

SAMPLE QUESTION PAPER

Mathematics & Statistics

1. If $A = \begin{pmatrix} 3 & 1 & -1 & 2 \end{pmatrix}$ then $14A^{-1}$ is given by which of the following matrix?
- $14 \begin{pmatrix} 3 & 1 & -1 & 2 \end{pmatrix}$
 - $\begin{pmatrix} 4 & -2 & 2 & 6 \end{pmatrix}$
 - $\begin{pmatrix} 4 & -2 & 2 & -6 \end{pmatrix}$
 - $\begin{pmatrix} -6 & -2 & 2 & -4 \end{pmatrix}$

Solution – (b)

2. If $(1+x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$ for any integer $n > 0$, then $C_0 - C_1 + C_2 - C_3 + \dots + (-1)^n C_n$ is equal to
- 3^n
 - 2^n
 - 1
 - 0

Solution – (d)

3. A person is to count 60 items. Let $x_n \geq 0$ denote the number of items he counts in the n^{th} minute. If $x_1 = x_2 = \dots = x_6 = 7$ and x_6, x_7, x_8, \dots are in an arithmetic progression with common difference of -1 then the time taken by him to count all items is
- 11 minutes
 - 10 minutes
 - 15 minutes
 - 12 minutes

Solution – (b)

4. From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on the shelf so that the dictionary is always in the middle. Then the number of such arrangements is
- less than 500
 - at least 500 but less than 750
 - at least 750 but less than 1000
 - at least 1000

Solution – (d)

5. For what possible value of x are the numbers $\frac{-2}{7}, x, \frac{-7}{2}$ in a geometric progression?
- Only when $x = (-1)$
 - Only when $x = 1$
 - Both when $x = 1$ and $x = -1$
 - None of the above

Solution – (c)

6. In how many ways can 4 people be seated on a square table, one on each side?
- 12
 - 6
 - 3
 - 1

Solution – (b)

7. $\frac{1}{n}$ is
- ∞
 - $-\infty$
 - Does not exist
 - None of the above

Solution – (c)

8. Find all the values of k for which $A = \begin{pmatrix} k & 8 & 4 \\ 2 & k & 2 \end{pmatrix}$ is a singular matrix.
- $k=4$
 - $k=-4$
 - $k=\pm 4$
 - $k=0$

Solution – (c)

9. The value of the determinant $\begin{vmatrix} x & x & y & x & 2y & x & 2y & x & x & y & x & y & x & 2y & x \end{vmatrix}$ is
- $9x^2(x+y)$
 - $7x^2(x+y)$
 - $3y^2(x+y)$
 - $9y^2(x+y)$

Solution – (d)

10. At $x=0$, the function $f(x)=|x|$ is
- Continuous but not differentiable
 - Differentiable but not continuous
 - Both continuous and differentiable
 - Neither continuous nor differentiable

Solution – (a)

11. Let A be a 2×2 matrix with non-zero entries and let $A^2 = I_2$, where I_2 is 2×2 identity matrix. Consider the following statements.

Statement- 1: $\text{Trace}(A)=0$.

Statement- 2: Determinant of $A=1$.

Which of the following options is true?

- Both statements are correct, but statement 2 is not the correct explanation for statement 1.
- Statement 1 is true but statement 2 is false.
- Statement 2 is true but statement 1 is false.
- Both statements are correct, and statement 2 is the correct explanation for statement 1.

Solution – (b)

12. Let M be an $n \times n$ matrix constructed by replacing k th row of the identity matrix by the vector $[x_1, x_2, \dots, x_n]$. Then the determinant of the matrix M is
- $x_1 + x_2 + \dots + x_n$
 - $x_1 - x_2 + x_3 - x_4 + \dots + (-1)^{n+1} x_n$
 - x_k
 - Insufficient data

Solution – (c)

13. The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable is
- $(-\infty, 0) \cup (0, \infty)$
 - $(-\infty, \infty)$
 - $(-\infty, 1) \cup (1, \infty)$
 - $(-\infty, \infty) \setminus \{-1, 0, 1\}$

Solution – (b)

14. The value of $\int_0^1 x(1-x)^8 dx$ is
- $\frac{1}{50}$
 - $\frac{1}{90}$
 - $\frac{1}{100}$
 - $\frac{1}{110}$

Solution – (b)

15. The value of $\int_{e^a}^{e^b} \frac{dx}{x \log(x)}$ is
- $e^{-a} - e^{-b}$
 - $\log\left(\frac{b}{a}\right)$
 - $\log(b-a)$
 - None of the above

Solution – (b)

16. Consider the function $f(x) = \{e^x, x < 0, -e^x, x \geq 0\}$. Then the maximum of $f(x)$ is
- 1
 - 1
 - Infinity
 - Does not exist

Solution – (d)

17. Which of the following functions does not have a unique minimizer?
- $f(x) = (1+2x)^2 + (1+x)^2$
 - $f(x) = (1+2x)^2 - (1+x)^2$
 - $f(x) = (1+2x)^2(1+x)^2$
 - $f(x) = \frac{(1+2x)^2}{(1+x)^2}$

Solution – (c)

18. Consider that a consumer is buying two products, whose unit prices are p and q respectively. He obtains a utility of (x^2+y^2) if he buys x units of the first product and y units of the second product. Find the maximum utility of the consumer is he has a budget of b .

- a. $\frac{b^2}{p^2} + \frac{b^2}{q^2}$
- b. $\frac{b^2}{4p^2} + \frac{b^2}{4q^2}$
- c. $\frac{b^2}{p^2+q^2}$
- d. None of the above

Solution – (d)

19. An aeroplane flies along the four sides of a square at speed 150, 200, 250, and 300 km per hour. Second time it flies at a speed 200 km per hour along the same four sides. What is the average speed of the aeroplane (in km/hr) for the two journeys combined?

- a. 205.13
- b. 225
- c. 212.5
- d. 215

Solution – (a)

20. Suppose a variable assumes the values α and β and $(n - 2)$ other values all equal to $(\alpha + \beta)/2$. The standard deviation is

- a. $|\alpha - \beta|/\sqrt{2n}$
- b. $|\alpha + \beta|/\sqrt{2n}$
- c. $(\alpha - \beta)^2/2n$
- d. $(\alpha + \beta)^2/2n$

Solution – (a)

21. In a certain city, suppose that 3% of the population is known to be affected by a particular disease. There is a test for the disease. Of those with the disease 98% test positive, and of those without the disease 99.8% test negative. What would be the probability that an individual selected at random with a positive test result does not have the disease?

- a. 0.397
- b. 0.062
- c. 0.938
- d. 0.031

Solution – (b)

22. A dart is thrown at a circular dart board of radius 5 units. Assume that the dart hit any point y over the dart board such that y is uniformly distributed. Let X denote the distance of the point where the dart lands from the centre. The probability density function of X is

- a. $f(x) = \left\{ \frac{x^2}{25}, 0 \leq x \leq 5, \text{ otherwise} \right.$
- b. $f(x) = \left\{ \frac{2x}{25}, 0 \leq x \leq 5, \text{ otherwise} \right.$
- c. $f(x) = \left\{ \frac{2x^2}{25}, 0 \leq x \leq 5, \text{ otherwise} \right.$

d. $f(x) = \begin{cases} \frac{x}{25} & , 0 \leq x \leq 50 \\ 0 & , \text{otherwise} \end{cases}$

Solution – (b)

23. Suppose that a quiz consists of four multiple choice questions each of which has three options to select from. Each question is worth 1 point for a total possible score of four points. For a wrong answer no point will be given also there is no negative marking. If someone guessing the answer to each question independently, then what is the probability of getting a total score of 4?

- a. 1/81
- b. 16/81
- c. 1/9
- d. 33/81

Solution – (a)

24. The infinite sum $\sum_{n=1}^{\infty} \frac{n^2 \lambda^n}{n!}$ equals

- a. $(\lambda^2 + \lambda)e^\lambda$
- b. λe^λ
- c. $\lambda^2 + \lambda$
- d. λ

Solution – (a)

25. Assume that the heights of a certain group of individuals are normally distributed with mean of 70 inches and standard deviation of 3 inches. The height that defines the tallest 10% of the individuals would be [Please provide standard normal probability table]

- a) 74.76 inches
- b) 73.84 inches
- c) 78.66 inches
- d) 72.28 inches

Solution – (b)

English Language and Logical Reasoning

26. Arrange the following sentences in sequence:

- A. "In recent years, a similar story has unfolded in Indochina, as wealthier neighbors persuaded Vietnam, Laos, and Cambodia to drop their Communist guard and start building transport arteries that now form a network "as dense as the wiring on a computer chip", one Thai official told me."
- B. "Strong leadership is critical to getting deals done."
- C. "A Japanese economist called this the "flying geese" model of development- with Japan playing the lead goose."
- D. "Asia's postwar boom began in Japan and spread to a second tier of economies led by South Korea and Taiwan, then to a third tier by Thailand and Indonesia, and a fourth led by China."

Select the correct sequence:

1. CBDA
2. ABCD
3. BDCA
4. DABC

Ans: 3

27. Fill in the blanks: "Reporters tend to _____ the lead of authorities like the IMF, which show a _____ tendency to hype hot economies."
- A. Pursuit; systemic
 - B. Follow; systematic
 - C. Pursue; particular
 - D. Judge; significant

Ans: B

28. Choose the correct sentence:

- A. It will take them between two to four weeks to complete the task.
- B. It will take them between two and four weeks to complete the task.
- C. It will take them between two or four weeks to complete the task.
- D. It will take them between either two or four weeks to complete the task.

Ans: B

29. We have the following statements and conclusions:

Statements:

All cups are books.

All books are shirts.

Conclusions:

(i) Some cups are not shirts.

(ii) Some shirts are cups.

Which of the following is correct?

- a. Only (i) conclusion follows
- b. Only (ii) conclusion follows
- c. Either (i) or (ii) follows
- d. Neither (i) nor (ii) follows
- e. Both (i) and (ii) follow

Ans: d

30. Consider the following paragraph:

“Given how woefully stock and bond portfolios have performed over the past year or so, you may not have noticed that financial markets are floating high on optimism. Yet there is no other way to describe today’s investors, who since the autumn have increasingly bet that inflation, the world economy’s biggest problem, will fall away without much fuss.”

Which of the following options complete the paragraph?

- A. “In America, Britain, Canada and New Zealand wage growth is still much higher than is consistent with the 2% inflation targets of their respective central banks; pay growth is lower in the euro area, but rising in important economies such as Spain.”
- B. “The result, many think, will be cuts in interest rates towards the end of 2023, which will help the world’s major economies—and most importantly America—avoid a recession.”
- C. “Yet fluctuations in headline inflation often mask the underlying trend.”
- D. “The main source of inflation is now the services sector, which is more exposed to labour costs.”

Ans: B

31. Indian currency notes show the denomination indicated in at least seventeen languages. If this is not an indication of the nation’s diversity, nothing else is.

Which of the following can be logically inferred from the above sentences?

- A. India is a country of exactly seventeen languages.
- B. Linguistic pluralism is the only indicator of a nation’s diversity.
- C. Indian currency notes have sufficient space for all the Indian languages.
- D. Linguistic pluralism is strong evidence of India’s diversity.

ANSWER: D

32. Six persons P, Q, R, S, T and U are sitting around a circular table facing the center not necessarily in the same order. Consider the following statements: · P sits next to S and T. · Q sits diametrically opposite to P. · The shortest distance between S and R is equal to the shortest distance between T and U. Based on the above statements, Q is a neighbor of

- A. U and S
- B. R and T
- C. R and U
- D. P and S

ANSWER: C

33. Rice, a versatile and inexpensive source of carbohydrate, is a critical component of diet worldwide. Climate change, causing extreme weather, poses a threat to sustained availability of rice. Scientists are working on developing Green Super Rice (GSR), which is resilient under extreme weather conditions yet gives higher yields sustainably. Which one of the following is the CORRECT logical inference based on the information given in the above passage?

- A. GSR is an alternative to regular rice, but it grows only in an extreme weather
- B. GSR may be used in future in response to adverse effects of climate change
- C. GSR grows in an extreme weather, but the quantity of produce is lesser than regular rice
- D. Regular rice will continue to provide good yields even in extreme weather

ANSWER: B

Read the passage below and answer questions (34) and (35):

The hastily arranged purchase of Credit Suisse, a bank, by UBS, its great rival, is reverberating through financial markets. Investors are _____ BLANK 1 _____ to understand the deal and identify knock-on consequences. One is already clear. The decision to write down around SFr16bn (\$17bn) in Additional-Tier 1 (at1) bonds issued by Credit Suisse—while stockholders merely suffered enormous losses—is causing _____ BLANK 2 _____ and pain elsewhere. Some observers fear it could even spell the end of the asset class.

34. The best word to fill up BLANK 1 is:

- A. Scrambling
- B. Proposing
- C. Scurrying
- D. Fishing

Ans: A

35. The best word to fill up BLANK 2 is:

- A. Happiness
- B. Fury
- C. Comfort
- D. Doubt

Ans: B

36. There are 100 participants in a Chess tournament. A chess match between two participants can only result in a win or loss. In other words, there is no possibility of having a tie. The participant who loses a match is out of the tournament. The minimum number of matches required to determine the winner is -----
- 51
 - 99
 - 100
 - 101

Answer: b

37. Sohan walks 20 meters in the north direction. Then, he makes a 90° degree turn to his left and walks for 50 meters. Then again, he makes a 90° turn to his right and walks for 100 meters. He is ----- meters from his initial position.

- 170
- 130
- 120
- None of the above

Answer: b

38. Which is the odd one out?

- Congregation
- Dispersion
- Symposium
- Convocation
- Aggregation

Answer: b

39. 75.8, 92, ?, 99.2, 99.8, 100. ----- should replace the question mark to complete the sequence.

- 98
- 96
- 97.4
- 98.2

Answer: c

40.



----- (number) should replace the question mark.

- 1

- b. 2
- c. 3
- d. 4

Answer: d

Introductory Economics

41. Suppose that the price of a good goes up by 14% while total expenditure on the good decreases by 9%. Which of the following could explain these changes?
- a) Demand increased, supply did not change.
 - b) Demand and supply both increased, and demand is elastic.
 - c) Supply decreased, demand did not change, and demand is elastic.
 - d) Supply decreased, demand did not change, and demand is inelastic.

Ans: c

42. Let X and Y be perfect substitutes. Consider two statements:
I: The law of diminishing marginal rate of substitution is violated for goods X and Y
II: A consumer is indifferent between any two points on its budget constraint

Which of these statements is true?

- a) I only
- b) II only
- c) Both I and II
- d) Neither I nor II

Ans: a

43. When can the law of demand be violated?
- a) When the good is a normal good and the income effect dominates the substitution effect
 - b) When the good is a normal good and the substitution effect dominates the income effect
 - c) When the good is an inferior good and the income effect dominates the substitution effect
 - d) When the good is an inferior good and the substitution effect dominates the income effect

Ans: c

44. Which of the following is true?
- a) If the marginal cost is positive, the average cost is increasing
 - b) If the marginal cost is higher than the average cost, the average cost is increasing
 - c) If the marginal cost is lower than the average cost, the marginal cost is increasing
 - d) If the marginal cost is lower than the average cost, the marginal cost is decreasing

Ans: b

45. The demand curve for a good is given by $Q=1000-10P$. There are 8 firms in the market. Each firm has a fixed cost of 900 and a variable cost of 7 per unit sold. Each firm has a capacity of 300 (that is, it cannot produce more than 300 units). What are the short-run perfectly competitive equilibrium price and quantity?
- $P=7, Q=2400$
 - $P=10, Q=2400$
 - $P=7, Q=930$
 - $P=70, Q=300$

Ans: c

46. Suppose in a particular economy and period, there are only three firms. Firm A grows crops and extracts minerals from its land with no inputs from other firms. Its sales are ₹100 million, half of which goes to consumers and half to firm B and C in equal amounts. Firm B buys inputs from firm A and sells its entire output of ₹200 million to Firm C. Firm C buys inputs from A and B, and sells its ₹450 million output directly to consumers. Also suppose that the import = 50, the income tax (direct tax) is 10% and there is no indirect tax. What is the GDP at market price?
- 550
 - 500
 - 600
 - 750

Answer: b

47. Suppose that for a particular economy and period, the income received by the owners of all factors of production = 4350 (assume that there is no tax deduction at source. That is, the owners of the factors of production will have to make the tax payment, if any, after receiving their income), export = 400, import = 700, depreciation of machines and buildings = 600, total indirect tax = 300, and total direct tax = 900. What is the GDP at market price?
- 6950
 - 6250
 - 4650
 - 5550

Answer: c

48. Suppose a typical consumer basket contains 20 Kg Rice, 10 Kg Wheat, and 30 units of electricity per year.

Year	Prices		
	Rice (per KG)	Wheat (per KG)	Electricity (per Unit)
2015	35	20	5
2016	40	30	5
2017	80	40	10

From the given table, estimate the inflation rate in year 2017 as compared to 2016?

- 5.6%
- 6.8%
- 8.4%
- 6.2%

Answer: c

49. Suppose that for a particular economy and period, the values of Consumption= 1000, Investment = 500, Saving =400, Government expenditure= 400, Tax= 300, Export= 500, and Import= 600. What is the GDP as per the expenditure method?

- a) 2600 b) 2500 c) 3700 d) 1800

Answer: d

50. Assume that an economy produces only two types of commodities: Rice and Apple. The table below shows the price and the total quantity of Rice and Apple produced in year 2010 and 2017.

Product	Year 2010		Year 2017	
	Quantity (KG)	Price (INR)	Quantity (KG)	Price (INR)
Rice	500	10	700	20
Apple	150	20	250	40

From the given table, what is the GDP deflator?

- a) 500 b) 400 c) 700 d) None of these

Answer: d

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