Engineering Economics Financial Decision Making for Engineers (Canadian) 6th edition Fraser Test Bank

SKU: 9780134511146-TEST-BANK

***Engineering Economics, 6e* (Fraser/Pirnia)**
Chapter 2 Time Value of Money

2.1 Multiple Choice Questions

1) What makes one dollar in the future less desirable than one dollar today?
A) variable interest rate
B) a forgone opportunity of investment
C) a diminishing purchasing power of money over time
D) a growing inflation
E) accumulated welfare of people
Answer: B
Diff: 1 Type: MC Page Ref: 20
Topic: 2.2. Interest and Interest Rates
Skill: Recall
Type: Qualitative

2) The principal amount is
A) the present value of money.
B) the future value of money.
C) the amount of money invested at the prime interest rate.
D) the annual equivalent value of money.
E) the difference between the amount of money lent and the amount of money later repaid.
Answer: A
Diff: 1 Type: MC Page Ref: 20
Topic: 2.3. Compound and Simple Interest
Skill: Recall
Type: Qualitative

3) Bill wants to buy a new car in three years from now. He expects that the price of a car will be $15 000 in three years. How much money should Bill put in his savings account now if a bank pays 5% interest rate on this account?
A) $11 629
B) $12 104
C) $12 958
D) $13 465
E) $14 286
Answer: C
Diff: 2 Type: MC Page Ref: 21
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

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4) Milo has just inherited $6 500 and immediately spent the money purchasing an investment certificate. He decided to use the investment certificate to finance his return to the university that he left because of the financial problems at the time. Milo calculated that the interest rate the bank would pay on his investment certificate would allow him to accumulate the $7 600 he would need over 4 years. What interest rate does the bank pay?
A) 2.0
B) 2.5
C) 3.0
D) 3.5
E) 4.0
Answer: E
Diff: 2 Type: MC Page Ref: 21
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Qualitative

5) It is known that the total interest paid over a 5-year period is $2 081.13. What was the principal amount borrowed at a 6% nominal interest rate compounded quarterly?
A) $3 000
B) $4 000
C) $5 000
D) $6 000
E) $7 000
Answer: D
Diff: 3 Type: MC Page Ref: 26-27
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

6) Nominal interest rate is calculated by
A) summing up all interest rates for all compounding periods.
B) converting a given interest rate with a compounding period to an equivalent interest rate with a one-year compounding period.
C) dividing the interest rate per compounding period by the number of compounding periods per year.
D) multiplying the simple interest rate by the number of years.
E) multiplying the interest rate per compounding period by the number of compounding periods per year.
Answer: E
Diff: 2 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Recall
Type: Qualitative

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7) Your credit card statement says that your card charges 0.0562% interest per day. What is the actual interest rate per year?
A) 11.6%
B) 14.5%
C) 18.3%
D) 20.1%
E) 22.8%
Answer: E
Diff: 2 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

8) If an interest rate is 18% per year, what is the equivalent interest rate per quarter?
A) 3.8%
B) 4.5%
C) 4.8%
D) 6.2%
E) 8.6%
Answer: B
Diff: 2 Type: MC Page Ref: 25
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

9) How many compounding periods are needed to obtain an effective interest rate of 25% if the interest rate per sub-compounding period is 1.88%?
A) 13
B) 12
C) 11
D) 10
E) 9
Answer: B
Diff: 2 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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10) Bill deposits $100 to his savings account biweekly. His savings account pays a nominal interest rate of 5% per year, compounded every six months. What is his savings account's effective interest rate for a 6-month period?
A) 2.1%
B) 2.5%
C) 3.2%
D) 4.2%
E) 5.1%
Answer: B
Diff: 2 Type: MC Page Ref: 64
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

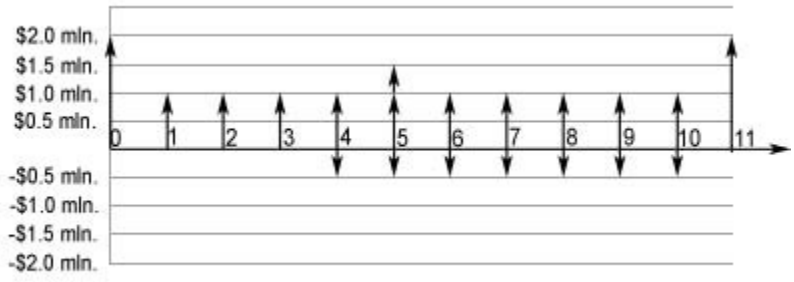
11) What does a cash flow diagram of a project represent?
A) summary of benefits and costs of a project
B) summary of the timing and magnitude of payments and receipts as they occur over time
C) magnitude of cash flows at a given period of time
D) summary of present, future, and annual worths of a project
E) change in value of money at different interest rates at various compounding periods
Answer: B
Diff: 2 Type: MC Page Ref: 29-31
Topic: 2.6. Cash Flow Diagrams
Skill: Recall
Type: Qualitative

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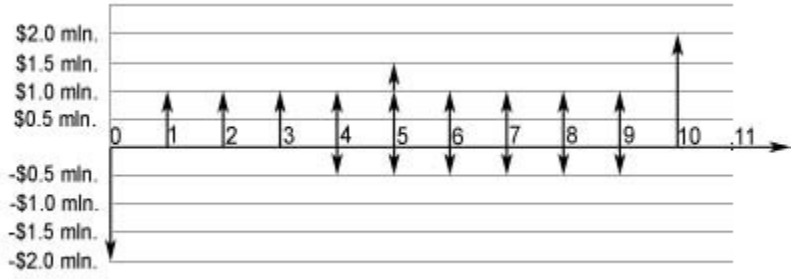
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12) J.D.Irving Ltd. is considering a construction project with $2 million initial investment that will last for 10 years. The duration of the construction phase is one year. Once the construction is over, the project starts yielding a constant annual revenue of $1.0 million. By the end of the fifth year the project generates $0.5 million extra revenue. The annual operation and maintenance expenses of $0.5 million will start at year four and last till the end of the project's life. At the very end of the 10-year project the used equipment can be sold for $1.5 million. What cash flow diagram represents this project?

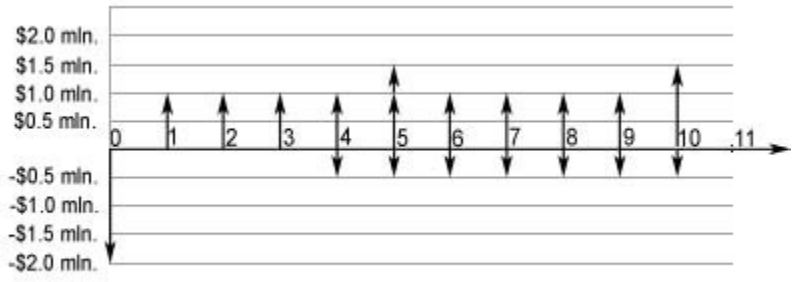
A)



B)



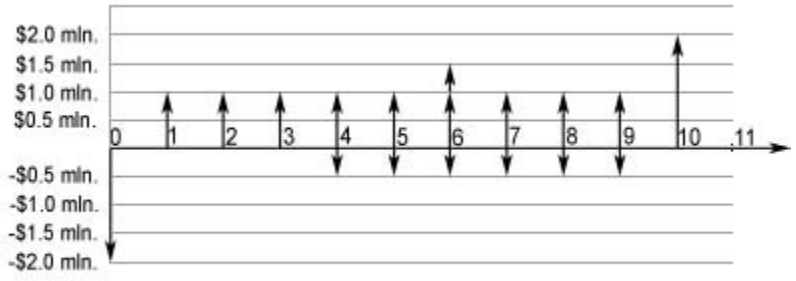
C)



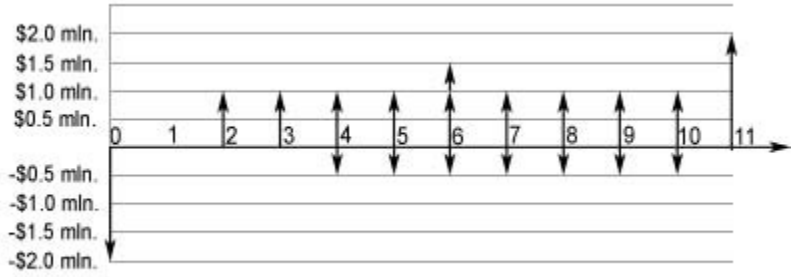
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D)



E)



Answer: B
Diff: 3 Type: MC Page Ref: 29-31
Topic: 2.6. Cash Flow Diagrams
Skill: Applied
Type: Quantitative

13) What does the term "market equivalence" imply?
A) indifference on the part of a decision maker among available choices
B) the existence of a mathematical relationship between time and money
C) the ability to exchange one cash flow for another at minimum cost
D) the ability to exchange one cash flow for another at no cost
E) the ability to obtain a zero net cash flow
Answer: A
Diff: 2 Type: MC Page Ref: 32
Topic: 2.8. Equivalence
Skill: Recall
Type: Qualitative

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14) You invest $10 000 at 5% interest rate compounded monthly, what is your accumulated interest at the end of year 2?
A) $511.62
B) $537.79
C) $1 025.00
D) $1 049.41
E) $1 089.41
Answer: D
Diff: 2 Type: MC Page Ref: 26-27
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

15) You would like to have $8 500 for future spending in three years from now. How much should you deposit in your bank account now if the account pays you 0.4% interest per month?
A) $2 071
B) $7 362
C) $8 102
D) $8 399
E) $8 429
Answer: B
Diff: 3 Type: MC Page Ref: 35
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

16) The nominal interest rate is 6% per year compounded quarterly. What is the effective annual rate?
A) 5.74%
B) 5.84%
C) 5.94%
D) 6.04%
E) 6.14%
Answer: E
Diff: 1 Type: MC Page Ref: 27
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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17) Emily is considering two mutually exclusive financial options: (i) to deposit $4 000 in her bank's savings account that pays 4.6% annual interest, or (ii) to purchase a $4 000 one-year guaranteed investment certificate with a monthly interest rate of 0.3%. From an opportunity cost standpoint, by making the decision to deposit $4 000 in the bank account, Emily will
A) gain $37.6 by the end of the year.
B) lose $37.6 by the end of the year.
C) gain $57.6 by the end of the year.
D) lose $57.6 by the end of the year.
E) make zero economic profit.
Answer: A
Diff: 3 Type: MC Page Ref: 32-34
Topic: 2.1. Introduction
Skill: Applied
Type: Quantitative

18) If you borrow $2 000 today at 20% interest rate for 5 years, what is your simple interest in this case?
A) $2 000
B) $4 000
C) $4 976.64
D) $976.64
E) $2 976.64
Answer: A
Diff: 1 Type: MC Page Ref: 24
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

19) COSCO invested $5.5 million in a project ten years ago. As of today the worth of this project is $24.9 million. What annual interest rate has the project been earning if interest is compounded monthly?
A) 14.2%
B) 14.8%
C) 15.2%
D) 15.8%
E) 16.2%
Answer: C
Diff: 3 Type: MC Page Ref: 27
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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20) Equivalence is a condition that exists when
A) the value of a cost at one time is numerically equal to the value of the related benefits received at a different time.
B) the present worth of a cost equals the future worth of a cost at any point in time.
C) the present worth of all costs and benefits equals the future worth of these costs and benefits at any point in time.
D) the project breaks even, meaning costs equal benefits at a certain point in time.
E) a decision-maker assesses two sets of cashflows as equally attractive.
Answer: E
Diff: 1 Type: MC Page Ref: 32
Topic: 2.8. Equivalence
Skill: Recall
Type: Qualitative

21) Jennifer lends $2 000 to her friend who is launching a small business. Her friend promises to pay her 9% per year compounding interest. How much interest would Jennifer get at the end of four years?
A) $823
B) $1 284
C) $1 892
D) $2 324
E) $2 823
Answer: A
Diff: 2 Type: MC Page Ref: 24
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

22) Nominal interest rate is
A) the actual but not usually stated interest rate.
B) the actual and usually stated interest rate.
C) the conventional method of stating the annual interest rate.
D) the key interest rate in an economy.
E) the overnight interest rate.
Answer: C
Diff: 1 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Recall
Type: Qualitative

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23) If the effective equivalent annual interest rate is 16.2%, and interest is compounded daily, what is the corresponding nominal annual interest rate?
A) 11%
B) 13%
C) 15%
D) 17%
E) 19%
Answer: C
Diff: 3 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

24) If you borrow $1 000 now at 10% interest for 5 years, what is the compound interest owed at the end of the fifth year?
A) $1 000
B) $1 100
C) $1 610.51
D) $610.51
E) $500
Answer: D
Diff: 2 Type: MC Page Ref: 24-25
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

25) Suppose the nominal rate is 10% per year and interest is compounded every two years. What is the effective annual rate?
A) 4.88%
B) 9.54%
C) 10.25%
D) 21%
E) 44%,
Answer: B
Diff: 3 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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26) If the effective annual interest rate is 10% and interest is continuously compounded, what is the nominal annual interest rate?
A) 9.00%
B) 9.53%
C) 10.53%
D) 11.53%
E) 12.53%
Answer: B
Diff: 3 Type: MC Page Ref: 28
Topic: 2.5. Continuous Compounding
Skill: Applied
Type: Quantitative

27) You have $100 to deposit. Bank A offers 20% simple interest, Bank B offers 15% interest compounded annually. How many years would you have to keep your money in the bank for Bank B to be a better choice than Bank A?
A) Bank B is always better.
B) 4 years
C) 5 years
D) 6 years
E) Bank B will never be better.
Answer: C
Diff: 2 Type: MC Page Ref: 22
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

28) You have $100 to deposit. Bank A offers 16% interest, compounded annually, Bank B offers 15% interest, compounded monthly. How many years would you have to keep your money in the bank for Bank B to be a better choice?
A) Bank B is always better.
B) 4 years
C) 5 years
D) 6 years
E) Bank B is never better.
Answer: A
Diff: 2 Type: MC Page Ref: 27
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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29) You need to borrow $1 000 for a period of 10 years. Bank A will lend you the money at 10% interest, compounded annually, whereas Bank B will lend you the money at 10% interest, compounded monthly. At the end of ten years, how much more interest will you owe if you borrow from Bank B instead of Bank A?
A) $74.59
B) $92.50
C) $113.30
D) $137.39
E) $148.12
Answer: B
Diff: 2 Type: MC Page Ref: 22-24
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

30) Suppose that you just paid $9.91 monthly interest compounded daily on an outstanding balance of $1 000 on your credit card. What is the nominal annual interest rate in this case?
A) 9%
B) 10%
C) 11%
D) 12%
E) 13%
Answer: D
Diff: 3 Type: MC Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

31) If the nominal annual interest rate is 10% and interest is continuously compounded, what is the effective annual interest rate?
A) 9%
B) 9.52%
C) 10.52%
D) 11%
E) 11.52%
Answer: C
Diff: 2 Type: MC Page Ref: 28
Topic: 2.5. Continuous Compounding
Skill: Applied
Type: Quantitative

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32) You need to borrow $1 000. Bank A will lend you the money at 5% interest, compounded annually, whereas Bank B will lend you the money at 5% interest, compounded monthly. Bank B also offers you a free cell phone, valued at $100, if you do business with them. What is the longest duration of the loan for which Bank B would be a better choice?
A) 10 years
B) 15 years
C) 20 Years
D) 25 years
E) 30 years
Answer: D
Diff: 2 Type: MC Page Ref: 22-24
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

33) What is the depreciation rate of a physical asset with the purchase price of $150 000 and salvage value of $16 100 after 10 years of service?
A) 16.40%
B) 16.66%
C) 20.00%
D) 25.00%
E) 59.20%
Answer: C
Diff: 2 Type: MC Page Ref: 169
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

34) A computer was bought for $2 000. After three years of service it can be sold for $500. If straight line depreciation is assumed, what was the computer's book value at the end of year 2?
A) $2 000
B) $1 500
C) $1 000
D) $500
E) $0
Answer: C
Diff: 2 Type: MC Page Ref: 166-167
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

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35) The most popular depreciation method for physical assets in Canada is
A) 150%-declining-balance depreciation.
B) declining-balance depreciation.
C) sum-of-the-years'-digits depreciation.
D) double-declining-balance depreciation.
E) units-of-production depreciation.
Answer: B
Diff: 1 Type: MC Page Ref: 169-170
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

36) Two assets, A and B, are purchased for the same price. Each loses 10% of its value in the first year. Subsequently, the value of A continues to decline in the same way by declining-balance depreciation, while the value of B continues to decline in the same way by straight-line depreciation. Which will have the greater book value in five years time?
A) A
B) B
C) Their book values will always be equal.
D) Their book values will generally be different, but they are exactly equal at the end of the fifth year.
E) It is impossible to say without knowing the MARR.
Answer: A
Diff: 3 Type: MC Page Ref: 166-171
Topic: 2.7. Depreciation
Skill: Recall
Type: Quantitative

37) What is depreciation?
A) the decline in value of a future good due to the time we have to wait to receive that good
B) the decline in value of expected future income, due to inflation
C) the tendency of money in a bank account to lose value over time
D) the loss in an asset's value over time
E) the accumulation of money in an interest-bearing account over time
Answer: D
Diff: 1 Type: MC Page Ref: 165
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

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38) What is functional loss?
A) Functional loss occurs when the asset can still perform its function despite a loss in its market value.
B) Functional loss occurs when the asset becomes unusable to to misuse.
C) Functional loss occurs when the asset wears out due to being used for its intended function.
D) Functional loss occurs when the asset wears out due to the passage of time, whether or not it is used.
E) Functional loss occurs when the asset can still perform its original function, but that function is no longer valued.
Answer: E
Diff: 1 Type: MC Page Ref: 165
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

39) What is the difference between market value and book value?
A) The market value represents the price for which an asset could be sold at the end of its physical life whereas the book value represents the depreciated value of the asset for accounting purposes.
B) The market value represents the price for which an asset could be sold at any point in its life, whereas the book value represents the depreciated value of the asset for accounting purposes.
C) The market value represents the price for which an asset could be sold at any point in its life whereas the book value represents the actual value of an asset at the end of its useful life.
D) The market value represents the price for which an asset could be sold at the end of its physical life whereas the book value represents the price for which an asset could be sold at the end of its useful life.
E) The market value represents the price for which an asset could be sold at the end of its useful life whereas the book value represents the depreciated value of an asset for accounting purposes.
Answer: B
Diff: 2 Type: MC Page Ref: 165
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

40) The only depreciation models needed for corporate tax calculations in Canada are
A) straight-line and declining balance.
B) declining balance and double-declining balance.
C) straight-line and Sum-of-year's digits.
D) straight-line and units-of-production.
E) declining-balance and 150%-declining-balance.
Answer: A
Diff: 2 Type: MC Page Ref: 166
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

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41) Calculate the depreciation rate of a vehicle if it was bought 5 years ago for $25 000 and can be sold now for $8 200.
A) 20%
B) 32%
C) 48%
D) 68%
E) 80%
Answer: A
Diff: 2 Type: MC Page Ref: 168-169
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

42) A company buys a corrugated-metal building to store fertiliser. Because of a change in plans, no fertiliser is ever stored in the building, but it rusts away due to exposure to the rain. What kind of depreciation is this?
A) a functional loss
B) a time-related physical loss
C) a use-related physical loss
D) a technological loss
E) a social loss
Answer: B
Diff: 1 Type: MC Page Ref: 165
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

43) Your accounting records show that an asset in use has book value of $7 119.14. The asset cost $30 000 when it was purchased and has been depreciated under the declining balance depreciation method with a 25% depreciation rate. How many years has the asset been in service?
A) 1 year
B) 2 years
C) 3 years
D) 4 years
E) 5 years
Answer: E
Diff: 2 Type: MC Page Ref: 168-171
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

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44) Calculate the salvage value of equipment with a service life of 15 years if it was purchased 5 years ago for $120 000 and depreciates at the rate of 10% per year.
A) $5 400
B) $12 000
C) $24 707
D) $60 000
E) $70 859
Answer: C
Diff: 2 Type: MC Page Ref: 168-171
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

45) Charles has just purchased a car for $9 520. He expects that the value of this car will decline by 5% each year. Eventually Charles wants to sell this car for at least $6 000 and buy a new one. How many years should Charles use this car before he can sell it?
A) 12
B) 10
C) 8
D) 6
E) 4
Answer: C
Diff: 2 Type: MC Page Ref: 168-169
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

46) Two assets, A and B, are purchased for the same price. Each loses 10% of its value in the first year. Subsequently, the value of A continues to decline in the same way by declining-balance depreciation, while the value of B continues to decline in the same way by straight-line depreciation. Which will have the greater book value in five years time?
A) A
B) B
C) Their book values will always be equal.
D) Their book values will generally be different, but they are exactly equal at the end of the fifth year.
E) It is impossible to say without knowing the MARR.
Answer: A
Diff: 3 Type: MC Page Ref: 166-171
Topic: 2.7. Depreciation
Skill: Recall
Type: Quantitative

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2.2 Short Answer Questions

1) Michael is indifferent about paying $1 500 for a new computer now and $2 000 two years from now. Define Michael's implied interest rate.
Answer: The implied interest rate can be defined from the following mathematical equivalence: $1\,500 \times (1 + i)^2 = 2\,000$ and $i = 15.5\%$.
Diff: 1 Type: ES Page Ref: 32-33
Topic: 2.8. Equivalence
Skill: Applied
Type: Quantitative

2) A credit card quotes its annual interest rate as 21%. If the interest rate is compounded monthly, what is the effective interest rate for this credit card?
Answer: $i_e = (1 + \frac{0.21}{12})^{12} - 1 = 0.2314$ or 23.14%

Diff: 1 Type: ES Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

3) Stan has invested $1 000 into mutual fund at a 5% annual rate of return, compounded daily. What are the nominal and effective interest rates in this case? Discuss how these two interest rates affect Stan's investment?
Answer: The 5% annual rate of return is a nominal interest rate. The effective interest rate is the actual rate used in financial calculations. In order to convert the 5% nominal interest rate into effective interest rate, we have to use the following formula:
$i_e = (1 + \frac{0.05}{365})^{365} - 1 = 0.05127$ or 5.127%.

Therefore, when calculating the real return on his investment, Stan should use 5.127% interest rate instead of 5%.
Diff: 2 Type: ES Page Ref: 26
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Qualitative

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4) Suppose that the effective interest rate associated with a VISA credit card is 20.9% while the nominal interest rate is 18.9%. What are the card's terms with respect to compounding?
Answer: The following relationship between effective interest rate ie and nominal interest rate *r* should be used in this case:

$i_e = (1 + \frac{r}{m})^m - 1$ where *m* is the number of compounding periods per year.

Plugging in values of i_e and *r*

$0.213 = (1 + \frac{0.189}{m})^m - 1$ and solving for *m* by trial and error:

Trying *m* = 2(semiannual), 4 (quarterly), 12 (monthly) and 365 (daily) compounding, it turns out that *m* = 365 or nominal interest rate of 18.9% is compounded daily.
Diff: 3 Type: ES Page Ref: 25-27
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

5) Paul just bought a car for $15 000 and paid in cash. Calculate Paul's opportunity cost as "funds tied up in the car" if you know that otherwise it was possible to invest the money at a 5% annual interest rate compounded monthly for five years.
Answer: Opportunity cost in this case is the money forgone as a result of the car purchase, which is forgone interest. If this sum of money was invested under the specified conditions, it would earn the following interest in five years:

$I_c = P(1 + i_e)^N - P$

where ie is the effective interest rate. In this case, the effective interest rate is

$i_e = (1 + \frac{0.05}{12})^{12} - 1 = 0.05116$ or 5.116%.

Therefore, interest forgone is

$I_c = 15\,000 \times (1+0.05116)^5 - 15\,000 = \$4\,250.21$

Diff: 3 Type: ES Page Ref: 23-24
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

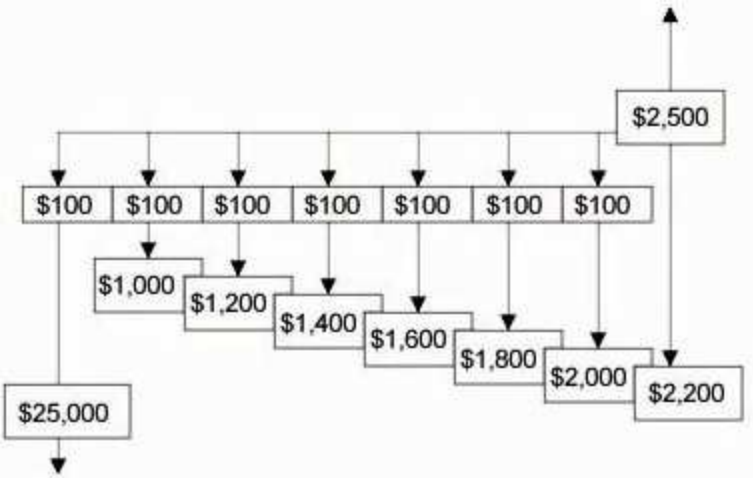
6) Suppose you invested $1 000 in a new savings account with an annual interest rate of 3% compounded daily. What is your accumulated interest at the end of the first year?
Answer: First, calculate the effective interest rate since 3% is nominal interest rate: $i_e = (1 + 0.03/365)^{365} - 1 = 0.03045$ or it is 3.045%. Interest is given by the difference between future worth of the investment and its present worth which is $\$1\,000 * (1 + 0.003045) - \$1\,000 = \$30.45$.
Diff: 2 Type: ES Page Ref: 25-27
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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7) Explain why equivalences are just convenient assumptions. Give examples of two real world financial situations in which these equivalences do not hold
Answer: Equivalences are needed to calculate and compare different costs and benefits over time. They are simplifications which capture the basic properties of cash flows without over-complicating the problem. They may not hold precisely true in the real world. For example, we borrow at a higher interest rate compared to savings. It means that in real life when we move along a time line in a cash flow diagram we might see different rates moving in two different directions; however, equivalences assume that the rate is the same. Another example is the cost of information. We assume (until Chapter 12 in the text) that information is free, while in real life information is costly.
Diff: 3 Type: ES Page Ref: 32-34
Topic: 2.8. Equivalence
Skill: Applied
Type: Qualitative

8) A transportation company just bought a new truck for $25 000. The service life of the truck is seven years. The company has to pay a $100 registration fee at the beginning of every year plus maintenance costs of $1 000 in the first year and$200 at the beginning of the second year. At the end of the truck's service life, it will be sold at 10% of its purchase price. Construct a cash flow diagram from the company's perspective.
Answer:



Diff: 2 Type: ES Page Ref: 29-31
Topic: 2.6. Cash Flow Diagrams
Skill: Applied
Type: Quantitative

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9) Consider the following statement: "Financial data are collected based on discrete time periods. However, in real life time is continuous. The error when using discrete compounding instead of continuous compounding is smaller the briefer the discrete compounding period is." Do you agree or disagree with this statement and why?
Answer: This statement is correct. With an increase in the number of discrete time periods, the error decreases. This can be seen by comparing two effective interest rates—compounded daily and continuously compounded—using the same nominal interest rate. In this case, the error is negligible.
Diff: 2 Type: ES Page Ref: 28-29
Topic: 2.5. Continuous Compounding
Skill: Applied
Type: Qualitative

10) Joan is deciding whether she should remodel her house now or one year from now. If she does it now, the cost will be $1 500. If she waits one year, the cost is expected to be $1 600. At current interest rate of 5.6%, should Joan remodel her house now or one year from now?
Answer: To compare the two alternatives, the concept of mathematical equivalence must be applied. According to the concept, $1 500 now is equivalent to $1\,500 \times (1 + 0.056) = \$1\,584$ one year from now. This is less than $1 600 and therefore Joan should remodel her house now.
Diff: 1 Type: ES Page Ref: 32
Topic: 2.3. Compound and Simple Interest
Skill: Applied
Type: Quantitative

11) Suppose that a power plant project requires $10 million in period zero, has operating costs of $1 million per year over 10 years, and brings revenue of $2 million per year over that period of time. Based on this information and the concept of time value of money, comment on whether this is a profit generating project or not?
Answer: If we forget about time value of money, then each year we have $2 million - $1 million = $1 million in net savings. Over 10 years it comes to $10 million. So, we invest $10 million now, and we will get $10 million in net savings over 10 years. However, if we take into account time value of money, net savings each year should be divided by some discount factor which means that net savings are less than $10 million. This project is not a good investment
Diff: 3 Type: ES Page Ref: 25-27
Topic: 2.1. Introduction
Skill: Applied
Type: Quantitative

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12) Suppose that the nominal interest rate is 18%. Calculate the effective interest rate when interest is compounded:
(i) Annually
(ii) Semiannually
(iii) Quarterly
(iv) Monthly
(v) Biweekly
(vi) Weekly
(vii) Daily
(viii) Continuously

Answer: Basic formula for (i) - (vii) is $i_e = (1 + \frac{r}{m})^m - 1$ where r is nominal interest rate and m is the number of sub-periods in the whole compounding period.

Therefore:

(i) Annually ($m = 1$): $i_s = r = 0.18$ or 18%

(ii) Semiannually ($m = 2$): $i_e = (1 + \frac{0.18}{2})^2 - 1 = 0.1881$ or 18.81%

(iii) Quarterly ($m = 4$): $i_e = (1 + \frac{0.18}{4})^4 - 1 = 0.1925$ or 19.25%

(iv) Monthly ($m = 12$): $i_e = (1 + \frac{0.18}{12})^{12} - 1 = 0.1956$ or 19.56%

(v) Biweekly ($m = 26$): $i_e = (1 + \frac{0.18}{26})^{26} - 1 = 0.1965$ or 19.65%

(vi) Weekly ($m = 52$): $i_e = (1 + \frac{0.18}{52})^{52} - 1 = 0.1968$ or 19.68%

(vii) Continuously: $i_e = e^r - 1 = 2.7182^{0.18} - 1 = 0.1925$ or 19.72%

Diff: 2 Type: ES Page Ref: 25-27
Topic: 2.4. Effective and Nominal Interest Rates
Skill: Applied
Type: Quantitative

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13) A hydraulic press has just been purchased. It will have a book value of $6 465 in year 5. The present worth of its salvage value at the end of year 10 is $700, assuming a MARR of 7%. What is the purchase price of the press?
Answer: We can set the following equations:

$P * (1 - d)^5 = 6\,465$
$P * (1 - d)^{10}/1.07^{10} = 700$

The second equation can be re-written as

$P * (1 - d)^5 * (1 - d)^5/1.07^{10} = 700$

Substituting the first one into the last expression:
$6\,465 * (1 - d)^5/1.07^{10} = 700$

and solving for d, we find that d = 0.266 or 26.6%

P can be found from the first equation as follows:

$P * (1 - 0.266)^5 = 6\,465$

So P = $30 353
Diff: 3 Type: ES Page Ref: 168-171
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

14) If a new technology comes into existence which partially replaces some old technology, how will the loss in the value of the old technology be classified?
Answer: This is an example of *functional loss.* The value of the old technology decreases because there is a better and cheaper way of producing services via the new technology.
Diff: 1 Type: ES Page Ref: 165
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

15) Explain the difference between *scrap value* and *salvage value.*
Answer: Scrap value is the value of an asset at the end of its physical life while salvage value is the value of an asset at the end of its useful life. Useful life can be shorter than or equal to, but never longer than an asset's physical life.
Diff: 1 Type: ES Page Ref: 165
Topic: 2.7. Depreciation
Skill: Applied
Type: Qualitative

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16) It is known that the book value of an asset depreciated through declining balance depreciation is
$3 000 in year 3. Purchase price of the asset was $3 800. What is the asset's salvage value at the end of its useful life, which is 10 years?
Answer: First we can find the depreciation rate from

$d = 1 - \sqrt[3]{3\,000/3\,800} = 0.0758$ or 7.58%

Salvage value at the end of the asset's life is its book value in year 10 or

$BV(10) = P * (1 - d)^{10} = \$3\,800 * (1 - 0.0758)^{10} = \$1\,727.60$
Diff: 2 Type: ES Page Ref: 169
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

17) What is the major advantage and the major drawback of the straight line depreciation method?
Answer: The straight-line depreciation method has the great advantage of being easy to calculate. It also is easy to understand and is in common use. The main problem with the method is that its assumption of a constant rate of loss in asset value is often not valid.
Diff: 1 Type: ES Page Ref: 168
Topic: 2.7. Depreciation
Skill: Recall
Type: Qualitative

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18) Suppose that the purchase price of a piece of equipment is $1 million. Its salvage value at the end of its 5-year service life is $500 000. Depreciate this asset using straight line depreciation and declining balance depreciation.
Answer: For Straight Line depreciation (SLD), we need to find the depreciation amount per year:

$$\frac{1\,000\,000 - 500\,000}{5} = \$100\,000$$

Under SLD, the asset's value loses this amount per year.

For Declining Balance Depreciation (DBD), we need to calculate the depreciation rate:

$$d = 1 - \sqrt[5]{\frac{500\,000}{1\,000\,000}} = 0.129$$

For DBD, the asset loses 12.9% of its value per year. Now we can calculate the book value in each year under both methods. The results are summarized in the following table:

	SLD	DBD
BV(0)	1 000 000	1 000 000
BV(1)	900 000	871 000
BV(2)	800 000	758 641
BV(3)	700 000	660 776
BV(4)	600 000	575 536
BV(5)	500 000	500 000

Diff: 2 Type: ES Page Ref: 166-171
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

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19) A piece of equipment has just been purchased. It is expected to have a 5-year service life and to depreciate via the declining balance method. The present worth of its salvage value is $1 000. If the depreciation rate is 10%,and the MARR is also 10%, what was the purchase price of this equipment?
Answer: The following equation captures this

$P*(1 - 0.1)^5/1.1^5 = 1\ 000$

where P is the purchase price of the equipment. Solving for P:

$P = 1\ 000 * (\frac{1.1}{0.9})^5 = \$2\ 727.41$

Diff: 3 Type: ES Page Ref: 169
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

20) A machinist's lathe was purchased five years ago and, with installation and setup, has an initial cost of $250 000. It will have a salvage value of $20 000 three years from now. Assuming straight-line depreciation is a reasonable model, determine the current book value.
Answer: BV(S) = BV(5) = 250 000 - 5[(250 000 - 20 000)/8] = 106 250

Diff: 2 Type: ES Page Ref: 19
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

21) If the book value of an item at the beginning of the first year is $20,000 and its useful life is 5 years, tabulate the depreciation deduction over the course of the first four years. After four years, what is the total of the interest that Jennifer will have received during that period? Assume a salvage value of $2000 and use the Single Declining Balance method.
Answer: Note that the salvage value does not enter into the table:

Year	Bn-1	Dn	Bn
1	20 000	4 000	16 000
2	16 000	3 200	12 800
3	12 800	2 500	10 240
4	10 240	1 048	8 192

Diff: 2 Type: ES Page Ref: 19
Topic: 2.7. Depreciation
Skill: Applied
Type: Quantitative

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