

CHAPTER 10

THE BASICS OF CAPITAL BUDGETING

(Difficulty: E = Easy, M = Medium, and T = Tough)

Multiple Choice: Conceptual

Easy:

Ranking methods

Answer: b Diff: E

1. Assume a project has normal cash flows (that is, the initial cash flow is negative, and all other cash flows are positive). Which of the following statements is most correct?
 - a. All else equal, a project's IRR increases as the cost of capital declines.
 - b. All else equal, a project's NPV increases as the cost of capital declines.
 - c. All else equal, a project's MIRR is unaffected by changes in the cost of capital.
 - d. Statements a and b are correct.
 - e. Statements b and c are correct.

Ranking conflicts

Answer: a Diff: E

2. Which of the following statements is most correct?
 - a. The NPV method assumes that cash flows will be reinvested at the cost of capital, while the IRR method assumes reinvestment at the IRR.
 - b. The NPV method assumes that cash flows will be reinvested at the risk-free rate, while the IRR method assumes reinvestment at the IRR.
 - c. The NPV method assumes that cash flows will be reinvested at the cost of capital, while the IRR method assumes reinvestment at the risk-free rate.
 - d. The NPV method does not consider the inflation premium.
 - e. The IRR method does not consider all relevant cash flows, particularly, cash flows beyond the payback period.

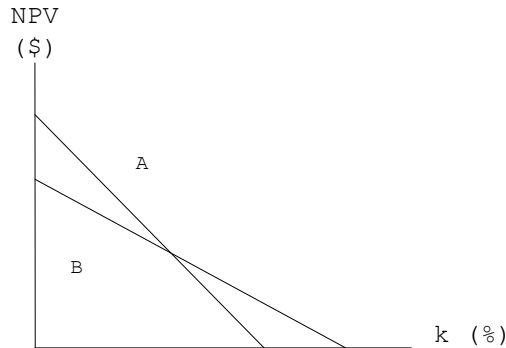
Payback period

Answer: d Diff: E

3. A major disadvantage of the payback period is that it
 - a. Is useless as a risk indicator.
 - b. Ignores cash flows beyond the payback period.
 - c. Does not directly account for the time value of money.
 - d. Statements b and c are correct.
 - e. All of the statements above are correct.

NPV profiles**Answer: b Diff: E**

4. Projects A and B have the same expected lives and initial cash outflows. However, one project's cash flows are larger in the early years, while the other project has larger cash flows in the later years. The two NPV profiles are given below:



Which of the following statements is most correct?

- a. Project A has the smaller cash flows in the later years.
- b. Project A has the larger cash flows in the later years.
- c. We require information on the cost of capital in order to determine which project has larger early cash flows.
- d. The NPV profile graph is inconsistent with the statement made in the problem.
- e. None of the statements above is correct.

NPV profiles**Answer: d Diff: E**

5. Projects A and B both have normal cash flows. In other words, there is an up-front cost followed over time by a series of positive cash flows. Both projects have the same risk and a WACC equal to 10 percent. However, Project A has a higher internal rate of return than Project B. Assume that changes in the WACC have no effect on the projects' cash flow levels. Which of the following statements is most correct?

- a. Project A must have a higher net present value than Project B.
- b. If Project A has a positive NPV, Project B must also have a positive NPV.
- c. If Project A's WACC falls, its internal rate of return will increase.
- d. If Projects A and B have the same NPV at the current WACC, Project B would have a higher NPV if the WACC of both projects was lower.
- e. Statements b and c are correct.

NPV profiles**Answer: e Diff: E**

6. Project A and Project B are mutually exclusive projects with equal risk. Project A has an internal rate of return of 12 percent, while Project B has an internal rate of return of 15 percent. The two projects have the same net present value when the cost of capital is 7 percent. (In other words, the "crossover rate" is 7 percent.) Assume each project has an initial cash outflow followed by a series of inflows. Which of the following statements is most correct?
- a. If the cost of capital is 10 percent, each project will have a positive net present value.
 - b. If the cost of capital is 6 percent, Project B has a higher net present value than Project A.
 - c. If the cost of capital is 13 percent, Project B has a higher net present value than Project A.
 - d. Statements a and b are correct.
 - e. Statements a and c are correct.

NPV profiles**Answer: e Diff: E**

7. Sacramento Paper is considering two mutually exclusive projects. Project A has an internal rate of return (IRR) of 12 percent, while Project B has an IRR of 14 percent. The two projects have the same risk, and when the cost of capital is 7 percent the projects have the same net present value (NPV). Assume each project has an initial cash outflow followed by a series of inflows. Given this information, which of the following statements is most correct?
- a. If the cost of capital is 13 percent, Project B's NPV will be higher than Project A's NPV.
 - b. If the cost of capital is 9 percent, Project B's NPV will be higher than Project A's NPV.
 - c. If the cost of capital is 9 percent, Project B's modified internal rate of return (MIRR) will be less than its IRR.
 - d. Statements a and c are correct.
 - e. All of the statements above are correct.

NPV profiles**Answer: a Diff: M N**

8. O'Leary Lumber Company is considering two mutually exclusive projects, Project X and Project Y. The two projects have normal cash flows (an up-front cost followed by a series of positive cash flows), the same risk, and the same 10 percent WACC. However, Project X has an IRR of 16 percent, while Project Y has an IRR of 14 percent. Which of the following statements is most correct?
- a. Project X's NPV must be positive.
 - b. Project X's NPV must be higher than Project Y's NPV.
 - c. If Project X has a lower NPV than Project Y, then this means that Project X must be a larger project.
 - d. Statements a and c are correct.
 - e. All of the statements above are correct.

NPV profiles**Answer: b Diff: E**

9. Cherry Books is considering two mutually exclusive projects. Project A has an internal rate of return of 18 percent, while Project B has an internal rate of return of 30 percent. The two projects have the same risk, the same cost of capital, and the timing of the cash flows is similar. Each has an up-front cost followed by a series of positive cash flows. One of the projects, however, is much larger than the other. If the cost of capital is 16 percent, the two projects have the same net present value (NPV); otherwise, their NPVs are different. Which of the following statements is most correct?
- a. If the cost of capital is 12 percent, Project B will have a higher NPV.
 - b. If the cost of capital is 17 percent, Project B will have a higher NPV.
 - c. Project B is larger than Project A.
 - d. Statements a and c are correct.
 - e. Statements b and c are correct.

NPV profiles**Answer: a Diff: E N**

10. Project X's IRR is 19 percent. Project Y's IRR is 17 percent. Both projects have the same risk, and both projects have normal cash flows (an up-front cost followed by a series of positive cash flows). If the cost of capital is 10 percent, Project Y has a higher NPV than Project X. Given this information, which of the following statements is most correct?
- a. The crossover rate between the two projects (that is, the point where the two projects have the same NPV) is greater than 10 percent.
 - b. If the cost of capital is 8 percent, Project X will have a higher NPV than Project Y.
 - c. If the cost of capital is 10 percent, Project X's MIRR is greater than 19 percent.
 - d. Statements a and b are correct.
 - e. All of the statements above are correct.

NPV and IRR**Answer: a Diff: E**

11. Which of the following statements is most correct?
- a. If a project's internal rate of return (IRR) exceeds the cost of capital, then the project's net present value (NPV) must be positive.
 - b. If Project A has a higher IRR than Project B, then Project A must also have a higher NPV.
 - c. The IRR calculation implicitly assumes that all cash flows are reinvested at a rate of return equal to the cost of capital.
 - d. Statements a and c are correct.
 - e. None of the statements above is correct.

NPV and IRR**Answer: a Diff: E**

12. Project A has an internal rate of return (IRR) of 15 percent. Project B has an IRR of 14 percent. Both projects have a cost of capital of 12 percent. Which of the following statements is most correct?
- a. Both projects have a positive net present value (NPV).
 - b. Project A must have a higher NPV than Project B.
 - c. If the cost of capital were less than 12 percent, Project B would have a higher IRR than Project A.
 - d. Statements a and c are correct.
 - e. All of the statements above are correct.

NPV, IRR, and MIRR**Answer: b Diff: E**

13. A project has an up-front cost of \$100,000. The project's WACC is 12 percent and its net present value is \$10,000. Which of the following statements is most correct?
- a. The project should be rejected since its return is less than the WACC.
 - b. The project's internal rate of return is greater than 12 percent.
 - c. The project's modified internal rate of return is less than 12 percent.
 - d. All of the statements above are correct.
 - e. None of the statements above is correct.

NPV, IRR, MIRR, and payback**Answer: d Diff: E**

14. A proposed project has normal cash flows. In other words, there is an up-front cost followed over time by a series of positive cash flows. The project's internal rate of return is 12 percent and its WACC is 10 percent. Which of the following statements is most correct?
- a. The project's NPV is positive.
 - b. The project's MIRR is greater than 10 percent but less than 12 percent.
 - c. The project's payback period is greater than its discounted payback period.
 - d. Statements a and b are correct.
 - e. All of the statements above are correct.

NPV and expected return**Answer: e Diff: E**

15. Stock C has a beta of 1.2, while Stock D has a beta of 1.6. Assume that the stock market is efficient. Which of the following statements is most correct?
- a. The required rates of return of the two stocks should be the same.
 - b. The expected rates of return of the two stocks should be the same.
 - c. Each stock should have a required rate of return equal to zero.
 - d. The NPV of each stock should equal its expected return.
 - e. The NPV of each stock should equal zero.

NPV and project selection**Answer: e Diff: E**

16. Moynihan Motors has a cost of capital of 10.25 percent. The firm has two normal projects of equal risk. Project A has an internal rate of return of 14 percent, while Project B has an internal rate of return of 12.25 percent. Which of the following statements is most correct?
- a. Both projects have a positive net present value.
 - b. If the projects are mutually exclusive, the firm should always select Project A.
 - c. If the crossover rate (that is, the rate at which the Project's NPV profiles intersect) is 8 percent, Project A will have a higher net present value than Project B.
 - d. Statements a and b are correct.
 - e. Statements a and c are correct.

IRR**Answer: b Diff: E**

17. Project A has an IRR of 15 percent. Project B has an IRR of 18 percent. Both projects have the same risk. Which of the following statements is most correct?
- a. If the WACC is 10 percent, both projects will have a positive NPV, and the NPV of Project B will exceed the NPV of Project A.
 - b. If the WACC is 15 percent, the NPV of Project B will exceed the NPV of Project A.
 - c. If the WACC is less than 18 percent, Project B will always have a shorter payback than Project A.
 - d. If the WACC is greater than 18 percent, Project B will always have a shorter payback than Project A.
 - e. If the WACC increases, the IRR of both projects will decline.

Post-audit**Answer: d Diff: E**

18. The post-audit is used to
- a. Improve cash flow forecasts.
 - b. Stimulate management to improve operations and bring results into line with forecasts.
 - c. Eliminate potentially profitable but risky projects.
 - d. Statements a and b are correct.
 - e. All of the statements above are correct.

Medium:

NPV profiles

Answer: b Diff: M

19. Projects L and S each have an initial cost of \$10,000, followed by a series of positive cash inflows. Project L has total, undiscounted cash inflows of \$16,000, while S has total undiscounted inflows of \$15,000. Further, at a discount rate of 10 percent, the two projects have identical NPVs. Which project's NPV will be more sensitive to changes in the discount rate?
- a. Project S.
 - b. Project L.
 - c. Both projects are equally sensitive to changes in the discount rate since their NPVs are equal at all costs of capital.
 - d. Neither project is sensitive to changes in the discount rate, since both have NPV profiles which are horizontal.
 - e. The solution cannot be determined unless the timing of the cash flows is known.

NPV profiles

Answer: a Diff: M

20. Two mutually exclusive projects each have a cost of \$10,000. The total, undiscounted cash flows for Project L are \$15,000, while the undiscounted cash flows for Project S total \$13,000. Their NPV profiles cross at a discount rate of 10 percent. Which of the following statements best describes this situation?
- a. The NPV and IRR methods will select the same project if the cost of capital is greater than 10 percent; for example, 18 percent.
 - b. The NPV and IRR methods will select the same project if the cost of capital is less than 10 percent; for example, 8 percent.
 - c. To determine if a ranking conflict will occur between the two projects the cost of capital is needed as well as an additional piece of information.
 - d. Project L should be selected at any cost of capital, because it has a higher IRR.
 - e. Project S should be selected at any cost of capital, because it has a higher IRR.

NPV profiles

Answer: d Diff: M

21. A company is comparing two mutually exclusive projects with normal cash flows. Project P has an IRR of 15 percent, while Project Q has an IRR of 20 percent. If the WACC is 10 percent, the two projects have the same NPV. Which of the following statements is most correct?
- a. If the WACC is 12 percent, both projects would have a positive NPV.
 - b. If the WACC is 12 percent, Project Q would have a higher NPV than Project P.
 - c. If the WACC is 8 percent, Project Q would have a lower NPV than Project P.
 - d. All of the statements above are correct.
 - e. None of the statements above is correct.

NPV profiles**Answer: d Diff: M**

22. Project C and Project D are two mutually exclusive projects with normal cash flows and the same risk. If the WACC were equal to 10 percent, the two projects would have the same positive NPV. However, if the WACC is less than 10 percent, Project C has a higher NPV, whereas if the WACC is greater than 10 percent, Project D has a higher NPV. On the basis of this information, which of the following statements is most correct?
- a. Project D has a higher IRR, regardless of the cost of capital.
 - b. If the WACC is less than 10 percent, Project C has a higher IRR.
 - c. If the WACC is less than 10 percent, Project D's MIRR is less than its IRR.
 - d. Statements a and c are correct.
 - e. None of the statements above is correct.

NPV profiles**Answer: e Diff: M N**

23. Project X and Project Y each have normal cash flows (an up-front cost followed by a series of positive cash flows) and the same level of risk. Project X has an IRR equal to 12 percent, and Project Y has an IRR equal to 14 percent. If the WACC for both projects equals 9 percent, Project X has a higher net present value than Project Y. Which of the following statements is most correct?
- a. If the WACC equals 13 percent, Project X will have a negative NPV, while Project Y will have a positive NPV.
 - b. Project X probably has a quicker payback than Project Y.
 - c. The crossover rate in which the two projects have the same NPV is greater than 9 percent and less than 12 percent.
 - d. Statements a and b are correct.
 - e. Statements a and c are correct.

NPV and IRR**Answer: c Diff: M**

24. Assume that you are comparing two mutually exclusive projects. Which of the following statements is most correct?
- a. The NPV and IRR rules will always lead to the same decision unless one or both of the projects are "non-normal" in the sense of having only one change of sign in the cash flow stream, that is, one or more initial cash outflows (the investment) followed by a series of cash inflows.
 - b. If a conflict exists between the NPV and the IRR, the conflict can always be eliminated by dropping the IRR and replacing it with the MIRR.
 - c. There will be a meaningful (as opposed to irrelevant) conflict only if the projects' NPV profiles cross, and even then, only if the cost of capital is to the left of (or lower than) the discount rate at which the crossover occurs.
 - d. All of the statements above are correct.
 - e. None of the statements above is correct.

NPV and IRR**Answer: a Diff: M**

25. Which of the following statements is incorrect?

- a. Assuming a project has normal cash flows, the NPV will be positive if the IRR is less than the cost of capital.
- b. If the multiple IRR problem does not exist, any independent project acceptable by the NPV method will also be acceptable by the IRR method.
- c. If $IRR = k$ (the cost of capital), then $NPV = 0$.
- d. NPV can be negative if the IRR is positive.
- e. The NPV method is not affected by the multiple IRR problem.

NPV and IRR**Answer: e Diff: M**

26. Project J has the same internal rate of return as Project K. Which of the following statements is most correct?

- a. If the projects have the same size (scale) they will have the same NPV, even if the two projects have different levels of risk.
- b. If the two projects have the same risk they will have the same NPV, even if the two projects are of different size.
- c. If the two projects have the same size (scale) they will have the same discounted payback, even if the two projects have different levels of risk.
- d. All of the statements above are correct.
- e. None of the statements above is correct.

NPV, IRR, and MIRR**Answer: a Diff: M**

27. Which of the following statements is most correct?

- a. If a project with normal cash flows has an IRR that exceeds the cost of capital, then the project must have a positive NPV.
- b. If the IRR of Project A exceeds the IRR of Project B, then Project A must also have a higher NPV.
- c. The modified internal rate of return (MIRR) can never exceed the IRR.
- d. Statements a and c are correct.
- e. None of the statements above is correct.

NPV, IRR, and MIRR**Answer: c Diff: M**

28. Which of the following statements is most correct?

- a. The MIRR method will always arrive at the same conclusion as the NPV method.
- b. The MIRR method can overcome the multiple IRR problem, while the NPV method cannot.
- c. The MIRR method uses a more reasonable assumption about reinvestment rates than the IRR method.
- d. Statements a and c are correct.
- e. All of the statements above are correct.

NPV, IRR, and MIRR**Answer: d Diff: M**

29. Jurgensen Medical is considering two mutually exclusive projects with the following characteristics:

- The two projects have the same risk and the same cost of capital.
- Both projects have normal cash flows. Specifically, each has an up-front cost followed by a series of positive cash flows.
- If the cost of capital is 12 percent, Project X's IRR is greater than its MIRR.
- If the cost of capital is 12 percent, Project Y's IRR is less than its MIRR.
- If the cost of capital is 10 percent, the two Project's have the same NPV.

Which of the following statements is most correct?

- a. Project X's IRR is greater than 12 percent.
- b. Project Y's IRR is less than 12 percent.
- c. If the cost of capital is 8 percent, Project X has a lower NPV than Project Y.
- d. All of the statements above are correct.
- e. None of the statements above is correct.

NPV, IRR, and payback**Answer: e Diff: M**

30. Project X has an internal rate of return of 20 percent. Project Y has an internal rate of return of 15 percent. Both projects have a positive net present value. Which of the following statements is most correct?

- a. Project X must have a higher net present value than Project Y.
- b. If the two projects have the same WACC, Project X must have a higher net present value.
- c. Project X must have a shorter payback than Project Y.
- d. Statements b and c are correct.
- e. None of the statements above is correct.

IRR**Answer: e Diff: M**

31. A capital investment's internal rate of return

- a. Changes when the cost of capital changes.
- b. Is equal to the annual net cash flows divided by one half of the project's cost when the cash flows are an annuity.
- c. Must exceed the cost of capital in order for the firm to accept the investment.
- d. Is similar to the yield to maturity on a bond.
- e. Statements c and d are correct.

MIRR**Answer: e Diff: M**

32. Which of the following statements is most correct? The modified IRR (MIRR) method:
- a. Always leads to the same ranking decision as NPV for independent projects.
 - b. Overcomes the problem of multiple internal rates of return.
 - c. Compounds cash flows at the cost of capital.
 - d. Overcomes the problems of cash flow timing and project size that lead to criticism of the regular IRR method.
 - e. Statements b and c are correct.

Ranking methods**Answer: b Diff: M**

33. Which of the following statements is correct?
- a. Because discounted payback takes account of the cost of capital, a project's discounted payback is normally shorter than its regular payback.
 - b. The NPV and IRR methods use the same basic equation, but in the NPV method the discount rate is specified and the equation is solved for NPV, while in the IRR method the NPV is set equal to zero and the discount rate is found.
 - c. If the cost of capital is less than the crossover rate for two mutually exclusive projects' NPV profiles, a NPV/IRR conflict will not occur.
 - d. If you are choosing between two projects that have the same life, and if their NPV profiles cross, then the smaller project will probably be the one with the steeper NPV profile.
 - e. If the cost of capital is relatively high, this will favor larger, longer-term projects over smaller, shorter-term alternatives because it is good to earn high rates on larger amounts over longer periods.

Ranking methods**Answer: d Diff: M**

34. When comparing two mutually exclusive projects of equal size and equal life, which of the following statements is most correct?
- a. The project with the higher NPV may not always be the project with the higher IRR.
 - b. The project with the higher NPV may not always be the project with the higher MIRR.
 - c. The project with the higher IRR may not always be the project with the higher MIRR.
 - d. Statements a and c are correct.
 - e. All of the statements above are correct.

Project selection**Answer: a Diff: M**

35. A company estimates that its weighted average cost of capital (WACC) is 10 percent. Which of the following independent projects should the company accept?
- a. Project A requires an up-front expenditure of \$1,000,000 and generates a net present value of \$3,200.
 - b. Project B has a modified internal rate of return of 9.5 percent.
 - c. Project C requires an up-front expenditure of \$1,000,000 and generates a positive internal rate of return of 9.7 percent.
 - d. Project D has an internal rate of return of 9.5 percent.
 - e. None of the projects above should be accepted.

Miscellaneous concepts**Answer: e Diff: M**

36. Which of the following is most correct?
- a. The NPV and IRR rules will always lead to the same decision in choosing between mutually exclusive projects, unless one or both of the projects are "nonnormal" in the sense of having only one change of sign in the cash flow stream.
 - b. The Modified Internal Rate of Return (MIRR) compounds cash outflows at the cost of capital.
 - c. Conflicts between NPV and IRR rules arise in choosing between two mutually exclusive projects (that each have normal cash flows) when the cost of capital exceeds the crossover rate (that is, the discount rate at which the NPV profiles cross).
 - d. The discounted payback method overcomes the problems that the payback method has with cash flows occurring after the payback period.
 - e. None of the statements above is correct.

Miscellaneous concepts**Answer: d Diff: M**

37. Which of the following statements is most correct?
- a. The IRR method is appealing to some managers because it produces a rate of return upon which to base decisions rather than a dollar amount like the NPV method.
 - b. The discounted payback method solves all the problems associated with the payback method.
 - c. For independent projects, the decision to accept or reject will always be the same using either the IRR method or the NPV method.
 - d. Statements a and c are correct.
 - e. All of the statements above are correct.

Miscellaneous concepts

Answer: a Diff: M

38. Which of the following statements is most correct?

- a. One of the disadvantages of choosing between mutually exclusive projects on the basis of the discounted payback method is that you might choose the project with the faster payback period but with the lower total return.
- b. Multiple IRRs can occur in cases when project cash flows are normal, but they are more common in cases where project cash flows are nonnormal.
- c. When choosing between mutually exclusive projects, managers should accept all projects with IRRs greater than the weighted average cost of capital.
- d. Statements a and b are correct.
- e. All of the statements above are correct.

Miscellaneous concepts

Answer: a Diff: M

39. Normal projects C and D are mutually exclusive. Project C has a higher net present value if the WACC is less than 12 percent, whereas Project D has a higher net present value if the WACC exceeds 12 percent. Which of the following statements is most correct?

- a. Project D has a higher internal rate of return.
- b. Project D is probably larger in scale than Project C.
- c. Project C probably has a faster payback.
- d. Statements a and c are correct.
- e. All of the statements above are correct.

Tough:

NPV profiles

Answer: b Diff: T

40. Your assistant has just completed an analysis of two mutually exclusive projects. You must now take her report to a board of directors meeting and present the alternatives for the board's consideration. To help you with your presentation, your assistant also constructed a graph with NPV profiles for the two projects. However, she forgot to label the profiles, so you do not know which line applies to which project. Of the following statements regarding the profiles, which one is most reasonable?
- a. If the two projects have the same investment cost, and if their NPV profiles cross once in the upper right quadrant, at a discount rate of 40 percent, this suggests that a NPV versus IRR conflict is not likely to exist.
 - b. If the two projects' NPV profiles cross once, in the upper left quadrant, at a discount rate of minus 10 percent, then there will probably not be a NPV versus IRR conflict, irrespective of the relative sizes of the two projects, in any meaningful, practical sense (that is, a conflict that will affect the actual investment decision).
 - c. If one of the projects has a NPV profile that crosses the X-axis twice, hence the project appears to have two IRRs, your assistant must have made a mistake.
 - d. Whenever a conflict between NPV and IRR exist, then, if the two projects have the same initial cost, the one with the steeper NPV profile probably has less rapid cash flows. However, if they have identical cash flow patterns, then the one with the steeper profile probably has the lower initial cost.
 - e. If the two projects both have a single outlay at $t = 0$, followed by a series of positive cash inflows, and if their NPV profiles cross in the lower left quadrant, then one of the projects should be accepted, and both would be accepted if they were not mutually exclusive.

NPV, IRR, and MIRR

Answer: c Diff: T

41. Which of the following statements is most correct?
- a. When dealing with independent projects, discounted payback (using a payback requirement of 3 or less years), NPV, IRR, and modified IRR always lead to the same accept/reject decisions for a given project.
 - b. When dealing with mutually exclusive projects, the NPV and modified IRR methods always rank projects the same, but those rankings can conflict with rankings produced by the discounted payback and the regular IRR methods.
 - c. Multiple rates of return are possible with the regular IRR method but not with the modified IRR method, and this fact is one reason given by the textbook for favoring MIRR (or modified IRR) over IRR.
 - d. Statements a and c are correct.
 - e. None of the statements above is correct.

NPV, IRR, and MIRR**Answer: a Diff: T**

42. Which of the following statements is correct?
- a. There can never be a conflict between NPV and IRR decisions if the decision is related to a normal, independent project, that is, NPV will never indicate acceptance if IRR indicates rejection.
 - b. To find the MIRR, we first compound CFs at the regular IRR to find the TV, and then we discount the TV at the cost of capital to find the PV.
 - c. The NPV and IRR methods both assume that cash flows are reinvested at the cost of capital. However, the MIRR method assumes reinvestment at the MIRR itself.
 - d. If you are choosing between two projects that have the same cost, and if their NPV profiles cross, then the project with the higher IRR probably has more of its cash flows coming in the later years.
 - e. A change in the cost of capital would normally change both a project's NPV and its IRR.

Choosing among mutually exclusive projects**Answer: c Diff: T**

43. Project A has an internal rate of return of 18 percent, while Project B has an internal rate of return of 16 percent. However, if the company's cost of capital (WACC) is 12 percent, Project B has a higher net present value. Which of the following statements is most correct?
- a. The crossover rate for the two projects is less than 12 percent.
 - b. Assuming the timing of the two projects is the same, Project A is probably of larger scale than Project B.
 - c. Assuming that the two projects have the same scale, Project A probably has a faster payback than Project B.
 - d. Statements a and b are correct.
 - e. Statements b and c are correct.

Multiple Choice: Problems**Easy:****Payback period****Answer: b Diff: E**

44. The Seattle Corporation has been presented with an investment opportunity that will yield cash flows of \$30,000 per year in Years 1 through 4, \$35,000 per year in Years 5 through 9, and \$40,000 in Year 10. This investment will cost the firm \$150,000 today, and the firm's cost of capital is 10 percent. Assume cash flows occur evenly during the year, 1/365th each day. What is the payback period for this investment?
- a. 5.23 years
 - b. 4.86 years
 - c. 4.00 years
 - d. 6.12 years
 - e. 4.35 years

Discounted payback**Answer: e Diff: E**

45. Coughlin Motors is considering a project with the following expected cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$700 million
1	200 million
2	370 million
3	225 million
4	700 million

The project's WACC is 10 percent. What is the project's discounted payback?

- a. 3.15 years
- b. 4.09 years
- c. 1.62 years
- d. 2.58 years
- e. 3.09 years

Discounted payback**Answer: d Diff: E**

46. A project has the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$3,000
1	1,000
2	1,000
3	1,000
4	1,000

Its cost of capital is 10 percent. What is the project's discounted payback period?

- a. 3.00 years
- b. 3.30 years
- c. 3.52 years
- d. 3.75 years
- e. 4.75 years

Discounted payback**Answer: e Diff: E N**

47. Project A has a 10 percent cost of capital and the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>
0	-\$300
1	100
2	150
3	200
4	50

What is Project A's discounted payback?

- a. 2.25 years
- b. 2.36 years
- c. 2.43 years
- d. 2.50 years
- e. 2.57 years

NPV**Answer: a Diff: E**

48. As the director of capital budgeting for Denver Corporation, you are evaluating two mutually exclusive projects with the following net cash flows:

	<u>Project X Cash Flow</u>	<u>Project Z Cash Flow</u>
<u>Year</u>		
0	-\$100,000	-\$100,000
1	50,000	10,000
2	40,000	30,000
3	30,000	40,000
4	10,000	60,000

If Denver's cost of capital is 15 percent, which project would you choose?

- a. Neither project.
- b. Project X, since it has the higher IRR.
- c. Project Z, since it has the higher NPV.
- d. Project X, since it has the higher NPV.
- e. Project Z, since it has the higher IRR.

NPV**Answer: a Diff: E**

49. Two projects being considered are mutually exclusive and have the following projected cash flows:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$50,000	-\$50,000
1	15,625	0
2	15,625	0
3	15,625	0
4	15,625	0
5	15,625	99,500

If the required rate of return on these projects is 10 percent, which would be chosen and why?

- a. Project B because it has the higher NPV.
- b. Project B because it has the higher IRR.
- c. Project A because it has the higher NPV.
- d. Project A because it has the higher IRR.
- e. Neither, because both have IRRs less than the cost of capital.

IRR**Answer: c Diff: E**

50. The capital budgeting director of Sparrow Corporation is evaluating a project that costs \$200,000, is expected to last for 10 years and produce after-tax cash flows, including depreciation, of \$44,503 per year. If the firm's cost of capital is 14 percent and its tax rate is 40 percent, what is the project's IRR?

- a. 8%
- b. 14%
- c. 18%
- d. -5%
- e. 12%

IRR**Answer: c Diff: E**

51. An insurance firm agrees to pay you \$3,310 at the end of 20 years if you pay premiums of \$100 per year at the end of each year for 20 years. Find the internal rate of return to the nearest whole percentage point.

- a. 9%
- b. 7%
- c. 5%
- d. 3%
- e. 11%

IRR, payback, and missing cash flow**Answer: d Diff: E**

52. Oak Furnishings is considering a project that has an up-front cost and a series of positive cash flows. The project's estimated cash flows are summarized below:

<u>Year</u>	<u>Project Cash Flow</u>
0	?
1	\$500 million
2	300 million
3	400 million
4	600 million

The project has a regular payback of 2.25 years. What is the project's internal rate of return (IRR)?

- a. 23.1%
- b. 143.9%
- c. 17.7%
- d. 33.5%
- e. 41.0%

IRR and mutually exclusive projects**Answer: d Diff: E**

53. A company is analyzing two mutually exclusive projects, S and L, whose cash flows are shown below:

Years	0	1	2	3
	----- k = 12% -----			
S	-1,100	1,000	350	50
L	-1,100	0	300	1,500

The company's cost of capital is 12 percent, and it can obtain an unlimited amount of capital at that cost. What is the regular IRR (not MIRR) of the better project, that is, the project that the company should choose if it wants to maximize its stock price?

- a. 12.00%
- b. 15.53%
- c. 18.62%
- d. 19.08%
- e. 20.46%

NPV and IRR**Answer: b Diff: E**

54. Your company is choosing between the following non-repeatable, equally risky, mutually exclusive projects with the cash flows shown below. Your cost of capital is 10 percent. How much value will your firm sacrifice if it selects the project with the higher IRR?

Project S:

0	1	2	3
----- ----- -----			
k = 10%			
-1,000	500	500	500

Project L:

0	1	2	3	4	5
----- ----- ----- ----- -----					
k = 10%					
-2,000	668.76	668.76	668.76	668.76	668.76

- a. \$243.43
- b. \$291.70
- c. \$332.50
- d. \$481.15
- e. \$535.13

NPV and IRR**Answer: e Diff: E**

55. Green Grocers is deciding among two mutually exclusive projects. The two projects have the following cash flows:

	Project A	Project B
Year	Cash Flow	Cash Flow
0	-\$50,000	-\$30,000
1	10,000	6,000
2	15,000	12,000
3	40,000	18,000
4	20,000	12,000

The company's weighted average cost of capital is 10 percent (WACC = 10%). What is the net present value (NPV) of the project with the highest internal rate of return (IRR)?

- a. \$ 7,090
- b. \$ 8,360
- c. \$11,450
- d. \$12,510
- e. \$15,200

NPV and IRR**Answer: d Diff: E N**

56. Projects X and Y have the following expected net cash flows:

	Project X	Project Y
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$500,000	-\$500,000
1	250,000	350,000
2	250,000	350,000
3	250,000	

Assume that both projects have a 10 percent cost of capital. What is the net present value (NPV) of the project that has the highest IRR?

- a. \$ 13,626.35
- b. \$ 16,959.00
- c. \$ 62,050.62
- d. \$107,438.02
- e. \$121,713.00

NPV, IRR, and payback**Answer: d Diff: E**

57. Braun Industries is considering an investment project that has the following cash flows:

<u>Year</u>	<u>Cash Flow</u>
0	-\$1,000
1	400
2	300
3	500
4	400

The company's WACC is 10 percent. What is the project's payback, internal rate of return (IRR), and net present value (NPV)?

- a. Payback = 2.4, IRR = 10.00%, NPV = \$600.
- b. Payback = 2.4, IRR = 21.22%, NPV = \$260.
- c. Payback = 2.6, IRR = 21.22%, NPV = \$300.
- d. Payback = 2.6, IRR = 21.22%, NPV = \$260.
- e. Payback = 2.6, IRR = 24.12%, NPV = \$300.

Crossover rate**Answer: b Diff: E**

58. Two projects being considered are mutually exclusive and have the following projected cash flows:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$50,000	-\$ 50,000
1	15,990	0
2	15,990	0
3	15,990	0
4	15,990	0
5	15,990	100,560

At what rate (approximately) do the NPV profiles of Projects A and B cross?

- a. 6.5%
- b. 11.5%
- c. 16.5%
- d. 20.0%
- e. The NPV profiles of these two projects do not cross.

Crossover rate**Answer: d Diff: E**

59. Hudson Hotels is considering two mutually exclusive projects, Project A and Project B. The cash flows from the projects are summarized below:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$100,000	-\$200,000
1	25,000	50,000
2	25,000	50,000
3	50,000	80,000
4	50,000	100,000

The two projects have the same risk. At what cost of capital would the two projects have the same net present value (NPV)?

- a. 2.86%
- b. 13.04%
- c. 15.90%
- d. 10.03%
- e. -24.45%

Crossover rate**Answer: a Diff: E**

60. Cowher Co. is considering two mutually exclusive projects, Project X and Project Y. The projects are equally risky and have the following expected cash flows:

<u>Year</u>	<u>Project X Cash Flow</u>	<u>Project Y Cash Flow</u>
0	-\$3,700 million	-\$3,200 million
1	1,400 million	900 million
2	1,070 million	1,000 million
3	1,125 million	1,135 million
4	700 million	720 million

At what cost of capital would the two projects have the same net present value (NPV)?

- a. 8.07%
- b. 45.80%
- c. 70.39%
- d. 6.90%
- e. Cannot be determined.

Crossover rate**Answer: c Diff: E**

61. Heller Airlines is considering two mutually exclusive projects, A and B. The projects have the same risk. Below are the cash flows from each project:

<u>Year</u>	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
0	-\$2,000	-\$1,500
1	700	300
2	700	500
3	1,000	800
4	1,000	1,100

At what cost of capital would the two projects have the same net present value (NPV)?

- a. 68.55%
- b. 4.51%
- c. 26.67%
- d. 37.76%
- e. 40.00%

Crossover rate**Answer: d Diff: E N**

62. Bowyer Robotics is considering two mutually exclusive projects with the following after-tax operating cash flows:

<u>Year</u>	<u>Project 1 Cash Flow</u>	<u>Project 2 Cash Flow</u>
0	-\$400	-\$500
1	175	50
2	100	100
3	250	300
4	175	550

At what cost of capital would these two projects have the same net present value (NPV)?

- a. 10.69%
- b. 16.15%
- c. 16.89%
- d. 20.97%
- e. 24.33%

Crossover rate**Answer: d Diff: E N**

63. Company C is considering two mutually exclusive projects, Project A and Project B. The projects are equally risky and have the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
0	-\$300	-\$300
1	140	500
2	360	150
3	400	100

At what cost of capital would the two projects have the same net present value (NPV)?

- a. 10%
- b. 15%
- c. 20%
- d. 25%
- e. 30%

Medium:

Payback period

Answer: c Diff: M

64. Michigan Mattress Company is considering the purchase of land and the construction of a new plant. The land, which would be bought immediately (at $t = 0$), has a cost of \$100,000 and the building, which would be erected at the end of the first year ($t = 1$), would cost \$500,000. It is estimated that the firm's after-tax cash flow will be increased by \$100,000 starting at the end of the second year, and that this incremental flow would increase at a 10 percent rate annually over the next 10 years. What is the approximate payback period?

- a. 2 years
- b. 4 years
- c. 6 years
- d. 8 years
- e. 10 years

Payback period

Answer: c Diff: M

65. Haig Aircraft is considering a project that has an up-front cost paid today at $t = 0$. The project will generate positive cash flows of \$60,000 a year at the end of each of the next five years. The project's NPV is \$75,000 and the company's WACC is 10 percent. What is the project's regular payback?

- a. 3.22 years
- b. 1.56 years
- c. 2.54 years
- d. 2.35 years
- e. 4.16 years

Discounted payback

Answer: e Diff: M

66. Lloyd Enterprises has a project that has the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$200,000
1	50,000
2	100,000
3	150,000
4	40,000
5	25,000

The cost of capital is 10 percent. What is the project's discounted payback?

- a. 1.8763 years
- b. 2.0000 years
- c. 2.3333 years
- d. 2.4793 years
- e. 2.6380 years

Discounted payback**Answer: b Diff: M**

67. Polk Products is considering an investment project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$100,000
1	40,000
2	90,000
3	30,000
4	60,000

The company has a 10 percent cost of capital. What is the project's discounted payback?

- a. 1.67 years
- b. 1.86 years
- c. 2.11 years
- d. 2.49 years
- e. 2.67 years

Discounted payback**Answer: d Diff: M**

68. Davis Corporation is faced with two independent investment opportunities. The corporation has an investment policy that requires acceptable projects to recover all costs within 3 years. The corporation uses the discounted payback method to assess potential projects and utilizes a discount rate of 10 percent. The cash flows for the two projects are:

<u>Year</u>	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
0	-\$100,000	-\$80,000
1	40,000	50,000
2	40,000	20,000
3	40,000	30,000
4	30,000	0

In which investment project(s) should the company invest?

- a. Project A only.
- b. Neither Project A nor Project B.
- c. Project A and Project B.
- d. Project B only.

NPV**Answer: d Diff: M**

69. The Seattle Corporation has been presented with an investment opportunity that will yield end-of-year cash flows of \$30,000 per year in Years 1 through 4, \$35,000 per year in Years 5 through 9, and \$40,000 in Year 10. This investment will cost the firm \$150,000 today, and the firm's cost of capital is 10 percent. What is the NPV for this investment?

- a. \$135,984
- b. \$ 18,023
- c. \$219,045
- d. \$ 51,138
- e. \$ 92,146

NPV**Answer: b Diff: M**

70. You are considering the purchase of an investment that would pay you \$5,000 per year for Years 1-5, \$3,000 per year for Years 6-8, and \$2,000 per year for Years 9 and 10. If you require a 14 percent rate of return, and the cash flows occur at the end of each year, then how much should you be willing to pay for this investment?
- a. \$15,819.27
 - b. \$21,937.26
 - c. \$32,415.85
 - d. \$38,000.00
 - e. \$52,815.71

NPV**Answer: d Diff: M N**

71. Brown Grocery is considering a project that has an up-front cost of \$X. The project will generate a positive cash flow of \$75,000 a year. Assume that these cash flows are paid at the end of each year and that the project will last for 20 years. The project has a 10 percent cost of capital and a 12 percent internal rate of return (IRR). What is the project's net present value (NPV)?
- a. \$1,250,000
 - b. \$ 638,517
 - c. \$ 560,208
 - d. \$ 78,309
 - e. \$ 250,000

NPV profiles**Answer: d Diff: M**

72. The following cash flows are estimated for two mutually exclusive projects:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$100,000	-\$110,000
1	60,000	20,000
2	40,000	40,000
3	20,000	40,000
4	10,000	50,000

When is Project B more lucrative than Project A? That is, over what range of costs of capital (k) does Project B have a higher NPV than Project A? Choose the best answer.

- a. For all values of k less than 7.25%.
- b. Project B is always more profitable than Project A.
- c. Project A is always more profitable than Project B.
- d. For all values of k less than 6.57%.
- e. For all values of k greater than 6.57%.

NPV, payback, and missing cash flow**Answer: b Diff: M**

73. Shannon Industries is considering a project that has the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	?
1	\$2,000
2	3,000
3	3,000
4	1,500

The project has a payback of 2.5 years. The firm's cost of capital is 12 percent. What is the project's net present value (NPV)?

- a. \$ 577.68
- b. \$ 765.91
- c. \$1,049.80
- d. \$2,761.32
- e. \$3,765.91

IRR**Answer: d Diff: M**

74. Genuine Products Inc. requires a new machine. Two companies have submitted bids, and you have been assigned the task of choosing one of the machines. Cash flow analysis indicates the following:

	<u>Machine A Cash Flow</u>	<u>Machine B Cash Flow</u>
<u>Year</u>		
0	-\$2,000	-\$2,000
1	0	832
2	0	832
3	0	832
4	3,877	832

What is the internal rate of return for each machine?

- a. $IRR_A = 16\%$; $IRR_B = 20\%$
- b. $IRR_A = 24\%$; $IRR_B = 20\%$
- c. $IRR_A = 18\%$; $IRR_B = 16\%$
- d. $IRR_A = 18\%$; $IRR_B = 24\%$
- e. $IRR_A = 24\%$; $IRR_B = 26\%$

IRR**Answer: c Diff: M**

75. Whitney Crane Inc. has the following independent investment opportunities for the coming year:

<u>Project</u>	<u>Cost</u>	<u>Annual Cash Inflows</u>	<u>Life (Years)</u>	<u>IRR</u>
A	\$10,000	\$11,800	1	
B	5,000	3,075	2	15
C	12,000	5,696	3	
D	3,000	1,009	4	13

The IRRs for Projects A and C, respectively, are:

- a. 16% and 14%
- b. 18% and 10%
- c. 18% and 20%
- d. 18% and 13%
- e. 16% and 13%

IRR**Answer: e Diff: M N**

76. A project has the following net cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$ X
1	150
2	200
3	250
4	400
5	100

At the project's WACC of 10 percent, the project has an NPV of \$124.78. What is the project's internal rate of return?

- a. 10.00%
- b. 12.62%
- c. 13.49%
- d. 15.62%
- e. 16.38%

NPV and IRR**Answer: a Diff: M**

77. A company is analyzing two mutually exclusive projects, S and L, whose cash flows are shown below:

Years	0	1	2	3	4
S	-1,100	900	350	50	10
L	-1,100	0	300	500	850

The company's cost of capital is 12 percent, and it can get an unlimited amount of capital at that cost. What is the regular IRR (not MIRR) of the better project? (Hint: Note that the better project may or may not be the one with the higher IRR.)

- a. 13.09%
- b. 12.00%
- c. 17.46%
- d. 13.88%
- e. 12.53%

IRR of uneven CF stream**Answer: d Diff: M**

78. Your company is planning to open a new gold mine that will cost \$3 million to build, with the expenditure occurring at the end of the year three years from today. The mine will bring year-end after-tax cash inflows of \$2 million at the end of the two succeeding years, and then it will cost \$0.5 million to close down the mine at the end of the third year of operation. What is this project's IRR?

- a. 14.36%
- b. 10.17%
- c. 17.42%
- d. 12.70%
- e. 21.53%

IRR of uneven CF stream**Answer: e Diff: M**

79. As the capital budgeting director for Chapel Hill Coffins Company, you are evaluating construction of a new plant. The plant has a net cost of \$5 million in Year 0 (today), and it will provide net cash inflows of \$1 million at the end of Year 1, \$1.5 million at the end of Year 2, and \$2 million at the end of Years 3 through 5. Within what range is the plant's IRR?

- a. 14.33%
- b. 15.64%
- c. 16.50%
- d. 17.01%
- e. 18.37%

IRR, payback, and missing cash flow**Answer: c Diff: M**

80. Hadl.com is considering the following two projects:

<u>Year</u>	<u>Project 1 Cash Flow</u>	<u>Project 2 Cash Flow</u>
0	-\$100	?
1	30	40
2	50	80
3	40	60
4	50	60

The two projects have the same payback. What is Project 2's internal rate of return (IRR)?

- a. 44.27%
- b. 23.40%
- c. 20.85%
- d. 14.73%
- e. 17.64%

MIRR**Answer: d Diff: M**

81. Alyeska Salmon Inc., a large salmon canning firm operating out of Valdez, Alaska, has a new automated production line project it is considering. The project has a cost of \$275,000 and is expected to provide after-tax annual cash flows of \$73,306 for eight years. The firm's management is uncomfortable with the IRR reinvestment assumption and prefers the modified IRR approach. You have calculated a cost of capital for the firm of 12 percent. What is the project's MIRR?

- a. 15.0%
- b. 14.0%
- c. 12.0%
- d. 16.0%
- e. 17.0%

MIRR**Answer: e Diff: M**

82. Martin Manufacturers is considering a five-year investment that costs \$100,000. The investment will produce cash flows of \$25,000 each year for the first two years ($t = 1$ and $t = 2$), \$50,000 a year for each of the remaining three years ($t = 3$, $t = 4$, and $t = 5$). The company has a weighted average cost of capital of 12 percent. What is the MIRR of the investment?

- a. 12.10%
- b. 14.33%
- c. 16.00%
- d. 18.25%
- e. 19.45%

MIRR and CAPM**Answer: d Diff: M R**

83. Below are the returns of Nulook Cosmetics and "the market" over a three-year period:

<u>Year</u>	<u>Nulook</u>	<u>Market</u>
1	9%	6%
2	15	10
3	36	24

Nulook finances internally using only retained earnings, and it uses the Capital Asset Pricing Model with an historical beta to determine its cost of equity. Currently, the risk-free rate is 7 percent, and the estimated market risk premium is 6 percent. Nulook is evaluating a project that has a cost today of \$2,028 and will provide estimated cash inflows of \$1,000 at the end of the next 3 years. What is this project's MIRR?

- a. 12.4%
- b. 16.0%
- c. 17.5%
- d. 20.0%
- e. 22.9%

MIRR and missing cash flow**Answer: d Diff: M**

84. Belanger Construction is considering the following project. The project has an up-front cost and will also generate the following subsequent cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	?
1	\$400
2	500
3	200

The project's payback is 1.5 years, and it has a weighted average cost of capital of 10 percent. What is the project's modified internal rate of return (MIRR)?

- a. 10.00%
- b. 19.65%
- c. 21.54%
- d. 23.82%
- e. 14.75%

MIRR, payback, and missing cash flow**Answer: d Diff: M**

85. Tyrell Corporation is considering a project with the following cash flows (in millions of dollars):

<u>Year</u>	<u>Project Cash Flow</u>
0	?
1	\$1.0
2	1.5
3	2.0
4	2.5

The project has a regular payback period of exactly two years. The project's cost of capital is 12 percent. What is the project's modified internal rate of return (MIRR)?

- a. 12.50%
- b. 28.54%
- c. 15.57%
- d. 33.86%
- e. 38.12%

MIRR and IRR**Answer: e Diff: M**

86. Jones Company's new truck has a cost of \$20,000, and it will produce end-of-year net cash inflows of \$7,000 per year for 5 years. The cost of capital for an average-risk project like the truck is 8 percent. What is the sum of the project's IRR and its MIRR?

- a. 15.48%
- b. 18.75%
- c. 26.11%
- d. 34.23%
- e. 37.59%

Mutually exclusive projects**Answer: b Diff: M**

87. Two projects being considered by a firm are mutually exclusive and have the following projected cash flows:

	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
<u>Year</u>		
0	-\$100,000	-\$100,000
1	39,500	0
2	39,500	0
3	39,500	133,000

Based only on the information given, which of the two projects would be preferred, and why?

- a. Project A, because it has a shorter payback period.
- b. Project B, because it has a higher IRR.
- c. Indifferent, because the projects have equal IRRs.
- d. Include both in the capital budget, since the sum of the cash inflows exceeds the initial investment in both cases.
- e. Choose neither, since their NPVs are negative.

Before-tax cash flows**Answer: b Diff: M**

88. Scott Corporation's new project calls for an investment of \$10,000. It has an estimated life of 10 years and an IRR of 15 percent. If cash flows are evenly distributed and the tax rate is 40 percent, what is the annual before-tax cash flow each year? (Assume depreciation is a negligible amount.)

- a. \$1,993
- b. \$3,321
- c. \$1,500
- d. \$4,983
- e. \$5,019

Crossover rate**Answer: b Diff: M**

89. McCarver Inc. is considering the following mutually exclusive projects:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$5,000	-\$5,000
1	200	3,000
2	800	3,000
3	3,000	800
4	5,000	200

At what cost of capital will the net present value (NPV) of the two projects be the same?

- a. 15.68%
- b. 16.15%
- c. 16.25%
- d. 17.72%
- e. 17.80%

Crossover rate**Answer: b Diff: M**

90. Martin Fillmore is a big football star who has been offered contracts by two different teams. The payments (in millions of dollars) he receives under the two contracts are listed below:

	Team A	Team B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	\$8.0	\$2.5
1	4.0	4.0
2	4.0	4.0
3	4.0	8.0
4	4.0	8.0

Fillmore is committed to accepting the contract that provides him with the highest net present value (NPV). At what discount rate would he be indifferent between the two contracts?

- a. 10.85%
- b. 11.35%
- c. 16.49%
- d. 19.67%
- e. 21.03%

Crossover rate**Answer: b Diff: M**

91. Shelby Inc. is considering two projects that have the following cash flows:

	Project 1	Project 2
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$2,000	-\$1,900
1	500	1,100
2	700	900
3	800	800
4	1,000	600
5	1,100	400

At what weighted average cost of capital would the two projects have the same net present value (NPV)?

- a. 4.73%
- b. 5.85%
- c. 5.98%
- d. 6.40%
- e. 6.70%

Crossover rate**Answer: d Diff: M**

92. Jackson Jets is considering two mutually exclusive projects. The projects have the following cash flows:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$10,000	-\$8,000
1	1,000	7,000
2	2,000	1,000
3	6,000	1,000
4	6,000	1,000

At what weighted average cost of capital do the two projects have the same net present value (NPV)?

- a. 11.20%
- b. 12.26%
- c. 12.84%
- d. 13.03%
- e. 14.15%

Crossover rate**Answer: c Diff: M**

93. Midway Motors is considering two mutually exclusive projects, Project A and Project B. The projects are of equal risk and have the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
0	-\$100,000	-\$100,000
1	40,000	30,000
2	25,000	15,000
3	70,000	80,000
4	40,000	55,000

At what WACC would the two projects have the same net present value (NPV)?

- a. 10.33%
- b. 13.95%
- c. 11.21%
- d. 25.11%
- e. 14.49%

Crossover rate**Answer: d Diff: M**

94. Robinson Robotics is considering two mutually exclusive projects, Project A and Project B. The projects have the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
0	-\$200	-\$300
1	20	90
2	30	70
3	40	60
4	50	50
5	60	40

At what weighted average cost of capital would the two projects have the same net present value (NPV)?

- a. 12.69%
- b. 8.45%
- c. 10.32%
- d. 9.32%
- e. -47.96%

Crossover rate**Answer: b Diff: M**

95. Turner Airlines is considering two mutually exclusive projects, Project A and Project B. The projects have the following cash flows:

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$100,000	-\$190,000
1	30,000	30,000
2	35,000	35,000
3	40,000	100,000
4	40,000	100,000

The two projects are equally risky. At what weighted average cost of capital would the two projects have the same net present value (NPV)?

- a. 3.93%
- b. 8.59%
- c. 13.34%
- d. 16.37%
- e. 17.67%

Crossover rate**Answer: b Diff: M**

96. Unitas Department Stores is considering the following mutually exclusive projects:

	Project 1	Project 2
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$215 million	-\$270 million
1	20 million	70 million
2	70 million	100 million
3	90 million	110 million
4	70 million	30 million

At what weighted average cost of capital would the two projects have the same net present value (NPV)?

- a. 1.10%
- b. 19.36%
- c. 58.25%
- d. 5.85%
- e. 40.47%

Crossover rate and missing cash flow**Answer: e Diff: M**

97. Athey Airlines is considering two mutually exclusive projects, Project A and Project B. The projects have the following cash flows (in millions of dollars):

	Project A	Project B
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$4.0	?
1	2.0	\$1.7
2	3.0	3.2
3	5.0	5.8

The crossover rate of the two projects' NPV profiles is 9 percent. Consequently, when the WACC is 9 percent the projects have the same NPV. What is the cash flow for Project B at $t = 0$?

- a. -\$4.22
- b. -\$3.49
- c. -\$8.73
- d. +\$4.22
- e. -\$4.51

Tough:**Multiple IRRs****Answer: c Diff: T**

98. Two fellow financial analysts are evaluating a project with the following net cash flows:

<u>Year</u>	<u>Cash Flow</u>
0	-\$ 10,000
1	100,000
2	-100,000

One analyst says that the project has an IRR of between 12 and 13 percent. The other analyst calculates an IRR of just under 800 percent, but fears his calculator's battery is low and may have caused an error. You agree to settle the dispute by analyzing the project cash flows. Which statement best describes the IRR for this project?

- a. There is a single IRR of approximately 12.7 percent.
- b. This project has no IRR, because the NPV profile does not cross the X-axis.
- c. There are multiple IRRs of approximately 12.7 percent and 787 percent.
- d. This project has two imaginary IRRs.
- e. There are an infinite number of IRRs between 12.5 percent and 790 percent that can define the IRR for this project.

NPV**Answer: c Diff: T**

99. Returns on the market and Takeda Company's stock during the last 3 years are shown below:

<u>Year</u>	<u>Market</u>	<u>Takeda</u>
1	-12%	-14%
2	23	31
3	16	10

The risk-free rate is 7 percent, and the required return on the market is 12 percent. Takeda is considering a project whose market beta was found by adding 0.2 to the company's overall corporate beta. Takeda finances only with equity, all of which comes from retained earnings. The project has a cost of \$100 million, and it is expected to provide cash flows of \$20 million per year at the end of Years 1 through 5 and then \$30 million per year at the end of Years 6 through 10. What is the project's NPV (in millions of dollars)?

- a. \$20.89
- b. \$22.55
- c. \$23.11
- d. \$25.76
- e. \$28.12

NPV**Answer: c Diff: T**

100. Returns on the market and Company Y's stock during the last 3 years are shown below:

<u>Year</u>	<u>Market</u>	<u>Company Y</u>
1	-24%	-22%
2	10	13
3	22	36

The risk-free rate is 5 percent, and the required return on the market is 11 percent. You are considering a low-risk project whose market beta is 0.5 less than the company's overall corporate beta. You finance only with equity, all of which comes from retained earnings. The project has a cost of \$500 million, and it is expected to provide cash flows of \$100 million per year at the end of Years 1 through 5 and then \$50 million per year at the end of Years 6 through 10. What is the project's NPV (in millions of dollars)?

- a. \$ 7.10
- b. \$ 9.26
- c. \$10.42
- d. \$12.10
- e. \$15.75

NPV profiles**Answer: b Diff: T**

101. As the director of capital budgeting for Raleigh/Durham Company, you are evaluating two mutually exclusive projects with the following net cash flows:

	Project X	Project Z
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$100	-\$100
1	50	10
2	40	30
3	30	40
4	10	60

Is there a crossover point in the relevant part of the NPV profile graph (the northeast, or upper right, quadrant)?

- a. No.
- b. Yes, at $k \approx 7\%$.
- c. Yes, at $k \approx 9\%$.
- d. Yes, at $k \approx 11\%$.
- e. Yes, at $k \approx 13\%$.

MIRR and NPV**Answer: c Diff: T**

102. Your company is considering two mutually exclusive projects, X and Y, whose costs and cash flows are shown below:

	Project X	Project Y
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>
0	-\$2,000	-\$2,000
1	200	2,000
2	600	200
3	800	100
4	1,400	75

The projects are equally risky, and the firm's cost of capital is 12 percent. You must make a recommendation, and you must base it on the modified IRR (MIRR). What is the MIRR of the better project?

- a. 12.00%
- b. 11.46%
- c. 13.59%
- d. 12.89%
- e. 15.73%

MIRR and IRR**Answer: a Diff: T**

103. Florida Phosphate is considering a project that involves opening a new mine at a cost of \$10,000,000 at $t = 0$. The project is expected to have operating cash flows of \$5,000,000 at the end of each of the next 4 years. However, the facility will have to be repaired at a cost of \$6,000,000 at the end of the second year. Thus, at the end of Year 2 there will be a \$5,000,000 operating cash inflow and an outflow of -\$6,000,000 for repairs. The company's weighted average cost of capital is 15 percent. What is the difference between the project's MIRR and its regular IRR?

- a. 0.51%
- b. 9.65%
- c. 11.22%
- d. 12.55%
- e. 13.78%

MIRR and missing cash flow**Answer: b Diff: T N**

104. Project C has the following net cash flows:

<u>Year</u>	<u>Project C Cash Flow</u>
0	-\$500
1	200
2	-X
3	300
4	500

Note, that the cash flow, X, at $t = 2$ is an outflow (that is, $X < 0$). Project C has a 10 percent cost of capital and a 12 percent modified internal rate of return (MIRR). What is the project's cash outflow at $t = 2$?

- a. -\$196.65
- b. -\$237.95
- c. -\$246.68
- d. -\$262.92
- e. -\$318.13

MIRR and missing cash flow**Answer: b Diff: T**

105. Diefenbaker Inc. is considering a project that has the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	?
1	\$100,000
2	200,000
3	200,000
4	-100,000

The project has a payback of two years and a weighted average cost of capital of 10 percent. What is the project's modified internal rate of return (MIRR)?

- a. 5.74%
- b. 12.74%
- c. 13.34%
- d. 16.37%
- e. 17.67%

MIRR**Answer: e Diff: T**

106. Mooradian Corporation estimates that its weighted average cost of capital is 11 percent. The company is considering two mutually exclusive projects whose after-tax cash flows are as follows:

	<u>Project S Cash Flow</u>	<u>Project L Cash Flow</u>
<u>Year</u>		
0	-\$3,000	-\$9,000
1	2,500	-1,000
2	1,500	5,000
3	1,500	5,000
4	-500	5,000

What is the modified internal rate of return (MIRR) of the project with the highest NPV?

- a. 11.89%
- b. 13.66%
- c. 16.01%
- d. 18.25%
- e. 20.12%

MIRR**Answer: d Diff: T**

107. A company is considering a project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$100,000
1	50,000
2	50,000
3	50,000
4	-10,000

The project's weighted average cost of capital is estimated to be 10 percent. What is the modified internal rate of return (MIRR)?

- a. 11.25%
- b. 11.56%
- c. 13.28%
- d. 14.25%
- e. 20.34%

MIRR**Answer: d Diff: T**

108. Javier Corporation is considering a project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$13,000
1	12,000
2	8,000
3	7,000
4	-1,500

The firm's weighted average cost of capital is 11 percent. What is the project's modified internal rate of return (MIRR)?

- a. 16.82%
- b. 21.68%
- c. 23.78%
- d. 24.90%
- e. 25.93%

MIRR**Answer: e Diff: T**

109. Taylor Technologies has a target capital structure that consists of 40 percent debt and 60 percent equity. The equity will be financed with retained earnings. The company's bonds have a yield to maturity of 10 percent. The company's stock has a beta = 1.1. The risk-free rate is 6 percent, the market risk premium is 5 percent, and the tax rate is 30 percent. The company is considering a project with the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>
0	-\$50,000
1	35,000
2	43,000
3	60,000
4	-40,000

What is the project's modified internal rate of return (MIRR)?

- a. 6.76%
- b. 9.26%
- c. 10.78%
- d. 16.14%
- e. 20.52%

MIRR**Answer: c Diff: T**

110. Conrad Corp. has an investment project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$1,000
1	200
2	-300
3	900
4	-700
5	600

The company's WACC is 12 percent. What is the project's modified internal rate of return (MIRR)?

- a. 2.63%
- b. 3.20%
- c. 3.95%
- d. 5.68%
- e. 6.83%

MIRR**Answer: b Diff: T**

111. Simmons Shoes is considering a project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$700
1	400
2	-200
3	600
4	500

Simmons' WACC is 10 percent. What is the project's modified internal rate of return (MIRR)?

- a. 17.10%
- b. 18.26%
- c. 25.28%
- d. 28.93%
- e. 29.52%

MIRR**Answer: e Diff: T**

112. Capitol City Transfer Company is considering building a new terminal in Salt Lake City. If the company goes ahead with the project, it must spend \$1 million immediately (at $t = 0$) and another \$1 million at the end of Year 1 ($t = 1$). It will then receive net cash flows of \$0.5 million at the end of Years 2-5, and it expects to sell the property and net \$1 million at the end of Year 6. All cash inflows and outflows are after taxes. The company's weighted average cost of capital is 12 percent, and it uses the modified IRR criterion for capital budgeting decisions. What is the project's modified IRR (MIRR)?

- a. 11.9%
- b. 12.0%
- c. 11.4%
- d. 11.5%
- e. 11.7%

MIRR**Answer: b Diff: T**

113. Houston Inc. is considering a project that involves building a new refrigerated warehouse that will cost \$7,000,000 at $t = 0$ and is expected to have operating cash flows of \$500,000 at the end of each of the next 20 years. However, repairs that will cost \$1,000,000 must be incurred at the end of the 10th year. Thus, at the end of Year 10 there will be a \$500,000 operating cash inflow and an outflow of -\$1,000,000 for repairs. If Houston's weighted average cost of capital is 12 percent, what is the project's MIRR? (Hint: Think carefully about the MIRR equation and the treatment of cash outflows.)

- a. 7.75%
- b. 8.17%
- c. 9.81%
- d. 11.45%
- e. 12.33%

MIRR**Answer: b Diff: T**

114. Acheson Aluminum is considering a project with the following cash flows:

<u>Year</u>	<u>Cash Flow</u>
0	-\$200,000
1	125,000
2	140,000
3	-50,000
4	100,000

Acheson's WACC is 10%. What is the project's modified internal rate of return (MIRR)?

- a. 17.95%
- b. 16.38%
- c. 14.90%
- d. 15.23%
- e. 12.86%

MIRR**Answer: e Diff: T**

115. Mississippi Motors is considering a project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$150,000
1	-50,000
2	200,000
3	50,000

The project has a WACC of 9 percent. What is the project's modified internal rate of return (MIRR)?

- a. 7.72%
- b. 29.72%
- c. 11.62%
- d. 12.11%
- e. 11.02%

MIRR**Answer: e Diff: T**

116. Walnut Industries is considering a project with the following cash flows (in millions of dollars):

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$300
1	-200
2	500
3	700

The project has a weighted average cost of capital of 10 percent. What is the project's modified internal rate of return (MIRR)?

- a. 26.9%
- b. 15.3%
- c. 33.9%
- d. 49.4%
- e. 37.4%

MIRR**Answer: c Diff: T**

117. Kilmer Co. is considering the following project:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$150
1	100
2	50
3	-50
4	150

The company's weighted average cost of capital is 10 percent. What is the project's modified internal rate of return (MIRR)?

- a. 4.01%
- b. 24.15%
- c. 16.34%
- d. 14.15%
- e. 17.77%

MIRR**Answer: e Diff: T N**

118. Arrington Motors is considering a project with the following cash flows:

<u>Time period</u>	<u>Cash Flows</u>
0	-\$200
1	+120
2	-50
3	+700

The project has a 12 percent WACC. What is the project's modified internal rate of return (MIRR)?

- a. 68.47%
- b. 51.49%
- c. 48.58%
- d. 37.22%
- e. 52.49%

MIRR**Answer: e Diff: T**

119. Ditka Diners is considering a project with the following expected cash flows (in millions of dollars):

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$300
1	-100
2	70
3	125
4	700

The project's WACC is 10 percent. What is the project's modified internal rate of return (MIRR)?

- a. 36.95%
- b. 18.13%
- c. 27.35%
- d. 26.48%
- e. 23.93%

PV of cash flows**Answer: c Diff: T**

120. After getting her degree in marketing and working for 5 years for a large department store, Sally started her own specialty shop in a regional mall. Sally's current lease calls for payments of \$1,000 at the end of each month for the next 60 months. Now the landlord offers Sally a new 5-year lease that calls for zero rent for 6 months, then rental payments of \$1,050 at the end of each month for the next 54 months. Sally's cost of capital is 11 percent. By what absolute dollar amount would accepting the new lease change Sally's theoretical net worth?

- a. \$2,810.09
- b. \$3,243.24
- c. \$3,803.06
- d. \$4,299.87
- e. \$4,681.76

Multiple part:

(The information below applies to the next two problems.)

Warrick Winery is considering two mutually exclusive projects, Project Red and Project White. The projects have the following cash flows:

<u>Year</u>	<u>Project Red Cash Flows</u>	<u>Project White Cash Flows</u>
0	-\$1,000	-\$1,000
1	100	700
2	200	400
3	600	200
4	800	100

Assume that both projects have a 10 percent WACC.

IRR**Answer: c Diff: M N**

121. What is the internal rate of return (IRR) of the project that has the highest NPV?

- a. 14.30%
- b. 21.83%
- c. 18.24%
- d. 10.00%
- e. 21.96%

Crossover rate**Answer: d Diff: E N**

122. At what weighted average cost of capital would the two projects have the same net present value?

- a. 10.00%
- b. 0.00%
- c. 20.04%
- d. 14.30%
- e. 24.96%

(The following information applies to the next five problems.)

Woodgate Inc. is considering a project that has the following after-tax operating cash flows (in millions of dollars):

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$300
1	125
2	75
3	200
4	100

Woodgate Inc.'s finance department has concluded that the project has a 10 percent cost of capital.

Payback period**Answer: b Diff: E N**

123. What is the project's payback period?

- a. 2.00 years
- b. 2.50 years
- c. 2.65 years
- d. 2.83 years
- e. 3.00 years

Discounted payback**Answer: d Diff: E N**

124. What is the project's discounted payback period?

- a. 2.00 years
- b. 2.50 years
- c. 2.65 years
- d. 2.83 years
- e. 3.00 years

IRR**Answer: d Diff: E N**

125. What is the project's internal rate of return (IRR)?

- a. 10.00%
- b. 16.83%
- c. 19.12%
- d. 23.42%
- e. 26.32%

NPV**Answer: c Diff: E N**

126. What is the project's net present value (NPV)?

- a. \$ 25.88 million
- b. \$ 40.91 million
- c. \$ 94.18 million
- d. \$137.56 million
- e. \$198.73 million

MIRR**Answer: c Diff: M N**

127. What is the project's modified internal rate of return (MIRR)?

- a. 7.64%
- b. 10.53%
- c. 17.77%
- d. 19.12%
- e. 27.64%

(The following information applies to the following four problems.)

Project A has a 10 percent cost of capital and the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>
0	-\$300
1	100
2	150
3	200
4	50

NPV

Answer: d Diff: E N

128. What is Project A's net present value (NPV)?

- a. \$ 21.32
- b. \$ 66.26
- c. \$ 83.00
- d. \$ 99.29
- e. \$112.31

IRR

Answer: d Diff: E N

129. What is Project A's internal rate of return (IRR)?

- a. 13.44%
- b. 16.16%
- c. 18.92%
- d. 24.79%
- e. 26.54%

MIRR

Answer: e Diff: M N

130. What is Project A's modified internal rate of return (MIRR)?

- a. 7.40%
- b. 12.15%
- c. 14.49%
- d. 15.54%
- e. 18.15%

Crossover rate**Answer: c Diff: M N**

131. In addition to Project A, the firm has a chance to invest in Project B. Project B has the following cash flows:

<u>Year</u>	<u>Project B Cash Flow</u>
0	-\$200
1	150
2	100
3	50
4	50

At what cost of capital would Project A and Project B have the same net present value (NPV)?

- a. 11.19%
- b. 12.23%
- c. 12.63%
- d. 13.03%
- e. 13.27%

(The following information applies to the next two problems.)

Company A is considering a project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	-\$5,000
1	5,000
2	3,000
3	-1,000

The project has a cost of capital of 10 percent.

NPV**Answer: b Diff: E N**

132. What is the project's net present value (NPV)?

- a. \$1,157
- b. \$1,273
- c. \$1,818
- d. \$2,000
- e. \$2,776

MIRR**Answer: c Diff: T N**

133. What is the project's modified internal rate of return (MIRR)?

- a. 16.6%
- b. 17.0%
- c. 17.6%
- d. 18.0%
- e. 18.6%

(The following information applies to the next two problems.)

Company B is considering a project with the following cash flows:

<u>Year</u>	<u>Project Cash Flow</u>
0	- X
1	175
2	175
3	300

Missing cash flow, payback period, and NPV

Answer: a Diff: M N

134. Assume that the project has a regular payback period of 2 years and a cost of capital of 10 percent. What is the project's net present value (NPV)?

- a. \$179.11
- b. \$204.11
- c. \$229.11
- d. \$254.11
- e. \$279.11

Missing cash flow, IRR, and NPV

Answer: c Diff: M N

135. Now instead of making an assumption about the payback period, instead assume that the project has an internal rate of return (IRR) of 15 percent. Given this assumption, what would be the project's net present value (NPV) if the WACC equals 12 percent?

- a. \$ 0.00
- b. \$18.08
- c. \$27.54
- d. \$37.30
- e. \$47.36

(The following information applies to the next four problems.)

Bell Corporation is considering two mutually exclusive projects, Project A and Project B. The projects have the following cash flows:

<u>Year</u>	<u>Project A Cash Flow</u>	<u>Project B Cash Flow</u>
0	-500	-500
1	150	300
2	200	300
3	250	350
4	100	-300

Both projects have a 10 percent cost of capital.

NPV

Answer: d Diff: E N

136. What is Project A's net present value (NPV)?

- a. 30.12
- b. 34.86
- c. 46.13
- d. 57.78
- e. 62.01

IRR**Answer: a Diff: E N**

137. What is Project A's internal rate of return (IRR)?

- a. 15.32%
- b. 15.82%
- c. 16.04%
- d. 16.68%
- e. 17.01%

MIRR**Answer: b Diff: T N**

138. What is Project B's modified internal rate of return (MIRR)?

- a. 12.05%
- b. 12.95%
- c. 13.37%
- d. 14.01%
- e. 14.88%

Crossover rate**Answer: c Diff: M N**

139. At what discount rate would the two projects have the same net present value?

- a. 4.50%
- b. 5.72%
- c. 6.36%
- d. 7.15%
- e. 8.83%

CHAPTER 10

ANSWERS AND SOLUTIONS

1. Ranking methods

Answer: b Diff: E

A project's NPV increases as the cost of capital declines. A project's IRR is independent of its cost of capital, while a project's MIRR is dependent on the cost of capital since the terminal value in the MIRR equation is compounded at the cost of capital.

2. Ranking conflicts

Answer: a Diff: E

3. Payback period

Answer: d Diff: E

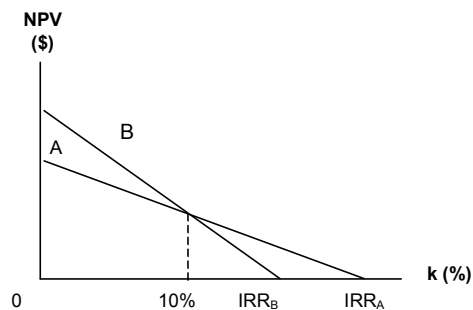
4. NPV profiles

Answer: b Diff: E

5. NPV profiles

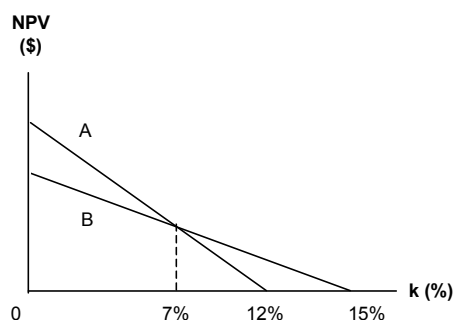
Answer: d Diff: E

You can draw the NPV profiles to get an idea of what is happening. (See the diagram below.) Statement a is false; Project B could have a higher NPV at some WACC if the NPV profiles cross. Statement b is false; Project B could have a negative NPV when A's NPV is positive. Statement c is false; the IRR is unaffected by the WACC. Statement d is the correct choice.



6. NPV profiles

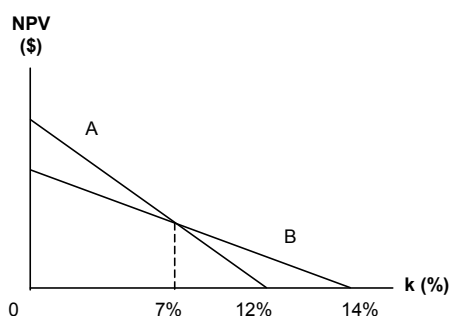
Answer: e Diff: E



Since both projects have an IRR greater than the 10% cost of capital, both will have a positive NPV. Therefore, statement a is true. At 6 percent, the cost of capital is less than the crossover rate and Project A has a higher NPV than B. Therefore, statement b is false. If the cost of capital is 13 percent, then the cost of capital is greater than the crossover rate and B would have a higher NPV than A. Therefore, statement c is true. Since statements a and c are both true, the correct choice is statement e.

7. NPV profiles

Answer: e Diff: E



Statement a is true because at any point to the right of the crossover point B will have a higher NPV than A. Statement b is true for the same reason that statement a is true; at any point to the right of the crossover point, B will have a higher NPV than A. Statement c is true. If B's cost of capital is 9 percent, the MIRR assumes reinvestment of the cash flows at 9 percent. When IRR is used, the IRR calculation assumes that cash flows are reinvested at the IRR (which is higher than the cost of capital). Since statements a, b, and c are true, statement e is the correct choice.

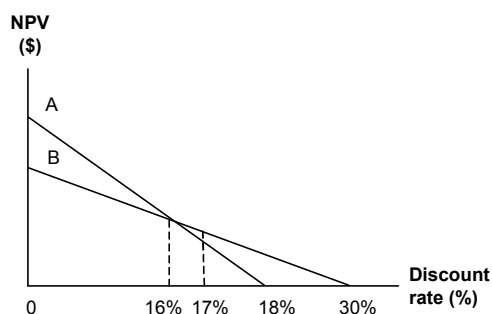
8. NPV profiles

Answer: a Diff: M N

The correct answer is statement a. The IRR of Project X exceeds its weighted average cost of capital; therefore, the project has a positive net present value. Statement b is incorrect; we do not know where the crossover point is (if one exists) for these two projects. Statement c is also incorrect; if anything, existing information would suggest that Project X was the smaller project. In addition, the lower NPV could be the product of the timing of cash flows or the length of the project's life.

9. NPV profiles

Answer: b Diff: E

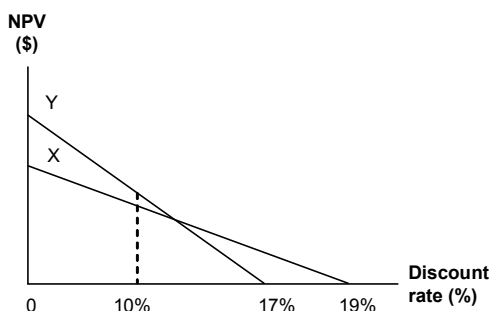


Draw the NPV profiles using the information given in the problem. It is clear that Project A will have a higher NPV when the cost of capital is 12 percent. Therefore, statement a is false. At a 17 percent cost of capital, Project B will have a higher NPV than Project A. Therefore, statement b is true. If the cost of capital were 0, then the NPV of the projects would be the simple sum of all the cash flows. In order for statement c to be true, B's NPV at a 0 cost of capital would have to be higher than A's. From the diagram we see that this is clearly incorrect. So, statement c is false.

10. NPV profiles

Answer: a Diff: E N

The correct answer is statement a. To see this, draw the projects' NPV profiles from the information given in the problem. The profiles look like this:



From this diagram, you can see that the crossover rate is greater than 10%, so statement a is correct. Project Y has a higher NPV for any cost of capital less than the crossover point (which we know is greater than 10%), so statement b is incorrect. Since these are normal projects, X's MIRR is between the cost of capital and X's IRR (making it less than 19%). So, statement c is incorrect.

11. NPV and IRR

Answer: a Diff: E

Statement a is true; the other statements are false. If the projects are mutually exclusive, then project B may have a higher NPV even though Project A has a higher IRR. IRR is calculated assuming cash flows are reinvested at the IRR, not the cost of capital.

12. NPV and IRR

Answer: a Diff: E

Statement a is true; projects with IRRs greater than the cost of capital will have a positive NPV. Statement b is false because you know nothing about the relative magnitudes of the projects. Statement c is false because the IRR is independent of the cost of capital. Therefore, the correct choice is statement a.

13. NPV, IRR, and MIRR

Answer: b Diff: E

Statement b is true; the other statements are false. Statement a is false; if the $NPV > 0$, then the return must be $> 12\%$. Statement c is false; if $NPV > 0$, then $MIRR > WACC$.

14. NPV, IRR, MIRR, and payback

Answer: d Diff: E

Statement a is true because the IRR exceeds the WACC. Statement b is also true because the MIRR assumes that the inflows are reinvested at the WACC, which is less than the IRR. Statement c is false. For a normal project, the discounted payback is always longer than the regular payback because it takes longer for the discounted cash flows to cover the purchase price. So, statement d is the correct answer.

15. NPV and expected return

Answer: e Diff: E

Statements a, b, c, and d are false. Statement e is correct because you can think of a firm as a big project. If the stock is correctly priced, i.e., the stock market is efficient, the NPV of this project should be zero.

16. NPV and project selection

Answer: e Diff: E

Statement a is true. The IRRs of both projects exceed the cost of capital. Statement b is false. We cannot determine this without knowing the NPVs of the projects. Statement c is true. To see why, draw the NPV profiles. Statement d is false. Therefore, statement e is the correct answer.

17. IRR

Answer: b Diff: E

The correct statement is b; the other statements are false. Since Project A's IRR is 15%, at a WACC of 15% $NPV_A = 0$; however, Project B would still have a positive NPV. Given the information in a, we can't conclude which project's NPV is going to be greater at a cost of capital of 10%. Since we are given no details about each project's cash flows we cannot conclude anything about payback. Finally, IRR is independent of the discount rate, that is, IRR stays the same no matter what the WACC is.

18. Post-audit

Answer: d Diff: E

19. NPV profiles

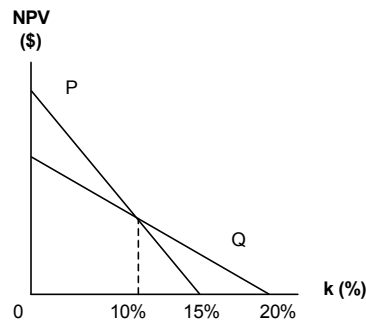
Answer: b Diff: M

20. NPV profiles

Answer: a Diff: M

21. NPV profiles

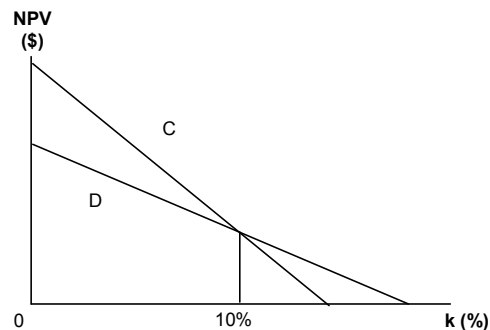
Answer: d Diff: M



The diagram above can be drawn from the statements in this question. From the diagram drawn, statements a, b, and c are true; therefore, statement d is the correct choice.

22. NPV profiles

Answer: d Diff: M



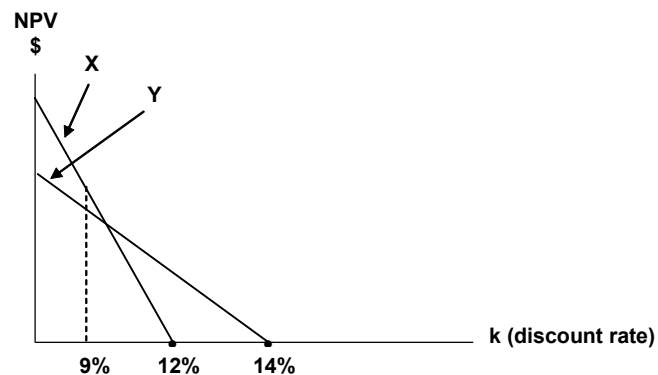
First, draw the NPV profiles as shown above. Make sure the profiles cross at 10 percent because the projects have the same NPV at a cost of capital of 10 percent. When WACC is less than 10 percent, C has a higher NPV, so C's NPV profile is above D's NPV profile to the left of the crossover point (10%).

Statement a is true. IRR is always independent of the cost of capital, and from the diagram above, we can see that D's IRR is to the right of C's where the two lines cross the X-axis. Statement b is false. IRR is independent of the cost of capital, and from the diagram C's IRR is always lower than D's. Statement c is true. D's MIRR will be somewhere between the cost of capital and the IRR. Therefore, the correct choice is statement d.

23. NPV profiles

Answer: e Diff: M N

The correct answer is statement e. To see this, draw the projects' NPV profiles from the information given in the problem. The profiles look like this:



Recall if $WACC > IRR$, the project has a negative NPV. If $WACC < IRR$, then the project has a positive NPV. So, statement a is correct. A lower IRR is usually associated with a longer payback. So, statement b is incorrect. Since Project X has a higher NPV at 9% than Project Y, yet the $IRR_X < IRR_Y$, then the crossover rate must be between 9% and the lowest IRR (the IRR of X, which is 12%). So, statement c is correct. Thus, statement e is the correct choice.

24. NPV and IRR

Answer: c Diff: M

25. NPV and IRR

Answer: a Diff: M

Statement a is the incorrect statement. NPV is positive if IRR is greater than the cost of capital.

26. NPV and IRR

Answer: e Diff: M

Statement a is false. The projects could easily have different NPVs based on different cash flows and costs of capital. Statement b is false. NPV is dependent upon the size of the project. Think about the NPV of a \$3 project versus the NPV of a \$3 million project. Statement c is false. NPV is dependent on a project's risk. Therefore, the correct choice is statement e.

27. NPV, IRR, and MIRR

Answer: a Diff: M

The correct answer is a; the other statements are false. The IRR is the discount rate at which a project's NPV is zero. If a project's IRR exceeds the firm's cost of capital, then its NPV must be positive, since NPV is calculated using the firm's cost of capital to discount project cash flows.

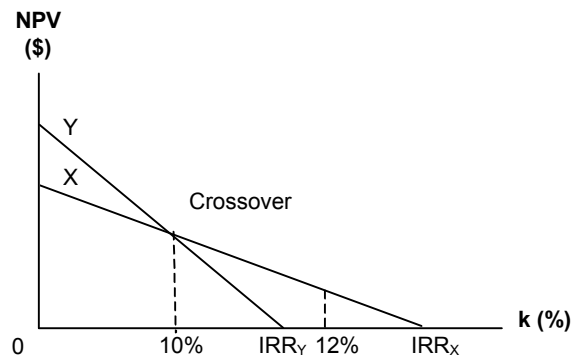
28. NPV, IRR, and MIRR

Answer: c Diff: M

Statement c is correct; the other statements are false. MIRR and NPV can conflict for mutually exclusive projects if the projects differ in size. NPV does not suffer from the multiple IRR problem.

29. NPV, IRR, and MIRR

Answer: d Diff: M



If IRR_X is greater than $MIRR_X$, then its IRR must be greater than the cost of capital. (Remember that the MIRR will be somewhere between the cost of capital and the IRR.) Therefore, statement a must be true. Similarly, if IRR_Y is less than $MIRR_Y$, then its IRR must be less than the cost of capital. Therefore, statement b must be true. At a cost of capital of 10 percent they have the same NPV, so this is the crossover rate. From statements a and b we know that IRR_X must be greater than IRR_Y , so to the right of the crossover rate NPV_X will be larger than NPV_Y . Consequently, to the left of the crossover rate NPV_X must be smaller than NPV_Y . Therefore, statement c is also true. Since statements a, b, and c are all true, the correct choice is statement d.

30. NPV, IRR, and payback

Answer: e Diff: M

Statement e is correct; the other statements are false. Statement a is false; the two projects' NPV profiles could cross, consequently, a higher IRR doesn't guarantee a higher NPV. Statement b is false; if the two projects' NPV profiles cross, Y could have a higher NPV. Statement c is false; we don't have enough information.

31. IRR

Answer: e Diff: M

32. MIRR

Answer: e Diff: M

33. Ranking methods

Answer: b Diff: M

This statement reflects exactly the difference between the NPV and IRR methods.

34. Ranking methods

Answer: d Diff: M

Both statements a and c are correct; therefore, statement d is the correct choice. Due to reinvestment rate assumptions, NPV and IRR can lead to conflicts; however, there will be no conflict between NPV and MIRR if the projects are equal in size (which is one of the assumptions in this question).

35. Project selection **Answer: a Diff: M**

This is the only project with either a positive NPV or an IRR that exceeds the cost of capital.

36. Miscellaneous concepts **Answer: e Diff: M**

Statement e is true; the other statements are false. IRR can lead to conflicting decisions with NPV even with normal cash flows if the projects are mutually exclusive. Cash outflows are discounted at the cost of capital with the MIRR method, while cash inflows are compounded at the cost of capital. Conflicts between NPV and IRR arise when the cost of capital is less than the crossover rate. The discounted payback method corrects the problem of ignoring the time value of money, but it still does not consider cash flows that occur beyond the payback period.

37. Miscellaneous concepts **Answer: d Diff: M**

Statements a and c are true; therefore, statement d is the correct choice. The discounted payback method still ignores cash flows that occur after the payback period.

38. Miscellaneous concepts **Answer: a Diff: M**

Statement a is true; the other statements are false. Multiple IRRs can occur only for projects with nonnormal cash flows. Mutually exclusive projects imply that only one project should be chosen. The project with the highest NPV should be chosen.

39. Miscellaneous concepts **Answer: a Diff: M**

Statement a is true; the other statements are false. Sketch the profiles. From the information given, D has the higher IRR. The project's scale cannot be determined from the information given. As C's NPV declines more rapidly with an increase in rates, this implies that more of the cash flows are coming later on. So C would have a slower payback than D.

40. NPV profiles **Answer: b Diff: T**

41. NPV, IRR, and MIRR **Answer: c Diff: T**

42. NPV, IRR, and MIRR

Answer: a Diff: T

Statement a is true. To see this, sketch out a NPV profile for a normal, independent project, which means that only one NPV profile will appear on the graph. If $WACC < IRR$, then IRR says accept. But in that case, $NPV > 0$, so NPV will also say accept. Statement d is false. Here is the reasoning:

1. For the NPV profiles to cross, then one project must have a higher NPV at $k = 0$ than the other project, that is, their vertical axis intercepts will be different.
2. A second condition for NPV profiles to cross is that one have a higher IRR than the other.
3. The third condition necessary for profiles to cross is that the project with the higher NPV at $k = 0$ will have the lower IRR.

One can sketch out two NPV profiles on a graph to see that these three conditions are indeed required.

4. The project with the higher NPV at $k = 0$ must have more cash inflows, because it has the higher NPV when cash flows are not discounted, which is the situation if $k = 0$.
5. If the project with more total cash inflows also had its cash flows come in earlier, it would dominate the other project--its NPV would be higher at all discount rates, and its IRR would also be higher, so the profiles would not cross. The only way the profiles can cross is for the project with more total cash inflows to get a relatively high percentage of those inflows in distant years, so that their PVs are low when discounted at high rates. Most students either grasp this intuitively or else just guess at the question!

43. Choosing among mutually exclusive projects

Answer: c Diff: T

Draw out the NPV profiles of these two projects. As B's NPV declines more rapidly with an increase in discount rates, this implies that more of the cash flows are coming later on. Therefore, Project A has a faster payback than Project B.

44. Payback period

Answer: b Diff: E

Time line (in thousands):

	0	1	2	3	4	5	6	7	8	9	10 Yrs.
	$k = 10\%$										
CFs	-150	30	30	30	30	35	35	35	35	35	40
Cumulative											
CFs	-150	-120	-90	-60	-30	5					

Using the even cash flow distribution assumption, the project will completely recover the initial investment after $\$30/\$35 = 0.86$ of Year 5:

$$\text{Payback} = 4 + \frac{\$30}{\$35} = 4.86 \text{ years.}$$

45. Discounted payback**Answer: e Diff: E**

The PV of the outflows is -\$700 million. To find the discounted payback you need to keep adding cash flows until the cumulative PVs of the cash inflows equal the PV of the outflow:

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$700 million	-\$700.0000	-\$700.0000
1	200 million	181.8182	-518.1818
2	370 million	305.7851	-212.3967
3	225 million	169.0458	-43.3509
4	700 million	478.1094	434.7585

The payback occurs somewhere in Year 4. To find out exactly where, we calculate $\$43.3509/\$478.1094 = 0.0907$ through the year. Therefore, the discounted payback is 3.091 years.

46. Discounted payback**Answer: d Diff: E**

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$3,000	-\$3,000.00	-\$3,000.00
1	1,000	909.09	-2,090.91
2	1,000	826.45	-1,264.46
3	1,000	751.31	-513.15
4	1,000	683.01	169.86

After Year 3, you can see that you won't need all of Year 4 cash flows to break even. To find the portion that you need, calculate $\$513.15/\$683.01 = 0.75$. Therefore, the discounted payback is 3.75 years.

47. Discounted payback**Answer: e Diff: E N**

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$300	-\$300.00	-\$300.00
1	100	$100/(1.10) = 90.91$	-209.09
2	150	$150/(1.10)^2 = 123.97$	-85.12
3	200	$200/(1.10)^3 = 150.26$	65.14
4	50	$50/(1.10)^4 = 34.15$	

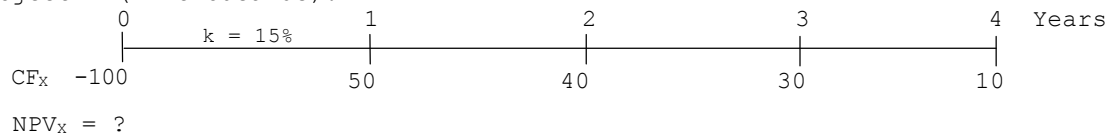
From the cumulative cash flows we can see that the discounted payback is somewhere between 2 and 3 years. We assume that the \$150.26 is received evenly throughout the third year. So, the initial outlay is recovered in $2 + \$85.12/\150.26 , or 2.57 years.

48. NPV

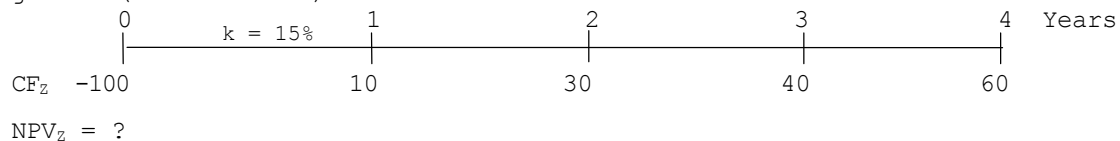
Answer: a Diff: E

Time line:

Project X (in thousands):



Project Z (in thousands):



Numerical solution:

$$NPV_X = -\$100,000 + \frac{\$50,000}{1.15} + \frac{\$40,000}{(1.15)^2} + \frac{\$30,000}{(1.15)^3} + \frac{\$10,000}{(1.15)^4}$$

$$= -832.97 \approx -\$833.$$

$$NPV_Z = -\$100,000 + \frac{\$10,000}{1.15} + \frac{\$30,000}{(1.15)^2} + \frac{\$40,000}{(1.15)^3} + \frac{\$60,000}{(1.15)^4}$$

$$= -\$8,014.19 \approx -\$8,014.$$

Financial calculator solution (in thousands):

Project X: Inputs: $CF_0 = -100$; $CF_1 = 50$; $CF_2 = 40$; $CF_3 = 30$;
 $CF_4 = 10$; $I = 15$.

Output: $NPV_X = -0.833 = -\$833$.

Project Z: Inputs: $CF_0 = -100$; $CF_1 = 10$; $CF_2 = 30$; $CF_3 = 40$;
 $CF_4 = 60$; $I = 15$.

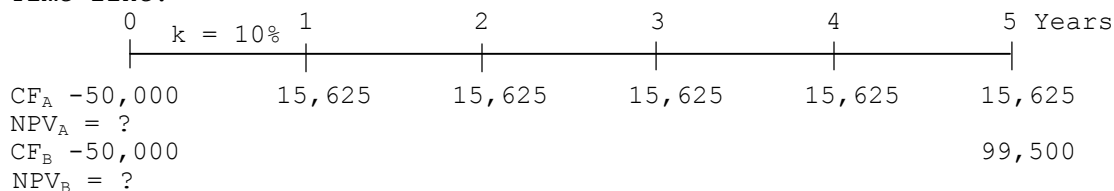
Output: $NPV_Z = -8.014 = -\$8,014$.

At a cost of capital of 15%, both projects have negative NPVs and, thus, both would be rejected.

49. NPV

Answer: a Diff: E

Time line:



Financial calculator solution:

Project A: Inputs: CF₀ = -50000; CF₁ = 15625; N_j = 5; I = 10.
Output: NPV = \$9,231.04.

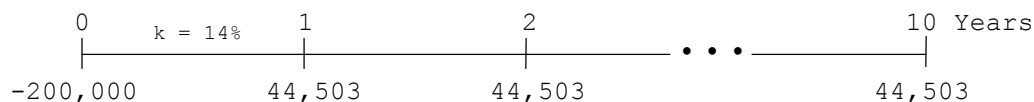
Project B: Inputs: CF₀ = -50000; CF₁ = 0; N_j = 4; CF₂ = 99500; I = 10.
Output: NPV = \$11,781.67.

NPV_B > NPV_A; \$11,781.67 > \$9,231.04; Choose Project B.

50. IRR

Answer: c Diff: E

Time line:



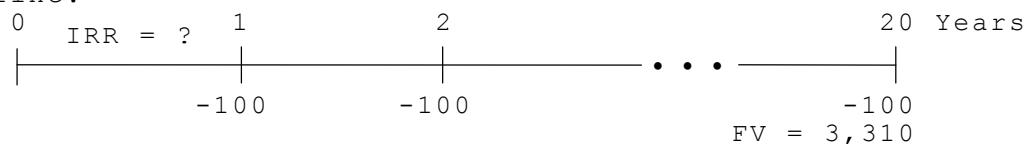
Financial calculator solution:

Inputs: CF₀ = -200000; CF₁ = 44503; N_j = 10. Output: IRR = 18%.

51. IRR

Answer: c Diff: E

Time line:



Financial calculator solution:

Inputs: CF₀ = 0; CF₁ = -100; N_j = 19; CF₂ = 3210. Output: IRR = 5.0%.

52. IRR, payback, and missing cash flow

Answer: d Diff: E

Step 1: Determine the cash outflow at t = 0:

The payback is 2.25 years, so the cash flow will be:

$$\begin{aligned} CF_0 &= -[CF_1 + CF_2 + 0.25(CF_3)] \\ &= -[\$500 + \$300 + 0.25(\$400)] \\ &= -\$900. \end{aligned}$$

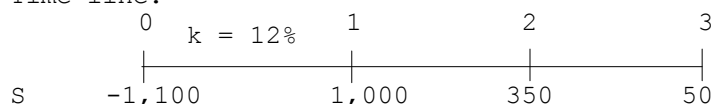
Step 2: Calculate the IRR:

CF₀ = -900; CF₁ = 500; CF₂ = 300; CF₃ = 400; CF₄ = 600; and then solve for IRR = 33.49% ≈ 33.5%.

53. IRR and mutually exclusive projects**Answer: d Diff: E**

Because the two projects are mutually exclusive, the project with the higher positive NPV is the "better" project.

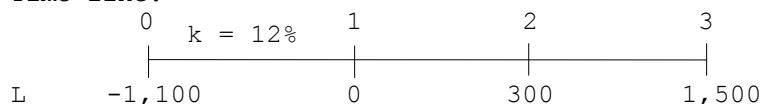
Time line:



Inputs: $CF_0 = -1100$; $CF_1 = 1000$; $CF_2 = 350$; $CF_3 = 50$; $I = 12$.

Outputs: NPV = \$107.46; IRR = 20.46%.

Time line:



Inputs: $CF_0 = -1100$; $CF_1 = 0$; $CF_2 = 300$; $CF_3 = 1500$; $I = 12$.

Outputs: NPV = \$206.83; IRR = 19.08%.

Project L is the "better" project because it has the higher NPV; its IRR = 19.08%.

54. NPV and IRR**Answer: b Diff: E**

Project S: Inputs: $CF_0 = -1000$; $CF_1 = 500$; $N_j = 3$; $I = 10$.

Outputs: \$243.43; IRR = 23.38%.

Project L: Inputs: $CF_0 = -2000$; $CF_1 = 668.76$; $N_j = 5$; $I = 10$.

Outputs: \$535.13; IRR = 20%.

Value sacrificed: $\$535.13 - \$243.43 = \$291.70$.

55. NPV and IRR**Answer: e Diff: E**

Enter the cash flows for each project into the cash flow register on the calculator as follows:

Project A: Inputs: $CF_0 = -50000$; $CF_1 = 10000$; $CF_2 = 15000$; $CF_3 = 40000$; $CF_4 = 20000$; $I = 10$.

Outputs: NPV = \$15,200.46 \approx \$15,200; IRR = 21.38%.

Project B: Inputs: $CF_0 = -30000$; $CF_1 = 6000$; $CF_2 = 12000$; $CF_3 = 18000$; $CF_4 = 12000$; $I = 10$.

Outputs: NPV = \$7,091.73 \approx \$7,092; IRR = 19.28%.

Project A has the highest IRR, so the answer is \$15,200.

56. NPV and IRR

Answer: d Diff: E N

Use your financial calculator to solve for each project's IRR:

Project X: $CF_0 = -500000$; $CF_1 = 250000$; $CF_2 = 250000$; $CF_3 = 250000$; and then solve for $IRR = 23.38\%$.

Project Y: $CF_0 = -500000$; $CF_1 = 350000$; $CF_2 = 350000$; and then solve for $IRR = 25.69\%$.

Since Project Y has the higher IRR, use its data to solve for its NPV as follows:

$CF_0 = -500000$; $CF_1 = 350000$; $CF_2 = 350000$; $I/YR = 10$; and then solve for NPV = \$107,438.02.

57. NPV, IRR, and payback

Answer: d Diff: E

$Payback = 2 + \$300/\$500 = 2.6$ years.

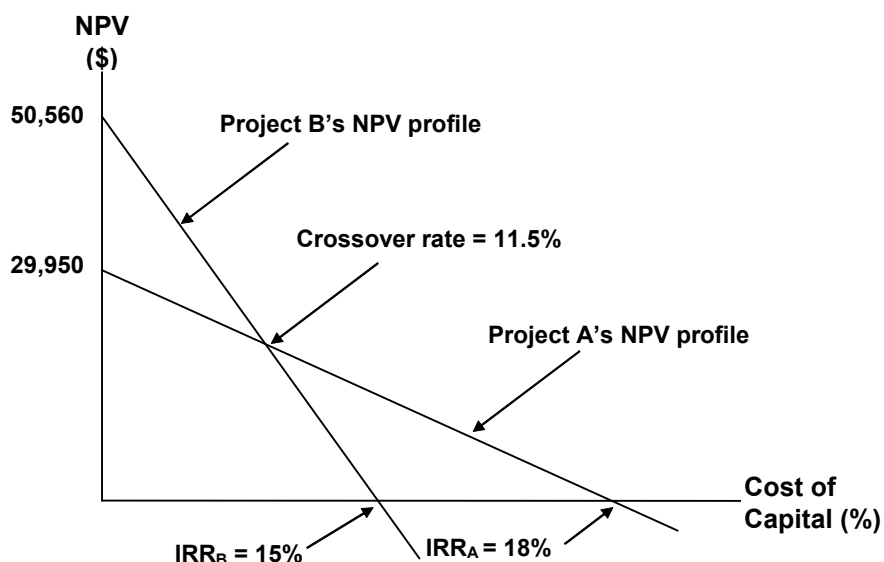
Using the cash flow register, calculate the NPV and IRR as follows:

Inputs: $CF_0 = -1000$; $CF_1 = 400$; $CF_2 = 300$; $CF_3 = 500$; $CF_4 = 400$; $I = 10$.

Outputs: $NPV = \$260.43 \approx \260 ; $IRR = 21.22\%$.

58. Crossover rate

Answer: b Diff: E



Time line:

	0	1	2	3	4	5	Years
CF_A	-50,000	15,990	15,990	15,990	15,990	15,990	
CF_B	-50,000	0	0	0	0	100,560	
CF_{A-B}	0	15,990	15,990	15,990	15,990	-84,570	

Financial calculator solution:

Solve for IRR_A :

Inputs: $CF_0 = -50000$; $CF_1 = 15990$; $N_j = 5$. Output: $IRR = 18.0\%$.

Solve for IRR_B :

Inputs: $CF_0 = -50000$; $CF_1 = 0$; $N_j = 4$; $CF_2 = 100560$.

Output: $IRR = 15.0\%$.

Solve for crossover rate using the differential project CFs, CF_{A-B}

Inputs: $CF_0 = 0$; $CF_1 = 15990$; $N_j = 4$; $CF_2 = -84570$.

Output: $IRR = 11.49\%$. The crossover rate is 11.49%.

59. Crossover rate

Answer: d Diff: E

Find the crossover rate, which is the IRR of the difference in each year's cash flow from the two projects. The differences of the cash flows ($CF_B - CF_A$) are entered into the calculator:

$CF_0 = -100000$; $CF_1 = 25000$; $CF_2 = 25000$; $CF_3 = 30000$; $CF_4 = 50000$; and then solve for $IRR = 10.03\%$.

60. Crossover rate**Answer: a Diff: E**

Step 1: Determine the differential cash flows (in millions of dollars) between Projects X and Y:

	Project X	Project Y	Δ CFs
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>	<u>X - Y</u>
0	-\$3,700	-\$3,200	\$-500
1	1,400	900	500
2	1,070	1,000	70
3	1,125	1,135	-10
4	700	720	-20

Step 2: Calculate the IRR of the differential cash flows:

Enter the following data in the calculator:

$CF_0 = -500$; $CF_1 = 500$; $CF_2 = 70$; $CF_3 = -10$; $CF_4 = -20$; and then solve for $IRR = 8.073\%$.

61. Crossover rate**Answer: c Diff: E**

Step 1: Determine the differential cash flows between Projects A and B:

	Project A	Project B	Δ CFs
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>	<u>A - B</u>
0	-\$2,000	-\$1,500	-\$500
1	700	300	400
2	700	500	200
3	1,000	800	200
4	1,000	1,100	-100

Step 2: Calculate the IRR of the differential cash flows:

Enter the following data in the calculator:

$CF_0 = -500$; $CF_1 = 400$; $CF_2 = 200$; $CF_3 = 200$; $CF_4 = -100$; and then solve for $IRR = 26.67\%$.

62. Crossover rate**Answer: d Diff: E N**

First, we must find the difference in the 2 projects' cash flows for each year.

	Project 1	Project 2	Δ CFs
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>	<u>1 - 2</u>
0	-\$400	-\$500	\$100
1	175	50	125
2	100	100	0
3	250	300	-50
4	175	550	-375

Then, enter these data into the cash flow register on your calculator and solve for IRR:

$CF_0 = 100$; $CF_1 = 125$; $CF_2 = 0$; $CF_3 = -50$; $CF_4 = -375$; and then solve for $IRR = 20.97\%$.

63. Crossover rate

Answer: d Diff: E N

This is simply asking for the crossover rate of these two projects. The first step to finding the crossover rate is to take the difference of the two projects' cash flows. Here, we subtracted the second column from the first:

	Project A	Project B	Δ CFs
Year	Cash Flow	Cash Flow	A - B
0	-\$300	-\$300	\$0
1	140	500	-360
2	360	150	210
3	400	100	300

To find the crossover rate, enter the Δ cash flows in the cash flow register: $CF_0 = 0$; $CF_1 = -360$; $CF_2 = 210$; $CF_3 = 300$; and then solve for IRR = 25.00%.

64. Payback period

Answer: c Diff: M

Time line (in thousands):

	0	1	2	3	4	5	6	...	10 Years
CF	-100	-500	100	110	121	133.1	146.41		
Cumulative NCF	-100	-600	-500	-390	-269	-135.9	10.51		

$$\text{Payback} = 5 + \frac{\$135.9}{\$146.41} = 5.928 \text{ years} \approx 6 \text{ years.}$$

65. Payback period

Answer: c Diff: M

Step 1: Calculate the PV of the cash flows:

Inputs: $N = 5$; $I = 10$; $PMT = 60000$; $FV = 0$.

Output: $PV = -\$227,447.21$. PV of cash flows = $\$227,447.21 \approx \$227,447$.

Step 2: Calculate the Year 0 outflow:

The outflow at $t = 0$ is X where $\$227,447 - X = \$75,000$. X or $CF_0 = -\$152,447$.

Step 3: Calculate the regular payback:

Year	CF	Cumulative CF
0	-\$152,447	-\$152,447
1	60,000	-92,447
2	60,000	-32,447
3	60,000	27,553
4	60,000	87,553
5	60,000	147,553

$$\text{So the payback is } 2 + \frac{\$32,447}{\$60,000} = 2.54 \text{ years.}$$

66. Discounted payback**Answer: e Diff: M**

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$200,000	-\$200,000.00	-\$200,000.00
1	50,000	45,454.55	-154,545.45
2	100,000	82,644.63	-71,900.82
3	150,000	112,697.22	40,796.40
4	40,000	27,320.54	68,116.94
5	25,000	15,523.03	83,639.97

$$\text{Payback period} = 2 \text{ years} + \frac{\$71,900.82}{\$112,697.22} = 2.638 \text{ years.}$$

67. Discounted payback**Answer: b Diff: M**

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$100,000	-\$100,000.00	-\$100,000.00
1	40,000	36,363.64	-63,636.36
2	90,000	74,380.17	10,743.81
3	30,000	22,539.44	33,283.25
4	60,000	40,980.81	74,264.06

$$\text{Discounted Payback} = 1 + \frac{\$63,636.36}{\$74,380.17} = 1.86 \text{ years.}$$

68. Discounted payback**Answer: d Diff: M**

Project A:

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$100,000	-\$100,000.00	-\$100,000.00
1	40,000	36,363.64	-63,636.36
2	40,000	33,057.85	-30,578.51
3	40,000	30,052.59	-525.92
4	30,000	20,490.49	19,964.57

Project A's discounted payback period exceeds 3 years, so it would not be accepted.

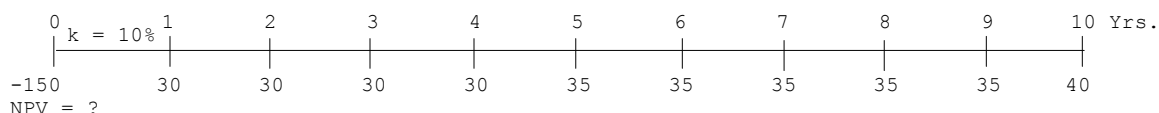
Project B:

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$80,000	-\$80,000.00	-\$80,000.00
1	50,000	45,454.55	-34,545.45
2	20,000	16,528.93	-18,016.52
3	30,000	22,539.44	4,522.92
4	0	0	4,522.92

You can see that in Year 3 the cumulative cash flow becomes positive so the project's payback period is less than 3 years.

69. NPV**Answer: d Diff: M**

Time line (in thousands):



Financial calculator solution (in thousands):

Inputs: $CF_0 = -150$; $CF_1 = 30$; $N_j = 4$; $CF_2 = 35$; $N_j = 5$; $CF_3 = 40$; $I = 10$.Output: $NPV = \$51.13824 = \$51,138.24 \approx \$51,138$.**70. NPV****Answer: b Diff: M**

Time line (in thousands):



Financial calculator solution (in thousands):

Inputs: $CF_0 = 0$; $CF_1 = 5$; $N_j = 5$; $CF_2 = 3$; $N_j = 3$; $CF_3 = 2$; $N_j = 2$; $I = 14$.Output: $NPV = 21.93726 = \$21,937.26$.**71. NPV****Answer: d Diff: M N**

First, find the value of X (the up-front cash flow in this project). IRR is the rate at which you need to reinvest the cash flows for NPV to equal \$0. In this case the IRR is 12 percent, so if you invest all the project's cash flows at 12 percent, you should have an NPV of zero.

Step 1: Calculate the value of the initial cash flow by solving for NPV at a 12 percent cost of capital:

You don't have CF_0 , so use 0 as the placeholder. Enter the following data as inputs in your calculator: $CF_0 = 0$; $CF_1 = 75000$; $N_j = 20$; and $I/Yr = 12$. Then solve for $NPV = \$560,208.27$.

This is the NPV when the initial cash flow is missing. The NPV when the cash flow is added must be \$0, so that initial cash flow must be $-\$560,208.27$.

Step 2: Calculate the net present value of the project at its cost of capital of 10 percent:

Enter the following data as inputs in your calculator: $CF_0 = -560208.27$; $CF_1 = 75000$; $N_j = 20$; and $I/Yr = 10$. Then solve for $NPV = \$78,309.01 \approx \$78,309$.

72. NPV profiles

Answer: d Diff: M

First, solve for the crossover rate. If you subtract the cash flows (CFs) of Project A from the CFs of Project B, then the differential CFs are $CF_0 = -10000$, $CF_1 = -40000$, $CF_2 = 0$, $CF_3 = 20000$, and $CF_4 = 40000$. Entering these CFs and solving for IRR/YR yields a crossover rate of 6.57%. Thus, if the cost of capital is 6.57%, then Projects A and B have the same NPV. If the cost of capital is less than 6.57%, then Project B has a higher NPV than Project A, since Project B's cash inflows come comparatively later in the project life. For lower discount rates, Project B's NPV is not penalized as much for having large cash inflows farther in the future than Project A.

73. NPV, payback, and missing cash flow

Answer: b Diff: M

First, find the missing $t = 0$ cash flow. If payback = 2.5 years, this implies $t = 0$ cash flow must be $-\$2,000 - \$3,000 + (0.5)\$3,000 = -\$6,500$.

$$\begin{aligned} NPV &= -\$6,500 + \frac{\$2,000}{1.12} + \frac{\$3,000}{(1.12)^2} + \frac{\$3,000}{(1.12)^3} + \frac{\$1,500}{(1.12)^4} \\ &= \$765.91. \end{aligned}$$

74. IRR

Answer: d Diff: M

Time line:

	$\begin{array}{c} IRR_A = ? \\ 0 \quad IRR_B = ? \end{array}$									
	0	1	2	3	4	Years				
CF _A	-2,000	0	0	0	3,877					
CF _B	-2,000	832	832	832	832					

Financial calculator solution:

Machine A: Inputs: $CF_0 = -2000$; $CF_1 = 0$; $N_j = 3$; $CF_2 = 3877$.

Output: $IRR = 17.996\% \approx 18\%$.

Machine B: Inputs: $CF_0 = -2000$; $CF_1 = 832$; $N_j = 4$.

Output: $IRR = 24.01\% \approx 24\%$.

75. IRR

Answer: c Diff: M

Financial calculator solution:

Project A: Inputs: $N = 1$; $PV = -10000$; $PMT = 0$; $FV = 11800$.

Output: $I = 18\% = IRR_A$.

Project C: Inputs: $N = 3$; $PV = -12000$; $PMT = 5696$; $FV = 0$.

Output: $I = 19.99\% \approx 20\% = IRR_C$.

76. IRR

Answer: e Diff: M N

Using your financial calculator find the NPV without the initial cash flow: $CF_0 = 0$; $CF_1 = 150$; $CF_2 = 200$; $CF_3 = 250$; $CF_4 = 400$; $CF_5 = 100$; $I = 10$; and then solve for $NPV = \$824.78$.

This means that the initial cash flow must be -700 ($\$124.78 - \$824.78 = -\$700$). Now, we can enter all the cash flows and solve for the project's IRR.

$CF_0 = -700$; $CF_1 = 150$; $CF_2 = 200$; $CF_3 = 250$; $CF_4 = 400$; $CF_5 = 100$; and then solve for $IRR = 16.38\%$.

77. NPV and IRR

Answer: a Diff: M

Time line:

	0	k = 12%	1	2	3	4	Years
Cash flows S	-1,100		900	350	50	10	
	$NPV_S = ?$		$IRR_S = ?$				
Cash flows L	-1,100		0	300	500	850	
	$NPV_L = ?$		$IRR_L = ?$				

Project S: Inputs: $CF_0 = -1100$; $CF_1 = 900$; $CF_2 = 350$; $CF_3 = 50$; $CF_4 = 10$; $I = 12$.

Outputs: $NPV_S = \$24.53$; $IRR_S = 13.88\%$.

Project L: Inputs: $CF_0 = -1100$; $CF_1 = 0$; $CF_2 = 300$; $CF_3 = 500$; $CF_4 = 850$; $I = 12$.

Outputs: $NPV_L = \$35.24$; $IRR_L = 13.09\%$.

Project L has the higher NPV and its $IRR = 13.09\%$.

78. IRR of uneven CF stream

Answer: d Diff: M

Time line:

0	1	2	3	4	5	6	Years
			$IRR = ?$				
			-3,000,000	2,000,000	2,000,000	-500,000	

Financial calculator solution (in millions):

Inputs: $CF_0 = -3$; $CF_1 = 2$; $N_j = 2$; $CF_2 = -0.5$.

Output: $IRR = 12.699\% \approx 12.70\%$.

79. IRR of uneven CF stream

Answer: e Diff: M

Time line (in millions):

0	1	2	3	4	5	Years
$IRR = ?$						
-5	1	1.5	2	2	2	

Financial calculator solution (in millions):

Inputs: $CF_0 = -5$; $CF_1 = 1.0$; $CF_2 = 1.5$; $CF_3 = 2.0$; $N_j = 3$.

Output: $IRR = 18.37\%$.

80. IRR, payback, and missing cash flow

Answer: c Diff: M

Step 1: Find Project 1's payback:

Year	Project 1 Cash Flow	Cumulative Cash Flow
0	-100	-100
1	30	-70
2	50	-20
3	40	20
4	50	70

$$\text{Payback}_{\text{Project 1}} = 2 + \$20/\$40 = 2.5 \text{ years.}$$

Project 2's payback = 2.5 years because we're told the two projects' paybacks are equal.

Step 2: Calculate Project 2's initial outlay, given its payback = 2.5 years:

$$\begin{aligned} \text{Initial outlay} &= -[CF_1 + CF_2 + (0.5)(CF_3)] \\ &= -[\$40 + \$80 + (0.5)(\$60)] \\ &= -\$150. \end{aligned}$$

Step 3: Calculate Project 2's IRR:

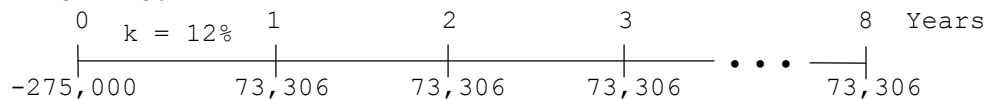
Enter the following data in the calculator:

$CF_0 = -150$; $CF_1 = 40$; $CF_2 = 80$; $CF_3 = 60$; $CF_4 = 60$; and then solve for $IRR = 20.85\%$.

81. MIRR

Answer: d Diff: M

Time line:



Financial calculator solution:

TV Inputs: $N = 8$; $I = 12$; $PV = 0$; $PMT = 73306$.

Output: $FV = -\$901,641.31$.

MIRR Inputs: $N = 8$; $PV = -275000$; $PMT = 0$; $FV = 901641.31$.

Output: $I = 16.0\%$.

Answer: e Diff: M

Alternatively, with a financial calculator you can find the FV of the cash inflows by first finding the NPV of these inflows and then finding the FV of their NPV.

N = 5; I = 12; PV = -137987.53; PMT = 0; and then solve for FV = \$243,181.18.

N = 5; PV = -1000000; PMT = 0; FV = 243181.18; and then solve for I = MIRR = 19.45%.

Answer: d Diff: M R

0	1	2	3	Years
$k = 16\%$				
-2,028	1,000	1,000	1,000	
	$\times (1.16)^2$	$\times 1.16$		
			1,160.00	
			1,345.60	
			<u>3,505.60</u>	
-2,028	MIRR = 20%			

Slope = Rise/Run = (36% - 9%) / (24% - 6%) = 27%/18% = 1.5. Beta = 1.5.

$$k_e = k_{RF} + (RP_M) \text{Beta} = 7.0\% + (6\%)1.5 = 16.0\%.$$

Output: $FV = -\$3,505.60$.

Output: $I = 20.01 = \text{MIRR} \approx 20\%$.

84. MIRR and missing cash flow**Answer: d Diff: M**

The up-front cost can be calculated using the payback:
 $\$400 + (\$500)(0.5) = \$650.$

The terminal value of the cash inflows are:
 $(\$400)(1.1)^2 + (\$500)(1.1) + \$200 = \$1,234.$

Use your calculator to obtain the MIRR:

Enter $N = 3$; $PV = -650$; $PMT = 0$; $FV = 1234$; and then solve for $MIRR = I = 23.82\%$.

85. MIRR, payback, and missing cash flow**Answer: d Diff: M**

Step 1: Solve for the CF_0 by knowing the payback is exactly 2.0:
The CF_0 for the project is $\$1 + \$1.5 = \$2.5$ million.

Step 2: Find the FV of the cash inflows:
$$FV = \$2.50 + (\$2.00)(1.12)^1 + (\$1.50)(1.12)^2 + (\$1.00)(1.12)^3$$
$$= \$2.50 + \$2.24 + \$1.88160 + \$1.40493$$
$$= \$8.026530 \text{ million.}$$

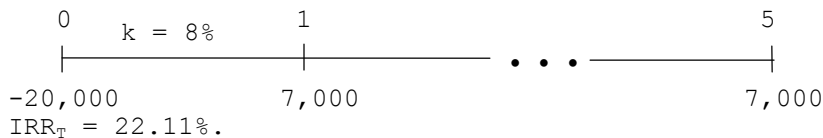
Step 3: Solve for the MIRR:

Enter the following input data in the calculator:

$N = 4$; $PV = -2.5$; $PMT = 0$; $FV = 8.026530$; and then solve for
 $I = MIRR = 33.85881\% \approx 33.86\%$.

86. MIRR and IRR**Answer: e Diff: M**

Time line:



Calculate $MIRR_T$:

Find TV of cash inflows:

$N = 5$; $I = 8$; $PV = 0$; $PMT = 7000$; and then solve for $FV = TV = \$41,066.21$.

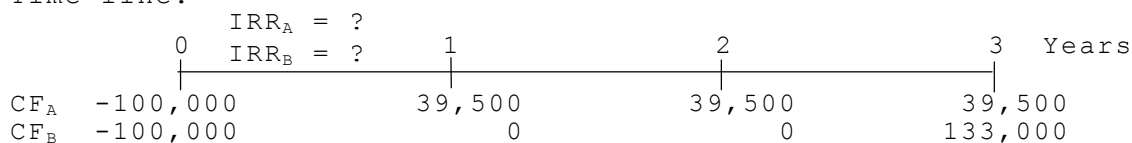
Find $MIRR_T = 15.48\%$:

$N = 5$; $PV = -20000$; $PMT = 0$; $FV = 41066.21$; and then solve for $I = MIRR = 15.48\%$.

Sum = $22.11\% + 15.48\% = 37.59\%$.

87. Mutually exclusive projects**Answer: b Diff: M**

Time line:



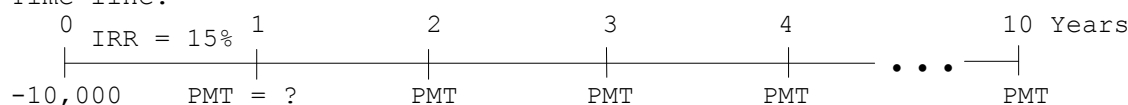
Financial calculator solution:

Project A: Inputs: $CF_0 = -100000$; $CF_1 = 39500$; $N_j = 3$.Output: $IRR_A = 8.992\% \approx 9.0\%$.Project B: Inputs: $CF_0 = -100000$; $CF_1 = 0$; $N_j = 2$; $CF_2 = 133000$.Output: $IRR_B = 9.972\% \approx 10.0\%$.

The firm's cost of capital is not given in the problem; so use the IRR decision rule. Since $IRR_B > IRR_A$; Project B is preferred.

88. Before-tax cash flows**Answer: b Diff: M**

Time line:



Financial calculator solution:

Inputs: $N = 10$; $I = 15$; $PV = -10000$; $FV = 0$. Output: $PMT = \$1,992.52$.Before-tax CF = $\$1,992.52 / 0.6 = \$3,320.87 \approx \$3,321$.**89. Crossover rate****Answer: b Diff: M**

Find the differences between the two projects' respective cash flows as follows:

$(CF_A - CF_B)$. $CF_0 = -5,000 - (-5,000) = 0$; $CF_1 = 200 - 3,000 = -2800$; $CF_2 = -2200$; $CF_3 = 2200$; $CF_4 = 4800$. Enter these CFs and find the $IRR = 16.15\%$, which is the crossover rate.

90. Crossover rate**Answer: b Diff: M**

First, find the differential CFs by subtracting Team A CFs from Team B CFs as follows:

$CF_0 = -5.5$; $CF_1 = 0$; $CF_2 = 0$; $CF_3 = 4$; $CF_4 = 4$; and then solve for $IRR = 11.35\%$.

91. Crossover rate**Answer: b Diff: M**

Subtract Project 2 cash flows from Project 1 cash flows:

$CF_0 = -100$; $CF_1 = -600$; $CF_2 = -200$; $CF_3 = 0$; $CF_4 = 400$; $CF_5 = 700$. Enter these in the cash flow register and then solve for $IRR = 5.85\%$.

92. Crossover rate**Answer: d Diff: M**

Find the differential cash flows by subtracting B's cash flows from A's cash flows for each year.

$CF_0 = -2000$; $CF_1 = -6000$; $CF_2 = 1000$; $CF_3 = 5000$; $CF_4 = 5000$. Enter these cash flows and then solve for $IRR = \text{crossover rate} = 13.03\%$.

93. Crossover rate**Answer: c Diff: M**

The crossover rate is the point where the two projects will have the same NPV. To find the crossover rate, subtract CF_B from CF_A :

$$-\$100,000 - (-\$100,000) = 0.$$

$$\$40,000 - \$30,000 = \$10,000.$$

$$\$25,000 - \$15,000 = \$10,000.$$

$$\$70,000 - \$80,000 = -\$10,000.$$

$$\$40,000 - \$55,000 = -\$15,000.$$

Enter these into your CF register and then solve for $IRR = 11.21\%$.

94. Crossover rate**Answer: d Diff: M**

Find the differential cash flows to compute the crossover rate. Subtracting Project A cash flows from Project B cash flows, we obtain the following differential cash flows:

	<u>Year</u>	<u>ΔCFs</u> <u>B - A</u>
	0	-\$100
	1	70
	2	40
	3	20
	4	0
	5	-20

Input the cash flows into your calculator's cash flow register and solve for the IRR to obtain the crossover rate of 9.32 percent.

95. Crossover rate**Answer: b Diff: M**

Step 1: Calculate the differential cash flows:

	<u>Project A</u>	<u>Project B</u>	<u>ΔCFs</u> <u>B - A</u>
<u>Year</u>	<u>Cash Flow</u>	<u>Cash Flow</u>	
0	-\$100,000	-\$190,000	-\$90,000
1	30,000	30,000	0
2	35,000	35,000	0
3	40,000	100,000	60,000
4	40,000	100,000	60,000

Step 2: Determine the crossover rate:

Enter the following inputs in the calculator:

$CF_0 = -90000$; $CF_1 = 0$; $CF_2 = 0$; $CF_3 = 60000$; $CF_4 = 60000$; and then solve for $IRR = 8.5931\%$.

96. Crossover rate**Answer: b Diff: M**

Step 1: Calculate the difference in the cash flows of the 2 projects:

Year	Project A Cash Flow	Project B Cash Flow	Δ CFs B - A
0	-\$215 million	-\$270 million	\$55 million
1	20 million	70 million	-50 million
2	70 million	100 million	-30 million
3	90 million	110 million	-20 million
4	70 million	30 million	40 million

Step 2: Calculate the IRR of the Δ CFs:

Enter the following data (in millions) in the calculator:

$CF_0 = 55$; $CF_1 = -50$; $CF_2 = -30$; $CF_3 = -20$; $CF_4 = 40$; and then solve for IRR = 19.36%.

97. Crossover rate and missing cash flow**Answer: e Diff: M**

Step 1: Determine the NPV of Project A at the crossover rate:

$$\begin{aligned} NPV_A &= -\$4 + \$2/1.09 + \$3/(1.09)^2 + \$5/(1.09)^3 \\ &= -\$4 + \$1.83486 + \$2.52504 + \$3.86092 \\ &= \$4.22082 \text{ million.} \end{aligned}$$

Step 2: Determine the PV of cash inflows for Project B at the crossover rate:

$$\begin{aligned} NPV_B &= CF_0 + \$1.7/1.09 + \$3.2/(1.09)^2 + \$5.8/(1.09)^3 \\ &= CF_0 + \$1.55963 + \$2.69338 + \$4.47866 \\ &= CF_0 + \$8.73167 \text{ million.} \end{aligned}$$

Step 3: Determine the cash outflow at $t = 0$ for Project B:

At the crossover rate, $NPV_A = NPV_B$; $NPV_A - NPV_B = 0$.

$NPV_A = \$4.22082$ million; $NPV_B = CF_0 + \$8.73167$ million.

$$\$4.22082 - CF_0 - \$8.73167 = 0$$

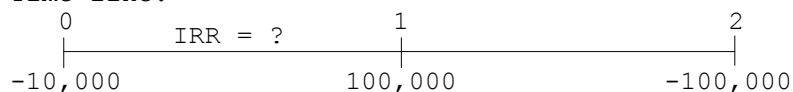
$$-CF_0 = \$8.73167 - \$4.22082$$

$$CF_0 = -\$4.51085 \text{ million.}$$

98. Multiple IRRs

Answer: c Diff: T

Time line:



Numerical solution:

This problem can be solved numerically but requires an iterative process of trial and error using the possible solutions provided in the problem.

Investigate first claim: Try $k = \text{IRR} = 13\%$ and $k = 12.5\%$

$$\text{NPV}_{k=13\%} = -10,000 + 100,000/1.13 - 100,000/(1.13)^2 = 180.91.$$

$$\text{NPV}_{k=12.5\%} = -10,000 + 100,000/1.125 - 100,000/(1.125)^2 = -123.46.$$

The first claim appears to be correct. The IRR of the project appears to be between 12.5% and 13.0%.

Investigate second claim: Try $k = 800\%$ and $k = 780\%$

$$\begin{aligned} \text{NPV}_{k=800\%} &= -10,000 + 100,000/9 - 100,000/(1 + 8)^2 \\ &= -10,000 + 11,111.11 - 1,234.57 = -123.46. \end{aligned}$$

$$\begin{aligned} \text{NPV}_{k=780\%} &= -10,000 + 100,000/8.8 - 100,000/(1 + 7.8)^2 \\ &= -10,000 + 11,363.64 - 1,291.32 = 72.32. \end{aligned}$$

The second claim also appears to be correct. The IRR of the project flows also appears to be above 780% but below 800%.

Below is a table of various discount rates and the corresponding NPVs.

Discount rate (%)	NPV	
12.0	(\$ 433.67)	
12.5	(123.46)	
12.7	(1.02)	$\text{IRR}_1 \approx 12.7\%$
13.0	180.91	
25.0	6,000.00	
400.0	6,000.00	
800.0	(123.46)	
787.0	2.94	$\text{IRR}_2 \approx 787\%$
780.0	72.32	

By randomly selecting various costs of capital and calculating the project's NPV at these rates, we find that there are two IRRs, one at about 787 percent and the other at about 12.7 percent, since the NPVs are approximately equal to zero at these values of k . Thus, there are multiple IRRs.

99. NPV

Answer: c Diff: T

Step 1: Run a regression to find the corporate beta. It is 1.1633.

Step 2: Find the project's estimated beta by adding 0.2 to the corporate beta. The project beta is thus 1.3633.

Step 3: Find the company's cost of equity, which is its WACC because it uses no debt:

$$k_s = \text{WACC} = 7\% + (12\% - 7\%)1.3633 = 13.8165\% \approx 13.82\%.$$

Step 4: Now find NPV (in millions):

$$CF_0 = -100; CF_{1-5} = 20; CF_{6-10} = 30; I = 13.82; \text{ and then solve for NPV} = \$23.11 \text{ million.}$$

100. NPV

Answer: c Diff: T

Step 1: Run a regression to find the corporate beta. Market returns are the X-input values, while Y's returns are the Y-input values. Beta is 1.2102.

Step 2: Find the project's estimated beta by subtracting 0.5 from the corporate beta. The project beta is thus $1.2102 - 0.5 = 0.7102$.

Step 3: Find the project's cost of equity, which is its WACC because it uses no debt:

$$k_s = \text{WACC} = 5\% + (11\% - 5\%)0.7102 = 9.26\%.$$

Step 4: Now find the project's NPV (inputs are in millions):

$$CF_0 = -500; CF_{1-5} = 100; CF_{6-10} = 50; I = 9.26\%; \text{ and then solve for NPV} = \$10.42 \text{ million.}$$

101. NPV profiles

Answer: b Diff: T

Time line:

	0	1	2	3	4	Years
CF_X	-100	50	40	30	10	
CF_Z	-100	10	30	40	60	
CF_{X-Z}	0	40	10	-10	-50	

Project X: Inputs: $CF_0 = -100$; $CF_1 = 50$; $CF_2 = 40$; $CF_3 = 30$; $CF_4 = 10$.
Output: IRR = 14.489% \approx 14.49%.

Project Z: Inputs: $CF_0 = -100$; $CF_1 = 10$; $CF_2 = 30$; $CF_3 = 40$; $CF_4 = 60$.
Output: IRR = 11.79%.

Calculate the NPVs of the projects at $k = 0$ discount rate.

$$NPV_{X,k=0\%} = -\$100 + \$50 + \$40 + \$30 + \$10 = \$30.$$

$$NPV_{Z,k=0\%} = -\$100 + \$10 + \$30 + \$40 + \$60 = \$40.$$

Calculate the IRR of the differential project, that is, Project_{X-Z}

IRR_{X-Z} Inputs: $CF_0 = 0$; $CF_1 = 40$; $CF_2 = 10$; $CF_3 = -10$; $CF_4 = -50$.

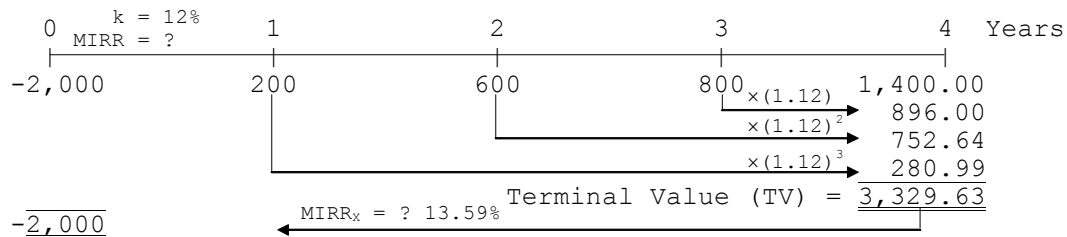
Output: IRR = 7.167 \approx 7.17%.

Solely using the calculator we can determine that there is a crossover point in the relevant part of an NPV profile graph. Project X has the higher IRR. Project Z has the higher NPV at $k = 0$. The crossover rate is 7.17% and occurs in the upper right quadrant of the graph.

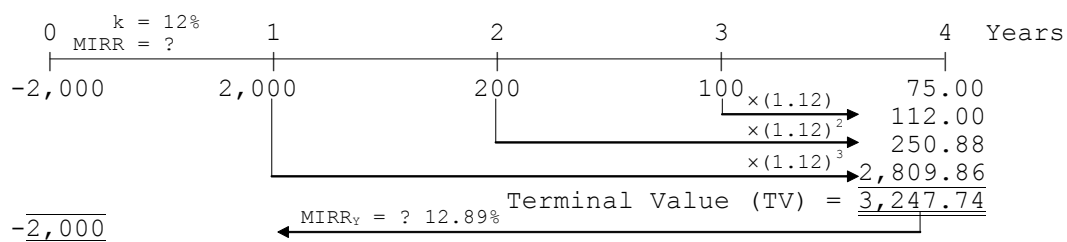
102. MIRR and NPV

Answer: c Diff: T

Find the MIRR of the Projects.
Time line for Project X:



Time line for Project Y:



Calculate NPV of Projects:

Project X: Inputs: $CF_0 = -2000$; $CF_1 = 200$; $CF_2 = 600$; $CF_3 = 800$; $CF_4 = 1400$; $I = 12$.
Output: $NPV_X = \$116.04$.

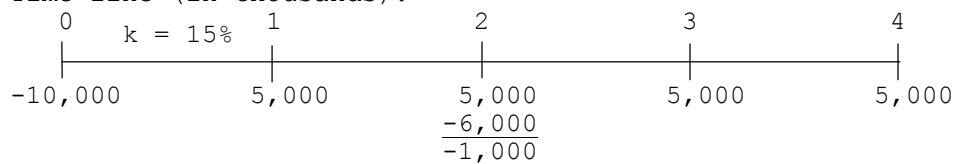
Project Y: Inputs: $CF_0 = -2000$; $CF_1 = 2000$; $CF_2 = 200$; $CF_3 = 100$; $CF_4 = 75$; $I = 12$.
Output: $NPV_Y = \$63.99$.

Note that the better project is X because it has a higher NPV. Its corresponding MIRR = 13.59%. (Also note that since the 2 projects are of equal size that the project with the higher MIRR will also be the project with the higher NPV.)

103. MIRR and IRR

Answer: a Diff: T

Time line (in thousands):



Step 1: Calculate IRR by inputting the following into a calculator:
 $CF_0 = -10000000$; $CF_1 = 5000000$; $CF_2 = -1000000$; $CF_{3-4} = 5000000$;
 and then solve for IRR = 13.78%.

Step 2: Calculate MIRR:

a. Calculate PV of the outflows:

$CF_0 = -10000000$; $CF_1 = 0$; $CF_2 = -1000000$; $I = 15$; and then solve for NPV = -\$10,756,143.67.

b. Calculate FV of the inflows:

$CF_0 = 0$; $CF_1 = 5000000$; $CF_2 = 0$; $CF_4 = 5000000$; $N_j = 2$; $I = 15$;
 and then solve for NPV = \$10,494,173.48.

c. Calculate MIRR:

$N = 4$; $PV = -10756143.67$; $PMT = 0$; $FV = 18354375$; and then solve for $I = \text{MIRR} = 14.29\%$.

Step 3: Calculate the difference between the project's MIRR and its IRR:
 $\text{MIRR} - \text{IRR} = 14.29\% - 13.78\% = 0.51\%$.

104. MIRR and missing cash flow

Answer: b Diff: T N

Step 1: Determine the PV of cash outflows and the FV of cash inflows.
 The PV of all cash outflows is $-\$500 + -X/(1.10)^2$. The FV of all cash inflows is $\$500 + \$300(1.1) + \$200(1.1)^3 = \$500 + \$330 + \$266.20 = \$1,096.20$.

Step 2: Find the PV of the future value of cash inflows using the MIRR. $N = 4$; $I = 12$; $PMT = 0$; $FV = 1096.20$; and then solve for PV = \$696.65.

Step 3: Determine the value of the missing cash outflow.

$$-\$696.65 = -\$500 - X/(1.10)^2$$

$$-\$196.65 = -X/1.21$$

$$-\$237.95 = -X$$

$$\$237.95 = X.$$

105. MIRR and missing cash flow

Answer: b Diff: T

Step 1: Determine the missing cash outflow:

The payback is 2 years so the project must have cash inflows through $t = 2$ that equal its cash outflow.

$$-CF_0 = CF_1 + CF_2; CF_0 = -(\$100,000 + \$200,000); CF_0 = -\$300,000.$$

Step 2: Calculate the present value of the cash outflows:

Enter the following inputs in the calculator:

$$CF_0 = -300000; CF_1 = 0; CF_2 = 0; CF_3 = 0; CF_4 = -100000; I = 10; \text{ and then solve for } NPV = -\$368,301.3455.$$

Step 3: Calculate the future value of the cash inflows:

Enter the following inputs in the calculator:

$$CF_0 = 0; CF_1 = 100000; CF_2 = 200000; CF_3 = 200000; CF_4 = 0; I = 10; \text{ and then solve for } NPV = \$406,461.3073.$$

Enter the following inputs in the calculator:

$$N = 4; I = 10; PV = -406461.3073; PMT = 0; \text{ and then solve for } FV = \$595,100.$$

Step 4: Calculate the MIRR:

Enter the following inputs in the calculator:

$$N = 4; PV = -368301.3455; PMT = 0; FV = 595100; \text{ and then solve for } I = \text{MIRR} = 12.7448\% \approx 12.74\%.$$

106. MIRR

Answer: e Diff: T

Use cash flow registers to determine the NPV of each project:

$$NPV_S = \$1,237.11; NPV_L = \$1,106.82.$$

Since $NPV_S > NPV_L$ we need to calculate $MIRR_S$.

Calculate the PV of cash outflows: $CF_0 = -3000$; $CF_{1-3} = 0$; $CF_4 = -500$; $I = 11$; and then solve for $NPV = -\$3,329.37$.

Calculate the TV of cash inflows:

First find the cumulative PV, then take forward as a lump sum to find the TV.

Calculate PV: $CF_0 = 0$; $CF_1 = 2500$; $CF_2 = 1500$; $CF_3 = 1500$; $I = 11$; and then solve for $NPV = \$4,566.47$.

Calculate TV or FV: $N = 4$; $I = 11$; $PV = -4566.47$; $PMT = 0$; and then solve for $FV = \$6,932.23$.

Calculate MIRR: $N = 4$; $PV = -3329.37$; $PMT = 0$; $FV = 6932.23$; and then solve for $MIRR = I = 20.12\%$.

107. MIRR**Answer: d Diff: T**

First, calculate the present value of costs:

$N = 4$; $I/YR = 10$; $PMT = 0$; $FV = 10000$; and then solve for $PV = -\$6,830.13$.

Add $-\$100,000 + -\$6,830.13 = -\$106,830.13$.

Find the terminal value of inflows:

$CF_0 = 0$; $CF_1 = 50000$; $CF_2 = 50000$; $CF_3 = 50000$; $CF_4 = 0$; $I = 10$.

Solve for $NPV = \$124,342.60$.

Use the TVM keys to calculate the future value of this present value.

$N = 4$; $I = 10$; $PV = -124342.60$; $PMT = 0$. Solve for $FV = \$182,050$.

Solve for MIRR:

$N = 4$; $PV = -106830.13$; $PMT = 0$; $FV = 182050$; and then solve for $I = MIRR = 14.25\%$.

108. MIRR**Answer: d Diff: T**

First, find PV of all cash outflows:

$CF_0 = -13000$; $CF_{1-3} = 0$; $CF_4 = -1500$; $I = 11$. Solve for $NPV = -\$13,988.10$.

Second, find the PV at $t = 4$ of all cash inflows:

$CF_0 = 0$; $CF_1 = 12000$; $CF_2 = 8000$; $CF_3 = 7000$; $CF_4 = 0$; $I = 11$. Solve for $NPV = \$22,422.13$.

Use the TVM keys to calculate the future value of this present value.

$N = 4$; $I = 11$; $PV = -22422.13$; $PMT = 0$. Solve for $FV = \$34,038.37$.

To find the MIRR, enter $N = 4$; $PV = -13988.10$; $PMT = 0$; $FV = 34038.37$; and then solve for $I = MIRR = 24.90\%$.

109. MIRR**Answer: e Diff: T**

First, find the company's weighted average cost of capital:

We're given the before-tax cost of debt, $k_d = 10\%$. We can find the cost of equity as follows:

$k_s = 0.06 + 0.05(1.1) = 0.115$ or 11.5% .

Thus, the WACC is: $k = 0.4(0.10)(1 - 0.3) + 0.6(0.115) = 0.097$ or 9.7% .

Second, the PV of all cash outflows can be calculated as follows:

$CF_0 = -50000$; $CF_{1-3} = 0$; $CF_4 = -40000$; $I = 9.7$.

Solve for NPV of costs = $-\$77,620.62$.

Third, find the terminal value of the project at $t = 4$:

$CF_0 = 0$; $CF_1 = 35000$; $CF_2 = 43000$; $CF_3 = 60000$; $CF_4 = 0$; $I = 9.7$.

Solve for $NPV = \$113,086.76$.

Use the TVM keys to calculate the future value of this present value.

$N = 4$; $I = 9.7$; $PV = -113086.76$; $PMT = 0$. Solve for $FV = \$163,771.48$.

Finally, calculate the MIRR:

$N = 4$; $PV = -77620.62$; $PMT = 0$; $FV = 163771.48$; and then solve for $I = MIRR = 20.52\%$.

110. MIRR**Answer: c Diff: T**

Find the present value of the outflows:

$CF_0 = -1000$; $CF_1 = 0$; $CF_2 = -300$; $CF_3 = 0$; $CF_4 = -700$; $CF_5 = 0$; $I = 12$.

Solve for NPV of costs = $-\$1,684.0208$.

Find the future value of the inflows:

$CF_0 = 0$; $CF_1 = 200$; $CF_2 = 0$; $CF_3 = 900$; $CF_4 = 0$; $CF_5 = 600$; $I = 12$. Solve for NPV = $\$1,159.6298$.

Use the TVM keys to calculate the future value of this present value.

$N = 5$; $I = 12$; $PV = -1159.6298$; $PMT = 0$. Solve for FV = $\$2,043.6639$.

Then find the MIRR:

$N = 5$; $PV = -1684.0208$; $PMT = 0$; $FV = 2043.6639$; and then solve for MIRR = $I = 3.9471\% \approx 3.95\%$.

111. MIRR**Answer: b Diff: T**

There are three steps to getting the MIRR.

Step 1: Find PV of outflows:

$$-\$700 + -\$200/(1.1)^2 = -\$865.2893.$$

Step 2: Find FV of inflows:

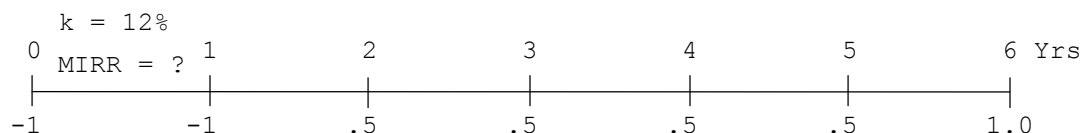
$$\$400(1.1)^3 + \$600(1.1) + \$500 = \$1,692.40.$$

Step 3: Find MIRR:

$N = 4$; $PV = -865.2893$; $PMT = 0$; $FV = 1692.40$; and then solve for $I = \text{MIRR} = 18.2593\% \approx 18.26\%$.

112. MIRR**Answer: e Diff: T**

Time line (in millions):



Calculate TV (Terminal value) of inflows:

Inputs: $CF_0 = 0$; $CF_1 = 0$; $CF_2 = 500000$; $N_j = 4$; $CF_3 = 1000000$; $I = 12$.

Output: NPV = $\$1,862,590.65$.

Inputs: $N = 6$; $I = 12$; $PV = -1862590.65$; $PMT = 0$.

Output: FV = $\$3,676,423.68$.

Calculate PV of costs:

Inputs: $CF_0 = -1000000$; $CF_2 = -1000000$; $I = 12$.

Output: NPV = $-\$1,892,857.14$.

Calculate MIRR:

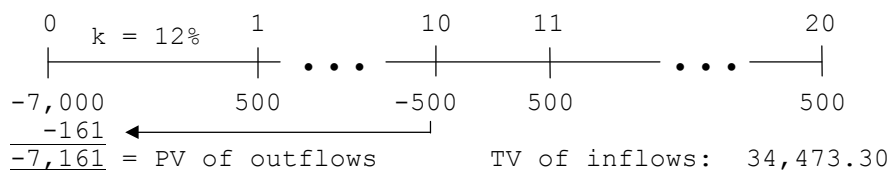
Inputs: $N = 6$; $PV = -1892857.14$; $PMT = 0$; $FV = 3676423.68$.

Output: $I = \text{MIRR} = 11.6995\% \approx 11.70\%$.

113. MIRR

Answer: b Diff: T

Time line (in thousands):



Calculation of PV of outflows:

$CF_0 = -7000$; $CF_{1-9} = 0$; $CF_{10} = -500$; $I = 12$; and then solve for NPV = $-\$7,160.99 \approx -\$7,161$.

Calculation of TV of inflows:

$CF_0 = 0$; $CF_{1-9} = 500$; $CF_{10} = 0$; $CF_{11-20} = 500$; $I = 12$. Solve for NPV = $\$3,573.74$.

Use TVM to calculate the future value of the present value. $N = 20$; $I = 12$; $PV = -3573.74$; $PMT = 0$. Solve for $FV = \$34,473.30$.

Calculation of MIRR:

$N = 20$; $PV = -7161$; $PMT = 0$; $FV = 34473.30$; and then solve for $I = \text{MIRR} = 8.17\%$.

Note: $IRR = 2.52\%$ and $NPV = -\$3,587,251$. Both are consistent with MIRR less than $WACC = 12\%$.

114. MIRR

Answer: b Diff: T

Step 1: Find the terminal value (TV) of the inflows with your calculator as follows:

$CF_0 = 0$; $CF_1 = 125000$; $CF_2 = 140000$; $CF_3 = 0$; $CF_4 = 100000$; $I/YR = 10$; and then solve for NPV = $\$297,640.1885$.

Compound this number 4 years into the future to get the TV: $(\$297,640.1885)(1.10)^4 = \$435,775$.

Step 2: Then, find the PV of the outflows:

$CF_0 = -200000$; $CF_1 = 0$; $CF_2 = 0$; $CF_3 = -50000$; $CF_4 = 0$; $I/YR = 10$; and then solve for NPV = $\$237,565.74$.

Step 3: Next, find the MIRR:

$N = 4$; $PV = -237565.74$; $PMT = 0$; $FV = 435775$; and then solve for $I = \text{MIRR} = 16.38\%$.

115. MIRR**Answer: e Diff: T**

The MIRR is the discount rate that equates the FV of the inflows with the PV of the outflows.

Step 1: Calculate the PV of the outflows:

$$PV = -\$150,000 + (-\$50,000/1.09) = -\$195,871.56.$$

Step 2: Calculate the FV of the inflows:

$$FV = (\$200,000)(1.09) + \$50,000 = \$268,000.00.$$

Step 3: Calculate the MIRR:

Enter the following data into the calculator:

N = 3; PV = -195871.56; PMT = 0; FV = 268000; and then solve for I = MIRR = 11.01657% \approx 11.02%.

116. MIRR**Answer: e Diff: T**

Remember that in order to solve for MIRR, we need the PV of the cash outflows and the FV of the inflows. The MIRR is the discount rate that equates the two.

Step 1: Calculate the present value of the outflows:

Enter the following input data in the calculator:

CF₀ = -300; CF₁ = -200; I = 10; and then solve for NPV = -\$481.8182 \approx -\$481.82.

Step 2: Calculate the future value of the cash inflows:

$$\begin{aligned} FV &= \$500(1.10)^1 + \$700 \\ &= \$550 + \$700 \\ &= \$1,250. \end{aligned}$$

Step 3: Calculate the MIRR:

N = 3; PV = -481.82; PMT = 0; FV = 1250; and then solve for I = MIRR = 37.4069% \approx 37.4%.

117. MIRR**Answer: c Diff: T**

Step 1: Calculate the present value of the cash outflows:

$$\begin{aligned} PV &= -\$150 + -\$50/(1.10)^3 \\ &= -\$150 - \$37.57 \\ &= -\$187.57. \end{aligned}$$

Step 2: Calculate the future value (terminal value) of the cash inflows:

$$\begin{aligned} FV &= \$100(1.10)^3 + \$50(1.10)^2 + \$150 \\ &= \$133.10 + \$60.50 + \$150 \\ &= \$343.60. \end{aligned}$$

Step 3: Calculate the MIRR:

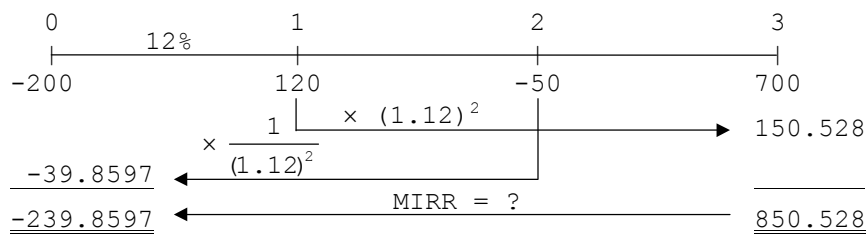
MIRR is the discount rate that equates the PV of the outflows with the future value of the inflows:

N = 4; PV = -187.57; PMT = 0; FV = 343.60; and then solve for I = MIRR = 16.34%.

118. MIRR

Answer: e Diff: T N

Time line:



Using your financial calculator, enter the following data as inputs: N = 3; PV = -239.8597; PMT = 0; and FV = 850.528. Then solve for I = MIRR = 52.4908% \approx 52.49%.

119. MIRR

Answer: e Diff: T

Step 1: Find the PV of the cash outflows (in millions of dollars):

$$PV = -\$300 + -\$100/1.10 = -\$390.9091.$$

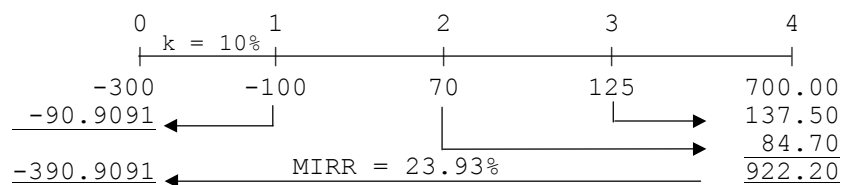
Step 2: Find the FV of the cash inflows (in millions of dollars):

$$\begin{aligned} FV &= \$70(1.10)^2 + \$125(1.10) + \$700 \\ &= \$84.70 + \$137.5 + \$700 \\ &= \$922.20. \end{aligned}$$

Step 3: Find the MIRR:

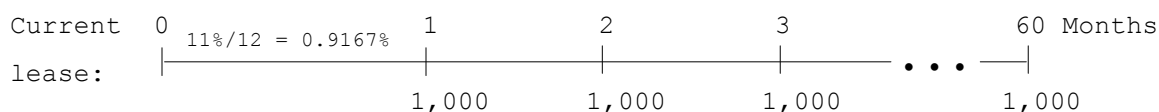
N = 4; PV = -390.9091; PMT = 0; FV = 922.20; and then solve for I = MIRR = 23.93%.

Time line:



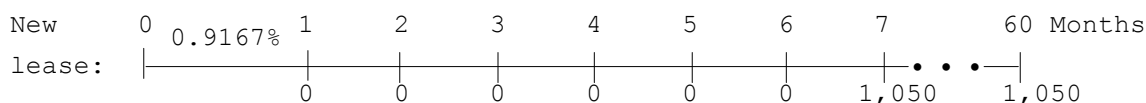
120. PV of cash flows

Answer: c Diff: T



60	$11/12 = 0.9167$		1,000	0
N	I/YR	PV	PMT	FV

-45,993.03



$CF_0 = 0$; $CF_{1-6} = 0$; $CF_{7-60} = 1050$; $I = 11/12 = 0.9167$; and then solve for NPV = -\$42,189.97.

Therefore, the PV of payments under the proposed lease would be less than the PV of payments under the old lease by $\$45,993.03 - \$42,189.97 = \$3,803.06$. Sally should accept the new lease because it would raise her theoretical net worth by \$3,803.06.

121. IRR

Answer: c Diff: M N

The project with the highest NPV will add the most value for shareholders. Find the NPV and IRR of both projects:

Project Red:

Using your financial calculator, enter the following data as inputs:

$CF_0 = -1000$; $CF_1 = 100$; $CF_2 = 200$; $CF_3 = 600$; $CF_4 = 800$; and $I/Yr = 10$. Then, solve for NPV = \$253.398 \approx \$253.40 and IRR = 18.2354% \approx 18.24%.

Project White:

Using your financial calculator, enter the following data as inputs:

$CF_0 = -1000$; $CF_1 = 700$; $CF_2 = 400$; $CF_3 = 200$; $CF_4 = 100$; and $I/Yr = 10$. Then, solve for NPV = \$185.5065 \approx \$185.51 and IRR = 21.8346% \approx 21.83%.

Project Red has the higher NPV, and its IRR is 18.24%.

122. Crossover rate**Answer: d Diff: E N**

Find the difference between the two projects' cash flows, enter the differences as your cash flows, and solve for the IRR of project Δ.

<u>Year</u>	<u>Project White Cash Flow</u>	<u>Project Red Cash Flow</u>	<u>ΔCFs White - Red</u>
0	-\$1,000	-\$1,000	\$ 0
1	700	100	600
2	400	200	200
3	200	600	-400
4	100	800	-700

Using your financial calculator, enter the following data as inputs:
 $CF_0 = 0$; $CF_1 = 600$; $CF_2 = 200$; $CF_3 = -400$; and $CF_4 = -700$. Then, solve for
 $IRR = 14.2978\% \approx 14.30\%$.

123. Payback period**Answer: b Diff: E N**

Remember, payback is calculated by determining how long it takes for a firm to recoup its initial investment.

<u>Year</u>	<u>Project Cash Flow</u>	<u>Cumulative Cash Flow</u>
0	-\$300	-\$300
1	125	-175
2	75	-100
3	200	100
4	100	200

Therefore, the project has a payback of $2 + \$100/\$200 = 2.5$ years.

124. Discounted payback**Answer: d Diff: E N**

Remember, discounted payback is calculated by determining how long it takes for a firm to recoup its initial investment using discounted cash flows. We must find the present values of the cash flows using the firm's 10% cost of capital.

<u>Year</u>	<u>Cash Flow</u>	<u>Discounted Cash Flow @ 10%</u>	<u>Cumulative PV</u>
0	-\$300	-\$300.00	-\$300.00
1	125	$125/1.10 = 113.64$	-186.36
2	75	$75/(1.10)^2 = 61.98$	-124.38
3	200	$200/(1.10)^3 = 150.26$	+25.88
4	100	$100/(1.10)^4 = 68.30$	+94.18

Therefore, the project's discounted payback is $2 + \frac{\$124.38}{\$150.26} = 2.83$ years.

125. IRR

Answer: d Diff: E N

For this problem, you simply need to enter the cash flows and then solve for IRR.

$CF_0 = -300$; $CF_1 = 125$; $CF_2 = 75$; $CF_3 = 200$; $CF_4 = 100$; and then solve for IRR = 23.42%.

126. NPV

Answer: c Diff: E N

Here, you just need to enter the cash flows, supply a discount rate (10%), and then solve for NPV.

$CF_0 = -300$; $CF_1 = 125$; $CF_2 = 75$; $CF_3 = 200$; $CF_4 = 100$; I/YR = 10; and solve for NPV = \$94.18. Note that the cash flows are in millions of dollars.

127. MIRR

Answer: c Diff: M N

To calculate the MIRR, we need to find the present value of all the outflows and the future value of all the inflows. The discount rate that equates the two is the modified internal rate of return.

PV of inflows	FV of outflows
$-\$300$	$\$125 \times 1.10^3 = \166.375
	$\$75 \times 1.10^2 = 90.750$
	$\$200 \times 1.10^1 = 220.000$
	$\$100 \times 1.10^0 = 100.000$
	<u><u>\$577.125</u></u>

Now we just enter these values into a financial calculator, along with the number of years and solve for I to get the MIRR.

N = 4; PV = -300; PMT = 0; FV = 577.125; and then solve for I = MIRR = 17.77%.

128. NPV

Answer: d Diff: E N

Using your financial calculator, enter the following input data:

$CF_0 = -300$; $CF_1 = 100$; $CF_2 = 150$; $CF_3 = 200$; $CF_4 = 50$; I = 10; and then solve for NPV = \$99.29.

129. IRR

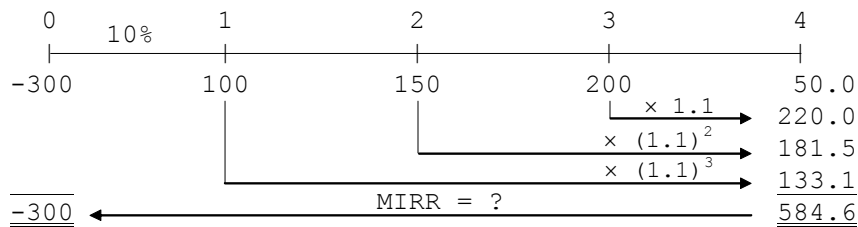
Answer: d Diff: E N

Using your financial calculator, enter the following input data:

$CF_0 = -300$; $CF_1 = 100$; $CF_2 = 150$; $CF_3 = 200$; $CF_4 = 50$; and then solve for IRR = 24.79%.

130. MIRR

Answer: e Diff: M N



All the cash outflows are discounted back to the present. The future value of all cash inflows are compounded to Year 4. Then, this becomes a TVM problem for the calculator to determine the interest rate (MIRR) that equates the two values.

Enter the following data in your calculator:

N = 4; PV = -300; PMT = 0; FV = 584.60; and then solve for I = MIRR = 18.15%.

131. Crossover rate

Answer: c Diff: M N

Year	Project A Cash Flow	Project B Cash Flow	ΔCFs A - B
0	-\$300	-\$200	-\$100
1	100	150	-50
2	150	100	50
3	200	50	150
4	50	50	0

Entering these values into your financial calculator's cash flow register, you can calculate the delta project's IRR, 12.63%. This is the discount rate where the two projects' NPVs are equal.

132. NPV

Answer: b Diff: E N

Enter all the cash flows into the cash flow register as follows: $CF_0 = -5000$; $CF_1 = 5000$; $CF_2 = 3000$; $CF_3 = -1000$; I/YR = 10; and then solve for NPV = \$1,273.48 \approx \$1,273.

133. MIRR

Answer: c Diff: T N

Step 1: The PV of all cash outflows is:
 $-\$5,000 + -\$1,000/(1.10)^3 = -\$5,751.3148$.

Step 2: The FV of all cash inflows is:
 $\$5,000(1.10)^2 + \$3,000(1.10) = \$9,350.00$.

Step 3: Now calculate the MIRR as follows:
 N = 3; PV = -5751.3148; PMT = 0; FV = 9350.00; and then solve for I = 17.58% \approx 17.6% = MIRR.

134. Missing cash flow, payback period, and NPV

Answer: a Diff: M N

If the project has a payback period of 2 years, then $X = 2 \times \$175 = \350 .

Numerical solution:

The NPV is $-\$350 + \$175/(1.10) + \$175/(1.10)^2 + \$300/(1.10)^3 = \$179.11$.

Financial calculator solution:

Enter the following data in your calculator: $CF_0 = -350$; $CF_1 = 175$; $CF_2 = 175$; $CF_3 = 300$; $I = 10$; and then solve for NPV = \$179.11.

135. Missing cash flow, IRR, and NPV

Answer: c Diff: M N

Numerical solution:

To have an IRR of 15%, the NPV at 15% is zero. So:

$-X + \$175/(1.15) + \$175/(1.15)^2 + \$300/(1.15)^3 = 0$, or $X = \$481.7539$.

So, the NPV with a WACC of 12% is calculated as follows:

$NPV = -\$481.7539 + \$175/(1.12) + \$175/(1.12)^2 + \$300/(1.12)^3 = \$27.5391 \approx \27.54 .

Financial calculator solution:

Step 1: Find the missing cash flow by entering the following data in your calculator:

$CF_0 = 0$; $CF_1 = 175$; $CF_2 = 175$; $CF_3 = 300$; $I = 15$; and then solve for NPV = \$481.7539.

Step 2: Calculate the NPV at a WACC of 12%:

$CF_0 = -481.7539$; $CF_1 = 175$; $CF_2 = 175$; $CF_3 = 300$; $I = 12$; and then solve for NPV = \$27.5391 \approx \$27.54.

136. NPV

Answer: d Diff: E N

The project NPV can be calculated by using the cash flow registers of your calculator as follows:

$CF_0 = -500$; $CF_1 = 150$; $CF_2 = 200$; $CF_3 = 250$; $CF_4 = 100$; $I = 10$; and then solve for NPV = \$57.78.

137. IRR

Answer: a Diff: E N

The project IRR can be calculated by using the cash flow registers of your calculator as follows:

$CF_0 = -500$; $CF_1 = 150$; $CF_2 = 200$; $CF_3 = 250$; $CF_4 = 100$; and then solve for IRR = 15.32%.

138. MIRR**Answer: b Diff: T N**

First, find the PV of all cash outflows:

$$PV = -\$500 + -\$300/(1.10)^4 = -\$704.90.$$

Second, find the FV of all cash inflows:

$$FV = \$300 \times (1.10)^3 + \$300 \times (1.10)^2 + \$350 \times (1.10)^1 = \$1,147.30.$$

Finally, find the MIRR using these two values by entering the following data into your financial calculator:

N = 4; PV = -704.90; PMT = 0; FV = 1147.30; and then solve for I = MIRR = 12.95%.

139. Crossover rate**Answer: c Diff: M N**

First, you need to determine the difference in the 2 projects' cash flows.

Time	Project A Cash Flow	Project B Cash Flow	Δ CFs A - B
0	-500	-500	0
1	150	300	-150
2	200	300	-100
3	250	350	-100
4	100	-300	400

Then, you need to enter the differences in cash flows between the two projects, and calculate the IRR:

CF₀ = 0; CF₁ = -150; CF₂ = -100; CF₃ = -100; CF₄ = +400; and then solve for IRR = 6.36%.