

1. If the population of a country increases by 20 percent in 10 years, the annual exponential growth rate of the population is
- (a) 2%
  - (b) more than 2%
  - (c) less than 2%
  - (d) None of the above

2. In regression analysis, a standardized variable
- (a) has a mean of 0 and a standard deviation of 1
  - (b) is always normally distributed
  - (c) has a bell-shaped distribution
  - (d) None of the above

$$Z = \frac{X - \mu}{\sigma} \quad Z \sim N(0, 1)$$

3. Consider the following null and alternative hypotheses :

$$H_0 : \pi = 0.16$$

$$H_1 : \pi > 0.16$$

The above setup

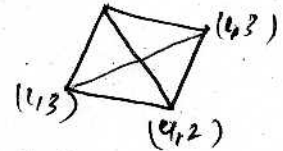
- (a) indicates a one-tailed test with a rejection area in the right tail
  - (b) indicates a one-tailed test with a rejection area in the left tail
  - (c) indicates a two-tailed test with an acceptance region in the right tail
  - (d) indicates a two-tailed test with a rejection area in the right tail
4. Suppose the penalty imposed for premature withdrawal of a time deposit from any bank in an economy increases from 1% to 2.5% of the amount of the deposit. Everything else remaining constant, what will happen to the transactions demand for money in the economy?
- (a) Remain unchanged
  - (b) Increase
  - (c) Decrease
  - (d) Cannot be determined

5. In which of the following cases would the purchase of rice be included in our calculation when we calculate the GDP of India from the expenditure side?
- A resident Indian purchases rice to make a dosa which he sells to his neighbour. He then pockets the money received
  - A resident Indian purchases rice to make a dosa which he sells to his neighbour. He donates the money received to a charity
  - A foreign citizen visiting India purchases rice to make a dosa which he sells to another foreign citizen visiting India
  - A non-resident Indian visiting India purchases rice, goes back to his country of residence, makes a dosa and then sells it to his neighbour

6. If three corners of a parallelogram are  $(1, 1)$ ,  $(4, 2)$  and  $(1, 3)$ , then the fourth corner is

- $(4, 4)$
- $(4, 0)$
- $(-2, 2)$
- $(4, 4)$  or  $(4, 0)$  or  $(-2, 2)$

$$\begin{aligned} & x, y \\ & = \left( \frac{1+1}{2}, \frac{1+3}{2} \right) \\ & = \left( \frac{2}{2}, \frac{4}{2} \right) \\ & = (1, 2) \end{aligned}$$



$$\begin{array}{l|l} 1 = \frac{4+x}{2} & 2 = \frac{2+y}{2} \\ 2 = 4+x & 4 = 2+y \\ -2 = x & 2 = y \end{array}$$

Question Nos. 7-10 are to be answered on the basis of the following information :

Consider a cube having  $(0, 0, 0)$ ,  $(1, 0, 0)$ ,  $(0, 1, 0)$  and  $(0, 0, 1)$  as four of its corners.

7. Which of the following is true?

- The other corners are  $(1, 1, 0)$ ,  $(1, 0, 1)$ ,  $(0, 1, 1)$  and  $(1, 1, 1)$
- The other corners are  $(-1, -1, 0)$ ,  $(-1, 0, -1)$ ,  $(0, -1, -1)$  and  $(-1, -1, -1)$
- The other corners are  $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$  and  $(1, 1, 1)$
- The other corners of the cube cannot be determined

8. Which of the following is true?

- $(\frac{1}{4}, \frac{1}{4}, \frac{1}{4})$  is the centre of the given cube
- $(\frac{1}{8}, \frac{1}{8}, \frac{1}{8})$  is the centre of the given cube
- The centre of the cube cannot be determined
- None of the above

9. Which of the following is true?
- (a) The volume of the cube is 1
  - (b) The volume of the cube is 6
  - (c) The volume of the cube is 8
  - (d) None of the above

$$V = a^3 = (1)^3 = 1$$

10. Which of the following is true?
- (a) The area of the cube is 1
  - (b) The area of the cube is 6
  - (c) The area of the cube is 8
  - (d) The area of the cube cannot be determined

$$T.S.A = 6(1)^2 = 6$$

Question Nos. 11-14 are to be answered on the basis of the following information :  
A random variable Y has the following distribution :

Y	-1	0	1	2	$-2+a^2$	$a^2$	$2+a^2$	$4+a^2$
P(Y)	3C	2C	0.4	0.1	0.3	0.2	0.4	0.1

11. The value of the constant C is

- (a) 0.10
- (b) 0.15
- (c) 0.20
- (d) None of the above

$$3C + 2C + 0.4 + 0.1 = 1$$

$$5C + 0.5 = 1$$

$$5C = 0.5$$

$$C = \frac{0.5}{5} = 0.1$$

12. The expected value of  $Y^2$  is

- (a) 0.90
- (c) 1.50

- (b) 0.80
- (d) 1.10

$$E(Y^2) = (-1)^2 \times 0.3 +$$

$$(0)^2 \times 0.2 + 1^2 \times 0.4$$

$$+ 2^2 \times 0.1$$

$$= 1.10$$

13. Consider the random variable  $2 \times Y + r^2$ , where r is a real number. The mean of this random variable is 0.7. Which of the following must be true?

- (a)  $r = 0.10$
- (b)  $r = 0.05$
- (c)  $r^2 = 0.40$
- (d) None of the above

$$E(X) = 0.7 \quad X = 2Y + r^2$$

$$= (-2 + r^2)(0.3) + r^2(0.2) +$$

$$(2 + r^2)(0.4) + (4 + r^2)0.1 = 0.7$$

$$= -0.6 + 0.3r^2 + 0.2r^2 +$$

$$0.8 + 0.4r^2 + 0.4 + 0.1r^2 = 0.7$$

$$0.6 + r^2 = 0.7$$

$$r^2 = 0.7 - 0.6$$

$$r^2 = 0.1$$

- (c) 16-16
- (d) None of the above

15. Assume that country A is relatively abundant in labour and country B is relatively abundant in land. Note that wages are the returns to labour and rents are the returns to land. According to the factor price equalization theorem, once country A begins specializing according to comparative advantage and trading with country B
- (a) wages and rents should fall in country A
  - (b) wages and rents should rise in country A
  - (c) wages should rise and rents should fall in country A
  - (d) wages should fall and rents should rise in country A

Question Nos. 16-18 are to be answered on the basis of the following information :

The table below shows the domestic demand and supply conditions for computers in a small country, Norway, in the world computer market :

<i>Price (in \$)</i>	<i>Demand</i>	<i>Supply</i>
1000	3200	800
1500	2800	1200
2000	2400	1600
2500	2000	2000
3000	1600	2400
3500	1200	2800

16. In the absence of trade, Norway's equilibrium price and quantity equal
- (a) \$ 1500 and 2800 computers
  - (b) \$ 2000 and 1600 computers
  - (c) \$ 2500 and 2000 computers
  - (d) \$ 3500 and 2000 computers

17. With free trade, suppose the rest of the world can supply computers at a price of \$ 1500. Norway's imports will now equal \_\_\_\_\_. Compared to what occurred in the absence of trade, Norway's consumer surplus will \_\_\_\_\_ and producer surplus will \_\_\_\_\_.
- (a) 1600 computers, decrease, increase  
 (b) 1600 computers, increase, decrease  
 (c) 1200 computers, decrease, increase.  
 (d) 1200 computers, increase, decrease

18. To reduce imports, suppose the Government of Norway imposes a quota equal to 800 computers. Compared to what occurred in the absence of trade, Norway's consumer surplus will \_\_\_\_\_ and producer surplus will \_\_\_\_\_.
- (a) increase, increase  
 (b) increase, decrease  
 (c) decrease, increase  
 (d) decrease, decrease

19. Let  $f(x) = (\log(x))/x$ , where  $0 < x < 1$ . Then for all  $x$ , such that  $0 < x < 1$

(a)  $f'(x) < 0$

(b)  $f'(x) > 0$

(c)  $f'(x) > 0$ , if  $0 < x < 0.5$  and  $f'(x) < 0$ , if  $0.5 \leq x < 1$

(d) Cannot say anything about the sign of  $f'(x)$

$$f(x) = \frac{\log x}{x} \Rightarrow f'(x) = \frac{\log x - \frac{1}{x} \times x}{x^2} = \frac{\log x - 1}{x^2}$$

20. Given two numbers,  $a = (3\sqrt{7} + 4\sqrt{7})^2$  and  $b = 343$ , which of the following must be true?

(a)  $a > b$

(b)  $b > a$

(c)  $a = b/2$

(d)  $a = b$

$$a = 9 \times 7 + 16 \times 7 + 3 \times 4 \times 2 \times \sqrt{7} \times \sqrt{7} = 63 + 112 + 168 = 343$$

21. Let  $S = 1 + 1/2^2 + 1/3^2 + 1/4^2 + 1/5^2 + \dots$ . Which of the following is true?

(a)  $S = 6$

(b)  $S = 8$

(c) The sum does not converge to any finite value

(d) None of the above

*It will converge*

Question Nos. 22-26 are to be answered on the basis of the following information :

Consider a closed economy in which aggregate output in short-run equilibrium is equal to the level of effective demand. There are only two types of expenditure on goods and services—private consumption expenditure and expenditure by the government ( $G$ ). Workers earn only wage income and non-workers earn all remaining income. Non-workers always spend a fixed amount on consumption. Suppose to produce every rupee of final output, 0.005 labour-day is required and the wage for a working day is Rs 150.

22. Suppose there is no taxation in the economy. If  $S$  denotes private savings and  $I$  denotes investment expenditure in the economy, which of the following is a condition for short-run equilibrium in the economy?

- (a)  $S = G$   
 (b)  $S = I$   
 (c)  $S = 0$   
 (d) None of the above

$$S + (T - G) = I$$

$$T = 0, I = 0 \Rightarrow \boxed{S = G}$$

23. Suppose workers consume their entire income and the only tax revenue comes from lump sum direct taxes imposed on non-workers. What is the value of the balanced budget multiplier in this economy?

- (a) 1  
 (b) 2.5  
 (c) 4  
 (d) None of the above

$$150(0.005Y) = W$$

$$0.75Y = W$$

$$0.25Y = NW$$

$$Y = W + a(Y - W - T) + G$$

$$Y = W + aY - aW - aT + G$$

$$Y = 0.75Y + aY - a(0.75Y) - aT + G$$

$$Y - 0.75Y = aY + a(0.75Y) - aT + G$$

$$= -aT + G$$

but  $T = G$

$$Y(1 - 0.75) = a[Y - 0.75Y] - aT + G$$

$$0.25Y = a(0.25Y) - aT + G$$

$$0.25Y(1 - a) = G - aG$$

$$Y = \frac{1}{0.25} G$$

24. Suppose workers consume a fraction 0.8 of their income and the only tax revenue comes from lump sum direct taxes imposed on non-workers. What is the value of the balanced budget multiplier?

- (a) 1  
 (b) 2.5  
 (c) 4  
 (d) None of the above

$$\Delta Y = 4 \Delta G$$

25. Suppose workers consume their entire income and the lump sum direct taxes are imposed on workers rather than on non-workers. What is the value of the balanced budget multiplier?

- (a) 1  
 (b) 2.5  
 (c) 4  
 (d) None of the above

$$Y = C + G$$

$$Y = (0.75Y - T) + 0.25Y + G$$

$$Y - 0.75Y - 0.25Y = -T + G$$

$$Y[1 - 0.75 - 0.25] = 0$$

$$Y[0] = 0$$

Balanced budget multiplier:  $\underline{1}$

$$Y = 0.8(0.75Y - T) + 0.25Y + G$$

$$Y = 0.6Y - 0.8T + 0.25Y + G$$

$$Y - 0.6Y - 0.25Y = G - 0.8G$$

$$0.15Y = G(1 - 0.8)$$

$$0.15Y = 0.2G$$

$$(at T=G)$$

26. Suppose workers consume a fraction 0.8 of their disposable income and the lump sum direct taxes are imposed on workers rather than on non-workers. What is the value of the balanced budget multiplier?

(a) 0.5

(b) 1

(c) 2

(d) 2.5

$$Y = 1.33 G$$

$$\Delta Y = 1.33 \Delta G$$

(approx)

27.  $A_1, A_2$  and  $A_3$  are independent events. The probability of event  $A_i$  is  $p_i; i = 1, 2, 3$ . The probability of the event  $\bigcup_{i=1}^3 A_i$  is equal to

(a)  $p_1 + p_2 + p_3$

(b)  $1 - (1 - p_1) \times (1 - p_2) \times (1 - p_3)$

(c)  $p_1 \times p_2 \times p_3$

(d) None of the above

28. A student must choose one of the subjects—Physics, Chemistry or Mathematics—for study. She is equally likely to choose Physics or Chemistry and twice as likely to choose Mathematics. The probability that the student chooses Mathematics is

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

(b)  $\frac{1}{4}$

(c)  $\frac{1}{2}$

(d) None of the above

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{2} = 1$$

$$\frac{1+1+2}{4} = 1$$

$$\frac{4}{4} = 1$$

$$1 = 1$$

29. Linda is 31, single, outspoken, and very bright. She studied Philosophy in college. As a student, she was deeply concerned with discrimination and other social issues, and participated in anti-nuclear demonstrations. Consider the following two situations:

(i) Linda is a bank teller.

(ii) Linda is a bank teller and active in the feminist movement.

Which of the following claims must be correct?

(a) Situation (ii) is strictly more likely than situation (i)

(b) Situation (i) is strictly more likely than situation (ii)

(c) Situation (i) is at least as likely as situation (ii)

(d) None of the above

30.  $x$  and  $y$  are real numbers such that  $x < y$ . Which of the following claims must be correct?

(a)  $x^2 < y^2$

(b)  $y^2 < x^2$

(c)  $x < x^2$

(d) None of the above

31.  $0.036 \times 0.02$  is equal to

(a) 0.0072

(b)  $72 \times 10^{-5}$

(c) 0.000072

(d) None of the above

Question Nos. 32-36 are to be answered on the basis of the following information :

The names of 7 students when ranked in ascending order of their weights are A, B, C, D, E, F and G. A's weight is 45 kg and G's weight is 75 kg.

32. If no pair of students has the same weight, then the median weight of the group is

(a) always equal to C's weight

(b) the average of C's weight and E's weight

(c) C's weight or E's weight

(d) None of the above

A B C D E F G

33. If three students among B, C, D, E and F have the same weight and the remaining two have different weights, then the median weight of the group of 7 students is

(a) always equal to C's weight

(b) the average of C's weight and E's weight

(c) C's weight or E's weight

(d) None of the above

A B C D E F G  
BCDEF  
same weight

34. Suppose the name of F is deleted from the list. Then, if the difference in weights between any two consecutively ranked students on the list is a constant positive number, the median weight is equal to

(a) B's weight

(b) the average of B's weight and E's weight

(c) B's weight or E's weight

(d) None of the above



35. Suppose the name of  $F$  is deleted from the list and the difference in weights between any two consecutively ranked students on the list is a constant positive number. Calculate the arithmetic mean of the absolute deviations of the weights of the six students from the arithmetic mean of their weights. How many students in the list have a weight which differs from the median weight by more than this amount?

$$\bar{x} = 60$$

- (a) 1  
~~(b)~~ 2  
 (c) 3  
 (d) 4

	$\bar{x} = 60$	
	$x - \bar{x}$	$(x - \bar{x})^2$
45	-15	225
51	-9	81
57	-3	9
63	3	9
69	9	81
75	15	225
		<hr/>
		630

36. Suppose the name of  $F$  is deleted from the list and the difference in weights between any two consecutively ranked students on the list is a constant positive number. The ratio between the standard deviation of the weights of the six students and the mean absolute deviation of their weights is

- (a) equal to unity  
 (b) less than unity  
~~(c)~~ greater than unity  
 (d) indeterminate

$$V_{02} = \frac{630}{9} = 70$$

$$SD = \sqrt{70} = 8.37$$

37. The probability of drawing two aces from a deck of 52 cards is

- ~~(a)~~ greater with replacement than without replacement  
 (b) the same with replacement as without replacement  
 (c) less with replacement than without replacement  
 (d) None of the above

38. The probability of drawing two spades from a deck of 52 cards without replacement is

- (a) greater than  $1/16$   
 (b) equal to  $1/16$   
~~(c)~~ less than  $1/16$   
 (d) None of the above

39.  $X$  is a positive integer satisfying the following conditions :

- (i)  $50 \leq X \leq 79$
- (ii) If  $X$  is a multiple of 3, then  $50 \leq X \leq 59$
- (iii) If  $X$  is not a multiple of 4, then  $60 \leq X \leq 69$
- (iv) If  $X$  is not a multiple of 6, then  $70 \leq X \leq 79$

Therefore, we can infer that

- (a)  $X = 54$
- (b)  $X = 65$
- (c)  $X = 76$
- (d) None of the above

40. Three trucks  $A$ ,  $B$  and  $C$  are used for transporting wheat and rice. The following information is given :

- (i) If  $A$  carried wheat, then  $B$  carried rice.
- (ii) If  $A$  carried rice, then  $C$  carried wheat.
- (iii) If  $B$  carried wheat, then  $C$  carried rice.

$$A_w \Rightarrow B_r \Rightarrow C_w = B_r = \frac{?}{?}$$
$$\sim B_w = \sim C_r$$

Which truck always carried the same thing?

- (a)  $A$
- (b)  $B$
- (c)  $C$
- (d) None of the above

41. Only one of the following three statements regarding the number of balls in an urn is true :

- (i) There are at least 100 balls in the urn.
- (ii) There are less than 100 balls in the urn.
- (iii) There is at least one ball in the urn.

Go by the options  
through elimination

How many balls are there in the urn?

- (a) 1
- (b) 100
- (c) 101
- (d) 0

Question Nos. 42 and 43 are to be answered on the basis of the following information :

- (i) Four students, named P, Q, R and S all opted for different subjects—Economics, History, Physics and Chemistry.
- (ii) Q opted neither for Physics nor for History.
- (iii) S opted neither for Physics nor for Chemistry.
- (iv) If Q did not opt for Chemistry, then R did not opt for Physics.
- (v) P opted neither for Physics nor for History.

42. Q opted for

- (a) Physics
- (b) Chemistry
- (c) Economics
- (d) History

P	Q	R	S
E	C	P	H

43. Economics was opted by

- (a) P
- (b) Q
- (c) R
- (d) S

Question Nos. 44 and 45 are to be answered on the basis of the following information :

Three sportspersons A, B and C each made two statements given below :

A's statements :

- (i) I do not belong to the hockey team.
- (ii) Mr. D is on the soccer team.

B's statements :

- (i) I do not belong to the soccer team.
- (ii) Mr. D is on the cricket team.

C's statements :

- (i) I do not belong to the cricket team.
- (ii) Mr. D is on the hockey team.

Both statements made by the person who belongs to the hockey team are true; both statements made by the person who belongs to the soccer team are false; and the person who belongs to the cricket team made one true statement and one false statement.

44. Mr. D is on the

- (a) cricket team
- (b) hockey team
- (c) soccer team
- (d) None of the above

45. The person belonging to the cricket team is

(a) A

(b) B

(c) C

(d) None of the above

A B C

E S H

46. Compared to a single-price monopoly, a perfectly competitive industry produces

(a) less output and has a lower price

(b) less output and has a higher price

(c) more output and has a lower price

(d) None of the above

47. A 95% confidence interval for a population mean will be — a 99% confidence interval for the same population mean. (Both calculations are based on the same set of data.)

(a) longer than

(b) shorter than

(c) the same length as

(d) None of the above

48. The equilibrium rent for four-bedroom apartments is Rs 1,500 per month. If the city government imposes a price ceiling of Rs 1,600 per month on rents, which of the following will happen?

(a) There will be excess demand for four-bedroom apartments

(b) There will be excess supply of four-bedroom apartments

(c) The government will earn Rs 100 per month from each four-bedroom apartment that is rented

(d) None of the above

49. Continue the following number series with the group of numbers below which best continues the series :

1 10 3 9 5 8 7 7 9 6 11 5

(a) 11 5

(b) 10 5

(c) 10 4

(d) 11 6

50. If two typists can type 2 pages in 2 minutes, how many typists will it take to type 18 pages in 6 minutes?

- (a) 4  
(b) 6  
(c) 12  
(d) 36

51. If you count from 1 to 100, how many 7s will you pass on the way?

- (a) 11  
(b) 19  
(c) 20  
(d) 21

52. Four years ago, Arka was twice as old as Saina. Four years on from now, Saina will be  $\frac{3}{4}$  of Arka's age. How old is Arka now?

- (a) 10 years  
(b) 12 years  
(c) 8 years  
(d) 16 years

$$(S+4) = \frac{3}{4} (A+4)$$
$$(A-4) = 2(S-4)$$

~~Saina~~, Arka = 12 year  
Saina = 8 year

53. Which number comes next in the following series of numbers?

2 3 5 7 11 13 17

- (a) 14  
(b) 15  
(c) 16  
(d) 17

54. Two men, starting at the same point, walk in opposite directions for 4 meters, turn left and walk another 3 meters. What is the distance between them?

- (a) 2 meters  
(b) 6 meters  
(c) 10 meters  
(d) 14 meters

use displacement  
formula.

55. In a lake, there is a patch of lily pads. Everyday, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake?

- (a) 24 days  
(b) 12 days  
(c) Cannot be determined from the statement of the problem  
(d) None of the above

Question Nos. 56-58 are to be answered on the basis of the following information :

In a two-good world, there is an individual with income  $m = 3$  and utility function is given by  $u(x, y) = x^{0.5}y^{0.5}$ . The price of good  $x$  is 1 per unit and the price of good  $y$  is also 1 per unit.

56. If the individual can consume any non-negative amount of goods  $x$  and  $y$ , then the optimum consumption bundle is

- (a)  $x = 1, y = 1$
- (b)  $x = 1.5, y = 1.5$
- (c)  $x = 2.5, y = 0.5$
- (d)  $x = 0, y = 3$

$$x = \left(\frac{c}{c+d}\right) \left(\frac{m}{p_1}\right)$$

$$x = \frac{1}{2} \left[ \frac{3}{1} \right]$$

$$x = 1.5$$

$$y = \left(\frac{d}{c+d}\right) \left(\frac{m}{p_2}\right)$$

$$y = \frac{1}{2} \left[ \frac{3}{1} \right]$$

$$y = 1.5$$

57. If the individual can consume either zero unit of good  $x$  or at most one unit of  $x$  and any non-negative amount of good  $y$ , then the optimum consumption bundle is

- (a)  $x = 1, y = 2$
- (b)  $x = 1, y = 3$
- (c)  $x = 0, y = 3$
- (d)  $x = 3, y = 0$

58. If both goods  $x$  and  $y$  can be consumed only in integer amounts (i.e., zero unit, one unit, two units, etc.), then the optimum consumption bundle is

- (a)  $x = 3, y = 1$
- (b)  $x = 1, y = 3$
- (c)  $x = 3, y = 0$
- (d) either  $x = 2, y = 1$  or  $x = 1, y = 2$

Question Nos. 59-61 are to be answered on the basis of the following information :

A firm produces a certain good and has two plants. To produce  $y_1$  units of the good in plant 1, the total cost for the firm is  $c_1(y_1) = y_1 \times y_1$ . To produce  $y_2$  units of the good in plant 2, the total cost for the firm is  $c_2(y_2) = y_2 \times y_2$ .

59. Suppose the firm produces output  $y$  at minimum cost. Which of the following is true?

- (a) All of the output is produced in one of the two plants
- (b) Output  $y/2$  is produced in plant 1 and output  $y/2$  is produced in plant 2
- (c) All divisions of output  $y$  between the two plants result in the same cost for the firm
- (d) None of the above

$$c_1(y_1) = y_1^2 ; c_2(y_2) = y_2^2$$

$$MC_1 = MC_2$$

$$2y_1 = 2y_2$$

$$y_1 = y_2$$

$$\text{Min } C = c_1(y_1) + c_2(y_2) \text{ subject to } y = y_1 + y_2$$

$$C = y_1^2 + y_2^2$$

$$\text{but } MC_1 = MC_2$$

$$2y_1 = 2y_2 = y$$

$$y_1 = \frac{y}{2}, y_2 = \frac{y}{2}$$

$$\therefore C = \left(\frac{y}{2}\right)^2 + \left(\frac{y}{2}\right)^2$$

$$C = \frac{y^2}{4} + \frac{y^2}{4}$$

$$C = \frac{2y^2}{4} = \frac{y^2}{2}$$

60. Each unit of good produced by the firm is sold at price equal to 3. The profit-maximizing output of the firm is

- (a) 3
- (b) 0
- (c) 6
- (d) The profit maximization problem does not have a solution

$$\begin{aligned} \pi &= TR - TC \\ &= PY - \frac{Y^2}{2} \end{aligned} \quad \left| \begin{array}{l} \frac{d\pi}{dY} = 0 \\ 3 - \frac{Y}{1} = 0 \\ \boxed{Y = 3} \end{array} \right.$$

$$\frac{d\pi}{dY} = 3 - \frac{Y}{1}$$

61. Each unit of good produced by the firm is sold at price equal to 3. The profit level of the profit-maximizing firm is

- (a) 9
- (b) 0
- (c) The profit maximization problem does not have a solution
- (d) None of the above

$$\begin{aligned} \pi &= 3[3] - \frac{[3]^2}{2} \\ &= 9 - \frac{9}{2} \\ &= 9 - 4.5 \end{aligned}$$

$$\boxed{\pi = 4.5}$$

62. Which of the following represents the same preferences as

$$U(x_1, x_2) = \min\{x_1, x_2\} + \max\{x_1, x_2\}$$

where  $x_1, x_2 \geq 0$ ?

- (a)  $x_1 + x_2$
- (b)  $x_1 \times x_2$
- (c)  $\max\{x_1, x_2\}$
- (d) None of the above

63. Let  $f$  be a twice differentiable real-valued function defined on the set of all real numbers greater than or equal to 0 and less than or equal to 1. Suppose  $f$  attains the maximum value in its domain at  $x^*$ . Which of the following must be true?

- (a)  $f'(x^*) = 0$
- (b)  $f''(x^*) < 0$
- (c)  $x^* = 0$  or  $x^* = 1$  or  $f'(x^*) = 0$
- (d) None of the above

$$0 \leq f \leq [0, 1]$$

Question Nos. 64-66 are to be answered on the basis of the following information :

A relation  $f$  from set  $X$  to set  $Z$  is a function if and only if for every element  $x$  in  $X$  there is a unique element  $z$  in  $Z$  such that  $x$  and  $z$  are associated through  $f$ .  $X$  is called the domain of  $f$  and  $Z$  the codomain of  $f$ . The range of  $f$  is the set of all elements in the codomain which are associated with at least one element in the domain.

$f$  is a surjective function if and only if every element in the codomain has an association in the domain.  $f$  is an injective function if and only if no two distinct elements in the domain are associated with the same element in the codomain.

Consider the following statements :

- (i) There exists an element  $x$  in the domain of  $f$  such that no element in the codomain is associated with it.
- (ii) There exists an element  $x$  in the domain of  $f$  and two distinct elements  $z$  and  $w$  in the codomain of  $f$  such that both  $z$  and  $w$  are associated with  $x$ .

64. Which of the following is true?

- (a) To prove that  $f$  is not a function, it is necessary to demonstrate (i)
- (b) To prove that  $f$  is not a function, it is necessary to demonstrate (ii)
- (c) To prove that  $f$  is not a function, it is necessary to demonstrate (i) or (ii)
- (d) None of the above

65. Which of the following is true?

- (a) Demonstration of (i) is sufficient to prove that  $f$  is not a function but demonstration of (ii) is not sufficient to prove that  $f$  is not a function
- (b) Demonstration of (ii) is sufficient to prove that  $f$  is not a function but demonstration of (i) is not sufficient to prove that  $f$  is not a function
- (c) Demonstration of (i) and (ii) is sufficient to prove that  $f$  is not a function
- (d) None of the above

66. Which of the following is true?

- (a) The range of a surjective function is always equal to its codomain
- (b) The range of a surjective function is never equal to its codomain
- (c) The range of a surjective function is equal to its codomain only if it is injective also
- (d) One of the conditions under which the range of a surjective function is equal to its codomain is that the function is injective also



Question Nos. 67-69 are to be answered on the basis of the following information :

A firm uses labour to produce a certain good. If  $x$  units of labour are used by the firm, the output of the good equals  $f(x) = 20x - x^2$ . Each unit of the good sells at a price of 1. Let  $w$  denote the price of each unit of labour. We must have  $x \geq 0$ . Assume that the firm hires labour to maximize profits.

67. What is the minimum  $w$  for which it is optimal for the firm to hire zero unit of labour?

- (a) 0
- (b) 10
- (c) 15
- (d) None of the above

$$\frac{w}{p} = MPL$$

$$w = MPL$$

$$20 - 2x = w$$

u When  $x = 0$ ,  
 $w = 20$

68. For what value of  $w$  is it optimal for the firm to hire 10 units of labour?

- (a) 0
- (b) 20
- (c) 10
- (d) None of the above

$$20 - 2x = w$$

$$20 - 2(10) = w$$

$$w = 0$$

69. Assume that  $w = 16$ . Then the profits of the firm equal

- (a) 2
- (b) 36
- (c) 4
- (d) None of the above

$$\pi = TR - TC$$

$$= P \cdot f(x) - w(x)$$

$$= (20x - x^2) - wx$$

$$= 20x - x^2 - 16x$$

$$= 4x - x^2$$

$$\frac{d\pi}{dx} = 4 - 2x$$

$$\pi = 20(2) - (2)^2 - 16(2)$$

$$= 40 - 4 - 32$$

$$= 4$$

$x = 2$       $\pi = 4$

Question Nos. 70-75 are to be answered on the basis of the following information :

Ms. Chi can repay a loan taken from Mr. Tao either by giving him  $u$  kg of gold today or by giving him  $v$  kg of gold after two years. The price of gold today is Rs  $x$  per gram. Ms. Chi is certain that after two years the price of gold will be Rs  $y$  per gram. If Ms. Chi chooses to repay the loan after two years, she will open a fixed deposit account at her bank today with a maturity period of two years and use the proceeds at maturity to purchase the necessary gold. Interest on such a deposit is compounded annually and is paid on the date of maturity. The rate of interest for a two-year fixed deposit is  $r$  percent per annum. Every year the interest paid into Ms. Chi's fixed deposit account will be taxed at the rate of  $t$  percent. Ms. Chi will decide when to repay the loan on the basis of which option will cost her the least amount of money today.

70. If  $u = v = 0.16$ ,  $x = 2000$ ,  $y = 2500$ ,  $r = 12.5$ ,  $t = 0$ , when will Ms. Chi repay the loan?

Here gold is in kg's  
 but price is in  $x$ /gram.

Today  
 $u$  kg of gold  
 $P = x$ /gram  
 value  
 $= 2000 \times 0.16$   
 Rs 320

- (a) Today
- (b) After two years
- (c) She will be indifferent between (a) and (b)
- (d) More information is necessary to provide the answer

value of gold =  $2500 \times 0.16$   
 400

Value today =  $\frac{400}{(1 + 0.125)^2}$   
 $= \frac{400}{1.265} = \text{Rs } 316.2$

So After 2 yrs.

Today  
 $2000x_u$   
 $= 2000u$

After 2 yrs.  
 $2500u$   
 $= \frac{2500u}{(1+0.12)^2}$   
 $= \frac{2500u}{1.2544}$   
 $= 2221.3u$

71. If  $u = v$ ,  $x = 2000$ ,  $y = 2500$ ,  $r = 12$ ,  $t = 0$ , when will Ms. Chi repay the loan?

- (a) Today
- (b) After two years
- (c) She will be indifferent between (a) and (b)
- (d) More information is necessary to provide the answer

72. If  $u = v$ ,  $x = 2000$ ,  $y = 2500$ ,  $r = 12.5$ ,  $t = 0.04$ , when will Ms. Chi repay the loan?

- (a) Today
- (b) After two years
- (c) She will be indifferent between (a) and (b)
- (d) More information is necessary to provide the answer

Today  
 $2000u$

After 2 yrs  
 $2500v$   
 $= \frac{2500u}{(1+0.125)(1+0.1246)}$   
 $= \frac{2500u}{(1.125)(1.1246)}$   
 $= 2500u$

73. If  $u = 0.16$ ,  $v = 0.165$ ,  $x = 2000$ ,  $y = 2500$ ,  $r = 12.5$ ,  $t = 0$ , when will Ms. Chi repay the loan?

- (a) Today
- (b) After two years
- (c) She will be indifferent between (a) and (b)
- (d) More information is necessary to provide the answer

Today  
 $0.16 \times 2000$   
 $= 320$

After 2 yrs  
 $0.165 \times 2500$   
 $= 412.5$   
 $= \frac{412.5}{(1+0.125)^2}$   
 $= 325.93$

After 2 yrs  
 $2500u$   
 $= \frac{2500u}{1.2651}$   
 $= 1976.128$

74. If  $u = 0.16$ ,  $v = 0.165$ ,  $x = 2000$ ,  $y = 2500$ ,  $r = 12$ ,  $t = 0$ , when will Ms. Chi repay the loan?

- (a) Today
- (b) After two years
- (c) She will be indifferent between (a) and (b)
- (d) More information is necessary to provide the answer

Today  
 $0.16 \times 2000$   
 $= 320$

After 2 yrs  
 $0.165 \times 2500$   
 $= 412.5$   
 $= \frac{412.5}{(1+0.12)^2}$   
 $= 328.8$

75. If  $u = 0.16$ ,  $v = 0.165$ ,  $x = 2000$ ,  $y = 2500$ ,  $r = 12$ ,  $t = 0.04$ , when will Ms. Chi repay the loan?

- (a) Today
- (b) After two years
- (c) She will be indifferent between (a) and (b)
- (d) More information is necessary to provide the answer

Today  
 $0.16 \times 2000$   
 $= 320$

After 2 yrs  
 $2500 \times 0.165$   
 $= 412.5$   
 $= \frac{412.5}{(1+0.125)(1+0.1246)}$   
 $= \frac{412.5}{(1.125)(1.1246)}$   
 $= 412.5$   
 $= \frac{412.5}{1.265}$   
 $= 326.086$

Question Nos. 76-79 are to be answered on the basis of the following information :

Consider the following tabulated data for an economy and answer the questions that follow :

Year	GDP at current prices	GDP at constant prices	Real GDP	Index
1975	21	17	-	123.529
1980	26	21	23.5%	123.80
1985	32	26	23.8%	123.07
1990	39	32	23.04%	121.87
1995	47	39	21.8%	120.51

76. In which period did the economy have the highest rate of growth of real GDP?
- (a) 1975-80  
 (b) 1980-85  
 (c) 1985-90  
 (d) 1990-95
77. In which period did the economy have the lowest rate of growth of real GDP?
- (a) 1975-80  
 (b) 1980-85  
 (c) 1985-90  
 (d) 1990-95
78. If the GDP deflator is taken as the price index for the economy, in how many of the periods 1975-80, 1980-85, 1985-90 and 1990-95 did the economy experience deflation?
- (a) 1  
 (c) 3  
 (b) 2  
 (d) 4
79. If the GDP deflator is taken as the price index for the economy, in how many of the periods 1975-80, 1980-85, 1985-90 and 1990-95 did the economy experience inflation?
- (a) 1  
 (c) 3  
 (b) 2  
 (d) 4

80. In a two-good world, a consumer's preferences over commodities 1 and 2 can be represented by the utility function  $U(x_1, x_2) = v(x_1) + x_2$ , where  $x_1, x_2 \geq 0$ . The consumer's income is known to be very high. Then, the demand for good 1 displays which of the following?
- (a) The substitution effect is negative and the income effect is positive
  - (b) The substitution effect is positive and the income effect is negative
  - (c) The substitution effect is zero and the income effect is positive
  - (d) The substitution effect is negative and there are no income effects
81. In a two-good world, suppose that the price of one good decreases. Which of the following holds true?
- (a) The Slutsky equation says that the total change in demand is exactly equal to the sum of the substitution effect and the income effect
  - (b) The Slutsky equation says that the total change in demand is less than the sum of the substitution effect and the income effect
  - (c) The Slutsky equation says that the total change in demand is more than the sum of the substitution effect and the income effect
  - (d) The Slutsky equation does not deal with income effects at all

Question Nos. 82-87 are to be answered on the basis of the following information :

Suppose a consumer's preferences over commodities 1 and 2 can be represented by the utility function  $U(x_1, x_2) = \min \{x_1, x_2\}$ , where  $x_1, x_2 \geq 0$ . The prices of the two commodities are 1 and 2 respectively and the consumer's income is 150.

82. The utility function of the consumer is
- (a) continuous at all points in the domain but not differentiable at all points in the domain
  - (b) not continuous at all points in the domain
  - (c) differentiable at all points in the domain
  - (d) None of the above
83. Which of the following is true?
- (a) At the optimum, the consumer should consume 150 units of commodity 1 and none of commodity 2
  - (b) At the optimum, the consumer should consume 75 units of commodity 2 and none of commodity 1
  - (c) At the optimum, the consumer should consume 50 units of commodity 1 and 50 units of commodity 2
  - (d) At the optimum, the consumer should spend equal amounts on the two commodities

84. If the income of the consumer increases by 1 unit, then
- (a) the optimum consumption of commodity 1 increases by  $\frac{1}{3}$  and the optimum consumption of commodity 2 increases by  $\frac{1}{3}$
  - (b) the optimum consumption of commodity 1 increases by  $\frac{1}{3}$  and the optimum consumption of commodity 2 increases by  $\frac{2}{3}$
  - (c) the optimum consumption of commodity 1 increases by  $\frac{1}{2}$  and the optimum consumption of commodity 2 increases by  $\frac{1}{2}$
  - (d) None of the above

85. Suppose the price of commodity 2 reduces to 1 while the price of the other commodity and the consumer's income remain unchanged. The substitution effect according to Slutsky of this price change on the optimal amount of commodity 1 is

- (a) -1
  - (b) 25
  - (c) -25
  - (d) 0
- $(u_0, y_0) = (50, 150)$      $u_1 = P_1 \times u_1^0 + P_2^1 \times u_2^0$   
 $= 1 \times 50 + 1 \times 50$   
 $= 100$   
 $(u_1', u_2') = \left(\frac{100}{2}, \frac{100}{2}\right) = (50, 50)$   
 $u_2' - u_2^0 = 50 - 50 = 0$

86. Suppose the price of commodity 2 reduces to 1 while the price of the other commodity and the consumer's income remain unchanged. The income effect according to Slutsky of this price change on the optimal amount of commodity 1 is

- (a) 0
  - (b) 25
  - (c) -25
  - (d) -1
- $u_1 + u_2 = 150$   
 $(u_1^2, u_2^2) = \left(\frac{150}{2}, \frac{150}{2}\right) = (75, 75)$   
 $TE = u_1^2 - u_1^0 = 75 - 50 = 25$   
 $TE = SE + IE$   
 $25 = 0 + IE$   
 $\therefore IE = 25$

87. The equation of the income expansion path for the consumer is

- (a)  $x_1 + 2x_2 = 150$
- (b)  $x_1 = 2x_2$
- (c)  $x_1 = x_2$
- (d) None of the above

Question Nos. 88-92 are to be answered on the basis of the following information :

In a village, there is a field. If  $n$  cows simultaneously graze on this field, the value of milk produced by each cow is  $v(n)$  :

$v(1)$	$v(2)$	$v(3)$	$v(4)$	$v(5)$	$v(6)$	$v(7)$
22	18	15	12	10	9	8

Assume that the market price of a cow is Rs 11.

88. Suppose all villagers are given free access to the field. This means that any villager can buy as many cows as she wants, graze her cows on the field, and sell the milk obtained from her cows. In equilibrium, the total number of cows bought by villagers and grazed on the field equals

- (a) 4  
 (b) 5  
 (c) 7  
 (d) None of the above

TR	TC	$\pi$
22	11	11
36	22	14
45	33	12
48	44	4
50	55	-5
54	66	-12
56	77	-21

89. Define the aggregate income of the village as follows :

Total value of milk produced by cows grazed on the field - Total cost of buying the cows.  
 How many cows must graze the field for the village's aggregate income to be maximized?

- (a) 1  
 (b) 2  
 (c) 3  
 (d) None of the above

90. If villagers are given free access to the field, the aggregate income of the village, in equilibrium, equals

- (a) 0  
 (b) 48  
 (c) 4  
 (d) None of the above

91. Assume that the villagers implement the following rule :

Each time a person buys a cow, she must pay Rs  $t$  to the village council. Thus, a person incurs a cost of Rs  $11 + t$  for each cow that she buys.

For which of the following values of  $t$  will the equilibrium number of cows bought and grazed on the field equal the number that maximizes the village's aggregate income?

- (a) 11  
 (b) 6  
 (c) 0  
 (d) None of the above

1	22	$11+t$	$\pi$
2	18	$22+2t$	$11-t$
3	15	$33+3t$	$-4-2t$
4	12	$44+4t$	
5	10	$55+5t$	
6	9	$66+6t$	
7	8	$77+7t$	

(100%)

If  $t=0$   $\pi = 11 - t$   
 $= 11$   
 $t=6$   $\frac{11-6}{11-6}$   
 $= \frac{5}{0}$   
 $t=11$   $= \frac{5}{0}$

92. Suppose  $t$  is set to 10. The revenue earned by the village council equals

(a) Rs 10

(b) Rs 20

(c) Rs 30

(d) Rs 0

$$\begin{aligned} & 22 + 2t \\ & 22 + 2 \times 10 \\ & 22 + 20 \\ & = 42 \end{aligned}$$

93. The function  $f(x)$  approaches infinity as  $x$  approaches infinity and the limit of the derivative of the function  $f(x)$  is 0 as  $x$  approaches infinity. What is the limit of  $f(x)/x$  as  $x$  approaches infinity?

(a) Infinity

(b) 0

(c) 1

(d) Cannot be determined

$$\begin{aligned} f(x) &\rightarrow \infty \text{ as } x \rightarrow \infty \\ \lim_{x \rightarrow \infty} f'(x) &= 0 \\ \lim_{x \rightarrow \infty} \frac{f(x)}{x} &= \frac{f(x)}{\infty} = 0 \end{aligned}$$

94. On which of the following intervals is the function  $x/(x^2 - 1)$  continuous?

(a)  $(-1, \infty)$

(b)  $(-\infty, 1)$

(c)  $[-1, 1]$

(d) None of the above

$$\begin{aligned} x^2 - 1 &\geq 0 \\ x^2 &\geq 1 \\ x &\geq \pm 1 \text{ but at these pts. it} \\ &\text{is discontinuous.} \end{aligned}$$

95. What is the value of the derivative of the function  $[(2x + 1)/(2x - 1)]^2$  at  $x = 1.5$ ?

(a) -4

(b) -2

(c) 2

(d) None of the above

96. Suppose  $f(x) = a_1x + a_2 + (a_3/x)$ , where  $a_1, a_2$  and  $a_3$  are positive constants and  $x$  is assumed to take only positive values. Which of the following statements is true?

(a)  $f(x)$  has a minimum value but no maximum value

(b)  $f(x)$  has a maximum value but no minimum value

(c)  $f(x)$  has neither a minimum value nor a maximum value

(d)  $f(x)$  has both a minimum value and a maximum value

$$f'(x) = a_1 - \frac{a_3}{x^2} = 0$$

$$a_1 x^2 - a_3 = 0$$

$$a_1 x^2 = a_3$$

$$x^2 = a_3/a_1$$

$$x = \pm \sqrt{a_3/a_1}$$

$$\therefore x = \sqrt{a_3/a_1}$$

$$f''(x) = \frac{2a_3}{x^3} > 0$$

97. If  $z = e^{f(x,y)}$ , where  $f(x,y) = x^2 + y^2$ , what is the elasticity of  $z$  with respect to  $x$  at  $(x, y) = (1, 2)$ ?

- (a) 1  
 (b) 2  
 (c) 4  
 (d) None of the above

$$z = e^{x^2 + y^2}$$

$$\frac{\partial z}{\partial x} = e^{x^2 + y^2} \cdot 2x$$

$$e_{zx} = \frac{x}{e^{x^2 + y^2}} \times e^{x^2 + y^2} \cdot 2x$$

$$= 2$$

Question Nos. 98-100 are to be answered on the basis of the following paragraph from the Economic Survey, 2010 :

India is a country which will be severely impacted by climate change. This puts additional hurdles in its developmental path in addition to the challenges of poverty eradication and growing population. The projected impacts of climate change cut across various sectors, natural system such as coastal areas, water resources, forests, agriculture and health. With a large agrarian population, India is vulnerable to changes in weather parameters. Further, rainfall variability and melting of glaciers will impact replenishment of rivers, thereby affecting availability of water in river basins and watersheds. In India, most of the rivers flowing in the northern regions are dependent on snow and glacial melt; thus climate change threatens the perennial nature of these rivers. This has huge implications for agriculture and allied activities and resultant livelihoods. This is a serious concern for an economy that is tied to its natural resources base along its developmental path.

98. The primary issue dealt with in this paragraph is

- (a) population growth  
 (b) climate change  
 (c) agriculture  
 (d) glaciers

99. It is argued in the paragraph that climate change will by itself

- (a) increase poverty  
 (b) make no difference to poverty in India  
 (c) put hurdles in the way of poverty eradication  
 (d) reduce inequalities in society

100. It is argued in the paragraph that climate change is a result of

- (a) large agrarian population  
 (b) India's long coastline  
 (c) lots of glaciers in the mountains  
 (d) None of the above