1. Value-added refers to:
   A) the cost of inputs
   B) the price of outputs
   C) the difference between cost of inputs and what customers are willing to pay
   D) the extra profit obtained from increased productivity
   E) all of the choices are correct
   Ans: C

2. Productivity is expressed as:
   A) output plus input
   B) output minus input
   C) output times input
   D) output divided by input
   E) input divided by output
   Ans: D

3. Given forecast errors of 4, 8, and -3, what is the mean absolute deviation?
   A) 4
   B) 3
   C) 5
   D) 6
   E) 12
   Ans: C

4. Given the following information, the utilization is:

   Effective capacity = 20 units per day
   Design capacity = 60 units per day
   Actual output = 15 units per day
   A) 1/4
   B) 1/3
   C) 1/2
   D) 3/4
   E) none of these
   Ans: A

5. Disadvantages of naive forecasts include:
   I. time-consuming
   II. not very accurate
   III. does not smooth random variations
   A) I, II and III
   B) I and II
   C) I and III
   D) II and III
   E) none of the choices are disadvantages
   Ans: D

6. Which technique is useful in computing seasonal relatives?
   A) double smoothing
   B) Delphi technique
   C) MSE
   D) centred moving average
   E) exponential smoothing
   Ans: D

7. Given the following historical data and weights of .5, .3, and .2, what is the three-period moving average forecast for period 5?

Period	Value	Period	Value
1	138	3	148
2	142	4	144

   A) 144.20
   B) 144.80
   C) 144.67
   D) 143.00
   E) 144.00
   Ans: B

8. Which of the following is a key step towards improving productivity?
   A) Develop focussed productivity measures on critical areas.
   B) Use an efficiency perspective.
   C) Measure improvements and publicize them.
   D) Establish difficult and challenging goals for improvement.
   E) All of the choices are key steps
   Ans: C

9. Seasonal variations are often easier to deal with in capacity planning than random variations because seasonal variations tend to be:
   A) smaller
   B) larger
   C) predictable
   D) controllable
   E) less frequent
   Ans: C

10. The following equation is used to predict quarterly demand: $Y_t = 350 - 2.5t$, where t = 0 in the second quarter of last year. Quarter relatives are Q1 = 1.5; Q2 = 0.8; Q3 = 1.1; and Q4 = 0.6. What is the forecast for the last quarter of this year?
   A) 201
   B) 335
   C) 268
   D) 199.5
   E) 266
   Ans: A

11. In a study of innovative projects at Hewlett-Packard, it was discovered that all of the following were required ingredients for innovation EXCEPT:
   A) successful sales strategies.
   B) management support.
   C) systematic product design process.
   D) skilled and helpful people.
   E) All of the choices are required ingredients
   Ans: A

12. Which of the following is <u>not</u> a stage in the life cycle of products and services?
   A) incubation
   B) growth
   C) adolescence
   D) saturation
   E) Decline
   Ans: C

13. The three primary functions that exist in most business organizations are:
    A) manufacturing, production, and operations
    B) operations, marketing, and finance
    C) operations, accounting, and marketing
    D) operations, production, and finance
    E) none of the choices are correct
    Ans: B

14. System capacity and placement of equipment are examples of:
    A) financial decisions
    B) tactical decisions
    C) systems design decisions
    D) system operation decisions
    E) forecasting decisions
    Ans: C

15. Coleman, known for making camping gear, started producing a smoke alarm with large buttons that could be shut off with a broom handle. This was an example of which approach to finding new product ideas?
    A) Listening to market complaints
    B) Gaps in the market
    C) Exploring niche markets
    D) Using new technology
    E) Creating new market space
    Ans: C

1. The utilization of a machine is 50%. The machine has a design capacity of 70 units per hour and an effective capacity of 60 units per hour. Find the efficiency of the machine.

$$utilization = \frac{actual\ output}{design\ capacity}$$

$$50\% = \frac{actual\ output}{70\ per\ hour}$$

$$actual\ output = 35\ units\ per\ hour$$

$$efficiency = \frac{actual\ output}{effective\ capacity} = \frac{35\ units\ perhour}{60\ units\ perhour} = 58.33\%$$

2. Use the following to answer questions 7-10:

Time Period	Demand
7 years ago	7
6 years ago	28
5 years ago	21
4 years ago	42
3 years ago	35
2 years ago	56
Last year	49

a. What is this year's forecast using the naive approach?

The data has a trend (it is changes +21 and -7 every alternate year).
Hence, next year's forecast will be (49+21) = 70.

b. What is this year's forecast using a four-year simple moving average?

$$forecast = \frac{(42+35+56+49)}{4} = 45.5$$

c. What is this year's forecast using exponential smoothing with alpha = .25, if last year's smoothed forecast was 45?

$$F_t = F_{t-1} + \propto (A_{t-1} - F_{t-1})$$
$$45 + .25(49 - 45)$$
$$45 + .25(4) = 45 + 1 = 46$$

d. What are this and next year's forecasts using the least squares trend line for these data?

Time Period	t	Demand (y)	t^2	ty
7 years ago	1	7	1	7
6 years ago	2	28	4	56
5 years ago	3	21	9	63
4 years ago	4	42	16	168
3 years ago	5	35	25	175
2 years ago	6	56	36	336
Last year	7	49	49	343
	$\Sigma t = 28$	**$\Sigma y = 238$**	**$\Sigma t^2 = 140$**	**$\Sigma ty = 1148$**

$$b = \frac{n\sum ty - \sum t \sum y}{n\sum t^2 - (\sum t)^2} = \frac{8036 - 6664}{980 - 784} = 7$$

$$a = \frac{\sum y - b\sum t}{n} = \frac{238 - 7(28)}{7} = 6$$

$$Y_8 = a + bt = 6 + 7(8) = 62$$

$$Y_9 = a + bt = 6 + 7(9) = 69$$