Decision tree

1. Beethoven has a new wonder product, the vylin, of which it expects great things. At the moment the company has two courses of action to open it, to test market the product or abandon it.
If the company test markets it, the cost will be $ 100000 and the market response could be positive or negative with probabilities of 0.60 and 0.40
If the response is positive the company could either abandon the product or market it full scale.
If it markets the vylin full scale, the outcome might be low, medium or high demand, and the respective net gains/ (losses) would be (200), 200 or 1000 in units of $1000(the result could range from a net loss of $200000 to a gain of $1000000). These outcomes have probabilities of 0.20, 0.50 and 0.30 respectively.
If the result of the test marketing is negative and the company goes ahead and markets the product, estimated losses would be $600000.
If at any point, the company abandons the product, there would be a net gain of $50,000 from the sale of scrap. All the financial values have been discounted to present.

Required:

a) Draw a decision tree.
b) Include figures for cost, loss or profit on the appropriate branches of the tree.

(Try it at your own)

Q2. Oil plc is oil exploring company. It undertakes geological surveys of land which it feels may bear oil. If the survey suggests that oil is present, oil plc drills the land, extracts the oil and then sells it to an oil refining company.
Based on past experience, the probability of a survey predicting that oil is present underground is 0.6. When oil plc has subsequently drilled for oil, it has been present 80% of the time. Currently surveys are undertaken using seismology equipment which was purchased by oil plc four years ago at a cost of £1.4 million and currently has a disposal value of £0.3 million.
A new piece of equipment has been designed by Seismik plc which would cost £2.0 million if purchased by oil plc. It includes a system which gives a better indication of where surveys should be undertaken. This leads to much greater accuracy. In tests, this new equipment has been shown to predict the existence of oil 85% of the time with an accuracy level of 92% (i.e. in tests of the new equipment , when the survey suggested oil was present and the land was drilled , oil was actually present 92% of the time)
Each time a survey is undertaken using oil plc's existing equipment, the cost of labour, material and other variable costs is £40000.
With the new equipment designed by Seismik plc, these costs would total £15000 per survey.
If oil plc decides to drill for oil, the drilling cost is £17500.
During the forthcoming year, oil plc would expect to undertake around 20 surveys.
When oil is found to be present, it can be sold to the refining company for £20 per barrel. On average, the amount of oil extracted is 10000 barrels. It is the policy of the company not to drill if a survey result is negative.
If no oil is found to be present, the sales revenue is obviously zero.

Requirements:

Assuming that 20 surveys are undertaken during the next year, use a decision tree to determine whether oil plc should continue to use its existing survey equipment or buy the new equipment available from seismic plc.

Q4. Firlands Limited, a retail outlet, is faced with a decision regarding whether or not to expand and build small or large premises at a prime location. Small premises would cost £300,000 to build and large premises would cost £550,000.
Regardless of the type of premises built, if high demand exists then the net income is expected to be £1,500,000.
Alternatively, if low demand exists, then net income is expected to be £600,000.
If large premises are built then the probability of high demand is 0·75. If the smaller premises are built then the probability of high demand falls to 0·6.
Firlands has the option of undertaking a survey costing £50,000. The survey predicts whether there is likely to be a good or bad response to the size of the premises. The likelihood of there being a good response, from previous surveys, has been estimated at 0·8.
If the survey indicates a good response then the company will build the large premises. If the survey does give a good result then the probability that there will be high demand from the large premises increases to 0·95.
If the survey indicates a bad response then the company will abandon all expansion plans.
Required:
Using decision tree analysis, establish the best course of action for Firlands Limited.

Q5. Gym Bunnies (GB) is a health club. It currently has 6,000 members, with each member paying a subscription fee of $720 per annum. The club is comprised of a gym, a swimming pool and a small exercise studio.
A competitor company is opening a new gym in GB's local area, and this is expected to cause a fall in GB's membership numbers, unless GB can improve its own facilities. Consequently, GB is considering whether or not to expand its exercise studio in a hope to improve its membership numbers. Any improvements are expected to last for three years.

Option 1

No expansion. In this case, membership numbers would be expected to fall to 5,250 per annum for the next three years. Operational costs would stay at their current level of $80 per member per annum.

Option 2

Expand the exercise studio. The capital cost of this would be $360,000.The expected effect on membership numbers for the next three years is as follows:

Probability	Effect on membership numbers
0·4	Remain at their current level of 6,000 members per annum
0·6	Increase to 6,500 members per annum

The effect on operational costs for the next three years is expected to be:

Probability	Effect on operational costs
0·5	Increase to $120 per member per annum
0·5	Increase to $180 per member per annum

Required:
(a) Using the criterion of expected value, prepare and fully label a decision tree that shows the two options available to GB. Recommend the decision that GB should make.
Note: Ignore time value of money. (12 marks)
(b) Calculate the maximum price that GB should pay for perfect information about the expansion's exact effect on MEMBERSHIP NUMBERS. (6 marks)
(c) Briefly discuss the problems of using expected values for decisions of this nature. (2 marks)
(20 marks)

Q3. A company has to decide which of three mutually exclusive projects to invest in during the next year. The directors believe that the success of the projects will vary depending on consumer demand. There is a 20% chance that consumer demand will be above average; a 45% chance that consumer demand will be average and a 35% chance that consumer demand will be below average.
The net present value for each of the possible outcomes is as follows:

Consumer demand	Project A	Project B	Project C
	$000s	$000s	$000s
Above average	400	300	800
Average	500	400	600
Below average	700	600	300

A market research company believes it can provide perfect information on potential consumer demand in this market.

Required:

Calculate, on the basis of expected value, the maximum amount that should be paid for the information from the market research company. ***(5 marks)***

Q4. A company has to decide which of three mutually exclusive projects to invest in next year. The directors believe that the success of the projects will vary depending on economic conditions. There is a 30% chance that conditions will be good, a 20% chance that conditions will be fair and a 50% chance that conditions will be poor. The company uses expected value to make this type of decision.
The net present value for each of the possible outcomes is as follows:

Economic Conditions	*Project A* *$000*	*Project B* *$000*	*Project C* *$000*
Good	700	800	700
Fair	400	500	600
Poor	300	400	500

A firm of economic analysts believes it can provide perfect information on economic conditions.

Required:

Calculate the maximum amount that should be paid for the information from the firm of economic analysts. ***(5 marks)***

Q5. A company has to decide which of three mutually exclusive projects to undertake. The directors believe that success of the projects will depend on consumer reaction. There is a 25% chance that consumer reaction will be strong, a 40% chance that consumer reaction will be good and a 35% chance that consumer reaction will be weak. The company uses expected value to make this type of decision.
The net present value for each of the possible outcomes is as follows:

Consumer reaction	***Project A***	***Project B***	***Project C***
	$000s	***$000s***	***$000s***
Strong	1,000	1,600	1,200
Good	250	300	375
Weak	200	140	100

A market research company believes it can provide perfect information on consumer reaction.

Required:

Calculate the maximum amount that should be paid for the information from the market research company. ***(5 marks)***