1. What is the maximum amount a firm should pay for a project that will return $15,000 annually for 5 years if the opportunity cost is 10%?

   The maximum investment would equate CF_0 with the present value of the inflows thereby producing a zero net present value. $CF_0 = \$15,000\ [(1 / 0.10) - [1 / 0.10(1.10)^5] = \$56,861.80$

2. A project that requires an initial investment of $1000, and is expected to provide $700 in the following two years. Do you recommend this investment if the discount rate is 15%?

   $NPV = -\$1,000 + \$700[(1 / 0.15) - 1 / 0.15(1.15)^2] = \$138.00$

   NPV is positive, so I recommend this project

3. Which mutually exclusive project would you select, if both are priced at $1,000 and your required return is 15%: Project A with three annual cash flows of $1,000; or Project B, with 3 years of zero cash flow followed by 3 years of $1,500 annually?

   $NPV_A = -\$1,000 + \$1,000[(1 / 0.15) - 1 / 0.15(1.15)^3] = \$1,283.23$

   To calculate NPV for project B, we should calculate the PV annuity for the future cash flows (coming in year 4, 5, and 6). The PV annuity is located on year 3 on the time line.

   $PV(3) = \{\$1,500[(1 / 0.15) - 1 / 0.15(1.15)^3]\}= \$3424.84$

   Then we can calculate the NPV as follows:

   $NPV_B = -\$1,000 + (3424.84 / 1.15^3) = \$1,251.89$

   We choose project A because it has a higher NPV

4. What is the profitability index for a project costing $40,000 and returning $15,000 annually for 4 years at an opportunity cost of capital of 12%?

   PI= NPV / investment

   $PI = \{-\$40,000 + \$15,000[(1 / 0.12) - 1 / 0.12(1.12)^4]\} / \$40,000 = 0.139$

5. Calculate the payback period, NPV, and PI for a project with a $20,000 initial cost, cash inflows of $6,667 per year for 6 years, and a discount rate of 15%

   Payback = $20,000 / $6,667 = 3 years

   $NPV = -\$20,000 + \$6,667[(1 / 0.15) - 1 / 0.15(1.15)^6] = \$5,231$

   PI = $5,231 / $20,000 = 0.262IRR = 26.15%

6. If a project's IRR is 13% and the project provides annual cash flows of $15,000 for 4 years, how much did the project cost?

   $PV = \$15,000\ [(1 / 0.13) - [1 / 0.13(1.13)^4] = \$44,617.07$

7. The following questions refer to the projects which can be seen below

Year	Project A	Project B
0	–$200	–$200
1	80	100
2	80	100
3	80	100
4	80	

A- If the opportunity cost of capital is 11%, which of these projects is worth pursuing?

$$\text{NPV(A)} = -200 + \$80 \times \left[\frac{1}{0.11} - \frac{1}{0.11 \times (1.11)^4} \right] = \$48.20$$

$$\text{NPV(B)} = -200 + \$100 \times \left[\frac{1}{0.11} - \frac{1}{0.11 \times (1.11)^3} \right] = \$44.37$$

Both projects are worth pursuing.

B- Suppose that you can choose only one of these projects. Which would you choose? The discount rate is still 11%.
Choose Project A, the project with the higher NPV.

C- If the opportunity cost of capital is 11 percent, what is the profitability index for each project? Does the profitability index rank the projects correctly?

The profitability indexes are as follows:

Project A: $48.20/$200 = 0.2410 = 24.1%

Project B: $44.37/$200 = 0.2219 = 22.19%

In this case, with equal initial investments, both the profitability index and NPV give projects the same ranking.

D- What is the payback period for each project?
Project A has a payback period of $200/$80 = 2.5 years.
Project B has a payback period of $200/$100 = 2 years.

E- Which project would you choose if the opportunity cost of capital was 16%?

$$\text{NPV(A)} = -200 + \$80 \times \left[\frac{1}{0.16} - \frac{1}{0.16 \times (1.16)^4} \right] = \$23.85$$

$$\text{NPV(B)} = -200 + \$100 \times \left[\frac{1}{0.16} - \frac{1}{0.16 \times (1.16)^3} \right] = \$24.5$$

Therefore, you should now choose Project B.

8. A proposed nuclear power plant will cost $2.2 billion to build and then will produce cash flows of $300 million a year for 15 years. After that period (in year 15), it must be decommissioned at a cost of $900 million. if the discount rate is 5%, should we build it? What if the discount rate is 18%?

NPV = –$2.2 billion + [$0.3 billion × annuity factor (r, 15 years)] - [$0.9 billion/$(1 + r)^{15}$]

$$= -\$2.2\text{ billion } + \$0.3\text{ billion } \times \left[\frac{1}{r} - \frac{1}{r \times (1+r)^{15}}\right] - \frac{\$0.9\text{ billion}}{(1+r)^{15}}$$

$r = 5\% \Rightarrow$ NPV = –$2.2 billion + $2.681 billion = $0.481 billion

$r = 18\% \Rightarrow$ NPV = –$2.2 billion + $1.452 billion = –$0.748 billion

We should only build it in the first case, and we should not accept the project in the second case as it would have a negative NPV.