

CBSE Class 12 Applied Mathematics 2026 - Set 465/7 - Compartment



Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions

- (i) This question paper contains 38 questions. All questions are compulsory.
- (ii) The question paper is divided into five sections: A, B, C, D and E.
- (iii) Section A: Questions 1–18 are multiple choice questions and Questions 19–20 are assertion–reason questions, carrying 1 mark each.
- (iv) Section B: Questions 21–25 are very short answer questions, carrying 2 marks each.
- (v) Section C: Questions 26–31 are short answer questions, carrying 3 marks each.
- (vi) Section D: Questions 32–35 are long answer questions, carrying 5 marks each.
- (vii) Section E: Questions 36–38 are case-study questions, carrying 4 marks each.
- (viii) There is no overall choice. Internal choice is provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.
- (ix) Use of calculators is not allowed.

Section A

1.

If $0 < x < 1$, then which of the following values is the greatest?

- (A) x (B) x^2
(C) $\frac{1}{x}$ (D) $\frac{1}{x^2}$

2.

In a 300 m race, player A beats player B by 22.5 m or 6 seconds. B's time to complete the race is:

- (A) 80 seconds (B) 82 seconds
(C) 76 seconds (D) 90 seconds

3.

If $A = [a_{ij}]_{2 \times 2}$, where $a_{ij} = \begin{cases} 1, & \text{if } i \neq j \\ 0, & \text{if } i = j \end{cases}$, then A^2 is equal to:

- (A) I (B) A
(C) O (D) none of these

4.

$\begin{vmatrix} 49 & 1 & 6 \\ 39 & 7 & 4 \\ 26 & 2 & 3 \end{vmatrix}$ is equal to:

- (A) 7 (B) 10
(C) -2 (D) 0

5.

If $y = \log x$ and $z = \frac{1}{x}$, then $\frac{dy}{dz}$ is equal to:

- (A) $\frac{1}{x}$ (B) $-\frac{1}{x}$
(C) $-x$ (D) $-\frac{1}{x^3}$

6.

For the curve $\sqrt{x} + \sqrt{y} = 1$, $\frac{dy}{dx}$ at $\left(\frac{1}{4}, \frac{1}{4}\right)$ is:

- (A) -1 (B) 1
(C) 2 (D) $\frac{1}{2}$

7.

$\int \frac{x-1}{x(x-\log x)} dx$ equals:

- (A) $x - \log|x| + C$ (B) $\log|x - \log x| + C$
(C) $x + \log|x| + C$ (D) $\log|x - \log x| - x + C$

8.

$\int_0^1 x e^x dx$ equals:

- (A) e (B) 1
(C) -1 (D) -e

9.

The sum of the order and the degree of the differential equation $\left(\frac{dy}{dx}\right)^5 + 3xy\left(\frac{d^3y}{dx^3}\right)^2 + y\left(\frac{d^2y}{dx^2}\right)^4 = 0$ is:

- (A) 7 (B) 6
(C) 5 (D) 4

10.

Solution of the differential equation $x dy + y dx = 0$ is:

- (A) $x = Cy$ (B) $xy = C$
(C) $x^2y = C$ (D) $xy^2 = C$

11.

If the probability distribution of a discrete random variable X is given as:

X	1	2	3	4
P(X)	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

then, $E(X^2)$ is equal to:

- (A) 3 (B) 5
(C) 7 (D) 10

12.

For a binomial variate X, if $n = 4$ and $P(X = 0) = \frac{16}{81}$, then $P(X = 4)$ is:

- (A) $\frac{1}{3}$ (B) $\frac{1}{27}$
(C) $\frac{1}{81}$ (D) $\frac{1}{16}$

13.

If the variance of a Poisson distribution is 2, then $P(X = 2)$ is:

- (A) $\frac{2}{e^2}$ (B) $2e^2$
(C) $\frac{4}{e^2}$ (D) $4e^2$

14.

If Z is a standard normal variate, then $P(0 < Z < 1.7)$ is equal to:

- (A) $F(0) - F(1.7)$ (B) $F(1.7) - F(0)$
(C) $1 - F(1.7)$ (D) $F(1.7) - 1$

15.

In a binomial distribution, the probability of getting a success is $\frac{1}{4}$ and the standard deviation is 3. Then, its mean is:

- (A) 6 (B) 8
(C) 12 (D) 48

16.

The present value of a perpetuity of ₹750 payable at the beginning of each year, if money is worth 5% p.a. is:

- (A) ₹15,000 (B) ₹15,750
(C) ₹14,250 (D) None of these

17.

An investment of ₹10,000 becomes ₹60,000 in 4 years. The compound annual growth rate (CAGR) is given by:

- (A) $\frac{\sqrt[4]{6} - 1}{100}$ (B) $\frac{\sqrt[4]{6} + 1}{100}$
(C) $(\sqrt[4]{6} - 1) \times 100$ (D) $(\sqrt[4]{6} + 1) \times 100$

18.

Time series analysis helps to:

- (A) understand the behaviour of a variable in the past (B) predict the future behaviour of a variable
(C) plan future operations (D) all of the above

19.

Assertion (A): In a binomial distribution, if mean = 4 and variance = 3, then the number of trials is 16.

Reason (R): In a binomial distribution with parameters n and p, mean = np and variance = $\sqrt{npq}$.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

20.

Assertion (A): Meena takes a loan of ₹3,00,000 at an interest of 10% compounded annually for 3 years. Under flat rate method, she is paying EMI of ₹10,833.33.

Reason (R): In flat rate method, the principal amount remains the same throughout the tenure and interest is charged on it at a constant rate throughout the loan tenure.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

Section B

21(a).

In a 10 km race, A, B and C, each running at uniform speed get the gold, silver and bronze medals respectively. If A beats B by 1 km and B beats C by 1 km, then find by how many metres does A beat C.

OR

21(b).

Find: $(486 + 729) \bmod 12$

22.

Calculate the trend values for the following data by the 3-yearly moving average method:

Year	Production (in tonnes)
1	2
2	4
3	5
4	7
5	8
6	10
7	13

23(a).

Rahul takes a personal loan of ₹2,00,000 at the rate of 12% p.a. for a period of 3 years. Calculate his EMI by using the flat rate method.

OR

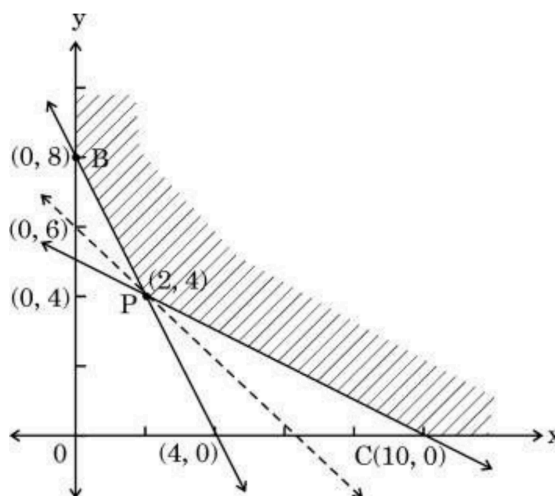
23(b).

Rahul takes a personal loan of ₹2,00,000 at the rate of 12% p.a. for a period of 3 years. Calculate his EMI by using the reducing balance method. [Given: $(1.01)^{36} = 1.429$]

24.

The annual depreciation of a car is ₹30,000. If the scrap value of the car after 15 years is ₹50,000, find the original cost of the car, using the linear method.

25. The feasible region for an LPP is shown shaded in the following figure. At which point does $\text{Min. } z = 50x + 70y$ occur? Also, find the minimum value of z .



26(a).

How many litres of water must be added to 1125 litres of a 45% solution of acid so that the resulting mixture will contain more than 25%, but less than 30% acid content?

OR

26(b).

Prove that the inequality $\sqrt{5} + \sqrt{3} > \sqrt{6} + \sqrt{2}$ holds true.

27(a).

For matrices $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

OR

27(b).

Using the matrix method, solve the system of equations:

$$5x - 7y = 2, 7x - 5y = 3$$

28.

Fit a straight line trend by the method of least squares and find the trend value for the year 2018.

Year	Production (in lakh tonnes)
2011	30
2012	35
2013	36
2014	32
2015	37
2016	40
2017	36

29.

Mrs. Anita is considering a ₹1,000 par value bond bearing a coupon rate of 11% that matures after 5 years, and the bond will be redeemed at par. She wants a minimum rate of return of 15%. The bond is currently available at ₹870. Should she buy the bond? [Given: $(1.15)^{-5} = 0.497$]

30.

Solve the following Linear Programming Problem (LPP) by graphical method:

$$\text{Minimize } Z = 20x + 10y$$

subject to constraints:

$$x + 2y \leq 40$$

$$3x + y \geq 30$$

$$4x + 3y \geq 60$$

$$x \geq 0, y \geq 0$$

31.

A manufacturer produces nuts and bolts for industrial machinery. It takes 1 hour of work on machine A and 3 hours on machine B to produce a packet of nuts, while it takes 3 hours on machine A and 1 hour on machine B to produce a packet of bolts. He earns a profit of ₹5 per packet of nuts and ₹2 per packet of bolts. How many packets of each should he produce per day so as to maximize his profit, if he operates his machines for at most 12 hours a day? Formulate this problem as an LPP and solve graphically.

32(a).

Find the adjoint of the matrix A given by, $A =$

$$\begin{bmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & 0 \end{bmatrix} \text{ and verify that } A(\text{adj } A) = |A|I = (\text{adj } A)A.$$

OR

32(b).

Show that the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $A^2 - 4A - 5I_3 = O$ and hence find A^{-1} .

33.

Students of a class were given a mathematical aptitude test. Their marks were found to be normally distributed with mean 60 and standard deviation 5. What percent of students scored:

(i) more than 60 marks?

(ii) less than 56 marks?

(iii) below 45 and 65 marks?

[Given: $P(0 \leq z < 0.8) = 0.2881$, $P(0 < z < 1) = 0.3413$, $P(0 < z < 3) = 0.4986$]

34.

(i) Define a hypothesis. Differentiate between Null and Alternative hypothesis.

(ii) Consider the following hypothesis:

$$H_0 : \mu = 35$$

$$H_a : \mu \neq 35$$

A sample of 81 items is taken whose mean is 37.5 and the population standard deviation is 5. Test the hypothesis at 1% level of significance. (Use: $z_\alpha = -2.33$)

35(a).

A loan of ₹2,00,000 at the interest of 6% p.a. compounded monthly is to be amortized by equal payment at the end of each month for 5 years. Find:

(i) The amount of each monthly installment.

(ii) The principal outstanding at the beginning of the 40th month.

(iii) Interest paid in the 40th installment.

(iv) Principal amount in the 40th installment, and

(v) Total interest paid.

[Given: $(1.005)^{60} = 1.3489$; $(1.005)^{21} = 1.1104$]

OR

35(b).

A firm anticipates a capital expenditure of ₹50,000 for new equipment in 5 years. How much should be set aside quarterly in a sinking fund earning 12% p.a. compounded quarterly, to provided for the expenditure? [Given: $(1.03)^{20} = 1.803$]

36.

Case Study – 1

According to an educational board survey, it was observed that class XII students apply at least one to four weeks before the colleges' application deadlines and the probability of a student to get admission in the college $P(X=x)$ is given as follows:

$$P(X = x) = \begin{cases} \frac{kx}{6}, & x = 0, 1 \text{ or } 2 \\ \frac{(1-k)x}{6}, & x = 3 \\ \frac{kx}{2}, & x = 4 \\ 0, & x > 4 \end{cases}$$

where k is a real number.

Based on the above information, answer the following questions. Show steps to support your answer.

36(i).

Find the value of k .

36(ii).

What is the probability that a student named Neha will get admission in the college, given that she applied at least 2 weeks before the application deadline?

36(iii)(a).

Calculate the mathematical expectation of the number of weeks taken by a student to apply before the college's application deadline.

OR

36(iii)(b).

To promote early admissions, the college is offering scholarships to the students for applying before the deadline as follows:

₹50,000 for applying 4 weeks early

₹20,000 for applying 3 weeks early

₹12,000 for applying 2 weeks early

₹9,600 for applying 1 week early

What is the expected scholarship offered by the college?

37.

Case Study – 2

Pulses are a good source of protein, vitamins and minerals. Rice is a source of carbohydrate which is the main fuel source for a human body.

A grocer has two varieties A and B of pulses costing ₹75 per kg and ₹125 per kg respectively. Also, he has two varieties P and Q of rice costing ₹74 per kg and ₹84 per kg respectively.

Based on the above information, answer the following questions:

37(i).

If the pulses A and B are mixed in the ratio 2:3, then find the cost (per kg) of the resulting mixture.

37(ii).

In what ratio must the grocer mix the rice P and Q so that he gets a resulting mixture costing ₹78 per kg?

37(iii)(a).

If another variety C of pulses is mixed with pulses A and B such that $A : B : C = 2 : 3 : 6$ and the cost of the resulting mixture is ₹160 per kg, then find the price per kg of C.

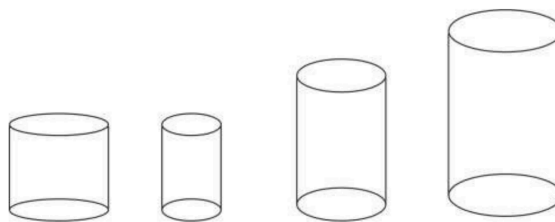
OR

37(iii)(b).

If another variety R of rice is mixed with rice P and Q such that $P : Q : R = 3 : 2 : 8$ and the cost of the resulting mixture is ₹88 per kg, then find the price per kg of R.

38. Case Study – 3

A company is planning to launch a new product and decides to pack the new product in closed right-circular cylindrical cans, each of volume $432\pi \text{ cm}^3$. The cans are to be made from tin sheets. The company tried different options.



Based on the above information, answer the following questions:

38(i).

If r cm is the radius of the base of the cylinder and h cm is the height, then find a relation between r and h .

38(ii).

If $S \text{ cm}^2$ is the surface area of the closed right-circular cylindrical can, then find S in terms of r .

38(iii)(a).

Find the value of r for S to be minimum.

OR

38(iii)(b).

Find the minimum surface area of the closed right-circular cylindrical can.

- End of Question Paper -