# Class XI , Applied Mathematics

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# Question Bank

## Chapter- 1 , Numbers

Q1. Convert the following decimal numbers into binary form:

(a) 25

(b) 47

(c) 63

Q2. Convert the following binary numbers into decimal form:

(a) $(1011)_2$

(b) $(11001)_2$

(c) $(11110)_2$

Q3. Explain the method of converting a decimal number into binary. Illustrate with an example of 29.

Q4. Convert the following decimal fractions into binary:

(a) 0.5

(b) 0.75

(c) 0.625

Q5. Convert the following binary fractions into decimal:

(a) $(0.101)_2$

(b) $(0.011)_2$

(c) $(0.111)_2$

Q6. Perform binary addition:

(a) 1011 + 1101

(b) 1110 + 1011

Q7. Perform binary subtraction:

(a) 1101 − 101

(b) 1000 − 111

Q8. Perform binary multiplication:

(a) 101 × 11

(b) 110 × 10

Q9. Perform binary division:

(a) 1010 ÷ 10

(b) 1111 ÷ 11

Q10. A number is given as $(101101)_2$.

(a) Convert it into decimal

(b) Verify your answer by reconverting the decimal number back into binary

# Chapter - 2 , Indices and Logarithms

Q1.Simplifyusinglawsofindices:

(a)2^3×2^5

(b)5^7/5^3

(c)(3^2)^4

Q2. Evaluate:

(a) 16^(3/4)

(b) 81^(-1/2)

(c) 27^(2/3)

Q3. Express in logarithmic form:

(a) 2^5 = 32

(b) 10^3 = 1000

(c) a^x = b

Q4. Convert into exponential form:

(a) log216 = 4

(b) log10100 = 2

Q5.Simplifyusinglawsoflogarithms:

(a)log(1000×100)

(b)log(1000/10)

(c)log(10^5)

Q6. Prove properties: (a) log(mn) = log m + log n (b) log(m/n) = log m –log n

Q7. Evaluate: (a) log28 + log24 (b) log101000 –log1010

Q8.Findtheantilogarithm:

(a)logx=2

(b)logx=3.5

(c)log2x=5

Q9. Solve using logarithms: (a) 2^x = 16 (b) 3^x = 81 (c) 5^x = 125

Q10. Application-based question:

The population of a town grows according to the formula : P = Po × 2^t

If the population doubles in 5 years, use logarithms to find the time required for the population to become 8 times.

# Chapter 3 - Quantitative Aptitude

## Clock

At what time between 3:00 and 4:00 will the hands of a clock be exactly opposite to each other?How many times do the hands of a clock coincide in a day (24 hours)?

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## Calendar

If 1st January 2025 is a Wednesday, what day of the week will 1st January 2026 be?

How many odd days are there in 100 years?

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## Time and Work

A can complete a work in 12 days and B can complete the same work in 18 days. In how many days will they complete the work together?

A alone can do a piece of work in 10 days. B alone can do it in 15 days. If A works for 2 days and then B joins, how many total days will the work take?

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## Time, Speed, and Distance

A car travels at 60 km/h and another at 90 km/h. If both start from the same point in the same direction, how long will it take for the faster car to be 60 km ahead?

A train 200 meters long passes a pole in 10 seconds. What is its speed in km/h?

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## Seating Arrangement

Five friends A, B, C, D, and E are sitting in a row. A is to the left of B, C is to the right of B, and D is at one end. Who is sitting in the middle?

In a circular seating arrangement, P sits opposite Q. R sits to the immediate right of P. S sits between Q and R. Who is to the left of Q?

# Chapter - 5 , Sets and Relation

Q1.**Let A and B are two sets containing 3 and 6 elements respectively . Find the maximum and minimum number of elements in A**$\cup$B

**Q2. U = { 1,2,3,4,5,6,8} A ={2,3,4}, B= {3,4,5} Verify both demorgans law**

**Q3.If A= {x; x = 2n ,n** $\mathbb{N}$**}, B={X: X= 2n-1,n** $\mathbb{N}$**} Find A B**

**Q4.Let T = { x/** $\frac{x+5}{x-7} - \frac{5}{4} = \frac{x-40}{13-x}$**}. is T is a non empty set justify.**

**Q5.Prove that A- (A** $\cap$ **B ) = A -B**

**Q6. If A = {2,4,6,9} , B = { ,4,6,18,27, 54} and a relation R from A to B is define by R = {(ab) ; a** $\in$ **A, b**$\in$**B a**

is the factor of b and a <b} then Write R in the roster form.

Q7.Let n(A) = m, n(B) = n then find the total number of non empty relation

Q8.Prove that A- (A ∩ B ) = A -B

Q9 .Given that N = {1,2,3--100} then write the subset B of N whose elements are represented by x+2

# CH-6 SEQUENCE AND SERIES

Q1. Let S be the sum, P be the product and R be the sum of the reciprocals of 3 terms of a GP. Then find the value of $P^2$ $R^3$: $S^3$

Q2. For positive real numbers, a, b and c if a+b+c = 18, find the maximum value of abc.

Q3. Find the value of ----

Q4. If l xl < 1 and y = $x+x^2+x^3+$--- then show that x =

Q5.Find the sum of the series $x(x+y)+x^2(x^2+y^2)+x^3(x^3+y^3)+$----nterms

Q6.Find the sum to the nth term 0.3 +0.33+0.333+---

Q7. Find the minimum value of

i) $8^x+8^{1-x}$, x ii)

Q8.If x ,y, z are distinct positive integers ,the find the value of (x+y)(y+z)(z+x)

Q9.The length of the three unequal edges of a rectangular solid block are in GP. The volume of the block is 216$cm^3$. The total surface barea is 252$cm^2$. Find the length of the longest side.

Q10CASE-STUDY BASED QUESTIONS:-

. After striking a floor a certain ball rebounds $(4/5)^{th}$ of the height from it has fallen. The ball is gently dropped from a height of 100 metres.

Based on this information, answer the following questions:

(i) Find the height to which the ball rebounds in 3rd rebound.

(ii) Find the total distance travelled by the ball in first five rebounds.

(iii) Find the total distance travelled by the ball before coming to rest.

## CH-7 Permutations and Combinations

Q1. Using the digits 0, 1, 2, 3, 4, 5, 6 how many 4 digit even numbers can be made, no digit being repeated?

Q2. There are 15 points in a plane out of which only 6 are in a straight line, then

(i) How many different straight lines can be made?

(ii) How many triangles can be made?

Q3. If there are 7 boys and 5 girls in a class, then in how many ways they can be seated in a row such that (i) No two girls sit together? (ii) All the girls never sit together?

Q4. Using the letters of the word 'EDUCATION' how many words using 6 letters can be made so that every word contains atleast 4 vowels?

Q5. What is the number of ways of choosing 4 cards from a deck of 52 cards? In how many of these,

(i) 3 are red and 1 is black.

(ii) All 4 cards are from different suits

(iii) Atleast 3 are face cards.

(iv) All 4 cards are of the same colour.

Q6. How many 3 letter words can be formed using the letters of the word INEFFECTIVE?

Q7. How many different four letter words can be formed (with or without meaning) using the letters of the word "MEDITERRANEAN" such that the first letter is E and the last letter is R.

Q8If all letters of word 'MOTHER' are written in all possible orders and the word so formed are arranged in a dictionary order, then find the rank of word

a)MOTHER' b) Random c)Krishna

Q9. From 6 different novels and 3 different dictionaries, 4 novels and a dictionary is to be selected and arranged in a row on the shelf so that the dictionary is always in the middle. Then find the number of such arrangements.

Q10. If $^{15}C_{3r} : {}^{15}C_{r+1} = 11 : 3$ = 11: 3, find r

## Chapter - 8 , Logical Reasoning

Odd Man Out

1. Find the odd man out: 4, 9 , 16, 25 , 37 , 49

2. Find the odd man out:. Triangle, Square , Circle , Rectangle

3. Find the odd man out: Apple , Mango , Potato, Banana

Coding-Decoding

4. In a certain code language: GANGA coded as AGNAG, how is YAMUNA coded ?

5. If: DELHI -> 45

Find the code for: INDIA

Blood Relations

6. Pointing to a woman, Ravi said,

“She is the daughter of my grandfather’s only son.”

How is the woman related to Ravi?

7. A man said:

“His mother is the only daughter of my mother.”

How is the man related to the child?

8. Introducing a boy, Seema said:

“He is the son of the daughter of my mother.”

How is the boy related to Seema?

Syllogism

9. Statements:

All teachers are educated.

Some educated people are writers.

Conclusions:

Some teachers are writers.

All teachers are educated.

Which conclusion follows?

10. Statements:

All roses are flowers.

Some flowers fade quickly.

Conclusions:

Some roses fade quickly.

All roses are flowers.

Which conclusion follows?

## Chapter - 9, Functions

Q.1. If f(x)= ax + b , where a and b are integers , f(-1)= -5 and f(3)=3, find a and b

Q.2. A = {-2, -1, 1 , 2} and f = { (x , 1/x) : x € A}

Q.3. Find the domain and range of the following functions:

(I) f(x) = -|x|  (ii) f(x) 1 - |x-2|.

Q.4. Solve the following equations for x :

(I) | 2x - 3 | = 5  (ii) |2x + 1| = -–2

Q.5. If f(x) = 2x+5 and g(x) = $x^2$ + 1, describe the functions:

(I) fog  (ii) gof

## Chapter - 10 , Limits and Continuity

1. Evaluate: $\lim_{x \to 2} (3x + 5)$

2. Find: $\lim_{x \to 1} [(x^2 - 1)/(x - 1)]$

3. Evaluate the Left Hand Limit and Right Hand Limit of: $f(x) = \{ 2x + 1, x < 3 ; x + 4, x \geq 3 \}$ at $x = 3$

4. Determine whether the following limit exists: $\lim_{x \to 0} |x|/x$

5. Find: $\lim_{x \to 4} [(\u221ax - 2)/(x - 4)]$

6. Evaluate: $\lim_{x \to 2} [(x^2 - 4)/(x - 2)]$

7. Check the continuity of the function: $f(x) = \{ x + 2, x < 1 ; 3, x = 1 ; 2x, x > 1 \}$ at $x = 1$

8. Find the value of k for which the function is continuous at $x = 2$: $f(x) = \{ x^2 + k, x \leq 2 ; 3x - 1, x > 2 \}$

9. Evaluate: $\lim_{x \to 0} (\sin x)/x$

10. Determine whether the function is continuous at $x = 0$: $f(x) = \{ x^2, x \neq 0 ; 1, x = 0 \}$

## Chapter - 11 , Differentiation

1. Find the derivative of: $f(x) = 5x^3 - 4x^2 + 7x - 9$

2. Differentiate: $y = \sqrt{x}$

3. Find: $d/dx\ (3x\blacksquare + 2x^2 - 5)$

4. Differentiate: $y = 1/x$

5. Find the derivative of: $y = (2x + 3)^5$

6. Differentiate: $y = \sqrt{(3x + 1)}$

7. Find: $d/dx\ (\sin x)$

8. Differentiate: $y = \sin(2x + 1)$

9. Find the derivative of: $y = (x^2 + 1)^4$

10. Differentiate: $y = e^{(3x)}$

# CH- 12 , Probability

Q1. Find the probability that in a random arrangement of the letters of the word UNIVERSITY two I's come together.

Q2 An urn contains 5 blue and an unknown number x of red balls. Two balls are drawn at random. If the probability of both of them being blue is  find x.

Q3.The probability that a new railway bridge will get an award for its design is 0.48, the probability that it will get an award for the efficient use of materials is 0.36, and that it will get both awards is 0.2. What is the probability, that

(i) it will get at least one of the two awards

(ii) it will get only one of the awards.

Q4.A girl calculates that the probability of her winning the first prize in a lottery is 0.02. If 6000 tickets were sold, how many tickets has she bought?

Q5.Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is less than 9?

Q6 All the face cards are removed from a deck of 52 playing cards. The remaining cards are well shuffled and then one card is drawn at random. Giving ace a value 1 and similar value for other cards. Find the probability of getting a card with value less than 7.

Q7.If A,B and C are three mutually exclusive and exhaustive events of an experiment such that

3P(A) = 2P(B) = P(C) then find the value of P(A).

Q8.A young man visit a hospital for medical checkup .The probability that he has lungs problem is 0.45 , heart problem is 0.29 and either lungs or heart problem is 0.47 .What is the probability that he has both types of problem lungs as well as heart  out of 1000 ?

Q9. To make a healthy routine and to do some physical exercise during lockdown a family decided to roll a dice and based on the outcomes, they will decide activities to be done.

If the outcome is 2, 4 or 6, they will do 30 minutes walk on the roof.

If it shows 1 or 3 on the dice, 15 minutes meditation to be done.

If outcome is 5, then they will toss a coin. If it shows "Head", the family will do 5 minutes of rope skipping. If there is "Tail", family will do 20 minutes of Yoga.

i. How many elements are there in the sample space?

ii. What is the probability of doing walking?

iii. What is the probability of doing rope skipping?

iv. What is the probability of doing yoga or meditation?

Q10.Four friends Dinesh, Yuvraj, Sonu, and Rajeev are playing cards. Dinesh, shuffling a cards and told to Rajeev choose any four cards

i. What is the probability that Rajeev getting all face card.

ii. What is the probability that Rajeev getting two red cards and two black card.

iii. What is the probability that Rajeev getting one card from each suit.

OR

What is the probability that Rajeev getting two king and two Jack cards.

## Chapter - 13 , Descriptive Statistics

. Find the mean of the following data: 12, 15, 18, 20, 25

2. Calculate the median of: 7, 9, 11, 15, 18, 20, 24

3. Find the mode of the following observations: 4, 6, 7, 6, 9, 6, 10, 4

4. Find the range of the data: 35, 42, 28, 50, 46

5. Calculate the mean deviation from the mean for: 2, 4, 6, 8, 10

6. Find the variance of: 3, 5, 7, 9, 11

7. Calculate the standard deviation of: 10, 12, 14, 16, 18

8. The marks obtained by 10 students are: 45, 52, 61, 73, 58, 64, 70, 49, 55, 68. Prepare a frequency distribution table using suitable class intervals.

9. Find the quartiles Q1 and Q3 for: 5, 8, 10, 12, 15, 18, 20, 24, 30

## Chapter - 14 , Compound Interest and Annuity

1. Find the compound interest on ₹10,000 at 10% per annum for 2 years, compounded annually.

2. Calculate the amount on ₹15,000 invested at 8% per annum for 3 years, compounded annually.

3. Find the compound interest on ₹20,000 at 12% per annum for 1 year, compounded half-yearly.

4. A sum of money doubles itself in 5 years at compound interest. Find the rate of interest per annum.

5. Calculate the amount when ₹25,000 is invested at 6% per annum compounded quarterly for 2 years.

6. Find the present value of ₹12,000 due after 2 years at 10% compound interest.

7. A person deposits ₹5,000 every year in a bank at 8% compound interest. Find the amount after 3 years if the deposits are made at the end of each year.

8. Find the compound interest and total amount on ₹18,000 for 2 years at 5% per annum compounded annually.

9. Calculate the future value of an annuity of ₹4,000 per year for 5 years at 7% per annum.

10. A loan of ₹50,000 is to be repaid in 5 equal annual installments at 10% compound interest. Find the annual installment.

## Chapter - 15 , Taxation

1. Define direct tax and indirect tax with one example each.

2. Calculate the GST payable on a mobile phone costing ₹18,000 if the GST rate is 18%.

3. A shopkeeper purchases a refrigerator for ₹25,000 and sells it for ₹30,000. If GST rate is 12%, find:

Input GST

Output GST

Net GST payable

4. Find the amount to be paid by a customer who buys goods worth ₹4,500 with GST charged at 5%.

5. An item is marked at ₹12,000 excluding GST. Find the final bill amount if GST rate is 28%.

6. Distinguish between:

CGST

SGST

IGST

7. Calculate the taxable income of a person whose annual income is ₹6,50,000 and deductions under Section 80C are ₹1,50,000.

# Chapter - 16 , Utility Bills

1. An electricity company charges:

₹5 per unit for first 100 units

₹7 per unit for next 100 units

Calculate the electricity bill for 180 units consumed.

2. A household consumes 250 units of electricity in a month. The rate per unit is ₹6 and fixed charges are ₹150. Find the total bill amount.

3. Calculate the water bill if:

Fixed charge = ₹120

Consumption charge = ₹8 per kilolitre

Water consumed = 15 kilolitres

4. A mobile company charges:

Monthly rental = ₹299

Call charges = ₹1.5 per minute

Find the total bill if a customer used 220 minutes in a month.

5. An LPG cylinder costs ₹950 including GST at 5%. Find:

GST amount

Cost before GST

6. The following electricity tariff is applicable:

Units Consumed

Rate per Unit

First 50 units

₹4

Next 100 units

₹5

Above 150 units

₹6

Find the bill for 210 units.

7. A telephone bill includes:

Fixed charge = ₹250

Internet charge = ₹500

GST = 18%

Find the final amount payable.

8. A family received a water bill of ₹720 including 20% tax. Find the original bill amount before tax.

## Chapter - 17 , Straight Line

Q1. Find the reflection of the point (4,-13)about the line 5x+y+6 =0

Q2.Find the distance between the lines $y = mx+c_1$ and $y = mx+c_2$

Q3. Find the equation of the line joining the points (a,b) and (a+b, a-b)

Q4.A straight line cuts intercepts from the axes of coordinates the sum of whose reciprocals is a constant .Show that it always passes through a fixed point.

Q5.Show that the equation of the line passing through ($a\cos^{3}\phi$, $a\sin^{3}\phi$) and perpendicular to the line $x\sec\phi + y\,\mathrm{cosec}\,\phi = a$ is $x\cos\phi - y\sin\phi = a\cos 2\phi$

Q6. Find the acute angle between x+y =0 and y =0

Q7.If the line 3y+4x =1 ,y= x+5 and 5y+bx =3 are concurrent then find the value of b.

Q8.Find the slope of

a) x axis b )y axis

Q9. If one diagonal of a square is along the line 8x -15y =0 and one of the vertex is at1,2).then find the equation of the sides of the square passing through this vertex

Q10.Equation of a straight line path is 2x + y - 12 = 0. A man is standing at a point (2, 3) . He wants to reach the straight line path in least possible time.

(i) Find the slope of the path followed by man.

(ii) Find the equation of the path followed by man.

(iii) Find the coordinates of point where path followed by man and given straight line path meet.

# Chapter - 18 , Circle and Parabola

## Circles

**1. Finding the Equation**Find the equation of a circle whose center is at (2, -3) and which passes through the point (5, 1).
**2. Identifying Center and Radius**Determine the center and radius of the circle given by the equation:
**3. Tangents and Normals**Find the equation of the tangent to the circle x^2 + y^2 = 25 at the point (3, 4).
**4. Diameter Form**Find the equation of the circle where the endpoints of a diameter are A(-1, 2) and B(3, 8).
**5. Intercepts on Axes**Find the equation of a circle that touches the x-axis at a distance of 3 units from the origin and has a radius of 5 units.

## Parabolas

**6. Basic Properties**For the parabola y^2 = 12x, find the coordinates of the focus, the equation of the directrix, and the length of the latus rectum.
**7. Equation from Focus and Directrix**Find the equation of the parabola whose focus is at (0, -4) and whose directrix is the line y = 4.
**8. Points on a Parabola**Find the coordinates of the point(s) on the parabola y^2 = 18x whose ordinate (y-value) is three times the abscissa (x-value).
**9. Shifting the Origin**Find the vertex and focus of the parabola (y - 2)^2 = 8(x + 1).
**10. Real-world Application (Bridge/Arch)**A parabolic arch has a span of 40 meters and a maximum height of 10 meters. Find the height of the arch at a point 8 meters from the center of the span.