1 = \$728.20$$

Qu15

$$R = 1.075$$

$$A_1 = 300 \times 1.075^{12}$$

$$A_2 = 300 \times 1.075^9$$

$$A_3 = 300 \times 1.075^6$$

$$A_4 = 300 \times 1.075^3$$

$$\therefore \text{Total} = 300(1.075^3 + \dots + 1.075^{12})$$

$$a = 1.075 \quad r = 1.075^3$$

$$\therefore S_n = 300 \left( \frac{1.075(1.075^{12} - 1)}{0.075} \right)$$

$$= \$5941.65$$

Qu16

(a) Let P be amount

$$A_1 = PR - M$$

$$A_2 = PR^2 - M(1+R)$$

$$A_5 = PR^5 - M(1+R+\dots+R^4)$$

$$0 = P(1.1)^5 - 3000 \left( \frac{1.1^5 - 1}{0.1} \right)$$

$$18315.30 = P(1.1)^5$$

$$P = \$11372.36$$

(b)

when  $A_2 = 0$

$$0 = PR^2 - M(1+R)$$

$$\therefore M(1+1.1) = 11372.36(1.1)^2$$

$$M = \$6552.65$$