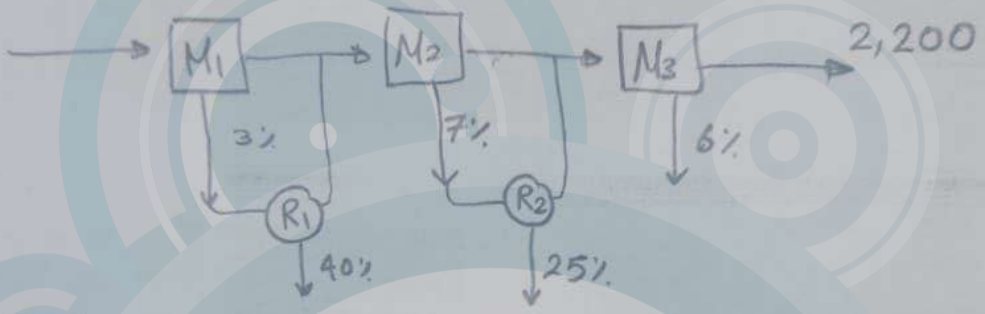
Solved Quiz Questions

Question 1: Consider a simple three-step manufacturing process as illustrated in the given figure. The defect rates are 3%, 7%, and 6%, respectively. Process 1 and 2 are capable of rework. Assume rework rate is 60% for process 1 and 75% for process 2. What is input required to satisfy the demand of 2.200 units?

a) What is the input required for the Machine 3?
b) What is input to the production line that is required to satisfy the demand of 2,200 units?



$$I_3 = \frac{2,200}{1-d_3} = \frac{2,200}{1-d_3} = \frac{2,200}{1-0.06} = \frac{2,200}{0.94} = [2,340.426]$$

$$\boxed{I_3 = 2,341 \text{ Units}}$$

$$I_3 = (1-d_2)I_2 + (1-d_5)d_2 I_2$$

$$2341 = 0.93 I_2 + 0.75(.07) I_2$$

$$\frac{2341}{.9825} = \frac{0.9825 I_2}{0.9825} \Rightarrow I_2 = [2382.697]$$

$$= \boxed{2,383 = I_2} \text{ Units}$$

$$I_1 = \frac{2,383}{0.97 + 0.6(.03)} \Rightarrow I_1 = [2,411.945]$$

$$I_1 = 2,412 \text{ Units}$$

Question 2: A certain type of machine will be used to produce three products: A, B, and C. Sales forecasts for these products are: 52,000, 65,000, and 70,000 units per year, respectively. Production rates for the three products are, respectively, 9, 15, and 10 pc/hr, and scrap rates are, respectively, 5%, 7%, and 9%. The plant will operate 50 weeks per year, 8 shifts per week, and 8 hours per shift. It is anticipated that production machines of this type will be down for repairs on average 10 percent of the time. How many machines will be required to meet demand?

Product	Defect rate	production rate	Forecasted demand	Standard time	Q	Q after rounding
A	0.05	9	52,000	6.666666667	54736.84211	54,737
B	0.07	15	65,000	4	69892.47312	69,893
C	0.09	10	70,000	6	76923.07692	76,924

# of wk	# of shifts	hr per shift	H
50	8	8	192,000

R
0.9

Numerator	1,106,029
Denominator	172800
F	6.400633
F_After rounding	7

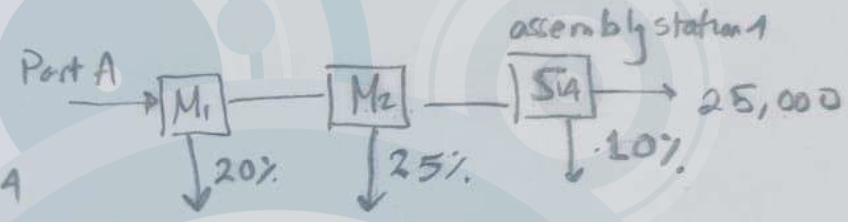
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Question 3: Part A is produced on machine 1 and then machine 2. One unit of Part A is assembled with Four units of Part B, which is produced on machine 3, in assembly station 4. Machine 1 has a scrap factor of 20%, Machine 2 has a scrap factor of 25%, and Machine 3 has a scrap factor of 15%. Of the poor-quality parts produced by machine 3, 70% percent can be reworked as good-quality parts at Station 5. Each day, 25,000 units of the completed product are required to meet demand. The assembly process has scrap factor of 10%

a) What is the number of units of Part A need to meet the daily demand for the completed product?

b) What is the number of units of Part B need to meet the daily demand for the completed product?

a)

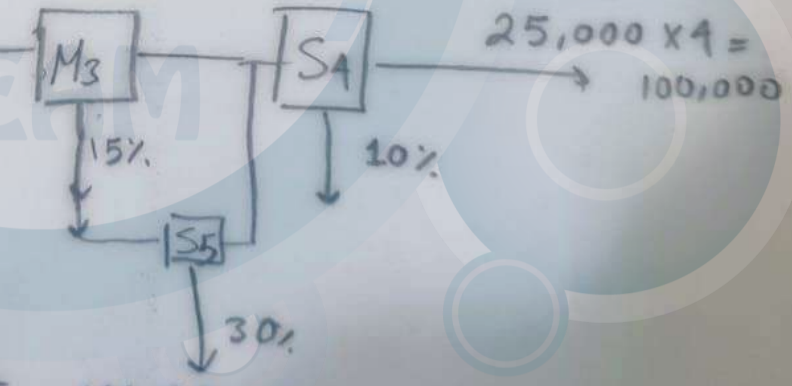


$$I_4 = \frac{O_4}{1-d_4} = \frac{25{,}000}{1-d_4} = \frac{25{,}000}{0.9} = \lceil 27{,}777.78 \rceil = 27{,}778 \text{ Units}$$

$$I_2 = \frac{O_2}{1-d_2} = \frac{27{,}778}{0.75} = \lceil 37{,}037.33 \rceil = 37{,}038 \text{ Units}$$

$$I_1 = \frac{O_1}{1-d_1} = \frac{37{,}038}{0.8} = \lceil 46{,}297.5 \rceil = 46{,}298$$

$$O_3 + O_5 = \frac{25{,}000 \times 4}{1-d_4} = \frac{25{,}000 \times 4}{.1}$$



$$O_3 + O_5 = 111{,}112$$

$$I_3(1-d_3) + (1-d_5)d_3 I_3 = 111{,}112$$

$$I_3(0.85) + (0.7)(.15)I_3 = 111{,}112 \Rightarrow I_3 = \lceil 116{,}347.61 \rceil$$

$$I_3 = 116{,}348 \text{ Unit}$$

Question 4: A job shop has received an order for high-precision formed parts. The cost of producing each part is estimated to be $75,000. The customer requires that 8, 9, or 10 parts be supplied. Each good part sold will produce revenue of $100,000. However, if fewer than 8 good parts are produced, the customer cannot use them for their original purpose but can make use of some major components. In this case he agrees to buy all of them (good or bad) for the price of the production cost. The manufacturer, however, needs to make some adjustments to each part which will cost him $600 per part. If 8 or more good parts are produced, the customer will buy only the good ones and will not make the purchase of the bad ones. If more than 10 good parts are produced, the extra ones will not be purchased for any value.

Revenue	Cost	
$75,000Q$	$75,000Q + 600Q = 75,600Q$	$X < 8$
$100,000X$	$75,000Q$	$X = 8, 9, \text{or } 10$
$100,000(10)$	$75,000Q$	$X > 10$