Sample questions

Question

A cargo ship has two cargo holds, one fore and one aft. The fore cargo hold has a weight capacity of 40,000 kilos and a volume capacity of 30,000 cubic feet. The aft hold has a weight capacity of 45,000 kilos and a volume capacity of 40,000 cubic feet. The ship's owner has contracted to carry loads of refined cooking oil and grain. The total weights of the available oil and available grain are 60,000 kilos each, but the owner must arrange to carry at least 30,000 kilos each of oil and grain. The volume per mass of the oil is 0.4 cubic foot per kilo, and the volume per mass of the grain is 0.8 cubic foot per kilo. The profit for shipping oil is Rs.70 per kilo, and the profit for shipping grain is Rs.24 per kilo. The owner is free to accept all or part of the available cargo; he wants to know how much oil at and grain to accept to maximize profit.

   (a) What is the maximum profit that the owner can make?
   (b) How much weight of oil should the owner load in the fore cargo?
   (c) How much weight of oil should the owner load in the aft cargo?
   (d) How much weight of grain should the owner load in the fore cargo?
   (e) How much weight of grain should the owner load in the aft cargo?
   (f) If the owner is offered to take in cargo from another ship, what is the minimum rate (per kilo) that he should charge for such cargo?

Question

GAMP Furniture is a manufacturer of fine hand-crafted furniture. During the next production period, management is considering producing dining room tables, dining room chairs, and/or bookcases. The time required for each item to go through the two stages of production (assembly and finishing), the amount of wood required, and the corresponding unit profits are given in the following table, along with the amount of each resource available in the upcoming production period.

	Tables	Chairs	Bookcases	Available
Assembly (minutes)	80	40	50	8100
Finishing (minutes)	30	20	30	4500
Wood (kilos)	80	10	50	9000
Unit Profit	Rs.3600	Rs.1250	Rs.3000	

   a. How many of each product should they produce to maximize profits?
   b. Suppose the profit per table increases by Rs.1000. What would be the total profit under this scenario?
   c. What should be the minimum profit from tables for them to be produced in any optimal mix?

Question

A family of farmers have run the family farm for over thirty years. They are currently planning the mix of crops to plant on their 120-acre farm for the upcoming season. The table below gives the labour hours and fertilizer required per acre, as well as the total expected profit per acre for each of

the potential crops under consideration. The farmers can work at most 6,500 total hours during the upcoming season. They have 20 tons of fertilizer available.

Crop	Labour Required (hours per acre)	Fertilizer Required (tons per acre)	Expected Profit (per acre)
Rice	50	1.5	Rs.5000
Wheat	60	2.0	Rs.6000
Barley	105	4.0	Rs.8500

Part 1: In order to maximize expected profits the farmers should plant _____ acres of rice, _____ acres of wheat, and _____ acres of barley.

Part 2: Their expected profit would be Rs._____

Part 3: If they were to buy additional amounts of fertilizer, then they would buy it at a maximum price of Rs. _____ per ton.

The amount of additional fertilizer they would buy at this rate would be _____ tons.

Part 4: Suppose they also had the option of planting potatoes. Potato farming would require 25 hours of labour per acre, and 4.5 tons of fertilizer per acre. The expected profits from planting potatoes would be Rs.7000 per acre. Should they plant potatoes?

   (a) Yes   (b) No.

Question

A company imports widgets from two ports P1 and P2, and supplies widgets to four locations L1, L2, L3, and L4. The monthly demands for widgets at the four locations are

L1: 1400	L2: 3200
L3: 2000	L4: 1500

P1 can supply 5000 widgets per month and P2 can supply 3500 widgets per month.

The costs in rupees of supplying one widget from each port to each location is given below.

	L1	L2	L3	L4
P1	2	6	6	2
P2	1	2	5	7

   (a) What is the minimum cost of satisfying the demands of the four locations?
   (b) How many widgets will be supplied to location L3 from port P1?
   (c) Which location(s) receive widgets from both ports in a minimum cost supply schedule?
   (d) If the monthly demand of widgets at L1 increase by 100 units and the monthly demand for widgets at L3 reduce by 200 units, what will be the change in the total cost of supplying all locations with their demands?

(e) If P1 could supply 200 more widgets per month and P2 could supply 200 less widgets per month, what will be the change in the total cost of supplying all locations with their demands?

Question

An oil Company is considering making a bid for an oil development contract to be awarded by the government. The company has decided to bid Rs.11.2 crore. The company estimates that it has a 60% chance of winning the contract with this bid. If the firm wins the contract, it can choose one of three methods for getting the oil. It can develop a new method for oil extraction, use an existing (inefficient) process, or subcontract the processing to a number of smaller companies. The results from these alternatives are as follows:

Develop new process:

Outcomes	Probability	Profit (Rs. crores)
Great success	0.3	60
Moderate success	0.6	30
Failure	0.1	−10

Use present process:

Outcomes	Probability	Profit (Rs. crores)
Great success	0.5	45
Moderate success	0.3	20
Failure	0.2	−4

Subcontract:

Outcome	Probability	Profit (Rs. crores)
Moderate success	1.0	25

The cost of preparing the contract proposal is Rs.2 crore. If the company does not make a bid, it will invest in an alternative venture with a guaranteed profit of Rs.30 crore.

(a) What would be the expected value of the profits to the company under the three alternatives?
(b) Which of the three alternatives should the company choose, if they decided to make a bid?
(c) Suppose the probability of moderate success for the present process remains at 0.3. What should be the probability of "Great success" for the company to be indifferent between the present process and the new process?
(d) Should the company invest in the alternate venture?
(e) What would be the expected profit for the company if they adopt their best decision?

Question

Mr. Kapoor, a Bollywood film producer, and he is currently evaluating a script by a new screenwriter and director, Ms. Sharma. Mr. Kapoor knows that the probability of a film by a new director being a success is about 0.10 and that the probability it will flop is 0.90. The studio accounting department estimates that if this film is a big hit, it will make a box office profit of Rs.250 crores, and it will make a box office profit of Rs.150 crores if it succeeds but is not a big hit. If it is a flop, it will lose Rs.80 crores. A box office success is a big hit 70% of the time and a not so big hit 30% of the time.

(a) What is the expected profit if Mr. Kapoor decides to take on the script to produce the film? (A positive value indicates a profit and a negative value indicates a loss)

(b) If Mr. Kapoor maximizes his expected profit, should he take up the film?

Mr. Kapoor would like to hire noted film critic Ms. Padamsee to read the script and assess its chances of success. Ms. Padamsee is generally able to correctly predict a successful film, i.e., she will report that the film will be a success if it is not a flop.

(c) What is the probability with which Ms. Padamsee will say the script will be successful?

Question

A company is considering launching a new product. It is estimated that there is a 0.7 probability of the product being successful and a 0.3 probability of it failing if the market is optimistic. If the market is pessimistic, then there is a 0.2 probability of the product being successful and a 0.8 probability of it failing. If the product is successful, the company would profit Rs.15 lakhs. If it is a failure, the company loses Rs.5 lakhs.

Part 1: Assume that the decision to launch the product is taken after the company finds out that the market would be optimistic. Should they launch the product or not? What would be their expected profit from their decision?

They should   (a) launch the product   (b) not launch the product

Their expected profit would be Rs._____

Part 2: Next assume that the company has to decide whether to launch the product BEFORE knowing whether the market sentiment. Should they launch the product or not? What would be the expected profit from their best decision?

They should   (a) launch the product   (b) not launch the product

Their expected profit would be Rs._____