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(1) An ice cream manufacturer sells soft scoop ice cream in special pressurized containers and is planning production for the summer. which is the peak period. The company wishes to ensure that it has the best quality containers in hand: too few and sales will be lost and too many and the surplus will have to be stored over the winter at a substantial cost. The containers can only be purchased in lots of 500. The following table shows the estimated cost contributions for various ordering patterns:

	NO. OF NEW CONTAINERS BOUGHT			
	0	500	1000	1500
POOR SUMMERS - LOW SALES	0	20	20	30
FAIR SUMMERS - REASONABLE SALES	15	0	15	20
GOOD SUMMERS - GOOD SALES	20	20	0	15
VERY GOOD SUMMER - VERY HIGH SALES	30	25	15	0

Based on Past data, the probabilities of the different types of weather are:

POOR : 0.3   FAIR = 0.4   GOOD: 0.2   VERY GOOD = 0.1

The firm has obtained a copy of the long-range weather forecast for the summer which indicates that there will be a good summer but the past experience states that forecasts are Not 100%. accurate, as follows:

P (forecast good but weather poor) = 0.3
P (forecast good but weather fair) = 0.4
P (forecast good and weather good) = 0.7
P (forecast good but weather very good) = 0.2

You are required.

(a) To CALCULATE the no. of containers that should be purchased based on PAST data only.

(b) To calculate whether the decision in (a) would be altered if the forecast is taken into account

(k) To explain any changes made in the purchase decision as a result of comparing your answers to (a) & (b) above.

SOLUTION:

(d)

WEATHER/SALES	PRIOR PROBABILITIES	COURSE OF ACTION (NO. OF CONTAINERS BOUGHT)			
		0	500	1000	1500
POOR (low)	0.3	0	20	20	30
FAIR (reasonable)	0.4	15	0	15	20
GOOD (good)	0.2	20	20	0	15
VERY GOOD (very high)	0.1	30	25	15	0
EMV =		13	12.5	13.5	20

Since the EMV is lowest for $500 containers being bought,

BASED ON PAST DATA, $500 CONTAINERS SHOULD BE PURCHASED BY THE ICE CREAM MANUFACTURER

(b)

WEATHER (SUMMER)	PRIOR. PROB.	CONDITIONAL PROB.		JOINT PROB.		POSTERIOR PROB.	
		GOOD	BAD	GOOD	BAD	GOOD	BAD
POOR	0.3	0.3	0.7	0.09	0.21	0.2195	0.3559
FAIR	0.4	0.4	0.6	0.16	0.24	0.3902	0.4068
GOOD	0.2	0.7	0.3	0.14	0.06	0.3415	0.1017
VERY GOOD	0.1	0.2	0.8	0.02	0.08	0.0488	0.1356
		MARGINAL PROB =		0.41	0.59		

SALES FORECAST (GOOD)

STATE OF NATURE (sales)	POSTERIOR PROB.	NO. OF CONTAINERS BOUGHT (COURSE OF ACTION)			
		0	500	1000	1500
LOW	0.2195	0	20	20	30
REASONABLE	0.3902	15	0	15	20
GOOD	0.3415	20	20	0	15
VERY HIGH	0.0488	30	25	15	0
	EMV =	14.147	12.44	10.975	19.5115

SALES FORECAST (BAD)

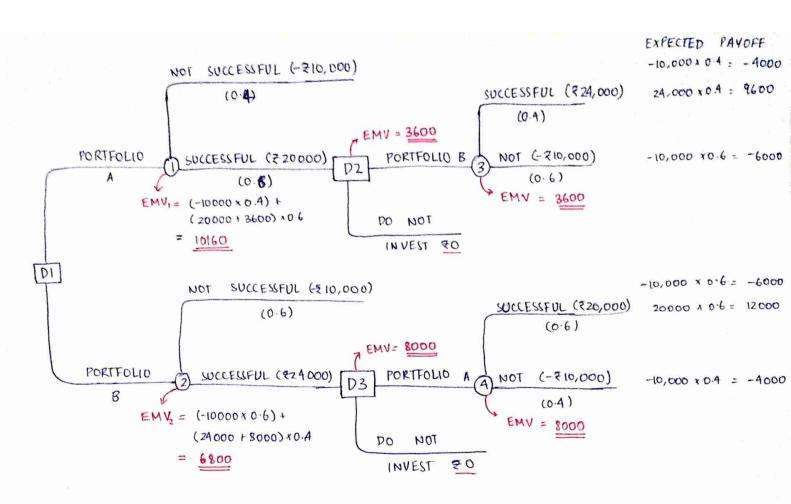| STATE OF NATURE (sales)	POSTERIOR PROB.	NO. OF CONTAINERS BOUGHT (COURSE OF ACTION)			
		0	500	1000	1500
LOW	0.3559	0	20	20	30
REASONABLE	0.4068	15	0	15	20
GOOD	0.1017	20	20	0	15
VERY HIGH	0.1356	30	25	15	0
	EMV =	12.204	12.542	15.254	20.3385

FORECAST	MARGINAL PROB.	COURSE OF ACTION	OPTIMAL EMV	EXPECTED EMV
GOOD	0.41	1000	10.975	4.4998
BAD	0.59	0	12.204	7.2004

POSTERIOR EMV = <u>11.7002</u>

On the basis of POSTERIOR ANALYSIS, the Ice cream manufacturer should dry 1000 containers if the forecast is GOOD and 0 containers if the forecast is BAD.

(c) Since the value of POSTERIOR EMV, i.e, 11.7002 is less than PRIOR EMV, i.e, 12.5, it is PROFITABLE to change the buying decision there by <u>reducing</u> TOTAL COST.

(2) A businessman has two independent investment portfolios A and B but lacks the capital to undertake both of them simultaneously. He can either choose A first and then stop or if A is not successful, then take B and vice versa. The probability of success of A is 0.6, while for B, it is 0.4. Both investments require an initial capital outlay of ₹10,000 and both return nothing if the venture proves to be unsuccessful. Successful completion of A will return ₹20000 (over cost) and successful completion of B will return ₹24000 (over cost). Draw a decision tree to determine the best strategy.

$-10,000 \times 0.4 = -4000$

$24,000 \times 0.4 = 9600$

NOT SUCCESSFUL $(-₹10,000)$

(0.4)

SUCCESSFUL $(₹24,000)$

(0.4)

EMV = 3600

PORTFOLIO A

PORTFOLIO B

SUCCESSFUL $(₹20000)$

NOT $(-₹10,000)$

$-10,000 \times 0.6 = -6000$

(0.6)

①

D2

③

(0.6)

$EMV_1 = (-10000 \times 0.4) +$

EMV = 3600

$(20000 + 3600) \times 0.6$

= 10160

DO NOT

INVEST ₹0

D1

NOT SUCCESSFUL $(₹10,000)$

$-10,000 \times 0.6 = -6000$

(0.6)

SUCCESSFUL $(₹20,000)$

$20000 \times 0.6 = 12000$

(0.6)

PORTFOLIO B

SUCCESSFUL $(₹24000)$

EMV = 8000

PORTFOLIO A

NOT $(-₹10,000)$

$-10,000 \times 0.4 = -4000$

②

D3

Ⓐ

(0.4)

$EMV_2 = (-10000 \times 0.6) +$

EMV = 8000

$(24000 + 8000) \times 0.4$

DO NOT

= 6800

INVEST ₹0

⟹ THEREFORE, SINCE THE $EMV_1 > EMV_2$, THE OPTIMAL STRATEGY WOULD BE TO FIRST INVEST IN PORTFOLIO A AND IF SUCCESSFUL, THEN INVEST IN PORTFOLIO B