

1. Suppose two fair, six-sided, dice are rolled. The probability of obtaining a value from the first dice that is at least two greater than the value from the second dice is

- (a) $\frac{1}{6}$
 (b) $\frac{9}{12}$
 (c) $\frac{5}{18}$
 (d) $\frac{1}{18}$

$$(3,1) (4,1) (4,2) (5,1) (5,2) (5,3) (6,1)$$

$$(6,2) (6,3) (6,4)$$

$$P = \frac{10}{36} = \frac{5}{18}$$

2. If the radius of a circle is increased by 20%, then the area is increased by

- (a) 44%
 (b) 120%
 (c) 144%
 (d) 40%

$$r, \quad r + \frac{20}{100}r = 1.2r$$

$$A_0 = \pi r^2$$

$$A = \pi r^2$$

$$A = \pi (1.2r)^2$$

$$A_1 = 1.44 \pi r^2$$

$$A_1 - A_0 = 1.44 \pi r^2 - \pi r^2$$

$$= 0.44 \pi r^2 = 44\%$$

3. Let x , y and z be distinct integers. x and y are odd and positive, and z is even and positive. Which one of the following statements cannot be true?

- (a) $(x-z)^2 y$ is even
 (b) $(x-z)y^2$ is odd
 (c) $(x-z)y$ is odd
 (d) $(x-y)^2 z$ is even

4. A line that is 13 units long has $(4, 1)$ as one of the endpoints. Which of the following could be the other endpoint?

- (a) $(-1, 13)$
 (b) $(9, 14)$
 (c) $(3, 7)$
 (d) $(5, 12)$

5. If p and q are the roots of the equation $x^2 - bx + c = 0$, then what is the equation if the roots are $(pq + p + q)$ and $(pq - p - q)$?

- (a) $x^2 - 2cx + (c^2 - b^2) = 0$
- (b) $x^2 - 2bx + (c^2 + b^2) = 0$
- (c) $bcx^2 - 2(b + c)x + c^2 = 0$
- (d) $x^2 + 2bx - (c^2 - b^2) = 0$

$D = b^2 - 4ac$; $x = \frac{-(-b) \pm \sqrt{b^2 - 4ac}}{2}$
 \therefore sum of roots $= \frac{-b}{a} = \frac{b}{1} = b$
 product of roots $= \frac{c}{a} = c$
 \therefore $p + q = b$; $pq = c$
 $pq + p + q = c + b$
 $pq - p - q = c - b$
 \therefore eqn is $x^2 - 2cx + (c^2 - b^2)$
 $p = \frac{b + \sqrt{b^2 - 4ac}}{2}$; $q = \frac{b - \sqrt{b^2 - 4ac}}{2}$
 $c + b + c - b = 2c$
 $(c + b)(c - b) = c^2 - b^2$

6. The domain of the function $f(x) = \frac{5}{\sqrt{x+7}}$ is

- (a) $(-7, \infty)$
- (b) $[-7, \infty)$
- (c) $(-\infty, \infty)$
- (d) $(-\infty, -7) \cup (-7, \infty)$

7. Suppose we know that $|a| < 3$. Which of the following conditions is enough to imply that $|b| < 5$?

- (a) $|a + b| < 8$
- (b) $2 < |a - b| < 8$
- (c) $|a - b| \leq 2$
- (d) $3 < |a - b| < 5$

8. A population consists of the following seven numbers :

2003; 1999; 2001; 1997; 2000; 2005; 1995

The variance of the population is

- (a) 11.6
- (b) 10
- (c) 2010
- (d) None of the above

9. Suppose a person's utility function is given by $u(x, y)$. If good x and good y are perfect substitutes, then the indifference curves are

- (a) straight lines
- (b) L-shaped
- (c) U-shaped
- (d) None of the above

10. If $f(x) = \frac{1}{x^2}$ is integrated over the interval [1, 2], then one gets

- (a) 0
- (b) $\log 2$
- (c) $\frac{1}{2}$
- (d) 1

11. Consider an economy wherein equilibrium level of aggregate income (Y) is the sum of aggregate investment expenditure (I) and aggregate consumption expenditure (C). For values of $Y \leq 1500$, $C = 200 + 0.6Y$ and any amount of aggregate income in excess of 1500 currency units is entirely saved in the economy. If the full employment level of $Y = 1750$, the minimum value of I necessary to ensure full employment in the economy is

- (a) 500
 - (b) 550
 - (c) 600
 - (d) None of the above
- $Y = 200 + 0.6Y$
 $Y = 200 + 0.6 \times 1500$
 $= 200 + 900 = 1100$
 $I \text{ should be } = 1750 - 1100 = 650$
- And 250 is saved
 so total $I = 400 + 250 = 650$

Question Nos. 12-15 are to be answered on the basis of the following information :

Consider an economy in which only three goods X, Y and Z are produced. X and Y are consumption goods and the output of Z in a year is used up in production of X and Y in that year. The following table gives the unit prices (p_X, p_Y and p_Z rupees respectively) and the number of units produced (q_X, q_Y and q_Z respectively) of each of the goods for three years I, II and III :

Year	p_X	q_X	p_Y	q_Y	p_Z	q_Z
I	1	2	2	5	1	2
II	1.5	3	2	6	1.5	4
III	1.5	6	3	6	2	5

Z is an intermediate good

$$p_X x + p_Y y =$$

$$1.5 \times 3 + 2 \times 6 = 16.5$$

~~$p_X x + p_Y y + p_Z z =$~~

~~$1.5 \times 6 + 3 \times 6 + 2 \times 5 = 39$~~

12. What is the GDP (in rupees) at current prices in year II?

- (a) 10.5
- (b) 16.5
- (c) 22.5
- (d) 28.5

13. If year I is the base year, what is the GDP (in rupees) at constant prices in year III?

- (a) 13
- (b) 14
- (c) 17
- (d) 18

$$1 \times 6 + 2 \times 6$$

$$= 6 + 12$$

$$= 18$$

14. If year I is the base year, what is the value of the GDP deflator in year III?

- (a) 100
- (b) 130.77 (approx.)
- (c) 141.67 (approx.)
- (d) 150

$$1.5 \times 6 + 3 \times 6$$

$$9 + 18 = 27$$

$$\frac{27}{18} \times 100 = 150$$

15. What is the rate of growth of real GDP (base year I) in year III?

- (a) 10%
- (b) 13.67% (approx.)
- (c) 18.18% (approx.)
- (d) 20%

$$I \quad 1 \times 2 + 2 \times 5 = 2 + 10 = 12$$

$$II \quad 1 \times 3 + 2 \times 6 = 3 + 12 = 15$$

$$III \quad 1 \times 6 + 2 \times 6 = 6 + 12 = 18$$

$$\frac{12}{12} \times 100 = 100 \quad \frac{15}{12} \times 100 = 125 \quad \frac{18}{12} \times 100 = 150$$

$$\frac{150 - 125}{125} \times 100 = 20\%$$

Question Nos. 16-22 are to be answered on the basis of the following information :

Let Y : aggregate real output per year, P : the price level, C : money value of aggregate consumption expenditure per year, I : money value of aggregate investment expenditure per year, L : aggregate employment (in labour hours per year), L^* : total labour supply (in labour hours per year) and w : hourly money wage rate. Let W denote the money value of aggregate wage income per year and R the money value of aggregate non-wage income per year. Consider an economy in which labour is homogeneous, the aggregate productivity of labour (Y/L) is a constant a and the price level (when output is below its full employment level) is a factor m times the wage cost per unit of aggregate output. The price at full employment is always greater than or equal to that at below full employment. In equilibrium, $PY = C + I$.

16. If $I = 4000$, $C = 1000 + 0.8W + 0.6R$, $w = 10$, $m = \frac{4}{3}$, $a = 16$, $L^* = 2000$, what is the full employment level of output in the economy?

- (a) 125
- (b) 625
- (c) 24000
- (d) None of the above

$$\frac{Y^*}{L^*} = a$$

$$Y^* = 16 \times 2000$$

$$= 32000$$

$$\begin{aligned}
 PY &= C + I \\
 &= 1000 + 0.8w + 6r + I \\
 &= 1000 + 0.8\left(\frac{3}{4}PY\right) + 6\left(\frac{1}{4}PY\right) + I \\
 0.25dPY &= 0 + dI \quad \frac{dY}{dPY} = \frac{1}{0.25} = 4
 \end{aligned}$$

17. If $C = 1000 + 0.8W + 0.6R$, $w = 10$, $m = \frac{4}{3}$, $a = 16$, $L^* = 2000$, and output is below its full employment level, what is the increase in nominal income per unit increase in investment expenditure in the economy?

- (a) 2
- (b) 4
- (c) 8
- (d) 16

$$\begin{aligned}
 W + R &= PY \\
 \frac{PY}{M} + R &= PY \\
 R &= \left(M - \frac{1}{M}\right) PY
 \end{aligned}$$

$M = 4/3$
 $R = 1/4 PY$
 $W = 3/4 PY$

18. If $I = 4000$, $C = 1000 + 0.8W + 0.6R$, $w = 10$, $m = \frac{4}{3}$, $a = 16$, $L^* = 2000$, what is the price level in the economy?

- (a) 0.83 (approx.)
- (b) 0.93 (approx.)
- (c) 1.07 (approx.)
- (d) 1.16 (approx.)

$$\begin{aligned}
 P &= \frac{M\bar{w}}{Y} = \frac{M \cdot wL^*}{Y^*} \quad \bar{w} = wL^* \\
 &= \frac{10 \times 2000 \times 4/3}{32000} = \frac{576}{6000} = 0.96
 \end{aligned}$$

19. If $I = 4000$, $C = 1000 + 0.8W + 0.6R$, $w = 10$, $m = \frac{4}{3}$, $a = 16$, $L^* = 2000$, what is the fraction of total labour supply which remains unemployed in the economy?

- (a) 5%
- (b) 10%
- (c) 12.5%
- (d) 25%

$$\begin{aligned}
 0.25PY &= 1000 + I \\
 0.25 \times 0.83 \times Y &= 1000 + 4000 \\
 Y &= 24096 \\
 \frac{L^* - L}{L^*} &= \frac{2000 - 1506}{2000} \times 100 = 25\%
 \end{aligned}$$

20. If $C = 1000 + 0.8W + 0.6R$, $w = 10$, $m = \frac{4}{3}$, $a = 16$, $L^* = 2000$, but I increases from 4000 to 5000, what is the resulting change in the price level in the economy?

- (a) 0%
- (b) 5% increase
- (c) 10% increase
- (d) 20% increase

21. If $C = 1000 + 0.8W + 0.6R$, $w = 10$, $m = \frac{4}{3}$, $a = 16$, $L^* = 2000$, but I increases from 4000 to 7000, what is the resulting change in the price level in the economy?

- (a) 0%
- (b) 10% increase
- (c) 20% increase
- (d) 50% increase

22. If $C = 1200 + 0.8W + 0.6R$, $\omega = 10$, $m = \frac{3}{3}$, $a = 16$, $L^* = 2000$, but I increases from 4000 to 7000, what is the change in the share of non-wage income in the total income of the economy?

- (a) No change
- (b) Increases by $\frac{1}{8}$
- (c) Increases by $\frac{1}{6}$
- (d) Increases by $\frac{1}{5}$

23. Suppose in a closed economy with no government expenditure and taxation the investment function is given by $I = 2000 + 0.1Y - 8000r$ and the saving function is given by $S = 1000 + 0.2Y + 2000r$ (Y denotes aggregate income and r the nominal rate of interest). The economy is subject to a liquidity trap at $r = 0.01$. What is the maximum equilibrium value of Y possible in this economy?

- (a) 7800
- (b) 9000
- (c) 11000
- (d) None of the above

Questions Nos. 24-27 are to be answered on the basis of the following information :

Suppose there is a consumer whose life is divisible into three periods which follow each other consecutively—youth, middle age and post-retirement age. The length of each period is 20 years and the consumer earns no labour income on post-retirement. In his youth the consumer earns labour income at the rate of Rs 2,500 per month. In his middle age the consumer's earnings are uncertain—there is a 25% probability that he will earn at the rate of Rs 5,000 per month, alternatively, he will earn at the rate of Rs 10,000 per month. The consumer gets to know what his rate of earnings in middle age will be at the end of his youth. Assume that the consumer expects to pay no taxes, the nominal rate of return on saving and the rate of interest is always zero and there is no inflation expected throughout his life.

$$20 + 20 + 20 = 60 \quad \text{Years of work} = 40 \text{ yrs}$$

24. What is the expected value of the consumer's earnings (Rs in lakhs) in middle age?

- (a) 18
- (b) 20
- (c) 30
- (d) None of the above

$$\text{Youth} = 2500 \times 12 \times 20$$

$$= \text{Rs } 600000$$

$$\text{Middle age} = 1200000 \text{ (5000)}$$

$$\text{" " " " } = 2400000 \text{ (10000)}$$

$$= \frac{1}{4} \times 1200000 + \frac{3}{4} \times 2400000$$

$$= 2100000$$

25. What is the present discounted value of the consumer's expected lifetime labour income (Rs in lakhs)?

- (a) 24
- (b) 26
- (c) 27
- (d) 36

Middle age + Youth
 $2,00,000 + 6,00,000$
 $= 27,00,000$

26. Suppose the consumer's attitude towards risk is as follows :

He prefers an alternative which promises him an amount of Rs X with probability p and an amount of Rs Y ($X > Y$) with probability $1 - p$ to an alternative which promises him an amount of Rs Z for sure if and only if $Z < Y + [2p/3](X - Y)$. An insurance company approaches the consumer in his youth and offers to pay Rs 7,615 per month to the consumer in his middle age in exchange for his flow of income during that period. Will the consumer accept the offer?

$X = 10000 \text{ } 75\%$
 $Y = 5000 \text{ } 25\%$

(a) Yes

(b) No

(c) The consumer will be indifferent between accepting and declining the offer

(d) The consumer's acceptance is a random event

$Z < Y + (2p/3)(X - Y)$
 $= 5000 + \frac{2}{3} \cdot \frac{3}{4} \cdot (10000 - 5000)$
 $= 5000 + \frac{1}{2} \cdot 5000$
 $= 7500$

$7615 > 7500$

27. Suppose the consumer can borrow any amount in a year but must repay the loan out of future labour income. The consumer wishes to end his life with no assets or liabilities. He plans to have the same constant flow of consumption in the last two periods of his life and wishes to minimize the difference between the expected rate of consumption in these two periods and a constant rate of consumption during his youth. What should be his savings per month (in Rs) during his youth?

- (a) -750
- (b) -1,250
- (c) 250
- (d) None of the above

Youth $C^A = 2500$
 His C^A in middle age + retirement
 Should be the same = $\frac{21,00,000}{12 \times 20}$

$= \frac{8750}{2} = 24375$

28. In a bookshop, the sales of scientific books increased by 40% while the sales of engineering books decreased by 50% from 2001 to 2002. If R is the ratio of the number of scientific books to the number of engineering books in 2001 and r the same ratio in 2002, what is k if it is given by $k = r/R$?

- (a) 2.8
- (b) 1.25
- (c) 0.2
- (d) 1

$R = \frac{S}{E}$
 $r = \frac{S'}{E'}$
 $R = \frac{140}{50} = 1$
 $k = \frac{r}{R} = \frac{14}{5} = 2.8\%$

29. Suppose the rate of profit is 20%, profit income is taxed at the rate of 30% and the rate of inflation is 5%. The real post-tax profit rate is

- (a) 9%
- (b) 10.5%
- (c) -15%
- (d) None of the above

Let $\pi = 100$ After $\pi = 120$
 $20 \times \frac{30}{100} = 6$
 $20 - 6 = 14$
 $14 - 5 = 9\%$

30. Bread and apple are substitute goods. A sudden rise in the supply of flour for making bread will result in

- (a) fall in the price of bread; and rise in the price of apple
- (b) fall in the price of bread; and fall in the price of apple
- (c) fall in the price of bread; and no change in the price of apple
- (d) None of the above

31. The utility function of a consumer is $u = 3(x_1 + x_2)$, where u , x_1 and x_2 denote utility, amount of good 1, and amount of good 2 respectively. Unit prices of good 1 and good 2 are Re 1 and Rs 3 respectively. Consumer's income is Rs 300. The consumer attains equilibrium at

- (a) $x_1 = 150$; $x_2 = 50$
- (b) $x_1 = 50$; $x_2 = 150$
- (c) $x_1 = 0$; $x_2 = 100$
- (d) $x_1 = 300$; $x_2 = 0$

Monotonic transformation of Substitute goods
 $P_1 = 1$ $P_2 = 3$ $M = 300$
 $x_1 = \frac{M}{P_1}$ & $x_2 = 0$ (as $P_2 > P_1$)
 $= \frac{300}{1} = 300$

32. The production function of a firm is given by $Q = X^{1/3}Y$, where Q , X and Y denote quantities of output, input 1 and input 2 respectively. The production function exhibits

- (a) constant returns to scale
- (b) increasing returns to scale
- (c) decreasing returns to scale
- (d) None of the above

$EQ = (tX)^{1/3} (tY)$
 $= t^{1/3} X^{1/3} t Y$
 $= t^{1/3+1} X^{1/3} Y$
 $= t^{4/3} X^{1/3} Y$

Question Nos. 33-36 are to be answered based on your understanding of the following passage from *Economic Development and the Price Level* by Geoffrey Maynard :

"Unless an appropriate relationship exists between the growth rates of agriculture and industry, the terms of exchange between them must alter. Since agricultural prices typically tend to respond much more rapidly than do the prices of industrial products to changes in the balance between supply and demand, their behaviour determines in large part the behaviour of the general price level. Thus in a situation where agricultural growth is tending to lag to an inappropriate extent behind both the growth of industrial output and the growth of real

income, excess demand pressures tend to appear in the agricultural product market. Whether excess demand or excess supply pressures exist in the industrial market depends on the balance between investment and saving; but, in either case, if agricultural prices are more flexible than industrial prices, then the required improvement in the terms of exchange of agriculture tends to be brought about by an absolute rise in agricultural prices, rather than by a fall in industrial prices. This is not just an immediate or short-run effect, for the rise in agricultural prices tends to generate consequential pressures on costs of production in industry, partly through a direct effect on raw material costs in industry, and partly, perhaps, through an induced effect on industrial money wages. Industrial prices may therefore be prevented from falling, even in a market where there tends to be excess supply; and indeed, if the cost pressures are substantial enough, they may even begin to rise. In this way, the improvement in agriculture's terms of exchange produces a rise in the general price level. Such a development is more likely to take place as the result of a spontaneous slowing down in the rate at which agricultural output is growing, relatively to other outputs; but it may also occur if the improvement in agriculture's terms of exchange is being produced by an acceleration in the rate of growth of industry. For opposite reasons, an acceleration in the rate of growth of agricultural output can produce a fall in the general price level."

33. According to the author, agricultural prices largely determine the behaviour of the general price level, because
- (a) agricultural growth tends to lag behind industrial growth
 - (b) agricultural prices respond to changes in demand-supply balances faster than industrial prices
 - (c) an appropriate relationship exists between agriculture and industry
 - (d) excess demand pressures always appear in this sector
34. Excess demand in the industrial market depends upon
- (a) the excess demand in agriculture
 - (b) whether agricultural prices are more flexible than industrial prices
 - (c) whether cost pressures are substantial enough
 - (d) the balance between saving and investment
35. The rise in agricultural prices
- (a) has only a short-run effect on industrial prices
 - (b) increases industrial costs of production
 - (c) creates excess supply in industry
 - (d) generates a spontaneous slowing down of agricultural output

36. An improvement in agriculture's terms of trade with industry
- (a) can occur when there is a balance between investment and saving
 - (b) occurs when industrial prices are prevented from falling
 - (c) can produce a rise in the general price level
 - (d) is the result of substantial cost pressures in industry
37. In terms of current annual human caused greenhouse gas emissions
- (a) the US is responsible for both the highest per capita and total emissions
 - (b) China is responsible for the highest total (but not per capita) emissions
 - (c) China is responsible for highest per capita and total emissions
 - (d) the US is responsible for the highest total (but not per capita) emissions
38. Utensils worth Rs 1,500 are produced with steel costing Rs 750 and other materials costing Rs 150. Labour cost of producing these utensils is Rs 150 and depreciation of machinery is 0. The value added in producing these utensils is
- (a) Rs 450
 - (b) Rs 600
 - (c) Rs 750
 - (d) None of the above
- $$\begin{array}{r}
 1500 \\
 - 750 \\
 - 150 \\
 \hline
 600
 \end{array}$$
39. During the last two decades of the 20th century, India's labour force has grown at the rate of
- (a) 1.5% per annum
 - (b) 2.5% per annum
 - (c) 3.5% per annum
 - (d) 4.5% per annum

40. The famous book titled, *Poverty and Un-British Rule in India* was authored by

- (a) W. C. Bonnerjea
- (b) Dadabhai Naoroji
- (c) R. C. Dutt
- (d) Lala Lajpat Rai

41. An outward shift of the production possibility frontier may be caused by

- (a) an increase in demand
- (b) more government spending
- (c) better training of employees
- (d) production inefficiency

42. Let $P(n, m)$ be a property about two integers n and m . If we want to disprove the claim that 'for every integer n , there exists an integer m such that $P(n, m)$ is true', then we need to prove that

- (a) there exist integers n, m such that $P(n, m)$ is false
- (b) there exists an integer m such that $P(n, m)$ is false for all integers n
- (c) there exists an integer n such that $P(n, m)$ is false for all integers m
- (d) for every integer n , there exists an integer m such that $P(n, m)$ is false

$\exists n$, for every integer m such that $P(n, m)$ is false.

43. Let X, Y, Z be statements. Suppose we know that 'X is true implies Y is true', and 'X is false implies Z is true'. If we know that Z is false, then we can conclude that

- (a) both X and Y are true
- (b) both X and Y are false
- (c) X is true and Y is false
- (d) X is false and Y is true

$$\begin{array}{l} X \Rightarrow Y \\ (T) \quad (T) \end{array}$$

$$\sim X \Rightarrow Z$$

$$\text{we } \sim Z \Rightarrow X \Rightarrow Y.$$

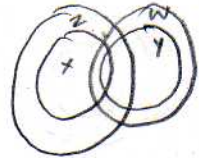
implies both X & Y are true.

44. Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is false, we can conclude that

$X \Rightarrow Y, Y \Rightarrow Z \quad X \Rightarrow Z$
 ALSO, $\neg Y \Rightarrow \neg X$

- (a) X is true
- (b) X is false
- (c) Z is true
- (d) Z is false

45. Suppose one wishes to prove that 'if some X are Y , then some Z are W '. To do this, it would suffice to show that



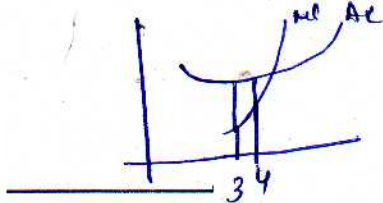
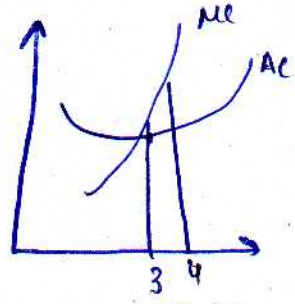
- (a) some X are Z , and some Y are W
- (b) some Z are X , and some W are Y
- (c) all X are Z , and all Y are W
- (d) all Z are X , and all W are Y

46. The annual average rate of employment generation in India during the decade of 1990s, compared to 1980s, was approximately

- (a) thrice
- (b) twice
- (c) same
- (d) half

47. If the marginal cost of producing 4th unit is greater than the marginal cost of producing 3rd unit, then it follows that

- (a) the average cost of producing 4 units must be greater than the average cost of producing 3 units
- (b) the average cost of producing 4 units must be less than the average cost of producing 3 units
- (c) the average cost of producing 4 units must be equal to the average cost of producing 3 units
- (d) None of the above



So cannot determine.

48. If the absolute value of price elasticity of demand for good X is greater than one, then we must have
- (a) if price increases by 1%, then the quantity demanded will decrease by less than 1%
 - (b) if price decreases by 1%, then the quantity demanded will increase by less than 1%
 - (c) if price of X increases, then the expenditure on the good will increase
 - (d) None of the above

49. Consider the following :
 Option I : You receive Rs 112 after one year.
 Option II : You receive Rs 55 after nine months and Rs 56 after one year.

Given that the market rate of interest is 12% per annum, it follows that

- (a) Option I is better than Option II
- (b) Option II is better than Option I
- (c) Option I and Option II are equally good
- (d) No conclusion can be drawn on the basis of the given information

(104.94)100

$$\frac{112}{1.12} = 100$$

$$\frac{55}{(1.12)^{3/4}} = 50.51, \quad \frac{56}{(1.12)^{1/4}} = 54.43$$

50. Suppose Rs 1,00,000 is deposited in an account for 3 years at 11% per annum, compounded annually. How much money would be there at the end of 3 years?

- (a) Rs 1,33,000
- (b) Rs 1,34,331.1
- (c) Rs 1,36,763.1
- (d) None of the above

$$\frac{11 + 11 + 11 \times 11}{100} = 22 + \frac{121}{100} = 22 + 1.21 = 23.21$$

$$\frac{23.21 + 11 + 23.21 \times 11}{100} = 23.21 + 11 + 2.55 = 36.76$$

$$\frac{50.51 + 54.43}{104.94}$$

51. Suppose the price elasticity of demand for good X is 0.2. If the price of X rises by 2.8%, what effect will it have on the total expenditure on good X?

- (a) Expenditure on X will fall by 5.6%
- (b) Expenditure on X will rise by 5.6%
- (c) Expenditure on X will rise by 2.2%
- (d) Expenditure on X will fall by 2.2%

$\frac{36.76}{100} \times 100000 = 36760$ approx.

$e = 0.2$
 $P \uparrow 2.8\%$

$$e = \frac{\% \Delta D}{\% \Delta P} \Rightarrow 0.2 = \frac{\% \Delta D}{2.8}$$

$$0.56 = \% \Delta D$$

$$\Delta TE = \Delta P \Delta Q$$

$$\ln TE = \ln P + \ln Q$$

$$= 2.8 - 0.56$$

$$= 2.2$$

52. A box contains red and green balls. The number of green balls is $\frac{1}{3}$ the number of red balls. If a ball is taken randomly from the box, what is the probability that the ball is red?

(a) $\frac{2}{3}$

(b) $\frac{1}{3}$

(c) $\frac{3}{4}$

(d) None of the above

$$G = \frac{1}{3} R \quad \therefore \quad 3G = R$$

$$\begin{aligned} R + G \\ 3G + G \\ = 4G \end{aligned}$$

53. The probability distribution of a random variable X is given in the table below :

X	Probability
0	0.24
1	0.38
2	0.20
3	0.13
4	0.05

The mean and variance of X are respectively

(a) 2; 2

(b) 2; 1.4142

(c) 1.37; 1.2731

(d) None of the above

54. In a certain country telephone numbers have 8 digits. The first two digits are the area code and are the same within a given area. The last 6 digits are the local number and cannot begin with 0. How many different telephone numbers are possible within a given area code in this country?

(a) 10^6

(b) 9^6

(c) 900000

(d) None of the above

$$\underline{9} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10}$$

55. Two dice are rolled. We define events E1, E2, E3 and E4 as follows :

E1 : Getting a sum equal to 10

E2 : Getting a double

E3 : Getting a sum less than 4

E4 : Getting a sum less than 7

Determine which statement is true

- (a) Events E1 and E2 are mutually exclusive
- (b) Events E3 and E4 are mutually exclusive
- (c) Events E2 and E3 are mutually exclusive
- (d) Events E1 and E4 are mutually exclusive

56. Limit of $\frac{e^x - 1}{x}$ as x approaches 0 is equal to

- (a) 0
- (b) 1
- (c) ∞
- (d) None of the above

57. If $f(x)$ and $g(x)$ are differentiable functions such that $f'(x) = 3x$ and $g'(x) = 2x^2$, then the limit $\frac{[f(x) + g(x)] - [f(1) + g(1)]}{(x - 1)}$ as x approaches 1 is equal to

- (a) 5
- (b) 0
- (c) 20
- (d) None of the above

58. Functions g and h are given by $g(x) = \sqrt{x-1}$ and $h(x) = x^2 + 1$. The composite function $(g \circ h)(x)$ is given by

- (a) x
- (b) $|x|$
- (c) \sqrt{x}
- (d) None of the above

$$\begin{aligned} g \circ h(x) &= g(h(x)) \\ &= \sqrt{(x^2 + 1) - 1} \\ &= \sqrt{x^2 + 1 - 1} \\ &= \sqrt{x^2} \\ &= \pm x = |x| \end{aligned}$$

59. Equation $x^2 + \frac{1}{2}mx + 1 = 0$ has two distinct real solutions, if

(a) $m = 3$

(b) $m = 4$

(c) $m = 5$

(d) None of the above

60. Income distribution of most countries follows

(a) linear pattern

(b) normal distribution

(c) sinusoidal curve

(d) log-normal distribution

61. If $m > n$, which of the following is necessarily true?

(a) $m^2 > n^2$

(b) $mn > 0$

(c) $mn > -mn$

(d) None of the above

62. If x and y are any real numbers such that $0 < x < 2 < y$, which of the following is necessarily true?

(a) $x < xy/2 < y$

(b) $0 < xy < 2x$

(c) $x < xy < 2$

(d) $xy < y$

63. A number of the form $213xy$, where x and y are digits, has a remainder less than 10 when divided by 100. The sum of all the digits in the above number is equal to 13. The digit y is

(a) 5

(b) 7

(c) 6

(d) 8

64. The graphs of the two equations $y = ax^2 + bx + c$ and $y = Ax^2 + Bx + C$, such that a and A have different signs and that the quantities $b^2 - 4ac$ and $B^2 - 4AC$ are both negative,

- (a) intersect at two points
- (b) intersect at one point
- (c) do not intersect
- (d) None of the above

(imaginary roots)

65. Three solutions of the equation $f(x) = 0$ are $-2, 0$ and 3 . Therefore, the three solutions of the equation $f(x-2) = 0$ are

- (a) $-4, -2$ and 1
- (b) $-2, 0$ and 3
- (c) $4, 2$ and 5
- (d) $0, 2$ and 5

66. If $1.56^x = 2$, then $x =$

- (a) $\log 1.56 / \log 2$
- (b) $\log 2 / \log 1.56$
- (c) $2 / \log 1.56$
- (d) $\log 2 / 1.56$

$$\log (1.56)^x = \log 2$$

$$x \cdot \log 1.56 = \log 2$$

$$x = \frac{\log 2}{\log 1.56}$$

67. If $\log_{10}(x-y) = 3$ and $\log_{10}(x+y) = 4$, then $x =$

- (a) 3.5
- (b) 11000
- (c) 5500
- (d) 103.5

$$10^3 = x - y$$

$$10000 = x + y$$

$$\begin{array}{r} x - y = 1000 \\ x + y = 10000 \\ \hline 2x = 11000 \end{array}$$

$$x = 5500$$

$$y = 4500$$

68. The real solution(s) to the equation $|x-1| = 2x+1$ is/are

- (a) -2
- (b) $-2, 0$
- (c) -1
- (d) 0

69. Four dice are thrown. What is the probability that the same number appears on each of them?

(a) $\frac{1}{36}$

(b) $\frac{1}{18}$

(c) $\frac{1}{216}$

(d) None of the above

$$\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$$

70. If $f(x) = -e^x - 2$, then the range of f is given by the interval

(a) $(-\infty, -2)$

(b) $(-\infty, +\infty)$

(c) $(-2, +\infty)$

(d) $(-\infty, +2)$

71. The mean of a data set is equal to 10 and its standard deviation is equal to 1. If we add 5 to each data value, then the mean and standard deviation become

(a) mean = 15, standard deviation = 6

(b) mean = 10, standard deviation = 6

(c) mean = 15, standard deviation = 1

(d) mean = 10, standard deviation = 1

72. The sum

$$\sum_{k=1}^{100} (3+k) =$$

(a) 5053

(b) 5050

(c) 300

(d) 5350

73. How many 4-digit numbers can be formed, if no digit is used more than once?

(a) 5040

(b) 3024

(c) 4536

(d) None of the above

$$\begin{aligned} \underline{7} \times \underline{8} \times \underline{9} \times \underline{10} &= 10 \times 9 \times 8 \times 7 - \boxed{789} \\ &= 9 \times 8 \times 7 \times \boxed{10-1} \\ &= 4536 \end{aligned}$$

74. How many of the 4-digit numbers can be formed, if no digit is used more than once, which are divisible by 5?

- (a) 1008
- (b) 952
- (c) 896
- (d) None of the above

Question Nos. 75-78 are to be answered on the basis of the following :

The following table shows the marginal cost of producing n th ($n = 1, 2, \dots, 10$) unit of output by a competitive firm :

Output	Marginal Cost	TVC	FC	TC
1	1.0	1.0	3	4
2	1.3	2.3	3	5.3
3	1.7	4	3	7
4	2.3	6.3	3	9.3
5	3.0	9.3	3	12.3
6	3.9	13.2	3	16.5
7	5.0	18.2	3	21.2
8	6.5	24.7	3	27.7
9	8.2	32.9	3	35.9
10	10.0	42.9	3	

It is also given that the total cost of producing 3 units of output is 7.

75. The total cost of producing 5 units of output (correct up to two decimal places) is

- (a) 15.00
- (b) 9.30
- (c) 12.30
- (d) None of the above

Till 3 units TC is 7

$$7 + 2.3 + 3.0 = 12.30$$

76. The average variable cost of producing 7 units of output (correct up to two decimal places) is

- (a) 2.60
- (b) 0.71
- (c) 3.03
- (d) None of the above

$$\sum MC = TVC$$

$$= 1.0 + 1.3 + 1.7 + 2.3 + 3.0 + 3.9 + 5.0 = 18.2$$

$$\frac{18.2}{7} = 2.60$$

77. The average cost of producing 9 units of output (correct up to two decimal places) is

- (a) 3.66
- (b) 3.99
- (c) 0.91
- (d) None of the above

$$\frac{35.9}{9} = 3.99$$

78. The profit-maximizing number of units of output for the firm, if the market price of the good is 6, is

- (a) 4
- (b) 7
- (c) 10
- (d) None of the above

$$P = MC$$

nearest to the answer

79. Suppose there are 3 alternatives x , y and z ; and four individuals 1, 2, 3 and 4. The individuals' rankings (orderings) of the three alternatives, R_i , $i = 1, \dots, 4$ are given by

- $R_1: (xy)z \quad (xy)Pz \quad - \quad xPz \text{ OR } yPz \rightarrow yPz$
- $R_2: yxz \quad yPz \quad zPx \rightarrow yPz$
- $R_3: z(xy) \quad zP(xy) \quad - \quad zPx \text{ OR } zPy$
- $R_4: (xy)z \quad (xy)Pz \quad - \quad xPz \text{ OR } yPz \rightarrow yPz$

(Notation: Alternatives inside the parentheses are indifferent to each other. If an alternative is written to the left of another alternative, then the former is preferred to the latter.)

Then the set of Pareto-optimal alternatives is

- (a) $\{x, y\}$
- (b) $\{x, z\}$
- (c) $\{y, z\}$
- (d) None of the above

80. With a positive externality

- (a) there is underconsumption in the free market
- (b) there is overconsumption in the free market
- (c) the government may tax to decrease production
- (d) society could be made better-off if less was produced

81. A circle of area A passes through the points $(8, 0)$ and $(0, 6)$. Then we must have

- (a) $A < 25\pi$
- (b) $A \geq 25\pi$
- (c) $A = 100\pi$
- (d) None of the above

82. For what value(s) of the parameter m does the equation $-2x^2 + mx = 2$ have one solution only?

- (a) 0
- (b) $-2, 2$
- (c) $-1, 1$
- (d) $-4, 4$

83. The Cash Reserve Ratio refers to

- (a) the liquid cash that banks have to maintain with the Reserve Bank of India as a certain percentage of their demand and time deposits
- (b) the cash that banks have to keep in their vaults in order to meet sudden demand from depositors in times of crisis
- (c) the cash that households have to keep in reserve to meet sudden increases in the price of essential goods and services
- (d) the cash that the government keeps in reserve so as to be ready to meet unexpected contingencies

84. The probability that Mr. A will be booked for illegal parking in the central market is $\frac{1}{3}$. During the last nine days, Mr. A has illegally parked everyday but has not been booked. Today, on the 10th day, he again decides to park illegally. The probability that he will be booked today is

- (a) greater than $\frac{1}{3}$
- (b) less than $\frac{1}{3}$
- (c) equal to $\frac{1}{3}$

(d) There is not enough information to make the required inference

85. The primary deficit refers to

- (a) the deficit in the primary sector of the economy
- (b) the deficit in the revenue account of the budget
- (c) the deficit in the capital account of the budget
- (d) the fiscal deficit less the interest outgo in the budget

86. The money multiplier in an economy increases with

- (a) increase in Cash Reserve Ratio
- (b) increase in Statutory Liquidity Ratio
- (c) increase in banking habit of the population
- (d) increase in the population of the country

Question Nos. 87 and 88 are to be answered on the basis of the following information :

The market for a good consists of 100 buyers and 50 sellers. Each seller has the same supply function, which is given by

$$\begin{aligned} \text{Supply} &= 0 \text{ if price} \leq 10 \\ &= p - 10 \text{ if price} > 10 \end{aligned}$$

Each buyer has the same demand function, which is given by

$$\begin{aligned} \text{Demand} &= 0 \text{ if price} \geq 20 \\ &= 20 - p \text{ if price} < 20 \end{aligned}$$

87. Market demand function is given by

- (a) Market demand = $2000 - 100p$
- (b) Market demand = $2000 - 100p$, if $p < 20$; and Market demand = 0, if $p \geq 20$
- (c) Market demand = $2000 - 100p$, if $p < 2000$; and Market demand = 0, if $p \geq 2000$
- (d) None of the above

88. Let the market equilibrium price be denoted by p^* . Then

(a) $10 < p^* < 11$

(b) $14 < p^* < 15$

(c) $16 < p^* < 17$

(d) None of the above

$$50P - 500 = 2000 - 100P$$

$$150P = 2500$$

$$P = \frac{2500}{150}$$

$$= 16.66$$

89. Let A be the set $\{f(x) \mid 0 < x < 1\}$. What does it mean if we say that y is not an element of A ?

(a) $f(y)$ is not an element of A

(b) $f(y)$ is not between 0 and 1

(c) y is not between $f(0)$ and $f(1)$

(d) None of the above

90. Which of the following statements is false?

(a) The numbers 4, 5, 6, 7 have the same standard deviation as the numbers 1231, 1232, 1233, 1234

(b) The numbers 1, 5, 7, 9 have a smaller standard deviation than the numbers 1231, 1235, 1237, 1239

(c) The numbers 1, 5, 6, 10 have a larger standard deviation than the numbers 1231, 1232, 1233, 1234

(d) The numbers 1, 2, 9, 10 have the same standard deviation as the numbers 1231, 1232, 1239, 1240

Question Nos. 91 and 92 are to be answered on the basis of the following information :

One of A, B, C and D has cheated in the examination with the help of another one of them. Here are the statements that these individuals made to the investigator.

A : If B is guilty of some wrong-doing, then C must be innocent.

B : If A is innocent, then C must be guilty.

C : If B cheated in the examination, then D must have had nothing to do with any wrong-doing.

D : I am innocent.

The statements of the person who has cheated and his accomplice are false and those of the remaining two are true.

91. The person who cheated in the examination was

- (a) A (b) B
(c) C (d) D

92. The accomplice of the person who cheated in the examination was

- (a) A (b) B
(c) C (d) D

93. There are four candidates for an award—A, B, C and D

Only one of the four candidates had cleared both Tests I and II.

Only one candidate had cleared both Tests I and III.

Only one candidate had cleared both Tests I and IV.

Only one candidate had cleared both Tests II and III.

Only one candidate had cleared both Tests II and IV.

Only one candidate had cleared both Tests III and IV.

Both A and B had cleared Test I.

Both C and D had cleared Test II.

Both B and C had cleared Test III.

D had cleared Test IV.

The award went to the candidate who had cleared more tests than any other candidate.

The award was given to

- (a) A (b) B
(c) C (d) D

$$P(q) = 90R$$

$$P(x) = 20Rs$$

$$MR = MC$$

$$TR = Pq = 90 \times 4x^{1/2}$$

$$MR = \frac{90 \times 4}{2} x^{-1/2}$$

$$180x^{-1/2} = 20$$

$$\frac{180}{\sqrt{x}} = 20$$

$$\sqrt{x} = 9$$

$$x = 81$$

94. A firm has a production function $q = 4x^{1/2}$, where q and x denote the quantities of output and input respectively. If the price of the output is Rs 90 per unit and the price of the input is Rs 20 per unit, the firm can earn a maximum profit of

- (a) Rs 1,620
 (b) Rs 3,600
 (c) Rs 808
 (d) None of the above

$$TR = PQ - TC$$

$$= 3240 - 1620$$

$$= 1620$$

95. The short-run supply curve of a competitive firm is given by

- (a) the marginal cost curve of the firm
 (b) the marginal cost curve above the average cost curve
 (c) the marginal cost curve above the average variable cost curve
 (d) the upward sloping part of the marginal cost curve

96. In situation I : Price of good X is twice the price of good Y; and the consumer spends his entire income on buying 6 units of good X and 20 units of good Y. In situation II : Consumer's income is double of his income in situation I, price of good Y is twice the price of good Y in situation I, and the price of good X is the same as in situation I. The consumer wants to continue consuming 20 units of good Y in situation II. The maximum number of units of good X that he can purchase in situation II is

- (a) 12
 (b) 14
 (c) 16
 (d) 6

I $x = 6, y = 20$ (price of X is twice of Y), M
 II $2M$, P_x is same & P_y is twice in I
 $x = 6, y = 20$
 Let $P_x = 2P_y = 1$
 I $= 2 \times 6 + 1 \times 20 = 32$
 II $= 2x + 2 \times 20 = 64$

97. Let units of good 1 be measured on the horizontal axis and units of good 2 on the vertical axis. Let price of good 1 be p and price of good 2 be q . The slope of the budget line is then given by

- (a) p/q
 (b) $-p/q$
 (c) q/p
 (d) $-q/p$

$$2x = 24$$

$$x = 12$$

Question Nos. 98-100 are to be answered on the basis of the following information :

Five teachers *R, S, T, U, V* teach five different subjects- Mathematics, History, Sociology, Economics, Literature. Each teacher teaches once a week on a fixed weekday (Monday through Friday); and each one teaches on a different day from others.

V does not teach Economics; and does not teach on Tuesdays.

S teaches History; and does not teach on a Monday or a Friday.

The Mathematics teacher teaches on Thursdays.

T does not teach Economics; and teaches on Wednesdays.

The Literature teacher, who is not *U*, teaches on Fridays.

R teaches on Mondays.

98. On which day does *S* teach?

- (a) Tuesday
- (b) Thursday
- (c) Friday
- (d) None of the above

99. Which subject does *T* teach?

- (a) Economics
- (b) Sociology
- (c) Mathematics
- (d) Literature

100. On which day is Economics taught?

- (a) Monday
- (b) Tuesday
- (c) Wednesday
- (d) None of the above