

20.1 Apply the concept of the time value of money to capital budgeting decisions.

1) In capital budgeting decisions, revenues and costs are analyzed over the short-run.

Answer: FALSE

Explanation: Capital projects are usually long-term.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-1

2) Accrual accounting measures income on a year-to-year basis.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-1

3) Cost systems with an exclusive period-by-period focus are more likely to identify project costs over multiple periods.

Answer: FALSE

Explanation: Cost systems that track life-cycle costs are more likely to identify project costs over multiple periods.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-1

4) Identify capital expenditures relevant to accomplishing strategic goals is the first step in the capital budgeting decision process model.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-1

5) Both financial and nonfinancial factors associated with proposed capital budgeting opportunities need to be considered as part of the capital budgeting decision process.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-1

6) Capital budgeting emphasizes the role of financial information in investment decisions.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-1

7) The net present value method is a discounted cash flow method that concentrates on cash accruals.

Answer: FALSE

Explanation: ...concentrates on cash flows.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-1

8) Capital budgeting focuses on projects over their entire lives to consider all the cash flows or cash savings from investing in a single project.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-1

9) Sources of funding for capital projects include the proceeds of debt and equity securities sold in capital markets as well as internally generated cash.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-1

10) Financing opportunities are always investigated prior to the formal analyses of the costs and benefits of various investments.

Answer: FALSE

Explanation: Often simultaneously, also after the project has been selected.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-1

11) Cost analysis has two dimensions, which are

A) financial and non-financial.

B) present and the future.

C) project and financial.

D) project and non-financial.

E) project and time.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-1

12) Life cycle costing is the accounting system that corresponds to

- A) the non-financial dimension of costs analysis.
- B) the project dimension of costs analysis.
- C) the cost dimension of costs analysis.
- D) the financial dimension of costs analysis.
- E) the time dimension of costs analysis.

Answer: B

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-1

13) Which of the following is NOT a part of the capital budgeting decision process model?

- A) Determine which investment yields the greatest benefit and the least cost to the organization.
- B) Track realized cash flows, compare against estimated numbers, and revise plans if necessary.
- C) Forecast all potential cash flows attributable to the alternative projects.
- D) Manage the control of non-quantitative factors.
- E) Identify potential capital investments that agree with the organization's strategy.

Answer: D

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-1

14) The consequences of capital expenditures are

- A) quantitative and financial.
- B) quantitative and qualitative.
- C) qualitative and nonfinancial.
- D) appropriate and inappropriate.
- E) nonfinancial and irrelevant.

Answer: B

Diff: 1 Type: MC

Skill: Understand

Objective: LO 20-1

15) In selecting capital projects, organizations choose

- A) the alternative that matches the RRR.
- B) the alternative that has revenues that exceed its costs.
- C) the alternative that has the highest revenues.
- D) the alternative that has the longest time horizon, but also exceeds the RRR.
- E) the alternative that provides benefits that exceed predicted costs by the greatest amount.

Answer: E

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-1

- 16) The first step in the capital budgeting decision process model is to
- A) Establish assumptions common for each potential capital investment.
  - B) Obtain appropriate sources of financing for investments.
  - C) Identify potential capital investments that agree with the organization's strategy.
  - D) Manage the control of non-quantitative factors.
  - E) Analyze the present value of future cash inflow and outflow and relevant qualitative factors.

Answer: C

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-1

- 17) Opportunity cost is a cost of capital for which of the following sources of funds?

- A) common shares
- B) short-term debt sold at a discount
- C) long-term debt
- D) internally generated cash flow
- E) preferred shares

Answer: D

Diff: 3 Type: MC

Skill: Understand

Objective: LO 20-1

18) Cast Iron Stove Company wants to buy a molding machine that can be integrated into its computerized manufacturing process. It has received three bids for the machine and related manufacturer's specifications. The bids range from \$3,500,000 to \$3,550,000. The estimated annual savings of the machines range from \$260,000 to \$270,000. The payback periods are almost identical and the net present values are all within \$8,000 of each other. The president just doesn't know what to do about which vendor to choose since all of the selection criteria are so close together.

Required:

What suggestions do you have for the president with regard to specific qualitative factors that could be considered?

Answer: The president needs to consider nonfinancial and qualitative factors between the three vendors. Quality of output units, manufacturing flexibility, and cycle time are all additional factors that can be considered about the machines. Other items might include worker safety, ease of learning and using, and ease of maintenance.

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-1

19) Explain capital budgeting, and list each of the five steps of the capital budgeting decision process model. Include both phases for step five.

Answer: Capital budgeting is long-run planning for investment projects that usually have a life that is greater than one year.

Step 1 Identify potential capital investments that agree with the organization's strategy.

Step 2 Gather information from all parts of the value chain to evaluate alternative projects .

Step 3 Forecast all potential cash flows attributable to the alternative projects.

Step 4 Determine which investment yields the greatest benefit and the least cost to the organization.

Step 5 Phase 1: Obtain funding and make the investments selected in step 4.

Phase 2: Track realized cash flows, compare against estimated numbers, and revise plans if necessary.

Diff: 3 Type: ES

Skill: Understand

Objective: LO 20-1

20.2 Evaluate discounted cash flow (DCF) and non-DCF methods to calculate rate of return (ROR).

1) Internal rate of return is a method of calculating the expected net monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point in time.

Answer: FALSE

Explanation: IRR calculates the discount rate at which the present value of all expected cash inflows equals the present value of all expected cash outflows.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-2

2) The primary advantage of the internal rate of return method is that the end result of the computation is in dollars instead of percentages.

Answer: FALSE

Explanation: End result is in percentages.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-2

3) The net present value method is preferable over the internal rate of return method when an organization does not require the same rate of return each year of the project.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-2

4) A capital budgeting project is accepted if the required rate of return equals or exceeds the internal rate of return.

Answer: FALSE

Explanation: A capital budgeting project is accepted if the internal rate of return equals or exceeds the required internal rate of return.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

5) The net present value method can on occasion indicate erroneous decisions as it implicitly assumes that project cash flows can be reinvested at the project's rate of return.

Answer: FALSE

Explanation: The internal rate of return method implicitly assumes that project cash flows can be reinvested at the project's rate of return. The net present value method accurately assumes that project cash flows can only be reinvested at the company's required rate of return.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

6) If the internal rate of return is less than the hurdle rate, the net present value of the project will be negative.

Answer: TRUE

Diff: 3 Type: TF

Skill: Understand

Objective: LO 20-2

7) Discounted cash flow methods measure all the expected future cash inflows and outflows of a project as if they occurred at equal intervals over the life of the project.

Answer: FALSE

Explanation: As if they occurred at a single point in time.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

8) Discounted cash flow methods focus on operating income.

Answer: FALSE

Explanation: Discounted cash flow methods focus on cash inflows and cash outflows.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

9) A capital budgeting project will have a positive net present value if its return is less than the hurdle rate.

Answer: FALSE

Explanation: A capital budgeting project will have a positive net present value if its return is greater than the hurdle rate.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

10) The net present value method calculates the expected monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point in time using the hurdle rate.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

11) Discounted cash flow measures the cash inflows and outflows of a project as if they occurred at a single point in time in order to facilitate a proper comparison.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-2

12) The required rate of return is the minimum acceptable percentage return on an investment and is set by the suppliers of investment funds.

Answer: FALSE

Explanation: The RRR is set by the company's management.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-2

13) An advantage of the internal rate of return method is that it can be used when the required rate of return varies over the life of the project.

Answer: FALSE

Explanation: This is an advantage of the net present value method.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-2

14) The internal rate of return method may result in erroneous decisions when used to compare mutually exclusive projects with unequal lives or unequal levels of initial investment.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-2

15) The discount rate, hurdle rate, or (opportunity) cost of capital all refer to the

- A) required rate of return.
- B) internal rate of return.
- C) net present value.
- D) discounted cash flow.
- E) payback period.

Answer: A

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-2

16) When all future cash inflows and outflows are discounted to the present using the required rate of return, the method used is

- A) capital budgeting.
- B) discounted cash flow.
- C) net present value.
- D) required rate of return.
- E) payback method.

Answer: C

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-2

17) If the net present value analyses of a project resulted in a positive value and the company does not accept the project, it may be assumed that

- A) qualitative factors outweigh the benefit of the investment.
- B) an alternative project has a lower NPV.
- C) the net initial investment cannot be recovered.
- D) the return is greater than that required by the company.
- E) quantitative factors outweigh the benefit of the investment.

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-2

18) When the present value of expected cash inflows from a project equals the present value of expected cash outflows of a project, the discount rate is the

- A) universal rate.
- B) internal rate of return.
- C) required rate.
- D) net present value rate.
- E) inflation rate.

Answer: B

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-2



Use the information below to answer the following question(s).

Wet Water Company drills residential and commercial wells. The company is in the process of analyzing the purchase of a new drill. Information on the proposal is provided below:

Initial investment:	
Asset	\$80,000
Working capital	\$16,000
Operations (per year for four years):	
Cash receipts	\$80,000
Cash expenditures	\$44,000
Disinvestment: Salvage value of drill (end of year four)	\$8,000
Discount rate 10 percent	

Note: Other than the initial investment, cash flows are end of period. The working capital is returned at the end of the investment period.

19) In what range is the internal rate of return for the Wet Water Company's new drill?

- A) 8 percent to 12 percent
- B) 12 percent to 16 percent
- C) 16 percent to 20 percent
- D) 20 percent to 24%
- E) greater than 24%

Answer: D

Explanation: D) Calculator: IRR = 20.561%

20 percent

$\$36,000 \times 0.833$     \$29,988  
 $\$36,000 \times 0.694$     24,984  
 $\$36,000 \times 0.579$     20,844  
 $\$44,000 \times 0.482$     21,208  
                              \$97,024

24 percent

$\$36,000 \times 0.806$     \$29,016  
 $\$36,000 \times 0.650$     23,400  
 $\$36,000 \times 0.524$     18,864  
 $\$44,000 \times 0.423$     18,612  
                              \$89,892

Diff: 2    Type: MC

Skill: Apply

Objective: LO 20-2

20) What is the net present value for the Wet Water Company's new drill?

- A) \$96,000
- B) \$1,722.83
- C) \$12,651.05
- D) \$23,579.26
- E) \$34,507.48

Answer: E

Explanation: E) Calculator \$34,507.48

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

21) Brown Corporation recently purchased a new machine for \$339,013.20. The new equipment has a useful life of 10 years. Net cash flows will be \$60,000 per year, end of year payments.

What is the internal rate of return?

- A) 10 percent
- B) 12 percent
- C) 14 percent
- D) 16 percent
- E) 18 percent

Answer: B

Explanation: B)  $\$339,013.20 = \$60,000F$

$F = 5.65022$

Chart criteria: 10 years 5.65022 results in 12 percent

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

22) Soda Manufacturing Company provides vending machines for soft drink manufacturers. The company has been investigating a new piece of machinery for its production department. The old equipment has a remaining life of 1 year and no sales value. The new equipment has a value of \$52,650 with a three-year life. The expected additional cash inflows are \$25,000 per year, end of year payments.

What is the internal rate of return?

- A) 24 percent
- B) 20 percent
- C) 16 percent
- D) 12 percent
- E) 8 percent

Answer: B

Explanation: B)  $\$52,650 = \$25,000F$

$F = 2.106$

Chart criteria: 3 years 2.106 results in 20 percent

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

23) Which of the following is TRUE, concerning NPV?

- A) When the NPV is positive, the sum of the cash flows from the project equal the initial investment.
- B) When the NPV is negative, the sum of the cash flows from the project must also be negative.
- C) The project just recovers the initial investment, discounted by the hurdle rate.
- D) The IRR is less than the RRR when the NPV is positive, after using the RRR as the discount rate.
- E) When the NPV is positive, the project recovers the initial investment and earns a return greater than the RRR.

Answer: E

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-2

24) In NPV analysis, if the IRR exceeds the RRR

- A) the project should be rejected.
- B) the NPV will be negative (when discounted at the IRR).
- C) the NPV is positive when project cash flows are discounted at the IRR.
- D) the NPV is positive when project cash flows are discounted at the RRR.
- E) the NPV is negative when project cash flows are discounted at the RRR.

Answer: D

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-2

25) In situations where the required rate of return is not constant for each year of the project, it is advantageous to use

- A) the adjusted rate of return method.
- B) the internal rate of return method.
- C) the net present value method.
- D) sensitivity analysis.
- E) the payback method.

Answer: C

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-2

26) The net present value method is better than the internal rate of return because

- A) managers generally find the NPV method easier to understand.
- B) it always yields the same result as IRR.
- C) IRR focuses more on accounting income.
- D) it considers the source of cash flows.
- E) the NPV's of different projects can be added together, and investments may have multiple required rates of return.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-2

27) A "what-if" technique that examines how a result will change if the original predicted data are not achieved, or if an underlying assumption changes, is called

- A) sensitivity analysis.
- B) net present value analysis.
- C) internal rate of return analysis.
- D) adjusted rate of return analysis.
- E) payback method.

Answer: A

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-2

28) Alberta Ltd. is considering the purchase of new machinery which costs \$147,800. The machine is expected to save \$42,300 in operating costs annually for the next 7 years. By how much can the annual cost savings fall (to the nearest hundred dollars) and still provide a 16% return? Ignore income taxes.

- A) \$5,700
- B) \$36,600
- C) \$21,200
- D) \$42,300
- E) \$0

Answer: A

Explanation: A)  $-\$147,800PV; 7n; 16\%i; \$0FV; CPT PMT = \$36,597.15$

Annual Cash Flows can drop  $\$42,300 - \$36,600 = \$5,700$

Diff: 3 Type: MC

Skill: Analyze

Objective: LO 20-2

29) Saturn Ltd. wants to automate one of its production processes. The new equipment will cost \$180,000. In addition, Saturn will incur installation and testing costs of \$5,000 and \$8,500 respectively. The expected life of the equipment is 8 years and the salvage value of the equipment is estimated at \$18,000. The annual cash savings are estimated at \$32,000. The company's required rate of return is 14%. Ignore income taxes. What is the net present value of this investment?

- A) (\$25,246)
- B) \$80,500
- C) (\$11,746)
- D) (\$45,056)
- E) (\$38,746)

Answer: E

Explanation: E) Cost of equipment =  $\$180,000 + \$5,000 + \$8,500 = \$193,500$

Annual cash flows = \$32,000 over 8 years.  $PV = \$148,443.64$

PV of salvage value of \$18,000 =  $\$6,310.06$

$NPV = (\$193,500) + \$148,443.64 + \$6,310.06 = (\$38,746.30)$

Diff: 2 Type: MC

Skill: Analyze

Objective: LO 20-2

*Use the information below to answer the following question(s).*

Neptune Ltd. wants to expand its operations by manufacturing a new product line. New equipment will cost \$225,000. Incremental sales are estimated at \$150,000 per year for 6 years. Variable costs of producing the new product line are 52% of sales and incremental annual fixed costs are \$25,000. The equipment can be salvaged after 6 years for 16% of its original cost. The company's required rate of return for new projects is 18%. Ignore income taxes.

30) What is the net present value of the Neptune Ltd. investment?

- A) (\$26,291)
- B) (\$47,277)
- C) \$225,536
- D) (\$60,613)
- E) \$93,000

Answer: B

Explanation: B) Initial investment = \$225,000

Annual cash flows = [ $\$150,000 \times 48\%$ ] - \$25,000 = \$47,000 [PV 6 years = \$164,387.32]

Salvage value =  $\$225,000 \times 16\%$  = \$36,000 [PV = \$13,335.54]

NPV =  $-\$225,000 + \$164,387.32 + \$13,335.54 = (\$47,277.14)$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

31) What is the internal rate of return of the Neptune Ltd. investment?

- A) 13.62%
- B) 12.75%
- C) 10.00%
- D) 6.86%
- E) 18.00%

Answer: C

Explanation: C) Initial investment = \$225,000

Annual cash flows = [ $\$150,000 \times 48\%$ ] - \$25,000 = \$47,000 [PV 6 years = \$164,387.32]

Salvage value =  $\$225,000 \times 16\%$  = \$36,000 [PV = \$13,335.54]

NPV =  $-\$225,000 + \$164,387.32 + \$13,335.54 = (\$47,277.14)$  IRR = 10.00%

Diff: 3 Type: MC

Skill: Analyze

Objective: LO 20-2

32) The time value of money

- A) is equal to the rate of inflation.
- B) includes the rate of inflation.
- C) is the same value for all companies.
- D) is equal to the bank prime rate.
- E) is the opportunity cost of not having the money today.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-2

- 33) The time value of money refers to the concept that
- A) saving money has value for the business.
  - B) both time and money are valuable resources to any organization.
  - C) money invested today will grow.
  - D) the value of a monetary unit today is worth less than the same unit in the future.
  - E) the value of a monetary unit today is worth more than the same unit in the future.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-2

- 34) Net present value is calculated using the
- A) internal rate of return.
  - B) required rate of return.
  - C) rate of return required by the investment bankers.
  - D) after tax cost of debt.
  - E) coupon interest rate on the firm's debt.

Answer: B

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-2

*Use the information below to answer the following question(s).*

Hawkeye Cleaners has been considering the purchase of an industrial dry-cleaning machine. The existing machine is operable for three more years and will have a zero disposal price. If the machine is disposed of now, it may be sold for \$30,000. The new machine will cost \$200,000, an additional cash investment in working capital of \$60,000 will be required and will be returned at the end of the project. The machine is expected to last 3 years and has an estimated disposal value at that time of \$20,000. The new machine will reduce the average amount of time required to wash clothing and will decrease labour costs. The investment is expected to net \$50,000 in additional cash inflows during the year of acquisition and \$150,000 each additional year of use. These cash flows will generally occur throughout the year and are recognized at the end of each year. Income taxes are not considered in this problem.

35) What is the net present value (rounded to the nearest thousand) of the investment assuming the required rate of return is 10 percent? Would Hawkeye Cleaners want to purchase the new machine?

- A) \$112,000; yes
- B) \$52,000; yes
- C) \$(52,000); no
- D) \$(67,000); no
- E) \$127,000; yes

Answer: A

Explanation: A)  $CF_0 = -\$200,000 + \$30,000 - \$60,000 = -\$230,000$

$CF_1 = \$50,000$ ;  $PV = \$45,454.55$

$CF_2 = \$150,000$ ;  $PV = \$123,966.94$

$CF_3 = \$150,000 + \$20,000 + \$60,000 = \$230,000$ ;  $PV = \$172,802$

$NPV = -\$230,000 + \$342,224 = \$112,224$

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-2

36) What is the net present value (rounded to the nearest thousand) of the investment assuming the required rate of return is 24 percent? Would Hawkeye Cleaners want to purchase the new machine?

- A) \$57,000; yes
- B) \$(57,000); no
- C) \$(3,000); no
- D) \$29,000; yes
- E) \$(13,000); no

Answer: D

Explanation: D)  $CF_0 = -\$200,000 + \$30,000 - \$60,000 = -\$230,000$

$CF_1 = \$50,000$ ;  $PV = \$40,322.58$

$CF_2 = \$150,000$ ;  $PV = \$97,554.63$

$CF_3 = \$150,000 + \$20,000 + \$60,000 = \$230,000$ ;  $PV = \$120,632$

$NPV = -\$230,000 + \$258,209 = \$28,509$

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-2

37) Shirt Company wants to purchase a new cutting machine for its sewing plant. The investment is expected to generate annual cash inflows of \$300,000 recognized at the end of each year. The required rate of return is 12 percent and the new machine is expected to last for 4 years. What is the maximum dollar amount Shirt Company would be willing to spend for the machine?

- A) \$507,000
- B) \$720,600
- C) \$791,740
- D) \$911,205
- E) \$957,600

Answer: D

Explanation: D)  $0 = -1X + [(\$300,000 \times 0.893) + (\$300,000 \times 0.797) + (\$300,000 \times 0.712) + (\$300,000 \times 0.636)]$

$X = \$911,400$ ; calculator \$911,204.80

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

38) When the net present value method is used, only projects with \_\_\_\_\_ are \_\_\_\_\_.

- A) negative net present value; acceptable
- B) negative net future value; not acceptable
- C) positive net future value; acceptable
- D) positive net present value; acceptable
- E) positive net value; not acceptable

Answer: D

Diff: 1 Type: MC

Skill: Understand

Objective: LO 20-2

39) Which of the following statements about the net present value method is TRUE?

- A) Projects with higher net present values are preferred when all other factors are equal.
- B) Projects with negative NPV are acceptable, if no positive NPV projects are available.
- C) It focuses on operating income.
- D) The origination of cash flows is not important in the analysis.
- E) Acceptable projects are those with the highest discount rate.

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-2

40) Which of the following results of net present value analyses is the LEAST acceptable?

- A) \$(15,000)
- B) \$(1,000)
- C) \$12,000
- D) \$0
- E) \$20,000

Answer: A

Diff: 1 Type: MC

Skill: Understand

Objective: LO 20-2



41) Project ABC is under consideration. Annual cash flows equal \$50,000 per year for 5 years. During the first three years the required rate of return is 2 percent. The required rate of return for cash flows in the final two years is 10 percent. What is the present value of cash inflows?

- A) \$250,000
- B) \$247,730
- C) \$235,650
- D) \$209,391
- E) \$203,642

Answer: D

Explanation: D) Yr 1.  $\$50,000 \times 0.980 = \$49,000$

Yr 2.  $\$50,000 \times 0.961 = \$48,050$

Yr 3.  $\$50,000 \times 0.942 = \$47,010$

Yr 4.  $\$50,000 \times 0.683 = \$34,150$

Yr 5.  $\$50,000 \times 0.621 = \$31,050$

\$209,350

Calculator \$50,000PMT 3n 2i \$0FV = \$144,194

\$50,000PMT 2n10i\$0FV = \$86,777 at end of year 3PV \$65.197Total = \$209,391

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

42) Use the following information to determine which machines to purchase based on net present value.

	<u>Machine 1</u>	<u>Machine 2</u>	<u>Machine 3</u>
Initial investment	\$225,000	\$235,000	\$210,000
Annual cash inflows	\$50,000	\$50,000	\$50,000
Useful lives	5 years	4 years	8 years

Cost of capital is 10 percent.

- A) purchase machine 3
- B) purchase machine 2
- C) purchase machine 1
- D) purchase machines 2 and 3
- E) purchase machines 1 and 3

Answer: E

Explanation: A)            Machine 1            Machine 2            Machine 3  
Initial investment        <\$225,000>        <\$235,000>        <\$210,000>

NPV cash inflows        \$189,540            \$158,494            \$266,747  
NPV of investment        \$35,460 <\$76,506>        \$56,747

#### Machine 1

$$\$50,000 \times 3.79079 = \$189,539.50$$

#### Machine 2

$$\$50,000 \times 3.16987 = \$158,493.50$$

#### Machine 3

$$\$50,000 \times 5.33493 = \$266,746.50$$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

43) Investment A requires a net investment of \$600,000. The required rate of return is 10 percent for the three-year annuity. What are the annual cash inflows if the net present value equals 0?

- A) \$184,842
- B) \$241,269
- C) \$249,791
- D) \$271,316
- E) \$360,000

Answer: B

Explanation: B) Calculator: \$241,268.88

$$2.487 \times \text{ACI} - \$600,000 = \$0$$

$$\text{ACI} = \$241,254.52$$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

44) Upper Darby Park Department is considering a new capital investment. The following information is available on the investment. The cost of the machine will be \$150,000. The annual cost savings if the new machine is acquired will be \$40,000. The machine will have a 5-year life, at which time the terminal disposal value is expected to be \$20,000. Upper Darby Park Department is assuming no tax consequences. If Upper Darby Park Department has a required rate of return of 10%, which of the following is closest to the net present value of the project?

- A) \$1,632
- B) \$12,418
- C) \$14,050
- D) \$150,000
- E) \$16,050

Answer: C

Explanation: C)  $(\$40,000 \times 3.791) + (\$20,000 \times .621) - \$150,000 = \$14,050$ .

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

45) The Zeron Corporation wants to purchase a new machine for its factory operations at a cost of \$950,000. The investment is expected to generate \$350,000 in annual cash flows for a period of four years. The required rate of return is 14%. The old machine can be sold for \$50,000. The machine is expected to have zero value at the end of the four-year period. Income taxes are not considered. What is the net present value of the investment?

- A) \$119,799
- B) \$69,799
- C) \$1,019,550
- D) \$326,750
- E) \$500,000

Answer: A

Explanation: A)

Year 0 =	$(\$50,000 - \$950,000) =$	$\$(900,000)$
Year 1 =	$\$350,000 \times 0.877 =$	306,950
Year 2 =	$\$350,000 \times 0.769 =$	269,150
Year 3 =	$\$350,000 \times 0.675 =$	236,250
Year 4 =	$\$350,000 \times 0.592 =$	<u>207,200</u>
		<u>\$119,550</u>

On calculator NPV = \$119,799

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

46) Wagner Ltd. is considering investing in a new piece of equipment for its factory. It estimates that annual cash flows would be \$17,000 and the equipment would last for 8 years. The company's required rate of return is 12%. What is the most that the company should be willing to invest in this equipment? (Ignore income taxes.)

- A) \$84,450
- B) \$136,000
- C) \$61,280
- D) \$128,115
- E) \$94,580

Answer: A

Explanation: A)  $\$17,000 \text{PMT } 8\text{n } 12\text{i } \$0\text{FV PV} = \$84,450$

Diff: 3 Type: MC

Skill: Analyze

Objective: LO 20-2

47) Easton Ltd. is considering investing in a new piece of machinery for its factory. The machine costs \$340,000 and is expected to last 7 years. It estimates that annual cash flows would be \$82,000 and the equipment would have a salvage value of \$13,000. The company's hurdle rate is 11%. What is the net present value of this investment? (Ignore income taxes.)

- A) \$87,625
- B) \$46,400
- C) \$52,662
- D) \$234,000
- E) \$247,000

Answer: C

Explanation: C)  $\text{CF}_0 = (\$340,000) \text{ CF } 1-6 = \$82,000 \text{ CF } 7 = \$95,000 \text{ NPV} = \$52,661.65$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-2

48) Weston Ltd. is considering investing in a new piece of equipment for its factory. It estimates that the machine will generate an additional \$120,000 per year in revenues. The contribution margin on these incremental revenues is estimated at 40%. Incremental annual fixed costs are estimated to be \$8,200. The equipment would have a salvage value of \$14,000 at the end of 6 years. The company's required rate of return is 13%. What is the net present value of this investment if the equipment costs \$250,000? (Ignore income taxes.)

- A) \$2,800
- B) (\$51,393)
- C) \$204,803
- D) \$11,768
- E) (\$84,173)

Answer: E

Explanation: E) Annual cash flows:

$$\text{CM} = 40\% \times \$120,000 = \$48,000$$

$$\text{Incremental Annual CF} = \$48,000 - \$8,200 = \$39,800 \text{ (years 1-5) [PV} = \$139,986]$$

$$\text{Year 6 CF} = \$39,800 + \$14,000 = \$53,800 \text{ [PV} = \$25,841]$$

$$\text{PV of Cash in} = \$165,827$$

$$\text{Cash In - Initial investment} = \$165,827 - \$250,000 = (\$84,173)$$

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-2

*Answer the following questions using the information below:*

Jonesville Hospital has been considering the purchase of a new x-ray machine. The existing machine is operable for five more years and will have a zero disposal price. If the machine is disposed now, it may be sold for \$90,000. The new machine will cost \$650,000 and an additional cash investment in working capital of \$20,000 will be required. The new machine will reduce the average amount of time required to take the x-rays and will allow an additional amount of business to be done at the hospital. The investment is expected to net \$60,000 in additional cash inflows during the year of acquisition and \$230,000 each additional year of use. The new machine has a five-year life, and zero disposal value. These cash flows will generally occur throughout the year and are recognized at the end of each year. Income taxes are not considered in this problem. The working capital investment will not be recovered at the end of the asset's life.

49) What is the net present value of the investment, assuming the required rate of return is 12%? Would the hospital want to purchase the new machine?

A) \$(97,340); no

B) \$51,430; no

C) \$ 97,340; yes

D) \$166,830; yes

Answer: C

Explanation: C)

Yr. 0  $(\$90,000 - \$650,000 - \$20,000) \times 1.000 = \$(-580,000)$

Yr. 1  $\$60,000 \times 0.893 = 53,580$

Yr. 2  $\$230,000 \times 0.797 = 183,310$

Yr. 3  $\$230,000 \times 0.712 = 163,760$

Yr. 4  $\$230,000 \times 0.636 = 146,280$

Yr. 5  $\$230,000 \times 0.567 = \underline{130,410}$   
\$ 97,340

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-2

50) What is the net present value of the investment, assuming the required rate of return is 20%? Would the hospital want to purchase the new machine?

- A) \$33,910; yes
- B) \$(33,910); no
- C) \$(33,910); yes
- D) \$50,700; yes

Answer: B

Explanation: B)

Yr. 0	$(\$90,000 - \$650,000 - \$20,000) \times 1.000 =$	$\$(580,000)$
Yr. 1	$\$60,000 \times 0.833 =$	49,980
Yr. 2	$\$230,000 \times 0.694 =$	159,620
Yr. 3	$\$230,000 \times 0.579 =$	133,170
Yr. 4	$\$230,000 \times 0.482 =$	110,860
Yr. 5	$\$230,000 \times 0.402 =$	<u>92,460</u>
		<u><math>\\$(33,910)</math></u>

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-2

51) The Zero Machine Company is evaluating a capital expenditure proposal that requires an initial investment of \$20,960 and has predicted cash inflows of \$5,000 per year for 10 years. It will have no salvage value.

Required:

- a. Using a required rate of return of 16%, determine the net present value of the investment proposal.
- b. Determine the proposals internal rate of return.

Answer:

a. Initial investment	$\$(20,960.00)$
Pmt = 5,000; n = 10, i = 16	<u>24,166.14</u>
Net present value	<u><math>\\$3,206.14</math></u>

- b. Present value factor of an annuity of  $\$1.00 = \$20,960 / \$5,000 = 4.192$ .

From the annuity table, the 4.192 factor is closest to the 10-year row at the 20% column. Therefore, the IRR is 20%; or, using a calculator: 20.0033%

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2

52) Next Service Centre is considering purchasing a new computer network for \$82,000. It will require additional working capital of \$13,000. Its anticipated eight-year life will generate additional client revenue of \$33,000 annually with operating costs, excluding depreciation, of \$15,000. At the end of eight years, it will have a salvage value of \$9,500 and return \$5,000 in working capital. Taxes are not considered.

Required:

- If the company has a required rate of return of 14%, what is the net present value of the proposed investment?
- What is the internal rate of return?

Answer:

a.

	<b>Predicted Cash Flows</b>	<b>Year(s)</b>	<b>PV Factor</b>	<b>PV of Cash Flows</b>
Initial investment	\$(95,000)	0	1.000	\$(95,000)
Annual operations, net	18,000	1 - 8	4.639	83,502
Salvage value, work cap	14,500	8	0.351	<u>5,090</u>
Net present value				<u><u>\$(6,408)</u></u>

- Trial and error is necessary. You know it is below 14% because the answer to Part A was negative and, therefore, less than the discount rate. Therefore, let's try 12%.

	<b>Predicted Cash Flows</b>	<b>Year(s)</b>	<b>PV Factor</b>	<b>PV Of Cash Flows</b>
Initial investment	\$(95,000)	0	1.000	\$(95,000)
Annual operations, net	18,000	1 - 8	4.968	89,424
Salvage value, work cap	14,500	8	0.404	<u>5,858</u>
Net present value				<u><u>\$ 282</u></u>

The (almost) zero net present value indicates an internal rate of return of approximately 12%.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-2



53) Anderson Equipment Manufacturing produces equipment for the natural gas industry. The company management is considering purchasing new controllers for the fabricating machines. The new controllers are expected to increase efficiency and product quality. The engineering staff estimate that annual net cash savings from increased efficiency will be \$35,000 per year for four years. The existing controllers can be sold for \$8,000. The new controllers have a purchase price of \$75,000 and will require installation costs in the amount of \$4,500. The annual software contract for the new controllers is \$1,700; the controllers will be depreciated using the straight-line method. The salvage value of the new controllers at the end of four years is estimated to be \$10,000. The company has a required rate of return of 15%.

Required:

- a. Determine the net present value of the investment in the new controllers.
- b. Calculate the internal rate of return of the investment in the new controllers.

Answer:  $CF_0 = \$8,000 - \$75,000 - \$4,500 = -\$71,500$

$CF_{1-3} = \$35,000 - \$1,700 = \$33,300$

$CF_4 = \$33,300 + \$10,000 = \$43,300$

a. NPV calculator = \$ 29,288.31

b. IRR calculator = 33.3%

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-2

54) Lion Enterprises Inc. is evaluating 3 investment alternatives. Each alternative requires a cash outflow of \$102,000. The cash inflows are summarized below (ignore taxes):

	Project A	Project B	Project C
Year 1	\$55,000	\$30,000	\$0
Year 2	\$40,000	\$30,000	\$0
Year 3	\$20,000	\$30,000	\$45,000
Year 4	\$5,000	\$30,000	\$55,000
Year 5	\$2,000	\$30,000	\$65,000

The company has a required rate of return of 9%.

Required:

Evaluate and rank each alternative using net present value (NPV).

Answer: Project A

NPV = \$2,411.57

CF0 - \$102,000 CF1 = \$55,000 CF2 = \$40,000 CF3 = \$20,000 CF4 = \$5,000 CF5 = \$2,000

Or individual cash flows PV = \$50,458.72 + \$33,667.20 + \$15,443.67 + \$3,542.13 + \$1,299.86 = \$104,411.58

\$104,411.58 - \$102,000 = \$2,411.58

Project B

NPV = \$14,689.54

CF0 - \$102,000 CF1 to 5 = \$30,000

or PV of \$30,000 annuity 5n 9% = \$116,689.54

\$116,689.54 - \$102,000 = \$14,689.54

Project C

NPV = \$13,957.18

CF0 - \$102,000 CF1 to 2 = \$0 CF3 = \$45,000 CF4 = \$55,000 CF5 = \$65,000

or individual cash flows PV = \$0 + \$0 + \$34,748.26 + \$38,963.39 + \$42,245.54 = \$115,957.19

\$115,957.19 - \$102,000 = \$13,957.19

Ranking B #1, C#2, A#3

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2

55) Toys and Junk Company is evaluating a capital expenditure proposal that requires an initial investment of \$16,004 and has predicted cash inflows of \$4,000 per year for 15 years. It will have no salvage value.

Required:

- a. Using a required rate of return rate of 14 percent, determine the net present value of the investment proposal.
- b. Determine the proposals internal rate of return.

Answer:

a.

	<u>Predicted</u> <u>cash flows</u>	<u>Year or</u> <u>years</u>	<u>PV</u> <u>factor</u>	<u>PV of</u> <u>cash flows</u>
Initial investment	\$(16,004)	0	1.000	\$(16,004)
Annual operations	4,000	15	6.142	<u>24,568</u>
Net present value				<u>\$8,564</u>

b.

Present value factor of an annuity of \$1.00 =  $\$16,004 / \$4,000 = 4.001$

From annuity table, the 4.001 factor is found on the 15-year row at the 24 percent column. Therefore the IRR is 24 percent.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2

56) Mercury Ltd. is considering purchasing laser equipment for \$72,000. The machine will require additional working capital of \$8,000. Its anticipated seven-year life will generate additional revenue of \$31,000 annually with operating costs, excluding depreciation, of \$14,000. At the end of seven years it will have a salvage value of \$9,760 and return \$8,000 in working capital.

Required:

- If the company has a required rate of return of 12 percent, what is the net present value of the proposed investment?
- What is the internal rate of return?

Answer:

a.

	Predicted <u>cash flows</u>	Year or <u>years</u>	PV <u>factor</u>	PV of <u>cash flows</u>
Initial investment	\$(80,000)	0	1.000	\$(80,000)
Annual operations, net	17,000	1-7	4.564	77,588
Salvage value, work cap.	17,760	7	0.452	<u>8,028</u>
Net present value				<u>\$5,616</u>

b.

Trial and error or use calculator. You know it is above 12 percent because the answer to Part A was positive and therefore greater than the discount rate. Therefore, let's try 14 percent.

	Predicted <u>cash flows</u>	Year or <u>years</u>	PV <u>factor</u>	PV of <u>cash flows</u>
Initial investment	\$(80,000)	0	1.000	\$(80,000)
Annual operations, net	17,000	1-7	4.288	72,896
Salvage value, work cap.	17,760	7	0.400	<u>7,104</u>
Net present value				<u>\$ -0-</u>

The zero net present value indicates an internal rate of return of exactly 14 percent.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-2

57) What conflicts can arise between using discounted cash flow methods for capital budgeting decisions and accrual accounting for performance

Answer: Using accrual accounting to evaluate the performance of a manager may create conflicts with using discounted cash flow (DCF) methods for capital budgeting because frequently a project using a DCF method will not report strong operating income results in the early years of the project under accrual accounting. If this is the case, a manager might be tempted not to use DCF methods even though the decisions based on them might be in the best interests of the company over the long run. The conflict can be reduced by evaluating managers on a project-by-project basis and by looking at their ability to achieve the amounts and timing of forecasted cash flows.

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-2

58) Retail Outlet is looking for a new location near a shopping mall. It is considering purchasing a building rather than leasing, as it has done in the past. Three retail buildings near a new mall are available but each has its own advantages and disadvantages. The owner of the company has completed an analysis of each location which includes considerations for the time value of money. The information is as follows:

	<u>Location A</u>	<u>Location B</u>	<u>Location C</u>
Internal rate of return	13%	17%	20%
Net present value	\$25,000	\$40,000	\$20,000

The owner does not understand how the location with the highest percentage return has the lowest net present value.

Required:

Explain to the owner the probable cause(s) of the comparable differences.

Answer: Location C may have a much lower initial investment than the other two. Therefore, it could show a higher rate of return with fewer dollars of inflow. Unfortunately, this may cause it to have the lowest net present value since this model is presented in dollar terms. Location C could also have a shorter life which could give it a higher percentage return during its life but fewer dollars overall.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2

59) A capital investment project typically has three categories of cash flows: (1) net initial investment; (2) cash flow from operations; and (3) terminal disposal and recovery of investment(s)

Required:

Complete the following list of components for each category:

Net initial investment

1. cost of asset acquisition
2. \_\_\_\_\_
3. \_\_\_\_\_

Cash flow from operations

1. \_\_\_\_\_
2. \_\_\_\_\_

Terminal disposal and recovery of investment(s)

1. \_\_\_\_\_
2. \_\_\_\_\_

Answer: Net initial investment

1. cost of asset acquisition
2. initial working capital investment
3. after-tax cash flow from current disposal of old asset

Cash flows from operations

1. annual after-tax cash flow from recurring operations
2. income tax cash savings from annual CCA

Terminal disposal and recovery of investment(s)

1. after-tax cash flow from terminal disposal of machines
2. after-tax cash flow from terminal recovery of working capital investment

Diff: 2 Type: ES

Skill: Remember

Objective: LO 20-2

20.3 Analyze the impact of income taxes on discounted cash flows and capital budgeting decisions.

1) After-tax savings from an operating cash inflow are calculated by multiplying the cash flow by  $(1 - t)$ , where  $t$  = the tax rate.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3

2) The Income Tax Act does not permit a company to deduct depreciation expense in the calculation of taxable income.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3

3) Capital cost allowance is the income tax version of financial reporting depreciation.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3

4) A Canadian corporation can deduct a full year's worth of CCA on any asset acquired in the year.

Answer: FALSE

Explanation: Half-year rule applies

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

5) The half-year rule assumes that all net additions are purchased in the middle of the year, and thus only one-half of the stated CCA rate is allowed in the first year.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

6) Capital Cost Allowance (CCA) is a cash flow.

Answer: FALSE

Explanation: CCA times the marginal tax rate is the cash flow from tax savings.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

7) CCA reduces taxable income, and therefore reduces tax payments and increases the firm's cash flow.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3

8) The Income Tax Act classifies every amortizable asset into one of several classes.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3

9) The acquisition cost of the assets in a class, minus the CCA claimed to date for that class, is referred to as the UCC of a particular class.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3

10) Capital cost allowance tax deductions result in tax savings that partially offset the cost of acquiring the capital asset.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-3

11) The use of an accelerated method of depreciation for tax purposes would usually increase the present value of the investment.

Answer: TRUE

Diff: 3 Type: TF

Skill: Understand

Objective: LO 20-3

12) In the net present value (NPV) method, after-tax cash flows should be used instead of pre-tax cash flows when taxes are a consideration.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-3

13) A decrease in the tax rate will decrease the net present value (NPV) for a given capital budgeting project.

Answer: FALSE

Explanation: A decrease in the tax rate will increase the net present value (NPV) for a given capital budgeting project.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-3

14) The tax effects are significant in capital budgeting decisions.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-3



15) Businesses may opt not to claim the full amount of available capital cost allowance.

Answer: TRUE

Explanation: The available CCA represents a maximum not a minimum.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

16) The disposal of a machine (or any depreciable asset) results in a lost tax shield.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

17) In capital budgeting the relevant tax rate is the average tax rate for the company.

Answer: FALSE

Explanation: The relevant tax rate is the marginal tax rate for the company.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

18) The minimum capital cost allowance (CCA) that a corporation may claim in a given year is the undepreciated capital cost of a particular pool times the CCA rate for that pool.

Answer: FALSE

Explanation: The minimum is zero, the maximum is as presented except for the year of acquisition.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-3

19) After-tax cash operating flows are equal to

A)  $(1 - \text{tax rate}) \times (\text{net income})$ .

B)  $(1 - \text{tax rate}) \times (\text{operating income}) + \text{CCA}$ .

C)  $(1 - \text{tax rate}) \times (\text{sales less costs excluding CCA})$ .

D)  $\text{sales less } (1 - \text{tax rate}) \times (\text{cash costs})$ .

E)  $(1 - \text{tax rate}) \times (\text{sales less costs including CCA})$ .

Answer: C

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-3

20) When considering the net cash inflows resulting from a capital budgeting decision, taxes will

- A) reduce the amount of the cash savings by  $(1 + \text{tax rate})$ .
- B) increase the amount of the cash savings by the tax rate.
- C) increase the amount of the cash savings by  $(1 - \text{tax rate})$ .
- D) reduce the amount of the cash savings by  $(1 - \text{tax rate})$ .
- E) increase the amount of the cash savings by  $(1 + \text{tax rate})$ .

Answer: C

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-3

21) A capital proposal is projected to result in annual savings of \$25,000. What is the after-tax cash flow if the tax rate is 35%?

- A) \$25,000
- B) \$16,250
- C) \$8,750
- D) \$7,500
- E) \$33,750

Answer: B

Explanation: B)  $\$25,000 \times (1 - .35) = \$16,250$

Diff: 1 Type: MC

Skill: Apply

Objective: LO 20-3

22) Wilf Company acquired an additional Class 10 (30% declining balance) asset for \$60,000. The UCC at the beginning of the year was \$100,000. The maximum CCA in the current year is

- A) \$48,000.
- B) \$24,000.
- C) \$45,000.
- D) \$37,500.
- E) \$39,000.

Answer: E

Explanation: E)  $(100,000 + (.5 \times 60,000)) \times 30\% = \$39,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-3

23) Better Products Ltd. had annual net income of \$20,000, CCA of \$40,000, a 40 percent tax rate, a discount rate of 10 percent and annual cash sales of \$200,000. The depreciable assets of Better Products belong in several different classes under the Income Tax Act, have a salvage value of zero at the end of six years, and were all bought new at the beginning of Year 1. What is the tax saving from CCA?

- A) \$16,000
- B) \$24,000
- C) \$36,000
- D) \$56,000
- E) \$14,400

Answer: A

Explanation: A)  $(\$40,000 \times 0.40) = \$16,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-3

24) If the appropriate tax rate is 35%, the after-tax effect of a single CCA deduction of \$60,000 is

- A) \$39,000 net after-tax cash outflow.
- B) \$39,000 net after-tax cash inflow.
- C) \$21,000 net after-tax cash outflow.
- D) \$21,000 net after-tax cash inflow.
- E) \$81,000 net after-tax cash inflow.

Answer: D

Explanation: D)  $\$60,000 \times .35 = \$21,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-3

25) Biermann Equipment is a publicly held corporation required to pay income taxes. For the current year it had revenues of \$5,000,000 and cash expenses of \$3,000,000, and claimed CCA of \$200,000. The company has a 30 percent tax rate. What would be the net cash flow for the current year if all revenues and expenses were in cash?

- A) \$1,190,000
- B) \$1,260,000
- C) \$1,460,000
- D) \$1,800,000
- E) \$2,000,000

Answer: C

Explanation: C) Revenue	\$5,000,000	
Expenses other than CCA	\$3,000,000	
Income taxes	<u>540,000</u>	<u>3,540,000</u>
Net cash flow		<u>\$1,460,000</u>

Income taxes =  $30\% \times (\$5,000,000 - \$3,000,000 - \$200,000) = \$540,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-3

- 26) The three factors that generally influence depreciation under IFRS/ASPE are: amount allowable for depreciation, allowable life of asset, and allowable methods of depreciation. In Canada, for tax purposes
- A) the amount allowable for CCA is the cost of the asset, and, the allowable life of asset and the amount of salvage value are determined by its Class under the Income Tax Act.
  - B) the amount allowable for CCA is the cost of the asset; the tax-based depreciation rate is determined by the Class of the asset under the Income Tax Act, and neither the estimated life of asset nor the amount of estimated salvage value are relevant in calculating the CCA claim.
  - C) the allowable depreciation for tax purposes (CCA) is increased for the first year only.
  - D) depreciable assets are placed in various classes by the Income Tax Act, based on their estimated salvage value.
  - E) in the year of acquisition of new assets into an existing pool the allowable CCA claim is based on 50% of all the assets in the pool.

Answer: B

Diff: 3 Type: MC

Skill: Remember

Objective: LO 20-3

- 27) Which of the following statements is TRUE?

- A) The accounting book value for all assets in a class equals the UCC for that class.
- B) The CCA claimed does not affect cash outflows.
- C) The total CCA available over the life of the asset depends on the method of depreciation used.
- D) Since CCA does not involve a cash expenditure, it can be ignored in capital-budgeting decisions.
- E) The depreciation method used does not affect cash inflows from operations.

Answer: E

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-3

- 28) A company purchased a class 8 asset (there were no disposals). If the asset cost \$20,000, had an estimated salvage value of \$5,000, using the declining balance method with an allowable rate of 20%, the allowable CCA in the first and second years would be, respectively

- A) \$1,500 and \$2,700.
- B) \$2,000 and \$3,600.
- C) \$2,000 and \$4,000.
- D) \$3,000 and \$2,400.
- E) \$4,000 and \$4,000.

Answer: B

Explanation: B) First year ( $\$20,000 \times .5 \times 20\%$ ) = \$2,000

Second year ( $\$20,000 - \$2,000 \times 20\%$ ) = \$3,600

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-3

29) The income tax depreciation method referred to as CCA

- A) allows a corporation some flexibility in choosing the class to which an asset is assigned.
- B) ignores estimated salvage value.
- C) only applies to businesses organized as corporations.
- D) provides an organization some flexibility in choosing a method of amortization.
- E) allows amortization over the asset's useful life as determined by management.

Answer: B

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-3

30) A project's net present value is increased if

- A) the CCA rate is decreased.
- B) the discount rate is increased.
- C) the CCA rate is increased.
- D) the company's net income is negative during the life of the project.
- E) the rate of inflation rises.

Answer: C

Diff: 3 Type: MC

Skill: Understand

Objective: LO 20-3

31) Which of the following are not considered in capital-budgeting?

- A) initial machine investment
- B) depreciation
- C) cash flow from current disposal of old machine
- D) cash flow from terminal disposal of new machine
- E) recurring after-tax operating flows

Answer: B

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-3

32) Which of the following is not a relevant cash flow in capital budgeting?

- A) after-tax cash flow from current disposal of old asset
- B) after-tax cash flow from future disposal of asset at life's end
- C) after-tax cash flow from accumulated depreciation
- D) initial asset investment of the replacement machine
- E) after-tax annual cash flows relating to the new asset

Answer: C

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-3

33) A new machine will cost \$500,000. It is in a CCA class pool that uses a declining balance rate of 30%. The company's tax rate is 40% and it requires a 15% rate of return on investments. Calculate the present value of the the tax shield the first year assuming the savings occur at year end.

- A) \$126,998.42
- B) \$78,214.34
- C) \$52,173.91
- D) \$119,765.22
- E) \$26,086.96

Answer: E

Explanation: E) Yr. 1 CCA  $\$500,000 \times 1/2 \times 0.30 = \$75,000$ ;  $\$75,000 \times 0.40 = \$30,000$ ; PV = \$26,086.96

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-3

34) A new machine will cost \$720,000. It is in a CCA class pool that uses a declining balance rate of 20%. The company's tax rate is 42% and it requires a 12% rate of return on investments. Calculate the present value of the the tax shield the first year assuming the savings occur at year end.

- A) \$60,480.00
- B) \$54,000.00
- C) \$27,000.00
- D) \$30,240.00
- E) \$37,285.71

Answer: C

Explanation: C) Yr. 1 CCA  $\$720,000 \times 1/2 \times 0.20 = \$72,000$ ;  $\$72,000 \times 0.42 = \$30,240$ ; PV = \$27,000

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-3

35) A new machine will cost \$1,800,000. It is in a CCA class pool that uses a declining balance rate of 30%. The company's tax rate is 38% and it requires a 9% rate of return on investments. Calculate the present value of the the tax shield the first year assuming the savings occur at year end.

- A) \$153,577.98
- B) \$188,256.88
- C) \$167,400.00
- D) \$94,128.44
- E) \$102,600.00

Answer: D

Explanation: D) Yr. 1 CCA  $\$1,800,000 \times 1/2 \times 0.30 = \$270,000$ ;  $\$270,000 \times 0.38 = \$102,600$ ; PV = \$94,128.44

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-3

*Use the information below to answer the following question(s).*

Albernie Ltd. purchased a CCA Class 8 (CCA rate of 20%) item of equipment for \$90,000. The equipment was the only item in the Class 8 capital cost allowance pool. The equipment is expected to generate savings in the amount of \$40,000 per year. The company uses straight-line depreciation, estimates a 3 year useful life with \$20,000 salvage value for the new equipment. The tax rate is 35%, and Albernie has a required rate of return of 9.0%.

36) What is the maximum capital cost allowance that Albernie Ltd. can claim in year 2, if the maximum was claimed in year 1?

- A) \$11,200
- B) \$12,600
- C) \$18,000
- D) \$16,200
- E) \$14,400

Answer: D

Explanation: D) UCC end of year 1:  $\$90,000 - [(\$90,000 \times 1/2) \times 20\%] = \$81,000$

CCA year 2:  $\$81,000 \times 20\% = \$16,200$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-3

37) What is present value of the after-tax savings that Albernie Ltd. expects during the useful life of the equipment?

- A) \$65,814
- B) \$101,252
- C) \$81,257
- D) \$50,370
- E) \$42,188

Answer: A

Explanation: A) After tax savings =  $\$40,000 \times (1-35\%) = \$26,000$

PV of three year annuity of \$26,000 at a discount rate of 9% = \$65,813.66

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-3

38) What is present value of the tax shield that Albernie Ltd. can expect from the equipment?

- A) \$ 18,124
- B) \$ 17,099
- C) \$ 12,816
- D) \$ 7,667
- E) \$ 10,222

Answer: B

Explanation: B) =  $[(\$90,000 \times 20\% \times 35\%)/(20\% + 9\%)] \times [(1 + (0.5 \times 9\%))/(1 + 9\%)]$  minus  
 $[(\$20,000 \times 20\% \times 35\%)/(20\% + 9\%)] \times [1/(1 + 9\%)^3]$   
=  $(\$21,724.14 \times .9587)$  minus  $(\$4,827.59 \times 0.7712)$   
= \$17,099.49

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-3

39) What is present value of the salvage value that Albernie Ltd. is expecting from the equipment?

- A) \$ 15,897
- B) \$ 20,000
- C) \$ 15,444
- D) \$ 11,574
- E) \$ 14,169

Answer: C

Explanation: C) FV = 20,000; i = 9; n = 3  
\$15,443.67

Diff: 1 Type: MC

Skill: Apply

Objective: LO 20-3

40) What is the net present value of the Albernie Ltd. investment in equipment?

- A) \$ 1,480
- B) \$ (1,075)
- C) \$ 89,799
- D) \$ 8,357
- E) \$ 9,382

Answer: D

Explanation: C)  
D) - \$90,000 + \$65,814 + \$ 17,099 + \$ 15,444 = \$8,357

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-3



41) Clock Manufacturing Company purchased a new piece of equipment at a cost of \$60,000 at the beginning of the year. For tax purposes the machine is a Class 8 asset (20% declining balance). The company has a 34 percent income tax rate. Assume that the company has no other Class 8 assets during the period.

Required:

- Compute the amount of tax savings from CCA for the first three years.
- Compute the amount of tax savings from CCA for the first three years using a required rate of return of 12 percent.

Answer:

- Tax savings = total CCA  $\times$  tax rate

<u>Calculation of CC</u>						
year	Ending Opening UCC	Addition	Half Yr Rule	CCA Rate	CCA	UCC balance
1	nil	\$60,000	0.5	.20	6,000	\$54,000
2	54,000	0	n/a	.20	10,800	43,200
3	43,200	0	n/a	.20	<u>8,640</u>	34,560
Total CCA					<u>\$25,440</u>	

Therefore, tax savings = \$25,440  $\times$  0.34 = \$8,649.60

- Calculation of present value of tax savings

<u>Present Value</u>			
year	Tax savings	Pv factor	Tax Savings
1	\$2,040	0.893	\$1,822
2	3,672	0.797	\$2,927
3	2,938	0.712	<u>\$2,092</u>
Total			\$6,841

By Calculator: \$6,839.93

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-3

42) Headwaters Ltd. is considering purchasing a new asset. It has a cost of \$1,350,000, an expected 6 year life and a salvage value of \$90,000. The equipment would qualify as a class 8 (20% CCA) asset and Headwaters has a required rate of return of 11% and an effective tax rate of 32%.

Required:

Calculate the tax shields that are generated from the purchase of this asset. Assume the asset will be placed in a pool and the pool will continue upon disposition. For tax purposes the disposition will occur on day 1 of Year 7. What is the net tax effect of the asset acquisition?

Answer: =  $\frac{(\$1,350,000 \times 20\% \times 32\%)/(20\% + 11\%)}{1 + (0.5 \times 11\%)} \times \frac{1}{(1 + 11\%)^6}$  minus  $\frac{(\$90,000 \times 20\% \times 32\%)/(20\% + 11\%)}{1 + 11\%}$   
 =  $(\$278,709.68 \times 0.9505)$  minus  $(18,580.65 \times 0.5346)$   
 = \$254,965.77 (difference due to rounding)

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-3

43) Johnson's Mini Mart is considering the purchase of a new electronic bar code scanner that will keep detailed records of every sale transaction. The scanner is likely to have little effect on operating revenues and expenses. Its acquisition is primarily for increasing management information about sales. The scanner costs \$4,600 and would be included in Class 8 for tax purposes. Johnson's accountant has stated that due to the fast write-off of Class 8 assets (20% CCA rate), its real cost is less than \$4,600.

Due to technological obsolescence, it would have zero salvage value.

Required:

- Since the bar code scanner cannot produce a profit or even show short run savings, should it even be evaluated as a capital budgeting expenditure? Explain.
- Explain whether or not the real cost is less than \$4,600.
- If the company has a 40 percent tax rate and a 10% discount rate, compute the real cost of the bar code scanner. Assume there would be other assets in the class.

Answer:

- Yes, it represents an expenditure that will produce benefits to the shop for a period beyond the current operating cycle. The benefits of long-run management information are generally difficult to quantify.
- The real cost is less than the \$4,600 because the tax savings from CCA reduce the actual outlay of the asset, although the tax savings are in future years.
- Tax Shield =  $\frac{(\$4,600 \times 20\% \times 40\%)/(20\% + 10\%)}{1 + (0.5 \times 10\%)} = \$1,170.91$

Because the asset has a PV of tax savings of \$1,170.91, its real cost is \$4,600 - \$1,170.91 or \$3,429.09

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-3

44) Windpower Systems Maintenance Ltd. purchased a CCA Class 10 (CCA rate of 30%) vehicle for \$360,000. The vehicle was the only item in the Class 10 capital cost allowance pool. The vehicle is expected to generate net cash income, excluding any tax effects, in the amount of \$70,000 per year. The company uses straight-line depreciation, estimates a 6 year useful life with a \$40,000 salvage value for the new vehicle at the end of year 6. The marginal tax rate is 35% and the company's average tax rate is 25%. Management requires a rate of return of 15.0%. Assume that cash flows occur at the end of the year.

Required:

- a. What is the unamortized capital cost at the beginning of year 2 if the maximum capital cost allowance that is allowed is taken in the first year?
- b. What is the net present value of the investment in the vehicle?

Answer:

$$a. \$360,000 - [\$360,000 \times (30\% \times 1/2)] = \$306,000$$

- b. Net present value

$$1. \text{ PV of after-tax net cash income: } pmt = \$70,000 \times (1 - 0.35); i = 15\%; n = 6 \\ = \$172,194$$

$$2. \text{ PV tax shield:} \\ = [(\$360,000 \times 30\% \times 35\%)/(30\% + 15\%)] \times [(1 + (0.5 \times 15\%))/(1 + 15\%)] \text{ minus } [(\$40,000 \\ \times 30\% \times 35\%)/(30\% + 15\%)] \times [1/(1 + 15\%)^6] \\ = (\$84,000.00 \times 0.9348) \text{ minus } (\$9,333.33 \times 0.4323) \\ = \$74,487 \text{ (difference due to rounding)}$$

$$3. \text{ PV of salvage value: } FV = \$40,000; i = 15\%; n = 6 \\ = \$17,293$$

$$NPV = -\$360,000 + \$172,194 + \$74,487 + \$17,293 = \$ (96,026)$$

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-3

45) Explain why the term tax shield is used in conjunction with amortization.

Answer: Amortization tax deductions result in tax savings which offset the cost of acquiring the capital equipment. The more rapid for tax purposes an asset's costs can be written off for tax purposes, the earlier the reductions in taxes can be realized. The term tax shield refers to the reduction in the tax payments owed. Thus the faster the amortization, the earlier the reductions in taxes and the greater the net present value of the tax shield.

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-3

20.4 Apply the concept of relevance to DCF methods of capital budgeting.

1) Initial machine investment costs include cash outflows for installation and transportation.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-4

2) Relevant cash flows are expected future cash flows that differ among the alternative uses of investment funds.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-4

3) In determining whether to keep a machine or replace it, the original cost of the machine is always a relevant factor.

Answer: FALSE

Explanation: In determining whether to keep a machine or replace it, the original cost of the machine is a sunk cost and is not a relevant factor.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-4

4) In determining whether to keep a machine or replace it, the net book value of the machine is irrelevant.

Answer: TRUE

Explanation: The net book value is comprised of historical (original) cost and accumulated depreciation. It is not a future cost and is thus irrelevant.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-4

5) The after-tax cash inflow from the terminal disposal value of the investment is usually a significant factor in capital budgeting decision making.

Answer: FALSE

Explanation: Usually insignificant because the discounted value is usually small relative to the other cash flows.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-4

- 6) The initial investment in working capital is usually recovered
- A) in year 0.
  - B) in year 1.
  - C) when the project is terminated.
  - D) in equal portions, with the recovery of the initial investment, based on the matching of revenues and all costs.
  - E) as soon as the RRR is achieved.

Answer: C

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-4

- 7) In capital budgeting decisions, relevant cash flows
- A) are actual cash flows that differ between alternatives.
  - B) are actual cash flows that do not differ between alternatives.
  - C) are expected future cash flows that differ between alternatives.
  - D) are expected future cash flows that do not differ between alternatives.
  - E) are past cash flows lost.

Answer: C

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-4

- 8) Which of the following is NOT a major category of cash flows in capital budgeting?
- A) initial investment in machines
  - B) recurring operating cash flows
  - C) cash flows from dispositions of assets
  - D) management and labour allocation deductions
  - E) initial working capital investment

Answer: D

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-4

- 9) A project has a net initial investment of \$500,000 and the cash flows cover five years. The project involves replacing an old machine with a new machine at the same time. Which of the following is TRUE based on the above assumptions, in NPV analysis?
- A) The book value of the old machine is relevant.
  - B) Recurring operating cash flows cannot be positive and negative.
  - C) Incremental working capital investment is irrelevant.
  - D) Any cash received from the disposal of the old machine would be a relevant cash flow for end of year 1.
  - E) Errors in forecasting the terminal disposal price of the new machine are seldom critical on long-duration projects.

Answer: E

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-4

10) Depreciation charges

- A) are not relevant in capital budgeting decisions, because they are not discounted.
- B) are not relevant because they are not cash flows.
- C) are considered an element of cash flows, and are thus relevant.
- D) affect the ending balance of operating income, and are thus relevant.
- E) are relevant because they relate to capital items.

Answer: B

Diff: 3 Type: MC

Skill: Understand

Objective: LO 20-4

11) The terminal disposal price of a replacement machine

- A) generally increases cash inflow in the year of disposal.
- B) is the total of the salvage values of the old machine and the new machine.
- C) is the salvage value of the old machine.
- D) is the NPV value of the new machine salvage value.
- E) is the NPV of the salvage value of the old machine.

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-4

12) A company is considering purchasing a new machine, at a cost of \$50,000. This amount will be written off over 5 years at \$10,000 per year. In the first year the company will have to increase its accounts receivable by \$4,000, and inventory by \$8,000. The disposal value of the machine being replaced is \$1,500 and will be used to offset the amount borrowed for the new machine. What is the initial working capital investment required for the purpose of capital budgeting?

- A) \$8,000
- B) \$60,500
- C) \$10,500
- D) \$12,000
- E) \$4,000

Answer: D

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-4

13) A company is considering purchasing new equipment. The equipment will allow the company to expand into a new product line. The equipment will be installed in the company's existing facility. Which of the following cash flows would NOT be relevant to the decision to acquire the new equipment?

- A) factory rent allocated to the new product line
- B) labour costs to operate the new equipment
- C) revenues from expanded production
- D) annual maintenance cost on the new equipment
- E) the salary of the manager hired to oversee the new product line

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-4

14) EIF Manufacturing company needs to overhaul its drill press or buy a new one. The facts have been gathered, and are as follows:

	Current <u>machine</u>	New <u>          </u>
Purchase price, new	\$80,000	\$100,000
Current book value	30,000	
Overhaul needed now	40,000	
Annual cash operating costs	70,000	40,000
Current salvage value	20,000	
Salvage value in five years	5,000	20,000

Required:

Based on present value analysis, which alternative is the most desirable with a current required rate of return of 20 percent? Show computations, ignore tax effect.

Answer: Present value of keeping current system:

	Predicted <u>cash flows</u>	Year or <u>years</u>	PV <u>factor</u>	PV of <u>cash flows</u>
Overhaul	\$(40,000)	0	1.000	\$(40,000)
Annual operations	(70,000)	1-5	2.991	(209,370)
Salvage value	5,000	5	0.402	<u>2,010</u>
Net present value				<u>\$(247,360)</u>

Calculator \$(247,333.46)

Present value of new system:

	Predicted <u>cash flows</u>	Year or <u>years</u>	PV <u>factor</u>	PV of <u>cash flows</u>
Investment	\$(100,000)	0	1.000	\$(100,000)
Salvage value, old	20,000	0	1.000	20,000
Annual operations	(40,000)	1-5	2.991	(119,640)
Salvage value	20,000	5	0.402	<u>8,040</u>
Net present value				<u>\$(191,600)</u>

Calculator \$(191,586.93)

Buying the new equipment is the most desirable by \$55,760 (\$247,360 - \$191,600).

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-4



15) ABC Boat Company is interested in replacing a moulding machine with a new improved model. The old machine has a salvage value of \$20,000 now and a predicted salvage value of \$4,000 in six years, if rebuilt. If the old machine is kept, it must be rebuilt in one year at a predicted cost of \$40,000. The new machine costs \$160,000 and has a predicted salvage value of \$28,000 at the end of six years. The new machine will generate cash savings of \$40,000 for each of the first three years and \$20,000 for each year of its remaining six-year life. Ignore income taxes.

Required:

What is the net present value of replacing the old machine if the company has a required rate of return of 14 percent?

Answer:	Predicted <u>cash flows</u>	Year or <u>years</u>	PV <u>factor</u>	PV of <u>cash flows</u>
Initial investment	\$(160,000)	0	1.000	\$(160,000)
Salvage of old	20,000	0	1.000	20,000
Annual operations	40,000	1-3	2.322	92,880
Annual operations	20,000	4-6	(3.889-2.332)	31,340
Save by not rebuilding	40,000	1	0.877	35,080
Incremental salvage of new	24,000	6	0.456	<u>10,944</u>
Net present value				<u>\$30,244</u>

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-4

16) Crofton Inc. is evaluating new machinery in its foundry. The machinery would replace existing equipment. The new machinery would cost \$230,000, would last 5 years, and would have a salvage value of \$28,000. The existing machinery currently has a net book value of \$52,000 and could be sold for \$38,000. If kept, the old machine would have a salvage value of \$6,000 in 5 years' time. The new machinery is expected to lower direct labour costs by \$18,000 per year. The current variable overhead rate is 120% of direct labour. Other annual cost savings are projected to be \$30,000. Due to the reduction in the production cycle time, working capital requirements will decrease by \$25,000 during the life of the new machine. Ignore income taxes.

Required:

- Compute the net present value of replacing the existing equipment at a 9 percent required rate of return.
- Compute the internal rate of return.

Answer:

a.

$$CF_0 = (\$167,000) = [-\$230,000 + \$38,000 + \$25,000]$$

$$CF_{1 \text{ to } 4} = \$69,600 = [\$18,000 + (\$18,000 \times 120\%) + \$30,000]$$

$$CF_5 = \$66,600 = [\$69,600 + \$28,000 - \$6,000 - \$25,000]$$

Initial investment		(\$230,000)
Salvage of old		\$38,000
Working capital	Increase CF	\$25,000
ACF	\$69,600 ann 5n 9%	\$270,720
Incremental salvage	(\$28,000-\$6,000) 5n 9%	\$14,298
Increase to working cap	(\$25,000) 5n 9%	(\$16,248)
NPV		\$101,770

$$NPV = \$101,769.93$$

b.

$$IRR \text{ by calculator} = 30.54\%$$

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-4

17) Samuel Manufacturing Inc. is evaluating new machinery in its factory. The machinery would replace existing equipment. The new machinery would cost \$430,000, would last 6 years, and would have a salvage value of \$36,000. The existing machinery currently has a net book value of \$72,000 and could be sold for \$65,000. If kept, the old machine would have a salvage value of \$5,000 in 6 years time. The new machinery is expected to lower direct labour costs by \$22,000 per year. The current variable overhead rate is 120% of direct labour. Other annual cost savings are projected to be \$15,000. Due to the reduction in the production cycle time, working capital requirements will decrease by \$8,000 during the life of the new machine. Ignore income taxes.

Required:

- Compute the net present value of replacing the existing equipment at a 12 percent required rate of return.
- Compute the internal rate of return.
- Comment on the efficacy of the use of internal rate of return versus net present value in making this decision.

Answer:

a.

$$CF_0 = (\$357,000) = [-\$430,000 + \$65,000 + \$8,000]$$

$$CF_{1 \text{ to } 5} = \$63,400 = [\$22,000 + (\$22,000 * 120\%) + \$15,000]$$

$$CF_6 = \$86,400 = [\$63,400 + \$36,000 - \$5,000 - 8,000]$$

Initial investment		\$(430,000)
Salvage of old		\$65,000
Working capital	Increase CF	\$8,000
ACF	\$63,400 annuity 6n 12%	\$260,663
Incremental salvage	(\$36,000-\$5,000) 6n 12%	\$15,706
Increase to working cap	(\$8,000) 6n 12%	(\$4,053)
NPV		\$(84,684)

$$NPV = \$(84,684.26)$$

b.

$$IRR \text{ by calculator} = 3.46\%$$

- The calculated value of internal rate of return is erroneous as the NPV is negative. IRR rate of return can be erroneous or ambiguous when there are negative cash flows or when the NPV is negative.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-4

20.5 Assess the complexities in capital budgeting within an interdependent set of value-chain business functions.

1) The payback method measures the time required to recoup the total dollars invested in the project through cash inflows.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-5

2) The payback method discounts cash flows prior to the payback date.

Answer: FALSE

Explanation: The payback method does not discount cash flows.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-5

3) The accrual accounting rate of return is an accounting measure of income divided by an accounting measure of investment.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 20-5

4) The payback method allows for managers to highlight liquidity.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-5

5) The accrual accounting rate of return method has a significant weakness for use in making capital budgeting decisions because it does not track cash flows and it ignores the time value of money.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-5

6) Projects with shorter paybacks always generate more cash flows.

Answer: FALSE

Explanation: This false because payback ignores cash flows beyond the payback period.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-5

7) Which of the following is NOT one of the methods that aid management in analyzing the expected results of capital budgeting decisions?

- A) accrual accounting rate of return
- B) net present value
- C) future-value cash flow
- D) payback method
- E) internal rate of return

Answer: C

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-5

8) The method that measures the time it will take to recoup, in the form of cash inflows, the total dollars invested in a project is called the

- A) the accrued accounting rate of return method.
- B) payback method.
- C) internal rate of return method.
- D) book-value method.
- E) the NPV.

Answer: B

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-5

9) The net initial investment for a new mainframe computer is \$2,000,000. Annual cash flows are expected to increase by \$800,000 per year. The equipment has a 10-year useful life. What is the payback period?

- A) 4.00 years
- B) 2.50 years
- C) 2.00 years
- D) 1.75 years
- E) 0.75 years

Answer: B

Explanation: B)  $\$2,000,000 / \$800,000 = 2.5$  years

Diff: 1 Type: MC

Skill: Apply

Objective: LO 20-5

10) Advantages from using the payback method when capital budgeting include

- A) is useful when future cash flows in later years are uncertain.
- B) promotes long-term projects.
- C) neglects the time value of money.
- D) emphasizes short-term projects.
- E) considers only cash flows during the payback period.

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-5

11) Which of the following is FALSE concerning the payback method of capital budgeting?

- A) It uses the accrual accounting rate of return.
- B) The payback method highlights liquidity.
- C) Its major strength is that it is easy to use.
- D) It does not consider cash flows after the recovery of the initial investment.
- E) Shorter payback periods give an organization more flexibility.

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-5

12) A company is considering purchasing two different high-speed photocopiers. The regular model costs \$4,500 and the deluxe model costs \$6,100. The company has projected cash savings of \$800 for the first year, and then \$850 annually thereafter for both models, but the vendor is claiming that the deluxe model is \$400 cheaper per year to operate than the regular model. What are the payback periods for the Regular and Deluxe models respectively assuming that the vendor is correct?

- A) 4.88 years; 5.63 years
- B) 5.08 years; 5.29 years
- C) 5.29 years; 4.88 years
- D) 5.29 years; 5.63 years
- E) 5.35 years; 4.92 years

Answer: E

Explanation: E) At the end of 5 years, the Regular model has returned  $\$800 + (4 * \$850) = \$800 + \$3,400 = \$4,200$ , leaving \$300 to recover in the 5th year.  $\$300/\$850 = 0.35$  more years. Total = 5.35

At the end of 4 years, the Deluxe model has returned  $\$1,200 + (3 * \$1,250) = \$1,200 + \$3,750 = \$4,950$  leaving \$1,150 left to recover ( $\$6,100 - \$4,950$ ). During the 5th year, the investment will be recovered in  $\$1,150/\$1,250 = 0.92$  more years. Total = 4.92.

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-5

13) An accounting measure of income divided by an accounting measure of investment is called

- A) accrual accounting rate of return.
- B) bailout payback.
- C) book-value method.
- D) rate of return on assets method.
- E) net previous value.

Answer: A

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-5

14) A rental company replaces its heavy drilling machine every four years (no salvage value). It is contemplating acquiring a larger machine, at a cost of \$70,000, which is guaranteed to last for seven years. The current machine can be traded-in for a \$3,000 down payment on the new machine, and the company expects annual savings in operating costs of \$15,000. What is the AARR for the new machine?

- A) 2.86%
- B) 6.85%
- C) 7.14%
- D) 20.55%
- E) 21.43%

Answer: C

Explanation: C) Depreciation is  $\$70,000 \div 7 \text{ years} = \$10,000$  (no salvage)

$[(\$15,000 - \$10,000) \div \$70,000] = 7.14\%$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 20-5

15) Return on investment (ROI) is also known as

- A) internal rate of return.
- B) accrual accounting rate of return.
- C) payback.
- D) net present value.
- E) time-adjusted rate of return.

Answer: B

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-5

*Use the information below to answer the following question(s).*

Saturn Ltd. wants to automate one of its production processes. The new equipment will cost \$180,000. In addition, Saturn will incur installation and testing costs of \$5,000 and \$8,500 respectively. The expected life of the equipment is 8 years and the salvage value of the equipment is estimated at \$18,000. The annual cash savings are estimated at \$32,000. The company uses straight-line depreciation and has a required rate of return of 14%. Ignore income taxes.

16) What is the payback period for the investment Saturn Ltd. is considering?

- A) 5.63 years
- B) 5.78 years
- C) 6.05 years
- D) 5.26 years
- E) The project does not payback.

Answer: C

Explanation: C)  $\$193,500 / \$32,000 = 6.05 \text{ years}$

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-5

17) What is the accrual accounting rate of return for the investment Saturn Ltd. is considering?

- A) 5.2%
- B) 16.5%
- C) 4.0%
- D) 5.9%
- E) 11.0%

Answer: A

Explanation: A) Annual depreciation is  $(\$193,500 - \$18,000)/8 \text{ years} = \$21,937.50$

AARR =  $(\$32,000 - \$21,937.50)/\$193,500 = 5.2\%$

C)

Diff: 3 Type: MC

Skill: Apply

Objective: LO 20-5

18) Which of the following is TRUE concerning capital budgeting analysis?

- A) The IRR and AARR consider the time value of money.
- B) The payback method and the AARR both consider profitability.
- C) NPV and IRR consider accruals.
- D) The payback method and the AARR both consider profitability, and NPV and IRR do not consider accruals.
- E) NPV and IRR do not consider accruals, and the IRR considers the time value, but AARR does not.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-5



19) Terrain Vehicle has received three proposals for its new vehicle painting machine. Information on each proposal is as follows:

	<u>Proposal X</u>	<u>Proposal Y</u>	<u>Proposal Z</u>
Initial investment in equipment	\$180,000	\$120,000	\$190,000
Working capital needed	0	0	10,000
Annual cash saved by operations:			
Year 1	75,000	50,000	80,000
Year 2	75,000	48,000	80,000
Year 3	75,000	44,000	80,000
Year 4	75,000	8,000	80,000
Salvage value end of year:			
Year 1	100,000	80,000	60,000
Year 2	80,000	60,000	50,000
Year 3	40,000	40,000	30,000
Year 4	10,000	20,000	15,000
Working capital returned	0	0	10,000

Required: Determine each proposals payback period.

Answer: Proposal X payback =  $\$180,000 / 75,000 = 2.4$  years

<u>Proposal Y</u>	<u>Cash Savings</u>	<u>Savings accumulated</u>	<u>To be recovered</u>
Year 0			\$120,000
Year 1	\$50,000	\$25,000	70,000
Year 2	48,000	49,000	22,000
Year 3	44,000	71,000	0

Payback = 2 years plus  $\$22,000 / \$44,000$  or 2.5 years

Proposal Z payback =  $(\$190,000 + \$10,000) / 80,000 = 2.5$  years

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-5

20) Central Trailer Supply has received three proposals for its new trailer assembly line. Information on each proposal is as follows:

	<b>Proposal X</b>	<b>Proposal Y</b>	<b>Proposal Z</b>
Initial investment in equipment	\$115,000	\$130,000	\$145,000
Working capital needed	0	0	15,000
Annual cash saved by operations:			
Year 1	55,000	60,000	60,000
Year 2	55,000	40,000	60,000
Year 3	55,000	40,000	60,000
Year 4	55,000	10,000	60,000
Salvage value end of year:			
Year 1	30,000	25,000	45,000
Year 2	25,000	20,000	40,000
Year 3	20,000	15,000	35,000
Year 4	15,000	10,000	25,000
Working capital returned:	0	0	15,000

Required:

Determine each proposals payback.

Answer: Proposal X payback =  $\$115,000 / \$55,000 = 2.09$  years

<b>Proposal Y</b>	<b>Cash Savings</b>	<b>Savings Accumulated</b>	<b>To Be Recovered</b>
Year 0			\$130,000
Year 1	\$60,000	\$ 60,000	70,000
Year 2	40,000	100,000	30,000
Year 3	40,000	140,000	0

Proposal Y payback = 2 years plus  $\$30,000 / \$40,000$  or 2.75 years.

Proposal Z payback =  $(\$145,000 + \$15,000) / \$60,000 = 2.67$  years

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-5

21) Fabian Company is considering the purchase of a piece of materials-handling equipment:

Net initial investment	\$125,000
Estimated Useful life	8 years
Estimated terminal disposal price	\$10,000
Estimated annual cash operating savings	\$35,000
Required rate of return	10%
Depreciation method: straight line	

Required:

- Calculate the payback period.
- Calculate the accrual accounting rate of return.

Answer:

- $\text{Payback} = \$125,000 / \$35,000 = 3.57 \text{ years}$
- $\text{Annual depreciation} = (\$125,000 - \$10,000) / 8 = \$14,375$   
 $\text{AARR} = (\$35,000 - \$14,375) / \$125,000$   
 $= \$20,625 / \$125,000 = 16.5\%$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-5

22) Jensen Manufacturing Ltd. is considering buying a laser machine which costs \$250,000. It requires working capital of \$25,000 which will be returned at the end of the project. Annual cash savings are anticipated to be \$103,000 for five years. The salvage value at the end of five years is expected to be nil. The company uses straight-line depreciation.

Required:

Determine the accrual accounting rate of return of the investment.

Answer:  $[(\$103,000 - (\$250,000 / 5 \text{ years})) \div (250,000 + 25,000)] = 19.27\%$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-5

23) Janet Manufacturing Ltd. is considering buying an automated machine that costs \$500,000. It requires working capital of \$50,000. Annual cash savings are anticipated to be \$206,000 for five years. The company uses straight-line depreciation. The salvage value at the end of five years is expected to be \$20,000. The working capital will be recovered at the end of the machine's life.

Required:

Compute the accrual accounting rate of return based on the initial investment.

$$\begin{aligned}\text{Answer: Accrual accounting income} &= \$206,000 - ((\$500,000 - \$20,000)/5) \\ &= \$206,000 - \$96,000 \\ &= \$110,000\end{aligned}$$

$$\begin{aligned}\text{AARR with initial investment} &= \$110,000/(\$500,000 + \$50,000) \\ &= \$110,000/\$550,000 \\ &= 0.20\end{aligned}$$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-5

24) Fisher Ltd. is considering the purchase of new equipment. Details of the investment follow:

Net initial investment	\$1,025,000
Estimated Useful life	8 years
Estimated terminal disposal price	\$120,000
Estimated annual cash sales	\$520,000
Estimated annual cash operating expenses	\$295,000
Required rate of return	12%
Depreciation method: straight line	

Required:

- Calculate the payback period.
- Calculate the accrual accounting rate of return based on the initial investment.
- Calculate the net present value.

Answer:

a.

$$\text{Annual cash flows} = \$520,000 - \$295,000 = \$225,000$$

$$\text{Payback} = \$1,025,000/\$225,000 = 4.56 \text{ years}$$

b.

$$\text{Annual depreciation} = (\$1,025,000 - \$120,000)/8 = \$113,125$$

$$\text{AARR} = (\$225,000 - \$113,125)/\$1,025,000 = 10.91\%$$

c.

$$\text{NPV} = \$141,184.93$$

$$\text{CF}_0 = -\$1,025,000 \text{ CF } 1 \text{ to } 7 = \$225,000 \text{ CF}_8 = \$345,000$$

$$\text{or PV of ACF of } \$225,000 \text{ for 8 years at } 12\% = \$1,117,718.95$$

$$\text{PV of salvage value of } \$120,000 = \$48,465.99$$

$$\text{NPV} = -\$1,025,000 + \$1,117,718.95 + \$48,465.99 = \$141,184.94$$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2 & 5

25) Hiroshi Inc. is evaluating 3 investment alternatives. Each alternative requires an initial investment cash outflow of \$176,000 and is to be depreciated on a straight-line basis (\$6,000 salvage value). Ignore income taxes. Cash flows for the various investments are summarized below:

	Project A	Project B	Project C
Year 1	\$87,000	\$52,600	\$0
Year 2	\$78,000	\$52,600	\$0
Year 3	\$65,000	\$52,600	\$89,000
Year 4	\$4,000	\$52,600	\$97,000
Year 5	\$2,000	\$52,600	\$109,000

The company has a required rate of return of 11.2%

Required:

- rank each alternative based on NPV
- rank each alternative based on IRR
- rank each alternative based on accrual accounting rate of return using average annual cash flows
- evaluate each project based on the payback periods

Answer:

	Project A	Project B	Project C
NPV	\$19,908.99	\$20,958.87	\$19,799.36
IRR	17.60%	15.78%	14.20%
Average cash flows	\$47,200	\$52,600	\$59,000
Depreciation	\$34,000	\$34,000	\$34,000
Investment	\$176,000	\$176,000	\$176,000
AARR	7.5%	10.57%	14.20%
Payback	2.17 years	3.35 years	3.90 years

Depreciation is the same for all projects:  $[\$176,000 - \$6,000] / 5 = \$34,000$

Investment is the same for all projects: \$176,000

#### Project A:

$CF_0 = -\$176,000$   $CF_1 = \$87,000$   $CF_2 = \$78,000$   $CF_3 = \$65,000$   $CF_4 = \$4,000$   $CF_5 = \$8,000$

or  $-\$176,000 + \$78,237.41 + \$63,079.03 + \$47,271.46 + \$2,616.02 + \$4,705.07 = \$19,908.99$

Average cash flows = total cash flows/5

Total cash flows =  $[\$87,000 + \$78,000 + \$65,000 + \$4,000 + \$2,000] = \$236,000$

Average cash flows =  $\$236,000 / 5 = \$47,200$

AARR =  $[\$47,200 - \$34,000] / \$176,000 = 7.5\%$

Payback:

$\$176,000 - \$87,000 - \$78,000 = \$11,000$

Payback = 2 years +  $\$11,000 / \$65,000 = 2.17$  years

**Project B:**

CF0 = -\$176,000 CF1 to 4 = \$52,600 CF 5 = \$58,600

or -\$176,000 + \$193,430.07 + \$3,528.80 (Investment + PV of ACF + PV of Salvage) = \$20,958.87

Average cash flows = \$52,600 (same each year)

AARR =  $[\$52,600 - \$34,000]/\$176,000 = 10.57\%$

Payback:

Payback =  $\$176,000/\$52,600 = 3.35$  years

**Project C:**

CF0 = -\$176,000 CF1 to 2 = \$0 CF3 = \$89,000 CF4 = \$97,000 CF5 = \$115,000

or -\$176,000 + \$0 + \$0 + \$64,725.53 + \$63,438.45 + \$64,106.57 + \$3,528.80 = \$19,799.35

Average cash flows = total cash flows/5

Total cash flows =  $[\$0 + \$0 + \$89,000 + \$97,000 + \$109,000] = \$295,000$

Average cash flows =  $\$295,000/5 = \$59,000$

AARR =  $[\$59,000 - \$34,000]/\$176,000 = 14.20\%$

Payback:

$\$176,000 - \$0 - \$0 - \$89,000 = \$87,000$

Payback = 3 years +  $\$87,000/\$97,000 = 3.90$  years

Diff: 3 Type: ES

Skill: Apply

Objective: LO 20-2 & 5

26) Supply the missing data for each of the following proposals.

	<u>Proposal A</u>	<u>Proposal B</u>	<u>Proposal C</u>
Initial investment	(a)	\$62,900	\$226,000
Annual net cash inflow	\$60,000	(c)	(e)
Life in years	10	6	10
Salvage value	\$0	\$10,000	\$0
Payback period in year	(b)	(d)	5.65
Internal rate of return	12%	24%	(f)

Answer:

- a.      Annual cash inflow                      \$60,000  
             Present value factor for 10 years  $\times$  5.650  
             Initial investment                      \$339,000  
             \$339,013 by calculator.

- b.      Payback period =  $\$339,000 / \$60,000 = 5.65$

- c.      Initial investment                              \$62,900  
             PV of salvage value ( $\$10,000 \times 0.275$ )      (2,750)  
             Net PV of annual net cash inflow              \$60,150

$$\text{Annual cash inflow} = \$60,150 / 3.020 = \$19,917.22 \text{ } (\$19,913.82 \text{ by calculator})$$

- d.      Payback =  $\$62,900 / \$19,917.22 = 3.158$

- e.      Annual net cash inflow =  $\$226,000 / 5.650 = \$40,000$

- f.      PV factor for 10 years =  $\$226,000 / \$40,000 = 5.650$

Look up value, 5.650 in PV of annuity table under 10 years and the internal rate of return is 12 percent.

Diff: 3    Type: ES

Skill: Analyze

Objective: LO 20-2 & 5

27) Book & Bible Bookstore desires to buy a new coding machine to help control book inventories. The machine sells for \$36,586 and requires working capital of \$4,000. Its estimated useful life is five years and will have a salvage value of \$4,000. Recovery of working capital will be \$4,000 at the end of its useful life. Annual cash savings from the purchase of the machine will be \$10,000. Ignore income taxes.

Required:

- Compute the net present value at a 14 percent required rate of return.
- Compute the internal rate of return.
- Determine the payback period of the investment.

Answer:

a.

	<u>Predicted cash flows</u>	<u>Year or years</u>	<u>PV factor</u>	<u>PV of cash flows</u>
Investment	\$(36,586)	0	1.000	\$(36,586)
Working capital needed	(4,000)	0	1.000	(4,000)
Annual operations	10,000	1-5	3.433	34,330
Working capital returned	4,000	5	0.519	2,076
Salvage value	4,000	5	0.519	<u>2,076</u>
Net present value				<u><u>\$(2,104)</u></u>

b.

Trial and error is required. Because net present value is negative in Part A, the internal rate of return is less than 14 percent. Start by trying 12 percent.

	<u>Predicted cash flows</u>	<u>Year or years</u>	<u>PV factor</u>	<u>PV of cash flows</u>
Investment	\$(36,586)	0	1.000	\$(36,586)
Working capital needed	(4,000)	0	1.000	(4,000)
Annual operations	10,000	1-5	3.605	36,050
Working capital returned	4,000	5	0.567	2,268
Salvage value	4,000	5	0.567	<u>2,268</u>
Net present value				<u><u>\$-0-</u></u>

With a zero net present value, the internal rate of return is 12 percent.

c.

Payback period =  $(\$36,586 + \$4,000) / \$10,000 = 4.06$  years.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2 & 5



28) Hentgen and Ferraro, baseball consultants, are in need of a microcomputer network for their staff. They have received three proposals, with related facts as follows:

	<u>Proposal A</u>	<u>Proposal B</u>	<u>Proposal C</u>
Initial investment in equipment	\$90,000	\$90,000	\$90,000
Annual cash increase in operations:			
Year 1	80,000	45,000	90,000
Year 2	10,000	45,000	0
Year 3	45,000	45,000	0
Salvage value	0	0	0
Estimated life	3 yrs.	3 yrs.	1 yr.

The company uses straight-line depreciation for all capital assets. Ignore income taxes.

Required:

- Compute the payback period, net present value, and accrual accounting rate of return using average annual income, for each proposal. Use a discount rate of 14 percent.
- Rank each proposal 1, 2, and 3 using each method separately. Which proposal is best? Why?

Answer:

a.

Payback for Proposal A: Year 1 \$80,000

Year 2 10,000

Payback is 2 years \$90,000

Payback for Proposal B: Year 1 \$45,000

Year 2 45,000

Payback is 2 years \$90,000

Payback for Proposal C: Year 1 \$90,000

Payback is 1 year

Net Present Value:

Proposal A:

	<u>Predicted cash flows</u>	<u>Year or years</u>	<u>PV factor</u>	<u>PV of cash flows</u>
Investment	\$(90,000)	0	1.000	\$(90,000)
Annual operations:				
Year 1	80,000	1	0.877	70,160
Year 2	10,000	2	0.769	7,690
Year 3	45,000	3	0.675	<u>30,375</u>
Net present value				<u>\$18,225</u>

\$18,243.83 by calculator.

Proposal B:

	<u>Predicted cash flows</u>	<u>Year or years</u>	<u>PV factor</u>	<u>PV of cash flows</u>
Investment	\$(90,000)	0	1.000	\$(90,000)
Annual operations:				
Year 1	45,000	1	0.877	39,465
Year 2	45,000	2	0.769	34,605
Year 3	45,000	3	0.675	<u>30,375</u>
Net present value				<u>\$14,445</u>
\$14,473.44 by calculator				

Proposal C:

	<u>Predicted cash flows</u>	<u>Year or years</u>	<u>PV factor</u>	<u>PV of cash flows</u>
Investment	\$(90,000)	0	1.000	\$(90,000)
Annual operations:				
Year 1	90,000	1	0.877	<u>78,930</u>
Net present value				<u>\$(11,070)</u>
(\$11,052.63) by calculator				

	<u>Proposal A</u>	<u>Proposal B</u>	<u>Proposal C</u>
Total cash increase	\$135,000	\$135,000	\$90,000
Total depreciation	<u>90,000</u>	<u>90,000</u>	<u>90,000</u>
Increase in income	<u>\$45,000</u>	<u>\$45,000</u>	<u>\$0</u>
Average annual increase	\$15,000	\$15,000	\$0
Initial investment	\$90,000	\$90,000	\$90,000
Return	= 0.167	= 0.167	= 0.0

b.

Method	<u>Proposal A</u>	<u>Proposal B</u>	<u>Proposal C</u>
Payback method ranks	2.5	2.5	1.0
Net present value	1.0	2.0	3.0
AARR	1.5	1.5	3.0

Even though Proposal C is number 1 for payback, it comes in last with the other two methods. Because the net present value method takes into account the time value of money, and the other proposals have no strong points, Proposal A would be the best alternative.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2 & 5

29) Jefferson Ltd. is considering the acquisition of new production equipment. If purchased, the new equipment would cost \$1,850,000. Installation and testing costs would be \$35,000 and \$25,000 respectively. Once operational, the equipment will cause an increase in working capital of \$120,000. The new equipment is expected to generate increased annual sales of \$720,000. Variable costs to operate the machine are estimated at 42% of sales and annual fixed costs would be lowered by \$75,000. The equipment has an estimate 6 year life and a salvage value of \$90,000. The company requires an 11% return on its investments. Ignore income taxes.

Required:

- Compute the net present value.
- Compute the internal rate of return.
- Determine the payback period of the investment.

Answer:

a.

Initial investment = \$1,850,000 + \$35,000 + \$25,000 = \$1,910,000

Annual cash flows (ACF) = (\$720,000 \* 58%) + 75,000 = \$417,600 + \$75,000 = \$492,600

Initial Investment	see above	(\$1,910,000)
Working Capital		(\$120,000)
ACF	\$492,600 annuity 6n	\$2,083,963
Salvage	\$90,000 6n	\$48,118
Working Capital Return	\$120,000	\$64,157
NPV		\$166,238

or CF0 = -\$2,030,000 CF 1 to 5 = \$492,600 CF 6 = \$702,600 [\$492,600 + \$90,000 + \$120,000]

NPV = \$166,237.52

b.

IRR by calculator = 13.68%

c.

Payback period = \$2,030,000/\$492,600 = 4.12 years

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2 & 5

30) Sam's Structures desires to buy a new crane and accessories to help move and install modular buildings. The machine sells for \$75,000 and requires working capital of \$10,000. Its estimated useful life is six years and it will have a salvage value of \$17,560. Recovery of working capital will be \$10,000 at the end of its useful life. Annual cash savings from the purchase of the machine will be \$20,000.

**Required:**

- Compute the net present value at a 12% required rate of return.
- Compute the internal rate of return.
- Determine the payback period of the investment.

Answer:

a.

	Predicted Cash Flows	Year(s)	PV Factor	PV of Cash Flows
Investment	\$(75,000)	0	1.000	\$(75,000)
Working capital needed	(10,000)	0	1.000	(10,000)
Annual operations	20,000	1-6	4.111	82,220
Working capital returned	10,000	6	0.507	5,070
Salvage value	17,560	6	0.507	8,903
Net present value				<u>\$11,193</u>

Calculator: \$11,190.90

- Trial and error is required. Because net present value is negative in part a, the internal rate of return is greater than 12%. Start by trying any % above 12% and the solution is listed below:

	Predicted Cash Flows	Year(s)	PV Factor	PV of Cash Flows
Investment	\$(75,000)	0	1.000	\$(75,000)
Working capital needed	(10,000)	0	1.000	(10,000)
Annual operations	20,000	1-6	3.685	73,700
Working capital returned	10,000	6	0.410	4,100
Salvage value	17,560	6	0.410	7,200
Net present value				<u>\$-0-</u>

With a zero net present value, the internal rate of return is 16%.

- Payback period =  $(\$75,000 + \$10,000) / \$20,000 = 4.25$  years.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 20-2 & 5

31) Bock Construction Company is considering four proposals for the construction of new loading facilities that will include the latest in ship loading/unloading equipment. After careful analysis, the company's accountant has developed the following information about the four proposals:

	<u>Proposal 1</u>	<u>Proposal 2</u>	<u>Proposal 3</u>	<u>Proposal 4</u>
Payback period	4 years	4.5 years	6 years	7 years
Net present value	\$80,000	\$178,000	\$166,000	\$308,000
Internal rate of return	12%	14%	11%	13%
Accrual accounting rate of return	8%	6%	4%	7%

Required:

How can this information be used in the decision making process for the new loading facilities? Does it cause any confusion?

Answer: The managers can use the information to determine which proposal is best under the various alternatives. This may be accomplished by ranking each alternative. Also, the managers must determine the factors that are the most important to the company. For example, if short-run risk is high, a short payback period may be highly desirable. In this case proposal 1 is best. However, if total cash returned is critical to the company's operations, then proposal 4 is probably best.

Any time that multiple measures are used there may be confusion because very seldom will one proposal appear to be the best with all models. In this case payback ranks proposal 1 the best, NPV ranks proposal 4 the best, IRR ranks proposal 2 the best, and AARR ranks proposal 1 the best. The importance of each ranking will depend upon the circumstances of the organization and the managers must be attuned as to what is most favourable.

Diff: 3 Type: ES

Skill: Understand

Objective: LO 20-5

32) What are the four alternative methods for evaluating capital budgeting projects? What is an advantage and disadvantage of each method?

Answer: The four methods are: 1. Net Present Value (NPV); 2. Internal Rate of Return (IRR); 3. Payback; and 4. Accrual Accounting Rate of Return (AARR). NPV has advantages in that it uses discounted cash flows, and can deal with uneven cash flows, considers the inflows and outflows of the project. A disadvantage of NPV is that the results indicate if it achieves a particular cost of capital or not, but it does not indicate what the rate of return actually is. The IRR method generates an expected rate of return for the investment given the time of the project and the discounting of cash flows. A disadvantage of the IRR is that the results are expressed in the form of a percentage rather than in dollars and it is difficult to use when the project has uneven cash flows. The payback is simple to use, and adapts to both even and uneven cash flows. It also highlights the liquidity of a project. A disadvantage to the payback is that it does not consider either the time value of money, or the cash flows that occur after the payback time period. The AARR method uses the information that is most often found in financial statements – including net income and depreciation. A drawback is that the method does not take into account the time value of money or the cash

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-5

20.6 Apply the concept of defensive strategic investment to the capital budgeting process.

1) Net present value can be used to examine the effects of alternative ways of increasing customer loyalty.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-6

2) Defensive strategies can be difficult to quantify because opportunity costs are difficult to predict.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 20-6

3) Companies should make decisions concerning investing in computer-integrated technology, based solely on the relevant costs.

Answer: FALSE

Explanation: Qualitative factors such as response time, quality, and flexibility are also important considerations

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-6

4) "*Faster response to market changes*" is a benefit of computer-integrated technology.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-6

5) Computer integrated technology may increase workers' knowledge of automation and facilitate future installations.

Answer: TRUE

Diff: 1 Type: TF

Skill: Understand

Objective: LO 20-6

6) In capital budgeting a single discount fits all alternative investment opportunities.

Answer: FALSE

Explanation: Discount rates often are different to adjust for project risk.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-6

7) International Financial Reporting Standards (IFRS) require an annual post investment review.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 20-6

8) A comparison of year-to-year changes in customer net present value estimates

A) is one way to be certain of the customer evaluation process.

B) highlights whether managers have been successful in maintaining long-run profitable relationships with their customers.

C) can be used to motivate customers.

D) is difficult to calculate because of the need to know the customers' cost of capital.

E) can be used in place of the payback method.

Answer: B

Diff: 2 Type: MC

Skill: Understand

Objective: LO 20-6

9) Comparison of the actual results for a project to the costs and benefits expected at the time the project was selected is referred to as

A) the audit trail.

B) management control.

C) a post-investment audit.

D) a cost-benefit analysis.

E) capital budgeting.

Answer: C

Diff: 1 Type: MC

Skill: Remember

Objective: LO 20-6

10) Post-investment audits

A) should be done as soon as possible after the investment is made.

B) provide management with feedback about the performance of a project.

C) include obtaining appropriation requests so that the funding will be authorized to purchase the equipment.

D) are usually not feasible in a large project because the cost accounting system does not collect actual costs at the same level of detail as the initial plans had.

E) should not be undertaken because they are too costly.

Answer: B

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-6

11) The difference between the yield on local government bonds and the yield on corresponding domestic government treasury bonds is known as

- A) sovereign spread.
- B) the foreign discount rate.
- C) interest expense.
- D) the risk free rate.
- E) interest rate risk.

Answer: A

Diff: 2 Type: MC

Skill: Remember

Objective: LO 20-6



12) Pender Ltd. is analyzing two proposals for cleaning contracts for the next 3 year period. The company has 200,000 square metres of floor space which is currently 75% occupied. It expects that occupancy will increase to 82% in year 2, and 90% in year 3.

The proposal from Company A is as follows:

Six janitors will be used at a budgeted annual salary of \$26,000/each. These salaries are expected to remain static over the 3 year period. One supervisor will be used at an annual salary of \$38,000. Salary increases for the supervisor will be \$1,500 per year. Indirect labour costs are at 12.5% of salaries. Indirect material costs will be at a rate of \$0.20 per square metre occupied. Fixed costs of \$7,200 per year will also be charged to Pender by the contractor.

The proposal from Company B is as follows:

A rate of \$1.40 per square metre occupied will be charged. In addition a part time supervisor will be required at an annual cost of \$24,000 plus benefits at 15%. Fixed costs of \$4,600 per year will be charged to Pender by Company B. No increases are forecast through the three year period.

Additional information:

Company A is the existing contractor. If the agency does not choose Company A, it must pay Company A a flat \$8,000 on termination of its services. This payment would be made immediately.

Assume cash flows occur at the end of the year unless otherwise stated. The discount rate to be used is 6% and is not expected to change in the next 3 years.

Required:

Evaluate these two proposals using the net present value method.

Answer: The cash flows and present value analysis for each of the two proposals are presented below:

<b>COMPANY A--PROPOSAL</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
Square metres occupied	150,000	164,000	180,000
Cleaning salaries (6 @ \$26,000)	\$156,000	\$156,000	\$156,000
Supervisor	\$38,000	\$39,500	\$41,000
SUBTOTAL	\$194,000	\$195,500	\$197,000
Indirect labour (12.5% of salaries)	\$24,250	\$24,438	\$24,625
Indirect material (\$0.20/sq m occupied)	\$30,000	\$32,800	\$36,000
Fixed costs	\$7,200	\$7,200	\$7,200
Total costs	\$255,450	\$259,938	\$264,825
PV FACTOR 6%i	0.9433962	0.8899964	0.8396193
PV ACF	\$240,991	\$231,343	\$222,352
TOTAL PV ACF (all years)			\$694,686

And for Company B:

<b>COMPANY B--PROPOSAL</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
Square metres occupied	150,000	164,000	180,000
Supervisor	\$24,000	\$24,000	\$24,000
Benefits (15% of salaries)	\$3,600	\$3,600	\$3,600
Variable costs (\$1.40/sq m occupied)	\$210,000	\$229,600	\$252,000
Fixed costs	\$4,600	\$4,600	\$4,600
Total Costs	\$242,200	\$261,800	\$284,200
PV FACTOR 6%i	0.9433962	0.8899964	0.8396193
PV ACF	\$228,491	\$233,001	\$238,620
Subtotal all years			\$700,111
Termination payment			\$8,000
Total NPV			\$708,111

Pender should select Company A's proposal as it will save \$13,425 [\$708,111-\$694,686]

Diff: 3 Type: ES

Skill: Analyze

Objective: Cumulative

13) Xanadu Manufacturing Ltd. (XML) has two main customers in its' Eastern Canada division. The current year is 2016 and the company is evaluating its' customers current and projected profitability taking the time value of money into consideration. XML has a required rate of return of 12%.

The customer gross margins projected for the five year period ending 2020 are as follows:

	2016	2017	2018	2019	2020
Customer A	\$890,000	\$900,000	\$880,000	\$920,000	\$910,000
Customer B	\$500,000	\$700,000	\$900,000	\$1,100,000	\$1,300,000

XML has identified the following customer related activities and their rates:

Activity	Cost Driver	Rate
Sales	# of visits	\$650
Order processing	# of orders	\$155
Product handling	# of units	\$72
Special shipping	# of shipments	\$900

The company has the following information for 2016 regarding the three customers:

Activity	Customer A	Customer B
# of visits	52	12
# of orders	126	24
Product handling	650	365
Special shipping	96	12

The ratio of activity costs to gross margin is expected to be the same for the years after 2016.

Required:

- Determine the profitability of each customer for 2016 using activity-based costing.
- Present a table showing the contribution to profit of each customer for each year assuming that the 2016 ratio of activity costs to gross margin is maintained. Include a column for the five year total.
- Use the present value method to discount each customer's contribution to profit. Assume end of period payments.
- Provide two qualitative measures that can be effective in evaluating customers.

Answer:

a. ABC for 2016

The customer related costs for each of the two customers are summarized below:

<b>Customer A</b>		<b>Customer B</b>	
52 visits * \$650	\$33,800	12 visits * \$650	\$7,800
126 orders * \$155	\$19,530	24 orders * \$155	\$3,720
650 units * \$72	\$46,800	365 units * \$72	\$26,280
96 shipments * \$900	\$86,400	12 shipments * \$900	\$10,800

Total customer hierarchy costs for Enbright are \$21,600 and for Jackson, total costs are \$25,260.

<b>Activity</b>	<b>Customer A</b>	<b>Customer B</b>
Gross margin	\$890,000	\$500,000
Customer activity costs	186,530	48,600
Customer margin	\$ 703,470	\$451,400
Activity cost % of GM	21.0%	9.7%

b. Table of net contribution margins

	<b>Total</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Customer A	\$3,555,370	\$703,470	\$711,000	\$695,200	\$726,800	\$718,900
Customer B	\$4,063,400	\$451,400	\$632,100	\$812,700	\$993,300	\$1,173,900

c. PV Customer A = \$2,559,550

PV Customer B = \$2,782,768

d. Qualitative factors include measures such as: the amount of referral business, the potential to reduce costs from cooperative effort, the competitive position of the customers, the degree of loyalty, the systems compatibility, and so forth.

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 20-6 & 16-2

14) Describe the purpose, features and benefits of a post investment audit for a capital budgeting project.  
Answer: A post investment audit compares the predictions of investment costs and outcomes made at the time the project was selected to the actual results. It provides management with feedback about the investments performance.

Care should be exercised when performing a post investment audit. It should be done only after project outcomes have stabilized. Doing an audit early may give a misleading picture.

Post investment audits of capital projects require information about project-specific costs and benefits. It can be extremely costly, however, to disentangle these actual outcomes as if they were independent from, instead of interdependent with, overall corporate outcomes.

The absence of post investment audits can lead managers to overstate project cash inflows and to accept projects that should never have been undertaken. Implementation problems, such as not achieving budgeted revenues or exceeding budgeted costs, are a concern because the returns from the project will then be inadequate. Post investment audits can point to these areas of implementation that need improvement (such as better quality-control processes).

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-6

15) A Company wants to buy a moulding machine that can be integrated into its computerized manufacturing process. It has received three bids for the machine and related manufacturer's specifications. The bids range from \$3,500,000 to \$3,550,000. The estimated annual savings of the machines range from \$260,000 to \$270,000. The payback periods are almost identical and the net present values are all within \$8,000 of each other. The president just doesn't know what to do about which vendor to choose; all the selection criteria are so close together.

Required:

What suggestions do you have for the president?

Answer: The president needs to consider nonfinancial and qualitative factors that may distinguish the three vendors from each other. Quality of output units, manufacturing flexibility, and cycle time are all additional factors that can be considered about the machines. Other items might include worker safety, ease of learning and using, and ease of maintenance.

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-6

16) Many new capital projects are investments in new technologies. Both benefits and costs of these new technologies are hard to estimate.

Required:

Discuss some of the difficulties in quantifying the expected benefits and costs of new technologies.

Answer: This is intended to be an open ended question. Some points for discussion follow:

There are many uncertainties with new technology. On the market side, how will customers react? What impact with the technologies have on both price and volume? What is the impact on quality? What is the impact on utility? From a manufacturing perspective, there is a benefit to being able to respond more quickly to market changes, but how often will a company need to make responses? How will workers adapt to the new technology? Will there be benefits and/or costs resulting from worker motivations?

It is stated that a benefit of technology is increased worker knowledge and this can benefit future installations. Again, how many future automation plans is the company pursuing?

On the cost side, will failure to automate result in reduced competitive position? How can this be measured? What are the full costs of retraining (again consider motivational effects)? Can maintenance costs accurately be measured?

What if the company invests in the wrong technology (consider Sony and Beta)?

Diff: 2 Type: ES

Skill: Understand

Objective: LO 20-6