

Question 1

A market survey aimed at determining the assessment of three products. The subjective assessments of each is classified according to a value scale X_j given in the table.

The survey showed that the proportion of interviewers rating the design according to this classification were as shown in Table (1). Find the assessment value of each product.

	Performance scale	X_j
a	Exciting and impressive	10
b	Highly satisfactory	8
c	Acceptable	6
d	Unattractive	3
e	Not acceptable	0

Table (1)

	Attribute	Objective	Importance V_i	Probability of occurrence P_{ij} for each product														
				A					B					C				
				a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
1	Comfort		10	.1	.4	.3	.2	0	.2	.3	.1	.3	.1	.3	.4	.1	.2	0
2	Ease of control		10	.2	.3	.2	.1	.2	.3	.4	.2	.1	0	.2	.4	.3	.1	.1
3	Reliability	Free of trouble	8	.3	.1	.3	.2	.1	.3	.2	.2	.2	.3	.3	.3	.2	.1	.1
4	Economy	Research	5	.2	.2	.2	.1	.3	.2	.1	.3	.3	.1	.3	.2	.2	.2	.1
5	Appearance		3	.3	.3	.1	.2	.1	.3	.4	.2	.1	0	.2	.2	.2	.2	.2

$$\text{Assessed value } B_i = \frac{\sum V_i b_i}{\sum V_i}$$

$$\text{index performance } b_i = \sum P_{ij} X_j / 10$$

Question 2

A market survey aimed at determining the assessment of three products. The subjective assessments of each is classified according to a value scale X_j given in the table

The survey showed that the proportion of interviewers rating the design according to this classification were as shown in Table (1). Find the assessment value of each product.

	Performance scale	X_j
a	Exciting and impressive	9
b	Highly satisfactory	7
c	Acceptable	5
d	Unattractive	2
e	Not acceptable	0

Table (2)

	Attribute	Objective	Importance V_i	Probability of occurrence P_{ij} for each product														
				A					B					C				
				a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
1	Comfort		25	.2	.4	.2	.2	0	.2	.3	.2	.2	.1	.3	.3	.2	.2	0
2	Ease of control		40	.2	.3	.2	0	.3	.3	.3	.2	.2	0	.2	.4	.3	.1	.1
3	Reliability	Free of trouble	20	.2	.1	.3	.3	.1	.3	.2	.2	.2	.3	.3	.3	.2	0	.2
4	Economy	Research	15	.2	.2	.3	0	.3	.2	0	.3	.3	.2	.3	.2	.3	.2	0
5	Appearance		10	.3	.4	.1	.2	0	.3	.4	.2	.1	0	.2	.2	.2	.2	.2

Question 3

An electronic company has developed a new integrated circuit product. The product offers significant advantage in size, stability, and reliability. It has wide market application and it will be sold at a higher price than the older circuit. The firm has applied for a patent. The two distinct industrial markets for the product are:-

- 1- Customer product manufacturers (radios, televisions, timing devices, and microwave ovens) which accounts for approximately 30% of the market. This amount is influenced by the economy conditions.

- 2- Industrial product manufacturers (power generation equipment, calculators, X-ray equipment, measuring devices, and military weapon systems which account for approximately 70% of the market.

Market research and test marketing are carried out in a one geographic area in a single test market. The research indicated with a high level of confidence that at least 5,000,000 units would be sold. For reasons independent of the market research, marketing officials believe that the market will be in the range of 7,000,000 to 15,000,000 units.

The marketing manager has recommended that 10,000,000 units production facility be built. However, the controller has requested that the product be market tested in other geographic areas. The market testing will take five months and cost 750,000 SR.

After plant capacity is decided, it will take six months to make the facility operational. The capital cost for the different size facilities under consideration are given in the table (3). If the plant is expanded after it is built, the cost will significantly exceed the initial plant costs listed in the table. Find the appropriate plant capacity.

Table (3)

Production plan	Plant Capacity (units)	Estimated capital cost (SR)
A	5,000,000	70,000,000
B	7,500,000	90,000,000
C	10,000,000	105,000,000
D	12,500,000	110,000,000

Question 4

A manufacturer has decided to add a an optional equipment to its optional list. A local supplier has offered to supply this equipment for 100 SR each. The sale projections and cost accounting data are shown in tables below. If existing plant capacity for the case is 8000 units, should the firm make or buy the case.

Sales (units)	4000	6000	8000	10000	12000
Probability	0.1	0.20	0.25	0.35	0.1

Unit cost Item, SR	Variable Mfg.	Additional plant & equipment	Additional overhead
Exiting plant capacity	85	0.00	12
Extended plant capacity	65	3	14

Question 5

An instrument manufacturer has decided to add a carrying case to its list of optional equipment. A local supplier has offered to supply a satisfactory case of 30.5 SR each. The sale projections and cost accounting data are shown in tables below. If existing plant capacity for the case is 6000 units, should the firm make or buy the case.

Sales (units)	2000	4000	6000	8000	10000
Probability	0.15	0.20	0.20	0.30	0.15

Unit cost Item, SR	Variable Mfg.	Additional plant & equipment	Additional overhead
Exiting plant capacity	25.2	0.00	6.8
Extended plant capacity	20.2	0.85	5.4

Question 6

A valve Company produces several small items for a local market. The firm manufactures some of its subassemblies and relies on contractors for others. Final assemblies operations take place on the firm plant.

The price of one of the products {a common exterior water valve} would be increased due to price increase of the handle that is produced by a contractor. The contractor new price is 9 SR per handle. The valve company officials do not believe that the market will support a price increase for the valve and alternative sources should be evaluated.

Currently, The handle is milled from stainless steel to the company's specifications by contractor and shipped to supply point at valve firm. The other major components of the valve are made in the own casting plant [presently operating at 80% of capacity]. The handle is attached to valve body. The entire assembly is then given a coated of corrosion-resistance paint and packaged for shipment.

When the problem has researched, alternative has reached to manufacture by using milling machine {price 28,000 SR - life 5 years – no salvage value}. It is estimates that the machine will cost 4000 SR/year to operate and that they can produce the same valve handle for 6.0 SR with a volume of 4000 valves/year.

- a- What recommendation would you make to the president?
- b- If the handle is manufactured in house, should it be the same as purchased?
- c- Could value analysis help resolve the issue?

Question 7

A manufacturer is thinking of adding a new line of waterbeds to its existing line of products. The manufacture believes that at least 900 beds/month must be sold to make any profit. Being a new product, waterbed sale will probably varies between 8% to 20 % of the market for the first five years. Market research showed the sales of waterbeds for the last five years as given in the table below. Apply the least squares method to predict the demand and to determine whether or not the manufacture should add the new line.

Year	1	2	3	4	5
Total sale/month	1200	3500	3600	4500	5800

Question 8

A company is thinking to add a new line for producing a new product and it is believed it must sell 950 unit/month to make profit. Market research showed that the sales of the product for last for seven years as given the Table below and the company share would be at the first year 10% of the market and then increase to 20% over next four years. Predict the demand and determine if the company should add the line.

Year	1	2	3	4	5	6	7
Sales/month (units)	1530	2540	4120	5250	6420	7210	8550

Question 9

A company is thinking to produce a new product. The market shows that the sales of the product for last for ten years are as given in the table below. If the company share would be at the first year 15% of the market and then increase to 28% over next four years, predict the demand. Should the company produce the product? If it is believed that the company must sell 850 unit/month to make profit.

Year	1	2	3	4	5	6	7	8	9	10
Sales/month (units), 1000	2.2	2.8	4.1	5.8	6.8	7.2	8.5	8.2	9.1	9.5

Question 10

A company is thinking to produce a new product. The market shows that the sales of the product for last for ten years are as given in the table below. If the company share would be at the first year 20% of the market and then increase to 40% over next two years, predict the demand. Should the company produce the product? If it is believed that the company must sell 1500 unit/year to make profit.

Year	1	2	3	4	5	6	7	8	9	10
Sales/year (units), 1000	2.2	2.8	3.1	2.8	3.8	4.2	4.5	5.2	6.1	6.5

Question 11

A market study showed the sale of a product for the last eight years as given in the table below. If 5% scrap loss is considered for setup and production loss, determine the production volume for planning the capacity requirement of men, equipment, and material. p = Probability, V = Volume x 1000.

Year	1		2		3		4		5		6		7		8	
Demand State	p	V	p	V	p	V	p	V	p	V	p	V	p	V	p	V
Pessimistic	.5	4	.4	5	.4	4.5	.3	4.2	.1	5.5	.05	6	.05	6.5	-	-
Most likely	.3	6	.6	7	.5	6	.5	7	.6	8	.75	9	.85	9.5	1	11
Optimistic	.2	8	-	-	.1	7.5	.2	8.6	.3	9.5	.2	10	.1	10.3	-	-
Degree of certainty	95%		90%		85%		80%		70%		65%		60%		55%	

Question 12

A market study showed the sale of a product for the last eight years as given in the table below. If 10% scrap loss is considered for setup and production loss, determine the production volume should be used in planning the capacity requirement of men, equipment, and material. P = Probability, V = Volume x 1000.

Year	1		2		3		4		5		6		7		8	
Demand State	p	V	p	V	p	V	p	V	p	V	p	V	p	V	p	V
Pessimistic	.4	5	.5	4	.3	4	.2	6	.1	7	.5	8	.2	10	.6	10
Most likely	.5	6	.5	7	.6	6	.6	7	.6	8	-	-	.8	12	.4	11
Optimistic	.1	7	-	-	.1	8	.2	9	.3	10	.5	12	-	-	-	-
Degree of certainty	90%		80%		80%		70%		70%		65%		60%		50%	

Question 13

For data given in the following table, products would be considered to be candidates for (i) discarding; (ii) a cost reduction exercise; (iii) an increase of selling price. To control product variety, two aspects should be investigated (Income and Contribution {selling price – cost}).

Item	A	B	C	D	E	F	G	H	J	K
Income	6500	2500	9000	800	600	400	100	400	300	1500
Selling price/unit	15	12	10	20	14	15	9.7	12	18	20
Cost/unit	13	10	9	11	12	10	12	14	23	22

Question 14

For data given in the following table, investigate how product variety could be controlled according to their contribution. Develop statistical analysis for the solution.

Item	A	B	C	D	E	F	G	H	J	K
Quantity x 1000	10	5.4	19	3.2	6.2	3	2	3.5	1.6	4
Selling price, SR/unit	65	50	40	80	62	70	85	48	90	75
Cost, SR /unit	52	40	35	50	54	45	52	40	70	72

Question 15

For data given in the following table, investigate how product variety could be controlled according to their contribution. Develop statistical analysis for the solution.

Item	A	B	C	D	E	F	G	H	J	K
Quantity	5200	2800	9200	1300	2100	1500	900	1500	800	1500
Selling price/unit	16	12	11	20	16	17	19	12	21	20
Cost/unit	13	9	10	12	13	11	12	15	16	22

Question 16

For data given in the following table, evaluate products candidates for (i) discarding; (ii) a cost reduction exercise; (iii) an increase of selling price.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Quantity sold	260	2030	160	200	3237	130	963	700	600	400	50	226	485	430	201
Unit selling price	4	8	250	44	33	20	300	162	20	52	750	50	60	55	67
Unit material cost	3.1	1.7	35.4	16.5	6.7	3.9	60.2	112.5	2.0	16.9	50.2	3.6	12.5	3.7	5.8
Unit labor cost	1.0	0.8	79.6	7.5	7.4	7.3	67.8	23.8	2.3	35.1	139.8	7.4	20.0	6.3	24.2

Question 17

For data given in the following table, products would be considered to be candidates for (i) discarding; (ii) a cost reduction exercise; (iii) an increase of selling price. To control product variety, two aspects should be investigated (Income and Contribution {selling price – cost}).

Item	A	B	C	D	E	F	G	H	J	K
Income	6500	4200	9000	800	600	1200	700	400	300	1500
Selling price/unit	20	12	10	20	15	12	14	20	25	30
Cost/unit	12	10	9	11	12	10	12	14	23	22

Question 18

For data given in the following table, products would be considered to be candidates for (i) discarding; (ii) a cost reduction exercise; (iii) an increase of selling price. To control product variety, two aspects should be investigated (Income and Contribution {selling price – cost}).

Item	A	B	C	D	E	F	G	H	J	K	L	M
Income	2000	5500	3000	9000	6000	800	400	1200	1500	4500	6000	3500
Selling price/unit	10	15	14	20	12	18	11	12	16	20	15	18
Cost/unit	13	10	9	11	12	10	12	14	18	22	10	16

Question 19

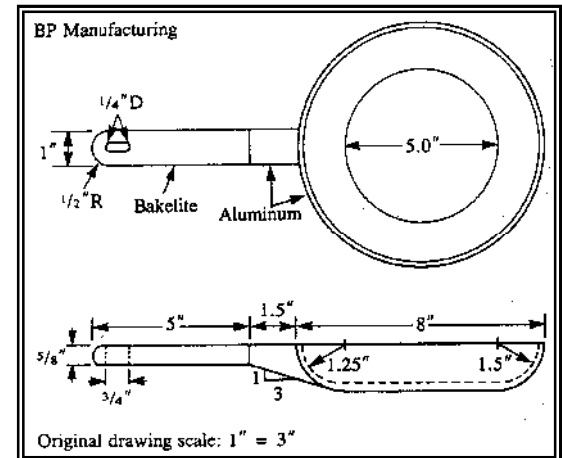
For data given below, find a policy to reduce product variation and cost.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Quantity sold	260	2030	16	160	200	3237	130	80	963	700	100	600	400	50	226	7105	485	430	201	1200
Unit selling price	4	8	1000	250	44	33	20	80	300	162	117	20	52	750	50	9	60	55	67	12
Unit material cost	3.1	1.7	3.8	35.4	16.5	6.7	3.9	10.2	60.2	112.5	26.7	2.0	16.9	50.2	3.6	1.25	12.5	3.7	5.8	4.1
Unit labor cost	1.0	0.8	10.6	79.6	7.5	7.4	7.3	1.1	67.8	23.8	35.3	2.3	35.1	139.8	7.4	5.0	20.0	6.3	24.2	1.9

Question 20

For the frying pan shown in the figure below.

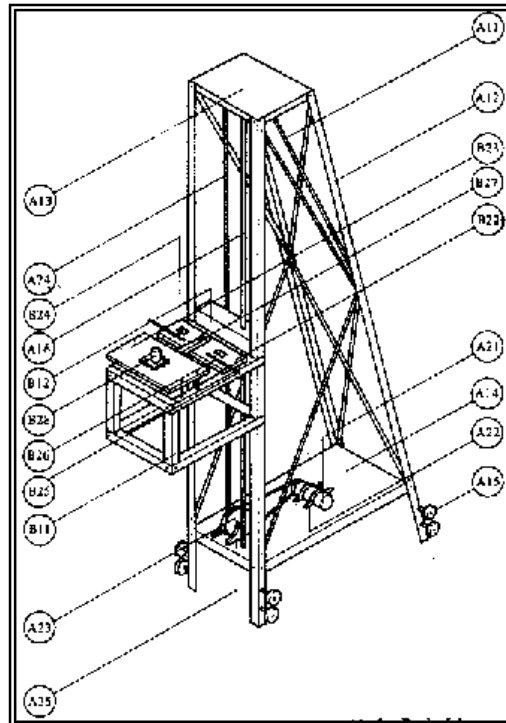
- Develop a bill of materials to include part name, number of parts needed, material, material description and supplier, and unit cost. The following data are given:
 - The weight of parts {Aluminum = 0,098 lb/in³, and bakelite = 0.162 lb/in³}
 - The cost {Aluminum = 1.35 \$/lb, and bakelite = 0.7 \$/lb}
- Calculate the yearly material requirements and cost for 200,000 frying pans.



Question 21

A manufacturer is producing cranes for a mini-load automated storage and retrieval system. The crane assembly is shown in the figure and table below.

- Construct the product structure, and the bill of material matrix.
- Compute the total requirement matrix and the material demand for 100 cranes.



PRODUCT: STORAGE/RETRIEVAL CRANE		
Level	Description	Quantity
A	Crane frame assembly	1
A1	Frame assembly	1
A11	Cross bracing	8
A12	Crane frame angles	4
A13	Top plate	1
A14	Bottom plate	1
A15	Bearings, 1.375 outer diameter	1
A16	Picking head guide	8
A2	Motor assembly	1
A21	Stepping motor, 750 ounces/inch	1
A22	Motor supports	2
A23	Sprocket	2
A24	Chain	2
A25	Sprocket support	4
B	Order picking head subassembly	1
B1	Bucket frame	1
B11	Picking head frame angles	8
B12	Chain support	1
B2	Motor assembly	1
B22	Moving plate	1
B23	Fixed plate	1
B24	Solenoid	2
B25	Picking lever	2
B26	Spring	2
B27	Rack and Pinion	2
B28	Stepping motor, 120 ounces/inch	1