

Chapter 3 – The time value of money

MULTIPLE CHOICE

1. Which of the following *cannot* be calculated?

- a. Present value of an annuity
- b. Future value of an annuity
- c. Present value of a perpetuity
- d. Future value of a perpetuity

ANS: D PTS: 1 DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

2. You have the choice between two investments that have the same maturity and the same nominal return. Investment A pays simple interest. Investment B pays compounded interest. Which one should you pick?

- a. A, because it has a higher effective annual return
- b. Either, because they offer the same return
- c. B, because it has higher effective annual return
- d. There is not enough information to decide.

ANS: C PTS: 1 DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Reflective thinking

LOC: understand the time value of money

3. For a positive r :

- a. future value will always exceed present value
- b. future and present will always be the same
- c. present value will always exceed future value
- d. present value will be two times lower than future value

ANS: A PTS: 1 DIF: M

REF: 3.3 Present Value of a Lump Sum Received in the Future

NAT: Reflective thinking

LOC: understand the time value of money

4. Which of the following statements is true?

- a. In an annuity due, payments occur at the end of the period.
- b. In an ordinary annuity, payments occur at the end of the period.
- c. A perpetuity will mature at some point in the future.
- d. One cannot calculate the present value of a perpetuity.

ANS: B PTS: 1 DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

5. The Springfield Crusaders just signed their star player to a 10-year, \$50 million contract. Is this contract really worth \$50 million? (Assume $r > 0$.)

- a. Yes; the payments over time add up to \$50 million.
- b. No; it is worth more because he can invest the money.
- c. No; it would only be worth \$50 million if it were all paid out today.
- d. Yes; the player's agent told him so.

ANS: C PTS: 1 DIF: M

REF: 3.6 Present Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

6. Last National Bank offers a term deposit paying 8% interest (compounded annually). If you invest \$5000, how much will you have at the end of year 6?
- a. \$712.99
 - b. \$1 402.55
 - c. \$7 934.27
 - d. \$1000

ANS: C

PV = 5000

PMT = 0

I/Y = 8

N = 6

FV = 7 934.37

PTS: 1

DIF: E

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Analytic skills

LOC: understand the time value of money

7. You want to buy a house in five years and expect to need \$30 000 for a down payment. If you have \$10 000 to invest, how much interest do you have to earn (compounded annually) to reach your goal?
- a. 16.67%
 - b. 13.62%
 - c. 25.74%
 - d. 24.57%

ANS: D

FV = 30 000

PV = 10 000

N = 5

PMT = 0

PTS: 1

DIF: E

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Analytic skills

LOC: understand the time value of money

8. How much do you have to invest today at an annual rate of 9%, if you need to have \$10 000 six years from today?
- a. \$3150.85
 - b. \$4236.75
 - c. \$5470.34
 - d. \$2938.48

ANS: A

FV = 10 000

PMT = 0

I/Y = 9

N = 6

PV = 5 470.34

PTS: 1

DIF: E

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Analytic skills

LOC: understand the time value of money

9. If you can earn 8% (compounded annually) on an investment, how long does it take for your money to triple?
- 14.27 years
 - 22.52 years
 - 19.48 years
 - 29.29 years

ANS: A

PV = 1

FV = 3

PMT = 0

I/Y = 8

N = 14.27

PTS: 1

DIF: M

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Analytic skills

LOC: understand the time value of money

10. What is the future value of cash flows for years 1–5 at the end year 5, assuming a 6% interest rate (compounded annually)?

<i>End of year</i>	<i>Cash flow</i>
1	\$2000
2	2500
3	1000
4	3000
5	1250
6	4530
7	2350

- \$13 879.36
- \$13 093.74
- \$97 844.40
- \$11 056.09

ANS: B

$$2000(1.06)^4 + 2500(1.06)^3 + 1000(1.06)^2 + 3000(1.06) + 1250 = 11\,056.09$$

PTS: 1

DIF: E

REF: 3.5 Future Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

11. What is the present value of the following cash flows if the discount rate is 8% annually?

<i>End of year</i>	<i>Cash flow</i>
1	\$2000
2	2500
3	1000
4	3000

5	1250
6	4530
7	2350

- a. \$18 380.00
- b. \$12 620.90
- c. \$22 358.69
- d. \$12 070.72

ANS: D

$CF_0 = 0$, $CF_1 = 2000$, $CF_2 = 2500$, $CF_3 = 1000$, $CF_4 = 3000$, $CF_5 = 1250$, $CF_6 = 4530$, $CF_7 = 2350$

$I/Y = 8$

$NPV = 12\,070.72$

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

12. You set up an investment plan in which you put \$1000 at the end of each year. How much money will you have accumulated in the fund after 20 years, if your investment plan earns 6% compounded annually?
- a. \$72 757.93
 - b. \$67 998.07
 - c. \$20 118.17
 - d. \$36 785.59

ANS: D

$PV = 0$

$PMT = 1000$

$I/Y = 6$

$N = 20$

$FV = 36\,785.59$

PTS: 1

DIF: E

REF: 3.5 Future Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

13. You set up an investment plan in which you put \$1000 at the beginning of each year. How much money will you have accumulated in the fund after 20 years, if your investment plan earns 6% compounded annually?
- a. \$72 757.93
 - b. \$67 998.07
 - c. \$20 118.17
 - d. \$38 992.73

ANS: D

$PV = 0$

$PMT(beg) = 1000$

$I/Y = 6$

$N = 20$

$FV = 38\,992.72$

PTS: 1

DIF: E

REF: 3.5 Future Value of Cash Flow Streams

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14. After you retire, you expect to live for another 25 years. During those 25 years, you want to be able to withdraw \$50 000 at the beginning of each year for living expenses. How much money do you need to have in your superannuation to do this? Assume that you can earn 9% on your investments.
- \$1 350 000.00
 - \$535 330.59
 - \$547 128.27
 - \$723 745.49

ANS: B

FV = 0

PMT (beg) = 50 000

I/Y = 9

N = 25

PV = 535 330.59

PTS: 1

DIF: M

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

15. You are offered a security that will pay you \$3500 at the end of each year forever. If your discount rate is 10%, what is the most you are willing to pay for this security?
- \$26 686
 - \$62 500
 - \$35 000
 - \$31 250

ANS: C

$3500/0.10 = 35\ 000$

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

16. What is the effective annual rate of 14% compounded monthly?
- 14%
 - 14.45%
 - 14.68%
 - 14.93%

ANS: D

NOM = 14

C/Y = 12

EFF = 14.93

PTS: 1

DIF: E

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

17. If you invested \$5000 in an account that pays 10% interest, compounded continuously, how much would be in the account in six years?

- a. \$9524.68
- b. \$9644.24
- c. \$9581.70
- d. \$9110.59

ANS: D

$$5000 \times e^{(0.10 \times 6)} = 9110.59$$

PTS: 1

DIF: E

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

18. You found your dream house. It costs \$180 000, and you put down \$30 000 as a down payment. For the rest you get a 30-year 6.25% mortgage. What will be your monthly mortgage payment? (Assume no early repayment.)
- a. \$729.44
 - b. \$862.54
 - c. \$389.42
 - d. \$923.57

ANS: D

$$PV = 180\,000 - 30\,000$$

$$FV = 0$$

$$I/Y = 6.25/12$$

$$N = 30 \times 12$$

$$PMT = 923.57$$

PTS: 1

DIF: E

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

19. You want to buy a new car. The car you have picked costs \$32 000, and you decide to go with the dealer's financing offer of 5.9% compounded monthly for 60 months. Unfortunately, you can only afford monthly loan payments of \$300. However, the dealer allows you to pay off the rest of the loan in a one-time lump sum payment at the end of the loan. How much do you have to pay to the dealer when the lump sum is due?
- a. \$14 000.00
 - b. \$21 890.43
 - c. \$25 455.37
 - d. \$22 071.75

ANS: D

$$PMT = 300$$

$$FV = 0$$

$$I/Y = 5.9/12$$

$$N = 60$$

$$PV = 15\,555$$

$$\text{Lump sum} = (32\,000 - 15\,555)(1 + 0.059/12)^{60} = 22\,071.75$$

PTS: 1

DIF: H

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

20. You are planning your retirement, and have come to the conclusion that you need to save \$1 300 000 in 30 years. You can invest in a superannuation fund that guarantees you a 6% return. How much do you have to put into your account at the end of every month to reach your retirement goal?
- a. \$1567.86
 - b. \$1501.94
 - c. \$1294.16
 - d. \$2526.27

ANS: C

FV = 1 300 000

PV = 0

I/Y = 6/12

N = 12 × 30

PMT = 1294.16

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

21. After you retire, you expect to live for another 25 years. During those 25 years, you want to be able to withdraw \$5500 at the beginning of every month for living expenses. How much money do you have to have in your superannuation to make this happen? Assume that you can earn 9% on your investments.
- a. \$545 133.98
 - b. \$660 304.34
 - c. \$548 768.20
 - d. \$673 625.34

ANS: B

FV = 0

PMT (beg) = 5500 I/Y = 9/12

N = 30 × 12

PV = 660 304.34

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

22. If you were to invest \$150 for two years and earn 9% compound interest, what is the total amount of interest you would earn?
- a. \$139.97
 - b. \$139.20
 - c. \$23.20
 - d. \$28.22

ANS: D

$[(1.09)^2 \times 150] - 150 = 28.22$

PTS: 1

DIF: M

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Analytic skills

LOC: understand the time value of money

23. If you were to invest \$150 for two years and earn 9% simple interest, what is the total amount of interest you would earn?
- a. \$139.97
 - b. \$139.20
 - c. \$27.85
 - d. \$27.00

ANS: D

$$150 \times (0.09 \times 2) = 27$$

PTS: 1

DIF: M

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Analytic skills

LOC: understand the time value of money

24. In the equation below, what does the exponent 3 represent?

$$\$133.10 = \$100 \times (1 + 0.1)^3$$

- a. the future value of an investment
- b. the present value of an investment
- c. the annual rate of interest paid
- d. the number of periods that the present value is left on the deposit

ANS: D

PTS: 1

DIF: E

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Reflective thinking

LOC: understand the time value of money

25. You are asked to choose between a four-year investment that pays 10% compound interest and a similar investment that pays 11.5% simple interest. Which investment will you choose?
- a. The 10% compound interest investment
 - b. The 11.5% simple interest investment
 - c. They offer the same result.
 - d. There is not enough information to answer the question.

ANS: A

Assume a \$10 investment:

$$\text{Compound interest value} = \$10 \times (1.1)^4 = \$14.64$$

$$\text{Simple interest value} = \$10 \times [1 + (0.115 \times 4)] = \$14.60$$

PTS: 1

DIF: M

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Analytic skills

LOC: understand the time value of money

26. The amount that someone is willing to pay today for a single cash flow in the future is:
- a. the future value of the cash flow
 - b. the future value of the stream of cash flows
 - c. the present value of the cash flow
 - d. the present value of the annuity of cash flows

ANS: C

PTS: 1

DIF: E

REF: 3.3 Present Value of a Lump Sum Received in the Future

NAT: Reflective thinking

LOC: understand the time value of money

27. Pam is in need of cash right now, and wants to sell the rights to a \$2000 cash flow that she will receive six years from today. If the discount rate for such a cash flow is 9.00%, then what is the fair price that someone should be willing to pay Pam today for rights to that future cash flow?
- a. \$1574.24
 - b. \$1100.55
 - c. \$1192.53
 - d. \$913.24

ANS: C

$$2000/(1.09)^6 = 1192.53$$

PTS: 1

DIF: M

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Analytic skills

LOC: understand the time value of money

28. Your parents set up a trust for you that you will not have access to until your 30th birthday, which is exactly nine years from today. By prior arrangement, the trust will be worth exactly \$200 000 on your 30th birthday. You need cash today and are willing to sell the rights to that trust today for a set amount. If the discount rate for such a cash flow is 12%, what is the maximum amount that someone should be willing to pay you today for the rights to the trust on your 30th birthday?
- a. \$72 122.01
 - b. \$178 571.43
 - c. \$224 000.00
 - d. \$225 000.00

ANS: A

$$200\ 000/(1.12)^9 = 72\ 122.00$$

PTS: 1

DIF: M

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Analytic skills

LOC: understand the time value of money

29. In the equation below, what does 100 represent?

$$\$75.13 = \$100/(1 + 0.1)^3$$

- a. The present value a cash flow to be received at a later date
- b. The future value a cash flow to be received at a later date
- c. The discount rate for the future cash flow
- d. The number of periods before the cash flow is to be received

ANS: B

PTS: 1

DIF: E

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Reflective thinking

LOC: understand the time value of money

30. You are trying to prepare a budget based upon the amount of cash flow that you will have available five years from now. You are initially promised a regular annuity of \$50, with the first payment to be made one year from now and the last payment to be made five years from now. However, you are actually going to receive an annuity due with the same number of payments, but where the first payment is to be made immediately. How much cash will you have five years from now based upon that error if the rate to invest funds is 10%?

- a. \$50.00
- b. \$38.58
- c. \$30.52
- d. -\$30.52

ANS: C

$$50 \times \{[(1.1)^5 - 1]/0.1\} - (50 \times \{[(1.1)^5 - 1]/0.1\} \times 1.1) = 30.52$$

PTS: 1

DIF: H

REF: 3.5 Future Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

31. An annuity can best be described as:
- a. a set of payments to be received during a period
 - b. a stream of payments to be received at a common interval over the life of the payments
 - c. an even stream of payments to be received at a common interval over the life of the payments
 - d. the present value of a set of payments to be received during a future period

ANS: C

PTS: 1

DIF: M

REF: 3.5 Future Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

32. Which of the following should have the greatest value if the discount rate applied to the cash flows is a positive value?
- a. The present value of a \$5 payment to be received one year from today
 - b. The future value of a \$5 payment received today but invested for one year
 - c. The present value of a stream of \$5 payments to be received at the end of the next two years
 - d. The future value of a stream of \$5 payments to be received at the end of the next two years

ANS: D

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

33. What is the present value of \$30 to be received at the end of each year for the next five years if the discount rate is 11%?
- a. \$125.00
 - b. \$113.06
 - c. \$102.79
 - d. \$110.88

ANS: D

$$(30/0.11) \times [1 - (1.11)^{-5}] = 110.88$$

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

34. What is the present value of \$30 to be received at the beginning of each year for the next five years if the discount rate is 11%?
- a. \$125.00
 - b. \$126.63

- c. \$115.12
- d. \$123.07

ANS: D

$$\{(30/0.11) \times [1 - (1.11)^{-5}]\} \times 1.11 = 123.07$$

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

35. Forever Insurance Company has offered to pay you or your heirs \$100 per year at the end of each year forever. If the correct discount rate for such a cash flow is 13%, what the amount that you would be willing to pay Forever Insurance for this set of cash flows?
- a. \$1000.00
 - b. \$869.23
 - c. \$769.23
 - d. \$100

ANS: C

$$100/0.13 = 769.23$$

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

36. You would like to have \$1000 one year (365 days) from now and you find that the bank is paying 7% compounded daily. How much will you have to deposit in the bank today to be able to have \$1000 in a year?
- a. \$934.58
 - b. \$933.51
 - c. \$932.40
 - d. \$931.60

ANS: C

$$1000/[1 + (0.07/365)]^{365} = 932.40$$

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

37. By increasing the number of compounding periods in a year while holding the annual percentage rate constant, you will:
- a. decrease the annual percentage yield
 - b. increase the annual percentage yield
 - c. not affect the annual percentage yield
 - d. increase the dollar return on an investment but will decrease the annual percentage yield

ANS: B

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Reflective thinking

LOC: understand the time value of money

38. The ratio of interest to principal repayment on an amortising loan:
- a. increases as the loan gets older

- b. decreases as the loan gets older
- c. remains constant over the life of the loan
- d. changes according to the level of market interest rates during the life of the loan

ANS: B PTS: 1 DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Reflective thinking

LOC: understand the time value of money

39. You are trying to accumulate \$2000 at the end of five years by contributing a fixed amount at the end of each year. You initially decide to contribute \$300 per year but find that you are coming up short of the \$2000 goal. What could you do to increase the value of the investment at the end of year 5?
- a. Invest in an investment that has a lower rate of return.
 - b. Invest in an investment that has a higher rate of return.
 - c. Make a sixth-year contribution.
 - d. Contribute a smaller amount each year.

ANS: B PTS: 1 DIF: M

REF: 3.5 Future Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

40. If you hold the annual percentage rate constant while increasing the number of compounding periods per year, then:
- a. the effective interest rate will increase
 - b. the effective interest rate will decrease
 - c. the effective interest rate will not change
 - d. the effective interest rate will decrease by half

ANS: A PTS: 1 DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Reflective thinking

LOC: understand the time value of money

41. A young couple buys their dream house. After paying their down payment and closing costs, the couple borrows \$400 000 from the bank. The terms of the mortgage are 30 years of monthly payments at an APR of 6% with monthly compounding. What is the monthly payment for the couple?
- a. \$2398.20
 - b. \$2421.63
 - c. \$2697.98
 - d. \$2700.00

ANS: A

$N = 360$

$r = 0.5\%$

$PV = 400\,000$

$FV = 0$

$PMT = 2398.20$

PTS: 1 DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

42. A young couple buys their dream house. After paying their down payment and closing costs, the couple borrows \$400 000 from the bank. The terms of the mortgage are 30 years of monthly payments at an APR of 6% with monthly compounding. Suppose the couple wants to pay off their mortgage early and will make extra payments to accomplish this goal. Specifically, the couple will pay an extra \$2000 every 12 months. (This extra amount is in addition to the regular scheduled mortgage payment.) The first extra \$2000 will be paid after month 12. What will be the balance of the loan after the first year of the mortgage?
- \$392 940.44
 - \$393 087.95
 - \$394 090.84
 - \$397 601.80

ANS: B

N = 360

r = 0.5%

PV = 400 000

FV = 0

PMT = 2398.20

Balance after 12 payments (use amortisation table):

For TI BA II Plus: $P_1 = 1$, $P_2 = 12$, Balance = \$395 087.95

New balance = \$395 087.95 – \$2000 = \$393 087.95

PTS: 1

DIF: H

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

43. Uncle Fester puts \$50 000 into a bank account earning 6%. He cannot withdraw the money until the balance has doubled. How long will he have to leave the money in the account?
- 9 years
 - 10 years
 - 11 years
 - 12 years

ANS: D

PV = –50 000

FV = 100 000

r = 6%

PMT = 0

N = 11.99 years

PTS: 1

DIF: E

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

44. Consider the following set of cash flows to be received over the next three years:

Year	1	2	3
Cash flow	\$100	\$225	\$300

If the discount rate is 10%, how would the formula be written to find the future value of this set of cash flows at year 3?

- a. $(\$100/1.10) + (\$220/1.10) + (\$300/1.10)$
- b. $\$100(1.10) + \$225(1.10) + \$300(1.10)$
- c. $\$100(1.10)^3 + \$225(1.10)^2 + \$300(1.10)$
- d. $\$100(1.10)^2 + \$225(1.10) + \$300$

ANS: D PTS: 1 DIF: E

REF: 3.5 Future Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

45. Which of the following is *not* correct regarding an ordinary annuity and annuity due?
- a. An annuity is a series of equal payments.
 - b. The present value of an ordinary annuity is less than the present value of an annuity due (assuming interest rate is positive).
 - c. As the interest rate increases, the present value of an annuity decreases.
 - d. As the length of the annuity increases, the future value of the annuity decreases.

ANS: D PTS: 1 DIF: H

REF: 3.5 Future Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

46. After graduating from university with a finance degree, you begin an ambitious plan to retire in 25 years. To build up your retirement fund, you will make quarterly payments into a mutual fund that on average will pay 12% APR compounded quarterly. To get you started, a relative gives you a graduation gift of \$5000. Once retired, you plan on moving your investment to a money market fund that will pay 6% APR with monthly compounding. As a young retiree, you believe you will live for 30 more years and will make monthly withdrawals of \$10 000. To meet your retirement needs, what quarterly payment should you make?
- a. \$2221.45
 - b. \$2588.27
 - c. \$2746.50
 - d. \$2904.73

ANS: B

PV of retirement withdrawals = FV of retirement savings

$N = 360$

$r = 0.5\%$

$PV = ?$

$PMT = 10\,000$

$FV = 0$

$PV = 1\,667\,916.14 = FV \text{ of savings}$

Payment:

$N = 100$

$r = 3\%$

$PV = -5000$

$PMT = ?$

$FV = 1\,667\,916.14$

$PMT = 2588.26$

PTS: 1 DIF: H

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

47. A bank account has a rate of 12% APR with quarterly compounding. What is the EAR for the account?
- a. 3.00%
 - b. 12.00%
 - c. 12.36%
 - d. 12.55%

ANS: D

$$(1 + 0.12/4)^4 - 1$$

PTS: 1

DIF: H

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

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48. An investor puts \$200 in a money market account today that returns 3% per year with monthly compounding. The investor plans to keep her money in the account for two years. What is the future value of his investment when she closes the account two years from today?
- a. \$215.00
 - b. \$212.35
 - c. \$206.08
 - d. \$188.37

ANS: B

$$N = 2$$

$$r = 3\%$$

$$PV = -200$$

$$PMT = 0$$

$$FV = 212.35$$

PTS: 1

DIF: E

REF: 3.2 Future Value of a Lump Sum Received Today

NAT: Analytic skills

LOC: understand the time value of money

49. What is the future value of a five-year ordinary annuity with annual payments of \$250, evaluated at a 15% interest rate?
- a. \$670.44
 - b. \$838.04
 - c. \$1250.00
 - d. \$1685.60

ANS: D

$$N = 5$$

$$r = 15\%$$

$$PV = 0$$

$$PMT = 250$$

$$FV = 1685.60$$

PTS: 1

DIF: M

REF: 3.5 Future Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

50. The present value of an ordinary annuity is \$2000. The annuity features monthly payments from an account that pays 12% APR (with monthly compounding). If this was an annuity due, what would be the present value? (Assume that same interest rate and same payments apply.)

- a. \$1785.71
- b. \$1980.20
- c. \$2020.00
- d. \$2080.00

ANS: C

PV of annuity due = PV of ordinary annuity $\times (1 + r)$

PTS: 1

DIF: H

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

51. Suppose that Hoosier Farms offers an investment that will pay \$10 per year forever. How much is this offer worth if you need an 8% return on your investment?
- a. \$8
 - b. \$80
 - c. \$100
 - d. \$125

ANS: D

$PV = \$10/0.08 = \125

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

52. Suppose a professional sports team convinces a former player to come out of retirement and play for three seasons. The team offers the player \$2 million in year 1, \$3 million in year 2, and \$4 million in year 3. Assuming end-of-year salary payments, how do you find the value of the player's contract today if the player has a discount rate of 12%?

- a. $PV = \frac{\$2}{1.12} + \frac{\$3}{1.12} + \frac{\$4}{1.12}$
- b. $PV = 2 + \frac{\$3}{(1.12)^2} + \frac{\$4}{(1.12)^3}$
- c. $PV = \frac{2}{(1.12)} + \frac{\$3}{(1.12)^2} + \frac{\$4}{(1.12)^3}$
- d. $PV = \frac{\$2 + \$3 + \$4}{(1.12)^3}$

ANS: C

PTS: 1

DIF: E

REF: 3.6 Present Value of Cash Flow Streams

NAT: Reflective thinking

LOC: understand the time value of money

53. Which statement is *false* concerning the time value of money?
- a. The greater the compound frequency, the greater the EAR.
 - b. The EAR is always greater than the APR.
 - c. An account that pays simple interest will have a lower FV than an account that pays compound interest.
 - d. The stated interest rate is also referred to as the APR.

ANS: B

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Reflective thinking

LOC: understand the time value of money

54. Suppose you made a \$10 000 investment 10 years ago in a speculative share fund. Your investment today is worth \$100 000. What annual compounded return did you earn over the 10-year period?
- 10%
 - 15%
 - 25.89%
 - 27.54%

ANS: C

N = 10

PV = -10 000

PMT = 0

FV = 100 000

r = 25.89%

PTS: 1

DIF: E

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

55. An athlete was offered the following contract for the next three years:

Year	1	2	3
Cash flow	\$5 million	\$7 million	\$9 million

The athlete would rather have her salary in equal amounts at the end of each of the three years. If the discount rate for the athlete is 10%, what yearly amount would she consider equivalent to the offered contract?

- \$5.37 million per year
- \$5.70 million per year
- \$6.71 million per year
- \$6.87 million per year

ANS: D

$$PV = \$5/(1.10) + \$7/(1.10)^2 + \$9/(1.10)^3 = \$17.09$$

Annuity:

N = 3

r = 10%

PV = 17.09

FV = 0

PMT = 6.87

PTS: 1

DIF: M

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

56. In five years, you plan on starting graduate school to earn your MBA. You know that graduate school can be expensive, and you expect you will need \$15 000 per year for tuition and other expenses. These payments will be made at the beginning of the year. To have enough money to attend graduate school, you decide to start saving today by investing in a money market fund that pays 4% APR with monthly compounding. You will make monthly deposits into the account starting today for the next five years. How much will you need to deposit each month to have enough savings for graduate school? (Assume that money that is not withdrawn remains in the account during graduate school, and the MBA will take two years to complete.)
- \$438.15
 - \$440.26
 - \$442.16
 - \$443.64

ANS: C

Value of tuition payments:

$$PV = \$15\,000 + \$15\,000/(1 + 0.040742) = \$29\,412.80$$

Savings (set calculator to BEGIN):

$$N = 60$$

$$r = 4\%/12$$

$$PV = 0$$

$$PMT = ?$$

$$FV = 29\,412.80$$

PTS: 1

DIF: H

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

57. As a young graduate, you plan to buy your dream car in three years. You believe the car will cost \$50 000. You have two sources of money to reach your goal of \$50 000. First, you will save money for the next three years in a money market fund that will return 8% annually. You plan on making \$5000 annual payments to this fund. You will make yearly investments at the beginning of the year. The second source of money will be a car loan that you will take out on the day you buy the car. You anticipate the car dealer will offer you a 6% APR loan with monthly compounding for a term of 60 months. To buy your dream car, what monthly car payment will you anticipate?
- \$483.99
 - \$540.15
 - \$627.73
 - \$652.83

ANS: C

$$\text{Value of car} = FV \text{ of savings} + PV \text{ of loan}$$

Savings (set calculator to BEGIN):

$$N = 3$$

$$r = 8\%$$

$$PV = 0$$

$$PMT = 5000$$

$$FV = 17\,530.56$$

$$\text{Car loan} = \$50\,000 - \$17\,530.56 = \$32\,469.44$$

Loan:

N = 60
r = 0.5%
PV = 32 469.44
FV = 0
PMT = 627.73

PTS: 1 DIF: H
REF: 3.7 Advanced Applications of Time Value NAT: Analytic skills
LOC: understand the time value of money

58. Which of the following investments would have the highest future value (in year 5) if the discount rate is 12%?
- a. A five year ordinary annuity of \$100 per year
 - b. A five year annuity due of \$100 per year
 - c. \$700 to be received at year 5
 - d. \$500 to be received today (year 0)

ANS: D
Choice B > Choice A
FV of B (set calculator to BEGIN):
N = 5
r = 12%
PV = 0
PMT = 100
FV = 711.52

Choice B > Choice C

FV of D:
N = 5
r = 12%
PV = 500
PMT = 0
FV = 881.17

PTS: 1 DIF: E
REF: 3.2 Future Value of a Lump Sum Received Today NAT: Analytic skills

LOC: understand the time value of money

59. Cosmo Costanza took out a \$24 000 bank loan to help purchase his dream car. The bank offered a five-year loan at a 6% APR. The loan will feature monthly payments and monthly compounding of interest. What is the monthly payment for this car loan?
- a. \$400.00
 - b. \$463.99
 - c. \$470.25
 - d. \$474.79

ANS: B
N = 60
r = 0.5%
PV = 24 000

$$FV = 0$$

$$PMT = 463.99$$

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

60. Cosmo Costanza took out a \$24 000 bank loan to help purchase his dream car. The bank offered a five-year loan at a 6% APR. The loan will feature monthly payments and monthly compounding of interest. Suppose that Cosmo would like to pay off the remaining balance on his car loan at the end of the second year (24 payments). What is the remaining balance on the car loan after the second year?
- \$10 469
 - \$12 171
 - \$14 400
 - \$15 252

ANS: D

$$N = 60$$

$$r = 0.5\%$$

$$PV = 24\,000$$

$$FV = 0$$

$$PMT = 463.9$$

Balance after two years (use AMORT):

$$P_1 = 1$$

$$P_2 = 24$$

$$\text{Balance} = \$15\,251.73$$

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

61. A \$100 investment yields \$112.55 in one year. The interest on the investment was compounded quarterly. From this information, what was the stated rate or APR of the investment?
- 12.55%
 - 12.25%
 - 12.15%
 - 12.00%

ANS: D

$$N = 4$$

$$PV = -100$$

$$PMT = 0$$

$$FV = 112.55$$

$$r = 3\%$$

$$APR = 4 \times 3\% = 12\%$$

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

62. What is the future value at year 3 of the following set of cash flows if the discount rate is 11%?

<i>Year</i>	<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>
Cash flow	\$100	\$125	\$200	\$225

- a. \$738
- b. \$761
- c. \$789
- d. \$812

ANS: A

$$\$100 \times (1.11)^3 + \$125 \times (1.11)^2 + \$200 \times (1.11)^1 + \$225$$

PTS: 1

DIF: E

REF: 3.5 Future Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

63. How much would a \$200 investment in an account that pays 7% continuous interest be worth in 20 years?
- a. \$774
 - b. \$792
 - c. \$811
 - d. \$819

ANS: C

$$\$200 \times e^{(0.07 \times 20)}$$

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

64. You buy a house for \$220 000 in a neighbourhood where home prices have risen 5% annually on average. You suspect that growth in home prices will slow to an average of 3.5% per year over the next five years. If your growth estimate of 3.5% growth is correct, how much less will your house be worth in five years compared with 5% growth?
- a. \$3 300.00
 - b. \$16 500.00
 - c. \$19 490.95
 - d. \$13 870.51

ANS: C

$$PV = 220\,000$$

$$N = 5$$

$$I/Y = 5$$

$$FV = 280\,781.94$$

$$PV = 220\,000$$

$$N = 5$$

$$I/Y = 3.5$$

$$FV = 261\,290.99$$

$$\$280\,781.94 - \$261\,290.99 = \$19\,490.95$$

PTS: 1 DIF: M
REF: 3.2 Future Value of a Lump Sum Received Today NAT: Analytic skills
LOC: understand the time value of money

65. If you deposit \$9000 at the end of each year in an account earning 8% interest, what will be the value of the account in 25 years?
- \$600 882.83
 - \$657 953.46
 - \$710 589.74
 - \$719 589.74

ANS: B
PMT = 9000
N = 25
I/Y = 8
FV = 710 589.74

PTS: 1 DIF: E
REF: 3.5 Future Value of Cash Flow Streams NAT: Analytic skills
LOC: understand the time value of money

66. You would like to retire with \$1 million on your 60th birthday. If you start saving equal annual amounts on your 26th birthday, make your last deposit on your 60th birthday and earn 10% interest on your money, how much must you invest each year to achieve your goal?
- \$3343.06
 - \$3436.14
 - \$3558.41
 - \$3689.71

ANS: D
FV = 1 000 000
I/Y = 10
N = 35
PMT = 3689.71

PTS: 1 DIF: M
REF: 3.5 Future Value of Cash Flow Streams NAT: Analytic skills
LOC: understand the time value of money

67. Having acquired a great fortune based on your mastery of finance, you decide to set up a charity. You would like to give the finance department of your alma mater \$100 000 next year, and you want to make an annual contribution in perpetuity, with each year's contribution growing by 4%. The university can generate an 8% return on invested capital. What is the value of a lump-sum donation needed today to accomplish this?
- \$3561
 - \$833 333
 - \$1 250 000
 - \$2 500 000

ANS: D
 $PV = CF_1 / (r - g)$
 $PV = 100\,000 / (0.08 - 0.04) = 2\,500\,000$

PTS: 1 DIF: M
REF: 3.6 Present Value of Cash Flow Streams NAT: Analytic skills
LOC: understand the time value of money

68. If you invest \$2500 in a bank account that pays 6% interest compounded quarterly, how much will you have in five years?
- \$2546.96
 - \$3367.14
 - \$8017.84
 - \$13 267.04

ANS: B
P/YR = 4
PV = 2 500
I/Y = 6
N = 20
FV = 3367.14

PTS: 1 DIF: M
REF: 3.7 Advanced Applications of Time Value NAT: Analytic skills
LOC: understand the time value of money

69. Your credit card carries a 9.9% APR, compounded daily. What is the effective annual rate, or annual percentage yield?
- 0.03%
 - 9.90%
 - 10.41%
 - 18.00%

ANS: C
 $(1 + 0.099/365)^{365} - 1 = 10.41\%$

PTS: 1 DIF: M
REF: 3.7 Advanced Applications of Time Value NAT: Analytic skills
LOC: understand the time value of money

70. Calculate the annual payment for a 20-year mortgage on a \$3.5 million building at a 7.5% interest rate. Assume that the entire building is financed and that payments are made at the end of each year, starting at the end of the first year and ending at the end of the 20th year.
- \$175 000.00
 - \$343 322.67
 - \$186 293.52
 - \$340 815.32

ANS: B
PV = 3 500 000
I/Y = 7.5
N = 20
PMT = 343 322.67

PTS: 1 DIF: E
REF: 3.7 Advanced Applications of Time Value NAT: Analytic skills

LOC: understand the time value of money

71. A stainless steel products manufacturer with an 8.5% cost of capital receives a \$3 000 000 order, payable at the end of three years. What is the annual payment amount made at the end of each year with the equivalent present value?
- \$660 864
 - \$919 618
 - \$949 473
 - \$997 785

ANS: B

FV = 3 000 000

I/Y = 8.5

N = 3

PMT = 919 618

PTS: 1

DIF: H

REF: 3.6 Present Value of Cash Flow Streams

NAT: Analytic skills

LOC: understand the time value of money

72. Hamilton Industries needs a bulldozer. The purchasing manager has her eye on a new model that will be available in three years at a price of \$75 000. If Hamilton's discount rate is 11%, how much money does she need now to pay for the bulldozer when it is available?
- \$49 405
 - \$50 250
 - \$54 589
 - \$60 872

ANS: C

FV = 75 000

N = 3

I/Y = 11

PV = 54 589

PTS: 1

DIF: E

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Analytic skills

LOC: understand the time value of money

73. If you deposit \$10 000 today in an account that pays 5% interest compounded annually for five years, how much interest will you earn?
- \$2500.00
 - \$2762.82
 - \$3400.96
 - \$12 762.82

ANS: B

PV = 10 000

I/Y = 5

N = 5

FV = 12 762.82

$12\,762.82 - 10\,000 = 2\,762.82$

PTS: 1 DIF: E
REF: 3.2 Future Value of a Lump Sum Received Today NAT: Analytic skills
LOC: understand the time value of money

74. A financial advisor recommends saving \$1 million for a comfortable retirement. With investment returns of 8%, what is the annual year-end cash flow generated by the \$1 million for 25 years, assuming you spend all of the principal and interest?
- a. \$80 000
 - b. \$86 740
 - c. \$93 678
 - d. \$94 978

ANS: C
PV = 1 000 000
N = 25
I/Y = 8
PMT = 93 678

PTS: 1 DIF: H
REF: 3.6 Present Value of Cash Flow Streams NAT: Analytic skills
LOC: understand the time value of money

75. You are evaluating a perpetuity. The first payment is \$100, and it arrives in one year. Each subsequent annual payment will increase by 10%. If the discount rate is 8%, what is the present value of this perpetuity?
- a. \$5500
 - b. \$1000
 - c. \$1250
 - d. The present value is infinite.

ANS: D
The PV is infinite since the growth rate exceeds the discount rate.

PTS: 1 DIF: H
REF: 3.6 Present Value of Cash Flow Streams NAT: Analytic skills
LOC: understand the time value of money

76. You invested \$10 000 in August 2012. In August 2017, the investment is worth \$12 000. What was your compound annual rate of return over the period?
- a. 3.09%
 - b. 3.71%
 - c. 4.00%
 - d. 4.21%

ANS: B
N = 5
PV = 10 000
FV = 12 000
I/Y = 3.71

PTS: 1 DIF: E
REF: 3.7 Advanced Applications of Time Value NAT: Analytic skills
LOC: understand the time value of money

77. If a bank lends you \$10 000 and requires that you make payments of \$2500 at the end of each of the next five years, what interest rate is the bank charging?
- 4.56%
 - 5.61%
 - 7.93%
 - 11.18%

ANS: C

PV = 10 000

PMT = 2500

N = 5

I/Y = 7.93

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

78. Discounting is:
- calculating the future value of present cash flows
 - calculating the present value of future cash flows
 - necessary in order to pull present values to the future
 - calculating the future value of future cash flows

ANS: B

PTS: 1

DIF: E

REF: 3.3 Present Value of a Lump Sum Received in the Future NAT: Reflective thinking

LOC: understand the time value of money

79. You are comparing four different investments, as described below:

- Investment A pays 12% compounded annually.
- Investment B pays 12% compounded quarterly.
- Investment C pays 12% compounded semiannually.
- Investment D pays 12% compounded continuously.

Which of the above investments would result in the highest future value?

- Investment A
- Investment B
- Investment C
- Investment D
- All of the investments would have the same future value because the stated interest rate is the same.

ANS: D

PTS: 1

DIF: M

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

80. Michelle is buying a house; the mortgage terms are 30 years, monthly payments. If the interest rate is 5% (APR), what are the payments on a \$150 000 loan?
- \$7500
 - \$9757
 - \$805

d. \$5229

ANS: C

$N = 30 \times 12 = 360$

$I = 5/12$

$PV = 150000$

$FV = 0$

$PMY = 805$

PTS: 1

DIF: E

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

81. Emma is buying a house and the mortgage terms are 30 years, monthly payments. If the interest rate is 6% (APR) on the \$200 000 loan and Emma will pay \$300 a month in addition to the required payment, what will be the life of the loan?
- 220 months
 - 360 months
 - 290 months
 - 185 months

ANS: A

$N = 30 \times 12 = 360$

$I = 6/12$

$PV = 200\ 000$

$FV = 0$

$PMY = 1199$

New payment = 1499

New $N = 220$

PTS: 1

DIF: H

REF: 3.7 Advanced Applications of Time Value

NAT: Analytic skills

LOC: understand the time value of money

SHORT ANSWER

1. What is the difference between simple interest and compound interest?

ANS: Simple interest is paid only on the initial principal of an investment. Compound interest is earned on both the initial principal and the interest earned in previous periods.

PTS: 1

DIF: E

REF: 3.2 Future Value of a Lump Sum Received Today

2. Explain the difference between annuity and perpetuity.

ANS: Annuity is a stream of equal periodic cash flows over a stated period. Perpetuity is an annuity with an infinite life; it promises to pay the same amount at the end of every year forever.

PTS: 1

DIF: M

REF: 3.5 Future Value of Cash Flow Streams; 3.6 Present Value of Cash Flow Streams

3. Can the future value of a perpetuity be calculated?

ANS: Because a perpetuity pays an annuity with an infinite life, its future value cannot be calculated.

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PTS: 1 DIF: E
REF: 3.6 Present Value of Cash Flow Streams

4. Explain why the effective annual rate is often greater than the stated annual rate.

ANS: The stated interest rate is the rate that banks will pay, whereas the effective annual rate is the rate of interest paid and the effect of compounding interest (interest on interest). For example, a bank that offers 10% interest rate compounding semiannually would have an effective annual rate of 10.25%.

PTS: 1 DIF: E
REF: 3.7 Advanced Applications of Time Value

5. What is a loan amortisation schedule?

ANS: A loan amortisation schedule is used to determine loan amortisation payments and the allocation of each payment to interest and principal.

PTS: 1 DIF: E
REF: 3.7 Advanced Applications of Time Value

6. Provide a brief explanation of the concept of the time value of money.

ANS: The time value of money is a financial concept that explicitly recognises that \$1 received today is worth more than \$1 received in the future.

PTS: 1 DIF: E
REF: 3.1 Introduction to the time value of money