

Answer Key

Exam II - Sample Exam Chapter 5 Finance (sections 5.1 thru 5.3)

1. Find the amount in your bank account if you start with \$5000 and leave it in the bank for two years and 6 months at 7.5% compounded monthly.

$$\begin{array}{l}
 A = \\
 P = 5000 \\
 r = .075 \\
 m = 12 \\
 t = 2.5
 \end{array}
 \quad
 5000 \left(1 + \frac{.075}{12} \right)^{12 \times 2.5}
 \quad
 \underline{\$ 6027.63}$$

2. Jake has to pick between three car loans, what is the total amount Jake will owe for each loan:

a. \$20,000 for 3 years at 12% per annum simple interest?

$$\begin{array}{l}
 P = 20,000 \\
 r = .12 \\
 t = 3
 \end{array}
 \quad
 20,000 (1 + (.12)(3))
 \quad
 \underline{\$ 27,200}$$

b. \$20,000 for 3 years at 9.5% compounded daily?

$$\begin{array}{l}
 P = 20,000 \\
 r = .095 \\
 m = 360 \\
 t = 3
 \end{array}
 \quad
 20,000 \left(1 + \frac{.095}{360} \right)^{360 \times 3}
 \quad
 \underline{\$ 26,594.24}$$

c. \$20,000 for 5 years at 8% compounded monthly?

$$\begin{array}{l}
 P = 20,000 \\
 r = .08 \\
 m = 12 \\
 t = 5
 \end{array}
 \quad
 20,000 \left(1 + \frac{.08}{12} \right)^{12 \times 5}
 \quad
 \underline{\$ 29,796.91}$$

Which loan should Jake take and why?

Loan B because he will pay the least amount of money with this loan

3. Heather deposits \$12,000 into an account that earns 5.25% interest. How much will be in the account after 7 years if the interest is

a. Compounded quarterly?

$$\begin{array}{l}
 P = 12,000 \\
 r = .0525 \\
 m = 4 \\
 t = 7
 \end{array}
 \quad
 12,000 \left(1 + \frac{.0525}{4} \right)^{4 \times 7}
 \quad
 \underline{\$ 17,288.06}$$

b. Compounded daily?

$$\begin{array}{l}
 P = 12,000 \\
 r = .0525 \\
 m = 360 \\
 t = 7
 \end{array}
 \quad
 12,000 \left(1 + \frac{.0525}{360} \right)^{360 \times 7}
 \quad
 \underline{\$ 17,328.97}$$

c. Simple?

$$\begin{array}{l}
 P = 12,000 \\
 r = .0525 \\
 t = 7
 \end{array}
 \quad
 12,000 (1 + (.0525)(7))
 \quad
 \underline{\$ 16,410}$$

4. Susan and Elliot want to buy a townhouse, but they need a down-payment of \$35,000.
- a. If they want to buy the townhouse in two years, how much should they save each month in a savings account that pays 6% per annum compounded monthly? (hint: future value of an annuity)

$$\begin{aligned}
 S &= 35,000 \\
 R &= \\
 r &= .06 \\
 m &= 12 \\
 t &= 2
 \end{aligned}$$

$$35,000 = R \left[\frac{\left(1 + \frac{.06}{12}\right)^{12 \times 2} - 1}{\frac{.06}{12}} \right]$$

$$\underline{\$ 1,376.22}$$

- b. Once Susan and Elliot have their down-payment of \$35,000 they apply the down-payment to a house costing \$250,000. If they take out a 30 year mortgage at 7.5% what is their monthly payments? (hint: amortizing a debt)

$$\begin{aligned}
 P &= 215,000 \\
 R &= \\
 r &= .075 \\
 m &= 12 \\
 t &= 30
 \end{aligned}$$

$$\begin{array}{r}
 250,000 \\
 - 35,000 \\
 \hline
 215,000
 \end{array}$$

$$215,000 = R \left[\frac{1 - \left(1 + \frac{.075}{12}\right)^{(-12)(30)}}{\frac{.075}{12}} \right]$$

$$\underline{1503.31}$$

5. A bank advertises that it pays $4\frac{1}{4}\%$ compounded daily. What is the effective interest rate?

$$\begin{aligned}
 r &= .0425 \\
 m &= 360
 \end{aligned}
 \quad r_e = \left(1 + \frac{.0425}{360}\right)^{360} - 1$$

$$r_e = .0434$$

$$\underline{4.34\%}$$

6. Ian's father planned well for his college education. He deposited \$200 every month into an account with 8.25% interest compounded monthly. How much will Ian have in his account at the end of 18 years?

$$\begin{aligned}
 R &= 200 \\
 r &= .0825 \\
 m &= 12 \\
 t &= 18
 \end{aligned}$$

$$200 \left[\frac{\left(1 + \frac{.0825}{12}\right)^{12 \times 18} - 1}{\frac{.0825}{12}} \right]$$

$$\underline{\$ 98,693.47}$$

7. Professor Smith wants to have \$250,000 in a retirement account ten years from now.

a. If the account pays 12% per annum and is compounded quarterly, what should her quarterly deposits be to meet her goal? (future value of an annuity)

$$\begin{aligned} S &= 250,000 \\ R &= \\ r &= .12 \\ m &= 4 \\ t &= 10 \end{aligned}$$

$$250,000 = R \left[\frac{\left(1 + \frac{.12}{4}\right)^{4 \times 10} - 1}{\frac{.12}{4}} \right]$$

$$\underline{\$ 3315.59}$$

b. Once professor Smith retires how much money can she withdraw quarterly from the account (with 12% per annum, compounded quarterly) for the next 15 years so the balance in the account after these 15 years is 0? (hint: present value of an annuity)

$$\begin{aligned} P &= 250,000 \\ R &= \\ r &= .12 \\ m &= 4 \\ t &= 15 \end{aligned}$$

$$250,000 = R \left[\frac{1 - \left(1 + \frac{.12}{4}\right)^{(-4)(15)}}{\frac{.12}{4}} \right]$$

$$\underline{\$ 9033.24}$$

8. Suri Cruise's parents set up a trust fund for her. The trust fund amounts to \$1,000,000 earning 10% compounded semi-annually and she is to receive the money in equal annual installments for the next 25 years. How much should she receive every 6 months?

$$\begin{aligned} P &= 1,000,000 \\ R &= \\ r &= .1 \\ m &= 2 \\ t &= 25 \end{aligned}$$

$$1,000,000 = R \left[\frac{1 - \left(1 + \frac{.1}{2}\right)^{(-2)(25)}}{\frac{.1}{2}} \right]$$

$$\underline{\$ 54,776.74}$$

9. Meghan borrows \$15,500 at an interest rate of 12% per year to buy a car. The loan is to be paid in monthly installments at the end of each month for 3 years.

a. How much will each payment be?

$$\begin{aligned} P &= 15,000 \\ R &= \\ r &= .12 \\ m &= 12 \\ t &= 3 \end{aligned}$$

$$15,500 = R \left[\frac{1 - \left(1 + \frac{.12}{12}\right)^{(-12)(3)}}{\frac{.12}{12}} \right] \quad \underline{\$ 514.82}$$

b. How much interest will Meghan end up paying at the end of the loan?

$$\begin{aligned} 514.82 \times 12 \times 3 &= 18,533.52 \\ - 15,500.00 & \\ \hline & \underline{\$ 3033.52} \end{aligned}$$

10. Jim and Jacquie estimate that they can afford to pay \$2,500 for a monthly mortgage payment. If their mortgage is a 30 year mortgage at a rate of 7.25% compounded monthly

a. How much can they afford to borrow?

$$\begin{aligned} P &= \\ R &= 2500 \\ r &= .0725 \\ m &= 12 \\ t &= 30 \end{aligned}$$

$$P = 2500 \left[\frac{1 - \left(1 + \frac{.0725}{12}\right)^{(-12)(30)}}{\frac{.0725}{12}} \right] \quad \underline{\$ 366,474.20}$$

b. How much interest will they have paid at the end of the 30 year mortgage?

$$\begin{aligned} 2500 \times 12 \times 30 &= 900,000.00 \\ - 366,474.20 & \\ \hline & \underline{\$ 533,525.80} \end{aligned}$$

11. Chris decides to stop buying coffee and a cookie at Jazzman's everyday and instead invest that money daily into an account that pays 7.5% compounded daily, if Chris spends \$4.30 everyday for his coffee and cookie

a. How much will be in the account 10 years from now?

$$\begin{aligned} S &= \\ R &= 4.30 \\ r &= .075 \\ m &= 360 \\ t &= 10 \end{aligned}$$

$$4.30 \left[\frac{\left(1 + \frac{.075}{360}\right)^{360 \times 10} - 1}{\frac{.075}{360}} \right] \quad \underline{\$ 23,051.47}$$

- b. How much interest did Chris earn by saving the money he spent on coffee and cookies?

$$4.30 \times 360 \times 10 = 15,480.00$$

$$\begin{array}{r} 23,051.47 \\ - 15,480.00 \\ \hline \end{array}$$

$$\underline{\$ 7571.47}$$

12. Mr. and Mrs. Levine have just purchased a \$375,000 house and have made a down payment of 20%. They can amortize the balance at 7.5% for thirty years.

- a. What is their monthly payment?

$$375,000 \times .2 = 75,000 \text{ Down payment}$$

$$\begin{array}{r} 375,000 \\ - 75,000 \\ \hline 300,000 \end{array} \text{ loan amount}$$

$$P = 300,000$$

$$R =$$

$$r = .075$$

$$m = 12$$

$$t = 30$$

$$300,000 = R \left[\frac{1 - \left(1 + \frac{.075}{12}\right)^{-(12)(30)}}{\frac{.075}{12}} \right]$$

$$\underline{\$ 2097.64}$$

- b. How much total interest will they pay?

$$\begin{array}{r} 2097.64 \times 12 \times 30 = 755,150.40 \\ - 300,000.00 \\ \hline \end{array}$$

$$\underline{\$ 455,150.40}$$

13. David took out a 5 year car loan of \$20,000 at 4.5% interest. Make an amortization table showing his first 5 payments.

$P = 20,000$
 $R =$
 $r = .045$
 $m = 12$
 $t = 5$

$$20,000 = R \left[\frac{1 - \left(1 + \frac{.045}{12}\right)^{-(12)(5)}}{\frac{.045}{12}} \right]$$

$$R = \$372.86$$

$$I = Prt \quad r = .045 \quad t = \frac{1}{12}$$

Payment Number	Amount of Payment	Interest	Principal	Balance
0				20,000
1	372.86	$I = 20,000(.045)\left(\frac{1}{12}\right) = 75$	$372.86 - 75.00 = 297.86$	$20,000 - 297.86 = 19,702.14$
2	372.86	$19,702.14(.045)\left(\frac{1}{12}\right) = 73.98$	$372.86 - 73.98 = 298.98$	$19,702.14 - 298.98 = 19,403.16$
3	372.86	72.76	300.10	19,103.06
4	372.86	71.64	301.22	18,801.84
5	372.86	70.51	302.35	18,499.49