

# JAMAICA\_ C.X.C. Course

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- Application: Scientific Notation
- Application: Scientific Notation

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- Example: How many sugar crystals are there in  $n$  kg sugar? (1)
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- Example: How long is the model ship if length of ship is given?
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- Example: How many extra men must be employed to complete the job? (1)
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- Example: How many boxes would be filled, if the batch is packed using  $n$  bottles? (1)
- Example: How long will it take when the car travels at the speed of  $a$  km/hr? (1)
- Example: How long would each period of school be, if the school has  $n$  periods a day? (1)
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- Example: How many persons should a contractor employ, if he has to complete the job in  $n$  days?
- Example: By how much should the speed of car be increased so that it may take only  $n$  hrs to cover same distance?
- Example: How many machines would be required to produce the same no. of articles in a days?
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- Example: Complete the table of proportion
- Example: Complete the table of proportion
- Example:  $m$  pipes are required to fill a tank in  $a$  hours  $b$  minutes how long it will take if  $n$  pipes are used
- Example: How long would the food last if there were  $n$  more animals in a herd?
- Example: How long should they take to complete the job, if the contractor uses  $n$  persons instead of  $m$  persons?
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- Practice Test
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- Test Your Skill

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- Example: Find what percent of the figure is shaded.(1)
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- Example: Application: Based on ratio to percent.(3)
- Application: Application: Based on ratio to percent.(3)

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- Example: Find the mean of all prime nos. less than n

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- Example: Find the excluded number
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## 2. Number Theory

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- Test your Skill

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- Practice Test
- Test your Skill

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- Tutorial: Laws of Exponents for Real Numbers

- Example: Simplify:  $11^{1/2}/11^{1/4}$
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- Example: Simplify:  $(2)^{2/3} * (2)^{1/3}$
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- Test Your Skill

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- Example: Words problem based on LCM (4)
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- Example: Find final price of item with 3 successive discounts
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- Example: Determine final price including tax
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- Example: Use  $R \times B = A$ , to find R, given B, A

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- Example: Word Problem: Compute simple interest and amount after n years
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- Example: Word Problem: Find the compound interest and the amount when interest is compounded quarterly.

## 4. Sets

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- Example: To write a given set in a roster form
- Example: To write a given set in a roster form
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- Example: Identify the equality of sets
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- Example: Identify the given statement for proper subset
- Example: Identify statement for an element belongs to a given set
- Example: Find number of elements of a power set
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- Example: Identify the universal set among the sets given

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- Example: Graph the union of two sets on number line
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- Example: Find intersection of two sets
- Example: Graph the intersection of two sets on a number line
- Example: Find the intersection of three non-empty sets
- Example: Find the complement of a set
- Example: Represent union of three sets by Venn-diagram
- Example: Determine the union of two sets
- Example: Determine the intersection of two sets
- Example: Union and intersection of two sets, which are in set-builder form

- Example: Identify the disjoint sets
- Example: Find difference of two sets

#### 4.5 Laws of Algebra of Sets

- Tutorial: Laws of algebra of sets
- Example: Determine the complement of the union of two sets

#### 4.6 Some Important Results on Number of Elements in a Set

- Tutorial: Some important results on number of elements in a set
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- Example: Solve the given word problem using the Venn-diagram
- Example: Solve the given word problem using the Venn-diagram
- Example: Solve the given word problem using the Venn-diagram
- Example: Solve the given problem using the Venn-diagram

### 5. Measurement

#### 5.1 Perimeter of Plane Figures

- Tutorial: Perimeter of Plane Figures
- Example: Wire in shape of rectangle is rebent in shape of square, find measure of its side
- Test Your Skill
- Practice Test

#### 5.2 Area of Plane Figures

- Tutorial: Area of Plane Figures
- Example: Find area of triangle
- Example: Find height if area & base known
- Example: Find length of perpendicular AD to base BC of  $\Delta ABC$  rt. angled at A
- Example: Find area of region inside a rectangle that surrounds the square
- Example: Find area of region
- Example: Find area of rectangle given perimeter & breadth
- Example: Find b of rectangular park if area is same as area of square park of given side
- Example: Find b & h if area is known
- Example: Find height corresponding to given base
- Example: Find area of triangle if perimeter & ratio of sides are given
- Example: Find length of perpendicular
- Example: Find area of triangle of given sides
- Example: Find area of triangle if perimeter & 2 sides are given
- Practice Test1
- Practice Test2
- Practice Test3
- Test Your Skill

#### 5.3 Perimeter and Area of a Circle

- Tutorial: Perimeter and area of a circle
- Example: Find radius given circumference equal to sum of circumferences (3 Marks)

- Example: Given speed, find number of revolutions made by car wheel in minutes (3 Marks)
- Example: Find diameter, given perimeter of protractor (1 Mark)
- Example: Find area whose circumference is given (1 Mark)
- Example: Find cost of fencing a circular track (3 Marks)
- Example: Find area of quadrant if circumference is given (2 Marks)
- Example: Find cost of ploughing a circular field (3 Marks)
- Example: Find radius of circle having area equal to sum of areas of 2 circles (2 Marks)
- Example: Find area of shaded region (3 Marks)
- Example: Find length of wire to fence a circular flower bed (1 Mark)
- Example: Find area of coloured portion (2 Marks)
- Example: Find radius if circumference and area are equal (1 Mark)
- Example: Find area between the concentric circles (1 Mark)
- Practice Test
- Test Your Skill

#### 5.4 Areas of Sector and Segment of a Circle

- Tutorial: Areas of sector and segment of a circle
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- Example: Find area between ribs of umbrella (3 Marks)
- Example: Find area covered by minute hand (2 Marks)
- Example: Find area of corners of a triangular field (1 Mark)
- Example: Find area of minor and major segment (3 Marks)
- Example: Find area of shaded region (semi circle in quadrant) (3 Marks)
- Example: Find area of sea over which ships are warned (3 Marks)
- Example: Find area of sector of brooch (6 Marks)
- Example: Find area cut off from vertices of a trapezium (1 Mark)
- Example: Find area of shaded region inside an equilateral triangle (6 Marks)
- Example: Find length of an arc if area is given (3 Marks)
- Example: Find radius if length of arc & area of sector are known (1 Mark)
- Example: Find area of region between 2 sectors (2 Marks)
- Example: Find area cleaned by 2 wipers (1 Mark)
- Example: Find radius of circle if length of arc is known (1 Mark)
- Example: Find area of sector (1 Mark)
- Example: Find area of four corners of a rectangle (1 Mark)
- Example: Find ratio of areas of two sectors (1 Mark)
- Example: Find ratio of length of arc to circumference of circle (1 Mark)
- Example: Given the radius of a circle and angle subtended by an arc, find the length of an arc, area of sector & area of segment
- Example: Find the area of corresponding segment of the circle
- Example: Find the cost of making the design at the given rate
- Practice Test

- Test Your Skill

### 5.5 Areas of Special Figures

- Tutorial: Areas of special figures
- Example: Find area of shaded region (2 Marks)
- Example: Find area of shaded region (triangle cut from quadrant) (2 Marks)
- Example: Find area of shaded region (2 Marks)
- Example: Find area of shaded region between quadrant and semi circle (2 Marks)
- Example: Find area of shaded region and express in Pi (2 Marks)
- Example: Find area of shaded region if side square is given (3 Marks)
- Example: Find area of shaded region (square with circles at opposite vertices) (3 Marks)
- Example: Find area of shaded region (3 Marks)
- Example: Find area of shaded region (3 Marks)
- Example: Find area of shaded region
- Example: Find area of shaded region
- Example: Find area of the remaining portion of the square
- Example: Find the area of the design
- Example: Find the distance around the track and the area of the track
- Example: Find the area of the remaining portion of the handkerchief
- Example: Calculate the area of the designed region in common between two quadrants
- Practice Test
- Test Your Skill

### 5.6 Areas of Rectangular Paths

- Tutorial: Areas of Rectangular Paths
- Example: Application based on area of path (3)
- Example: Problems based on area of cross roads and cost of constructing them (4)
- Example: Application based on area of cross roads (4)
- Practice Test
- Test your Skill

### 5.7 Surface Area and Volume of Solids

- Tutorial: Surface area and volume of solids
- Example: Find volume of cuboid formed by joining 2 cubes (2 Marks)
- Example: Find the volume of the tank
- Example: Find the mass of the pole
- Example: Find the surface area of the resulting cuboid
- Example: Find the cost of tin-plating the inner side of hemispherical bowl
- Example: Find the total cost to paint the vessel all over
- Example: Find the volume of milk a hemispherical bowl can hold
- Example: Find the ratio of surface area of sphere A to sphere B
- Example: Find the volume of the solid obtained
- Example: Find the area of the paper sheet required to make to make required no. of caps

- Example: Find the ratio of volumes of cone of same ht., given the ratio of their bases
- Example: Find the ratio of volume of reduced cylinder to that of original cylinder
- Example: Given the volume and ratio of radius & height, find the radius of cylinder
- Example: Find the area of the playground
- Example: How many square metres of sheet required to make cylindrical tank
- Example: How much water will fall into the sea
- Example: Find the number of cubes that can be put in a box
- Example: Calculate the total surface area of all the small cubes
- Example: Find the surface area of the base of a cuboid
- Example: Find the dimensions of the rectangular box
- Example: Find the dimensions of the cuboid given its TSA and ratio of their dimensions
- Example: Find the curved surface area of the cylinder formed from a rectangular sheet
- Example: Find the ratio of volumes of two cylinders given the ratio of their radii and ht.
- Example: How many cubes can be cut from a given cuboid?
- Example: Find the height of a cone given its volume & area of its base
- Example: Find the total surface area of a toy mounted on a hemisphere
- Example: Find the surface area of the resulting cuboid formed after joining two cubes
- Example: Find the inner surface area of the vessel in the form of a hemisphere mounted by cylinder
- Example: Find the surface area of solid after surmounting the hemisphere
- Example: Find the surface area of the capsule
- Example: Find the total surface area of the remaining solid when a conic cavity is hollowed out from cylinder
- Example: Find the surface area of the wooden article
- Example: Find the volume of the solid consisting of a cone standing on a hemisphere
- Example: Find the volume of the air contained in the model
- Example: Find approx. how much syrup would be found in gulab jamuns shaped like cylinder
- Example: Find the cost of canvas required for making a tent
- Example: Find the volume of the wood in the entire pen stand
- Example: Find the number of lead shots dropped in the vessel
- Example: Find the volume of water left in the cylinder
- Example: How many bricks can be put in without overflowing the water in cistern?
- Example: Find the length & mass of the wire which is covered around cylinder
- Example: Find the volume & SA of the double cone so formed
- Example: Find the CSA of rt. circular cylinder given ht. & circumference
- Example: Find the SA of sphere of given diameter
- Example: Find the radius of the hemispherical bowl, given its circumference of circular top
- Example: Find the vertical height of cone given its diameter of base & slant height
- Example: Find the SA of spherical tank of given diameter
- Example: Find the ratios of radius of two cones given ratios of their volumes
- Practice Test

- Test Your Skill

### 5.8 Pyramid and Regular Octahedron

- Tutorial: Pyramid and Regular Octahedron
- Example: Find the slant ht. of pyramid given the length of an edge of a regular triangular pyramid
- Example: Find the ht., LSA & volume of pyramid given the measure of each side of a regular triangular pyramid
- Example: Find the volume of pyramid given its ht. & area of its base
- Example: In a regular pyramid(P - ABC), given the length of each edge. Find PG if G is centroid of Triangle ABC
- Example: Find LSA & TSA of triangular pyramid given length of each side of base & slant ht.
- Example: Find the length of median, ht. of AG & PG, area of tri ABC & volume of pyramid given edge of pyramid
- Example: Find the volume of triangular pyramid given each side of base & ht. of pyramid
- Example: Find the measure of each side of base of pyramid given its LSA & slant ht.

## 6. Statistics

### 6.1 Presentation of Data

- Tutorial: Presentation of data
- Example: Calculate range, given marks in Math & English (2)
- Practice Test
- Test your Skill

### 6.2 Graphical representation of data

- Tutorial: Graphical representation of data
- Example: Observe histogram & answer given questions (3)

### 6.3 Median of Grouped Data

- Tutorial: Median of grouped data
- Example: Find median of frequency distributions (3 Marks)
- Example: Find missing frequencies if median is given (6 Marks)
- Example: Find median for "less than" distributions (6 Marks)
- Practice Test
- Test Your Skill

### 6.4 Mean of Grouped Data

- Tutorial: Mean of grouped data
- Example: Find increased mean (1 Mark)
- Example: Given mean, find the missing frequency (6 Marks)
- Example: Given mean, find the missing frequencies (6 Marks)
- Example: Find mean (1 Mark)
- Example: Find frequency of class interval from less than distribution (1 Mark)
- Example: Find the mean number of plants per house
- Example: Find the missing frequency
- Example: Find the mean number of mangoes kept in a packing box

- Example: Find the mean concentration of SO<sub>2</sub> in the air
- Example: Find the mean number of days a student was absent
- Example: Find the mean of the frequency distribution with unequal class length
- Test Your Skill

### 6.5 Mode of Grouped Data

- Tutorial: Mode of grouped data
- Example: Find mode for the following data (3 Marks)
- Example: Find x and y if the mode and total frequency is given (6 Marks)
- Example: Find mode for the frequency distribution (6 Marks)
- Example: Find mode (1 Mark)
- Example: Find lower limit of modal class (1 Mark)
- Example: Find modal life (3 Marks)
- Example: Find the mode and mean of the given data
- Example: Find the modal monthly expenditure of the families. Also find the mean
- Example: Find the mode and mean of the given data
- Example: Find the mode of the given data
- Practice Test
- Test Your Skill

### 6.6 Quartiles

- Tutorial: Quartiles
- Example: Find median, lower, upper quartile & inter quartile (4)
- Example: Find median, lower & upper quartile, inter & semi quartile range (5)

### 6.7 Probability

- Tutorial: Probability
- Example: Probability when die is thrown (1 Mark)
- Example: Find probability of drawing a particular ball (1 Mark)
- Example: Find probability of selecting boy/girl (1 Mark)
- Example: Find x, if probability of drawing a ball is given (2 Marks)
- Example: Find probability of a specific day in non leap year (2 Marks)
- Example: Find probability of getting prize winning ticket (1 Mark)
- Example: Find probability of choosing a consonant/vowel (1 Mark)
- Example: Find probability of getting a specific day in a leap year (2 Marks)
- Example: Probability of birthday problem (1 Mark)
- Example: Find probability of drawing 2 digit number from a box (1 Mark)
- Example: Probability of game of spinning arrow (1 Mark)
- Example: Probability of tossing 3 unbiased coins (1 Mark)
- Example: Probability of die landing in a circle (1 Mark)
- Example: Probability of ball in roulette wheel (1 Mark)
- Example: Probability of raining on a day (1 Mark)
- Example: Probability if coin is tossed three time (1 Mark)

- Example: Probability of at least 2 boys (2 Marks)
- Example: Problem of coloured balls (2 Marks)
- Example: Probability of drawing a card (1 Mark)
- Example: Probability of drawing non defective nut (1 Mark)
- Example: Find  $(1 - P(\bar{E}))$  (1 Mark)
- Example: Probability on throwing a die (1 Mark)
- Example: Probability of drawing a ball (1 Mark)
- Example: Write sample space for balls (1 Mark)
- Example: Check for probability (1 Mark)
- Example: Probability of drawing a card (1 Mark)
- Example: Find the probability of that the coin will be a 50p coin/ will not be a Rs 5 coin
- Example: What is the probability that the fish taken out is a male fish?
- Example: Find the probability that the bulb is not defective
- Example: Find the probability of getting a card of heart, king, club etc.
- Example: Find the probability of getting exactly two heads
- Example: What is the probability that the sum of two numbers appearing on the top of dice is n
- Example: What is the probability that the two friends visit the shop on same day?
- Example: What is the probability that the total score on die is even
- Example: Find the number of blue marbles in the jar
- Example: A dice is thrown. What is the probability that a given no. will come up atleast once
- Practice Test
- Test Your Skill

## 7. Algebra

### 7.1 Understanding Variables

- Tutorial: Understanding Variables
- Example: Write an algebraic expression for the given condition (3)
- Example: Translate the given word problem into algebraic expression (3)
- Example: Write an algebraic expression for the given condition (2)
- Example: Write an algebraic expression for the given condition (2)
- Example: Write an algebraic expression for the given condition (1)
- Example: Write an algebraic expression for the given condition (3)
- Example: Find a rule to find number of matchsticks required to make given alphabet
- Example: Write algebraic expression for pencil distributed among students
- Example: Observe the matchstick pattern & find the rule for given condition
- Example: Express the distance covered by bird in terms of its flying time in minutes
- Practice Test
- Test your Skill

### 7.2 Use of Variables in common Rules

- Tutorial: Use of Variables in common Rules
- Example: Express the perimeter of polygons using l (1)

- Example: Find the correct algebraic expression for given statement
- Practice Test

### 7.3 Understanding Expressions

- Tutorial: Understanding Expressions
- Example: Write an expression for the given (1)
- Example: Translate into algebraic expression (2)
- Example: Translate into algebraic expression (1)
- Example: Write an algebraic expression for the given condition (3)
- Example: Translate into algebraic expression (4)
- Example: Translate into algebraic expression (5)
- Example: Write algebraic expression for given operation
- Example: Write algebraic expression for given statement (2 operations multiplication and subtraction)
- Example: Write algebraic expression (2 operations multiplication and addition)
- Example: Write algebraic expression (simple age problem)
- Example: Write algebraic expression (complex age problem)
- Example: Express length and breadth of rectangular box in terms of height
- Example: Match algebraic expression with given statement
- Example: Match algebraic expression with given statement (single algebraic expression)
- Example: Form algebraic expression using two number operation
- Example: Change given statement into algebraic expression (2 operations)
- Practice Test1
- Practice Test2
- Test your Skill1

### 7.4 Algebraic Expressions

- Tutorial: Algebraic Expressions
- Example: Identify the numerical coefficient and variable part of the given term
- Example: Determine the degree, terms and coefficients of the following polynomial
- Example: What is the coefficient of  $y$  in the given expression
- Example: Identify the given expression as monomial, binomial or trinomial
- Example: What is the coefficient of  $x$  in the given expression
- Example: What is the coefficient of  $x$  in the given expression
- Example: What is the coefficient of  $y^2$  in the given expression
- Example: Identify the terms of the given expression
- Example: Match the expression with their mathematical statement
- Example: State whether the terms are like or unlike
- Example: Give two examples of like terms to make three like terms
- Example: Give two examples of unlike terms to make three unlike terms
- Practice Test1
- Practice Test2
- Test your Skill

## 7.5 Simplifying Algebraic Expressions

- Tutorial: Simplifying Algebraic Expressions
- Example: Simplify by combining like terms (1)
- Example: Simplify the expression (5)
- Example: Simplify the expression (5)
- Example: Add the polynomials (2)
- Example: Add the polynomials (2)
- Example: Add the polynomials (2)
- Example: Problems based on subtraction of quadratic equations (2)
- Example: Subtract the polynomials (3)
- Example: Subtract the polynomials (3)
- Example: Subtract the polynomials (3)
- Example: Subtract the polynomials (3)
- Example: Subtract the polynomials (3)
- Example: Problems based on perimeter of triangle (2)
- Example: Add the polynomials (2)
- Example: Application based on polynomials (4)
- Example: Subtract  $axy$  from  $bxy$  (1)
- Example: Subtract  $-ax^n$  from  $bx^n$
- Example: Simplify by adding like terms
- Example: Add the given terms
- Example: Add the given terms
- Example: Identify the group of like terms
- Example: Subtract  $ax^2 + bx - c$  from  $dx^2 + ex - f$
- Example: Subtract given polynomial from sum of two polynomials
- Example: Subtract  $ax^2 + bx + c$  from  $dx^2 - ex - f$ . Add another polynomial to it
- Example: Simplify the given algebraic expression
- Practice Test
- Test your Skill

## 7.6 Division of Algebraic Expressions

- Tutorial: Division of Algebraic Expressions
- Example: Simplify (1)
- Example: Find the polynomial given divisor & quotient (2)
- Example: Divide (3)
- Example: Divide the given polynomial by the monomial
- Example: Divide the given binomial by the monomial
- Example: Division of algebraic expression
- Example: Division of algebraic expression
- Example: Division of algebraic expression
- Example: Division of algebraic expression
- Example: Division of algebraic expression

- Example: Division of algebraic expression
- Example: Division of algebraic expression
- Example: Carry out the given expression
- Example: Divide the given polynomial by the monomial
- Example: Divide the given polynomial by the monomial
- Practice Test
- Test Your skill

### 7.7 Evaluating Algebraic Expressions

- Tutorial: Evaluating Algebraic Expressions
- Example: Compute the expression when the value of variable is given (1)
- Example: Compute the expression for the given value of variable (2)
- Example: Compute the expression when value of variable is known (1)
- Example: Compute the expression for given value of variable (3)
- Example: Find the value of  $x^2 - 2x - 100$  for given value of  $x$
- Example: Simplify the expression and find its value for given value of  $x$  &  $y$
- Example: Find the value of "a", given the value of expression for given  $x$
- Example: Find the value of given expression for given value of  $a$  &  $b$
- Practice Test1
- Practice Test2
- Test your Skill

### 7.8 Factorisation by Grouping

- Tutorial: Factorisation by Grouping
- Example: Find the greatest common factor of the given numbers (1)
- Example: Find the greatest common factor of the given numbers (3)
- Example: Factor out the greatest common factor from the given expression (3)
- Example: Factor out the greatest common factor of given the trinomial (3)
- Example: Factor out the minus sign from given binomial.(2)
- Example: Factorize by grouping (5)
- Example: Factorize by grouping:  $y^2 + ay + by + c$  (5)
- Example: Factorize  $x^2 + xy + ax + by$  (2)
- Example: Find the common factor of given terms
- Example: Factorise the given expression:  $ax - b$
- Example: Factorise the given expression:  $pa^2 + qa$
- Example: Factorise the given expression:  $ax^2y - bxy^2$
- Example: Factorise the given expression:  $pa^2 - qb^2 + tc^2$
- Example: Factorise the given expression:  $-pa^2 + qab - tca$
- Example: Factorise the given expression:  $apq + b + cq + dp$
- Example: Find the common factor of given terms
- Example: Factorise the given expression:  $ax+by-ay-by$
- Practice Test1

- Practice Test2
- Test Your Skill

### 7.9 Factorisation using Identities

- Tutorial: Factorisation using Identities
- Example: Factorize the difference of two squares:  $x^2 - a^2$  &  $y^2 - (b/c)^2$  (2)
- Example: Factorize the difference of two squares:  $az^2 - b$ ,  $cx^2 - dy^2$  &  $ex^4 - fy^2$  (3)
- Example: Factorize  $ax^4 - by^4$  (2)
- Example: Factorize  $x^4 - a$  (2)
- Example: Factorize  $am^{4n} - bn$  (2)
- Example: Factorize  $x^2 - ax + b$  &  $x^2 + cx + d$  (2)
- Example: Factorize  $ax^2 - bx + c$  &  $pa^2 + qab + rb^2$  (4)
- Example: Factorize  $(a/b)x^4 - (c/d)x^2 + (e/f)$  (2)
- Example: Factorize the sum of cubes:  $x^3 + a$  &  $bx^3 + c$  (2)
- Example: Factorize  $ap^6 + bq^3$  &  $cm^6 + dn^6$  (3)
- Example: Factorize the difference of cubes:  $x^3 - a$  &  $bx^3 - c$  (2)
- Example: Factorize  $ap^6 - bq^3$  &  $cm^6 - dn^6$  (3)
- Example: Factorize  $x^4 - a^4$  (2)
- Example: Factorize  $x^4 + a$  (2)
- Example: Factorize  $pa^2 - qb^2 + rbc - sc^2$  (3)
- Example: Factorize  $(l + am)^2 - blm$  (2)
- Example: Factorize the given quadratic polynomial:  $a^2 + pa + q$
- Example: Factorize the given polynomial:  $ay^2 + byz + cz^2$
- Example: Factorize the given quadratic polynomial:  $a^2 - bx + c$
- Example: Factorize the given expression:  $(l+m)^2 - alm$
- Example: Factorize the given expression:  $a^4 + p(a^2)(b^2) + b^4$
- Example: Factorize the given expression:  $pa^3 - qb^2$
- Example: Factorize the given expression
- Example: Factorize the given expression:  $a(x^2)(y^2) - b$
- Example: Factorize the given expression:  $(x^2 - ax + y^2) - z^2$
- Example: Factorize the given expression:  $x^4 - (y+z)^4$
- Example: Factorize the given expression:  $a^4 - 2(a^2)(b^2) + b^4$
- Practice Test
- Test Your Skill

### 7.10 Algebraic Fractions

- Tutorial: Algebraic Fractions
- Example: Find LCM of given 2 polynomials
- Example: Find LCM of given 3 polynomials
- Example: Find LCM of given 2 rational expressions
- Example: Find LCM of given 3 rational expressions
- Example: Find LCM of given 3 rational expressions

- Practice Test1
- Test Your Skill

### 7.11 Simplification of Algebraic Fractions

- Tutorial: Simplification of Algebraic Fractions
- Example: Add algebraic fractions
- Example: Simplify (addition)
- Example: Add rational expression (find LCM)
- Example: Add (using LCM)
- Example: Simplify (subtraction)
- Example: Simplify (subtraction using LCM)
- Example: Simplify (changing signs)
- Example: Multiply
- Example: Multiply
- Example: Multiply and simplify (2 fractions)
- Example: Multiply and simplify (3 fractions)
- Example: Simplify (divide)
- Example: Simplify (divide)
- Example: Simplify (factorize and divide)
- Example: Simplify (factorize and divide)
- Practice Test1
- Practice Test2
- Test Your Skill

### 7.12 Exponents

- Tutorial: Recall
- Tutorial: Powers with Negative Exponents
- Tutorial: Laws of integral Exponents
- Tutorial: Expressing Numbers in the Standard Form
- Tutorial: Converting Numbers from Standard Form to Usual Form
- Example: Express the number as power of 2 (3)
- Example: Express the number as the product of powers of their prime factors (3)
- Example: Express the expression in exponential form (1)
- Example: Simplify (1)
- Example: Simplify the expression in positive powers (2)
- Example: Simplify the expression in negative powers (2)
- Example: Simplify and give the result in positive exponent (2)
- Example: Simplify and give the result with only positive exponents (2)
- Example: Simplify the expression having negative exponents (4)
- Example: By what no. should 'x' be multiplied to get 'y' (4)
- Example: By what no. should 'x' be divided to get 'y' (4)
- Example: Find the multiplicative inverse of  $a^{-b}$ .

- Example: Simplify and express the result with positive exponent (4)
- Example: Simplify and express the result with positive exponent (4)
- Example: Simplify the expression (4)
- Example: Simplify (4)
- Example: Simplify and express the result with positive exponent (4)
- Example: Simplify product of 3 exponents & express result with +ve exponents (4)
- Example: Find the value of 'm' from the given expression (4)
- Example: Simplify and express in exponential form (4)
- Example: Evaluate the expression (4)
- Example: Simplify & express the result in power notation with positive notation
- Example: Find the value of  $1/a^{-n}$
- Example: Evaluate  $(-m)^{-n}$
- Example: Simplify & express the result in power notation with positive notation
- Example: Simplify & express the result in power notation with positive notation
- Example: Simplify & express the result in power notation with positive notation
- Example: Find the value of given expression
- Example: Find the value of given expression
- Example: Find the value of given expression
- Example: Find the value of given expression
- Example: Find the value of given expression
- Example: Find the value of given expression
- Example: Find the value of given expression
- Example: Find the value of  $(a/b)^{-m} * (b/a)^{-n}$
- Example: Evaluate the expression
- Example: Evaluate the expression
- Example: What number should m be multiplied so that the product may be equal to n
- Example: What number should m be divided so that the quotient may be equal to n
- Example: Find the value of x in given equation
- Example: Find the value of m in given equation
- Example: Find the value of  $x^{-a}$  when  $x = (a/b)^m * (b/a)^{-m}$  is given
- Example: Find the value of x when  $x^n = (a/b)^{-m} * (a/b)^p$
- Example: Express the decimal number in standard form (5)
- Example: Express the decimal number in standard form (5)
- Example: Express the number in standard form
- Example: Application based on expressing numbers in the standard form
- Example: Express product of decimal number & negative exponent in usual form (1)
- Example: Express product of a decimal number & exponent in usual form (1)
- Practice Test
- Practice Test
- Test Your Skill

- Test Your Skill

### 7.13 Linear Equations in One Unknown

- Tutorial: Linear Equation
- Tutorial: Solving Linear Equations
- Example: Identify the equation as linear or non linear (1)
- Example: Check if given value of variable is a solution of given equation (1)
- Example: Solve for x:  $x + (a/b) = -(c/d)$  (3)
- Example: Solve the given equation for x:  $(a/b)(x + c) + (d/e)x = f$  (4)
- Example: Solve the given equation for x:  $(a/b)x + c = x + (d/e)$  (3)
- Example: Solve the given equation for x:  $(a/b)x - (c/d)x = x - (e/f)$  (2)
- Example: Solve the given equation for x:  $(a/b) + cx = d$  (3)
- Example: Solve the given equation for x:  $(a/(x - b)) + (cx/(x + d)) = e$  (5)
- Example: Solve the given equation for x:  $-ax/(x+b) = c + d/((x+e))$  (3)
- Example: Solve the given equation for x:  $x + a = b$  (1)
- Example: Solve the given equation for x:  $ax=b$  (1)
- Example: Solve the given equation for x:  $ax - b = c$  (1)
- Example: Solve for x:  $ax + (b/c) = (d/e)$  (3)
- Example: Solve the given equation for x:  $a(x-b) + cx = d$  (2)
- Example: Solve the given equation for x:  $a - (bx-c) = d(x+e) + f$  (3)
- Example: Solve the given equation for x:  $(x+a)/b - (x+c)/d = (x+e)/f - g$  (5)
- Example: Solve the given equation for x:  $(ax+b)/(cx+d) = e/f$  (3)
- Example: Solve the given equation for x:  $(ax+b)/(cx-d) = e$  (3)
- Example: Solve the given equation for x:  $(ax+b)/(cx+d) = (ex+f)/(gx+h)$  (5)
- Example: Solve the given equation for x:  $x-a=b$
- Example: Solve the given equation for t:  $t/a = b$
- Example: Solve the given equation for x:  $ax/b = c$
- Example: Solve the given equation for x:  $ax+b = c+dx$
- Example: Solve the given equation for y:  $a = y/b$ ; a & b are decimals
- Example: Solve the given equation for x:  $ax-b=c$
- Example: Solve the given equation for x:  $x/a + b = c/d$
- Example: Solve the given equation for x:  $ax = bx + c$
- Example: Solve the given equation for x:  $ax+b = c(x-d) + e$
- Example: Solve the given equation for x:  $x = (a/b)(x+c)$
- Example: Solve the given equation for x:  $ax/b + c = dx/e + f$
- Example: Solve the given equation for x:  $(x-a)/b = (x-c)/d$
- Example: Solve the given equation for m:  $m - (m-a)/b = c - (m-d)/e$
- Example: Solve the given equation for t:  $a(t-b) = c(dt + e)$
- Example: Solve the given equation for m:  $am = bm - (c/d)$
- Example: Solve the given equation for y:  $a(y-b) - c(y-d) + e(y+f) = 0$
- Example: Solve the given equation for f:  $a(bf-c) = d(ef-g)$

- Example: Solve the given equation for x:  $(ax-b)/cx = d$
- Example: Solve the given equation for x:  $x+a - (bx/c) = (d/e) - (fx/g)$
- Example: Solve the given equation for x:  $(x/a) - (b/c) = (x/d) + (e/f)$
- Example: Solve the given equation for t:  $(at-b)/c - (dt+e)/f = (g/h) - t$
- Practice Test
- Test your skill
- Test your skill

#### 7.14 Word Problems - Linear Equations

- Tutorial: Application of Linear Equations
- Example: Find the equal sides of isosceles triangle when its base & perimeter are given
- Example: Find the numbers if sum of two numbers is given & one exceeds the other by x
- Example: Application based on linear equation
- Example: Application based on age problem
- Example: Application based on age problem
- Example: Application based on age problem
- Example: Application based on finding the original fraction
- Example: Application based on linear equation
- Example: Application based on linear equation
- Example: Application based on linear equation
- Example: Application based on age problem
- Example: Application based on linear equation
- Example: Application based on linear equation
- Example: Application based on linear equation
- Example: Application based on age problem
- Example: Application based on age problem
- Example: Application based on rational number
- Application: Application based on time (2)
- Application: Application based on numbers (1)
- Application: Application based on ratio (1)
- Application: Application based on dimension of rectangle (3)
- Application: Application based on age problem (4)
- Application: Application based on coin problem (5)
- Application: Application based on currency denomination (4)
- Application: Application based on age problem (3)
- Application: Application based on finding the original number (3)
- Application: Find the consecutive integers, when their sum is given (2)
- Application: Find no. of winners, given total no. of participants, total prize money, winner's amount, loser's amount (4)
- Application: Application based on ratio (2)
- Application: Find numbers, given their ratio & difference (2)

- Application: Application based upstream & downstream problem (5)
- Application: Application based on age problem (3)
- Application: Find the consecutive multiples of 'x', when their sum is given (2)
- Application: Application based on finding the original number (2)
- Application: Application based on finding the original number
- Practice Test
- Test Your Skill

### 7.15 Solving Quadratic Equations by Factorization

- Tutorial: Solving quadratic equations by factorization
- Example: Solve quadratic equation of type  $a(x^2) + b = 0$  by factorisation (1 Mark)
- Example: Solve quadratic equation of type  $a(x^2) + bx + c = 0$  by factorisation (1 Mark)
- Example: Solve quadratic equation of type  $a(x^2) + bx + c = 0$  by factorisation (1 Mark)
- Example: Solve for x (2 Marks)
- Example: Solve quadratic equation of type  $p(x^2) + qx + r = 0$  (1 Mark)
- Example: Application based on numbers (3 mks)
- Example: Find the number if sum and product is given (3 Marks)
- Example: Find the number if difference of their squares is known (6 Marks)
- Example: Application on dimensions (2 mks)
- Example: Find the cost and number of articles produced in a cottage industry (6 Marks)
- Example: Find the marks obtained in two subjects in a class test (6 Marks)
- Application: Age Problem
- Application: Application on consecutive integers (2 marks)
- Application: Application on dimensions of rectangle (2 marks)
- Application: Application on dimensions (2 marks)
- Application: Application on sides of triangles (3 marks)
- Application: Application on measure of angles (3 marks)
- Application: Application on distance formula (3 marks)
- Application: Application on area & perimeter of rectangle (3 marks)
- Application: Application on areas and perimeters (3 marks)
- Application: Application on purchase of books (3 marks)
- Application: Application on finding the fraction (3 marks)
- Application: Application on lengths of sides of triangle (3 marks)
- Application: Application on flight of aircraft (6 marks)
- Practice Test
- Test Your Skill

### 7.16 Linear Inequation in One Unknown

- Tutorial: Inequation
- Tutorial: Solutions of Linear Inequalities
- Example: Solve & graph the inequality  $(a+bx < cx+d)$
- Example: Solve & graph the inequality  $(ax \text{ less then equal to } b)$

- Example: Solve & graph the inequality ( $a+bx < cx+d$ )
- Example: Solve & graph the inequality ( $ax$  less than equal  $b$ )
- Example: Solve the inequality & graph the solution
- Example: Solve the inequality & graph the solution
- Practice Test1
- Test Your Skill
- Test Your Skill

### 7.17 Changing the subject of a Formula

- Tutorial: Frame of Formula
- Tutorial: Change of Subject
- Tutorial: Evaluation of the Subject of a Formula
- Example: Write expression for operations on numbers
- Example: Write an equation involving operations on numbers
- Example: Given formula for  $P$ , express  $L$  in terms of  $P$  &  $W$
- Example: Solve given equation for variable
- Example: Find value of the unknown variable
- Practice Test1
- Test Your Skill
- Test Your Skill
- Practice Test1
- Test Your Skill

### 7.18 Simultaneous Linear Equations

- Tutorial: Pair of equation in two variables
- Tutorial: Algebraic method of solving pair of linear equation
- Example: Identify if given point is solution of given system (1 Mark)
- Example: Represent cost of Items algebraically (1 Mark)
- Example: Identify if given ordered pair is solution of given system (1 Mark)
- Example: Write equations of given axis (1 Mark)
- Example: Find 'a' so that given point lies on the line (1 Mark)
- Example: Check if given values of  $x$ ,  $y$  are solution of given equation (1 Mark)
- Example: Express  $y$  in terms of  $x$  in the given equation and check if given point is on the line (1 Mark)
- Example: Solve using substitution method (2 Marks)
- Example: Solve for  $x$  and  $y$  (3 Marks)
- Example: Applications on age problem (3 Marks)
- Example: Applications on two digit no (3 Marks)
- Example: Find 2 numbers from given (2 Marks)
- Example: Application on two digit number (3 Marks)
- Example: Application on salary and annual increment (3 Marks)
- Example: Application on taxi fare (3 Marks)
- Example: Application on income and expenditure (3 Marks)

- Example: Application on finding angles of a triangle (3 Marks)
- Example: Application on questions in a test (3 Marks)
- Example: Application on upstream/downstream (6 Marks)
- Example: Application on monthly expenses (3 Marks)
- Example: Application on finding l and b of rectangle, if area is known (3 Marks)
- Example: The two given equations have a unique solution, find value of k (2 Marks)
- Example: Find value of k for which given values of x & y is solution of given equation (1 Mark)
- Application: Applications on price of item (3 Marks)
- Application: Applications on % in mixture (3 Marks)
- Application: Applications on upstream/downstream (3 Marks)
- Application: Applications on speed (3 Marks)
- Application: Applications on % in solutions (3 Marks)
- Application: Applications of currency (3 Marks)
- Application: Applications of fractions (3 Marks)
- Application: Applications on library charges (3 Marks)
- Application: Applications on age problem (3 Marks)
- Practice Test
- Practice Test1
- Practice Test2
- Test your skill

## **8. Relations, Functions and Graphs**

### **8.1 Cartesian System**

- Tutorial: Cartesian system
- Example: Write the abscissa and ordinate of the point with given coordinates (1)
- Example: Find the coordinates of point from graph (2)
- Example: Find the coordinates of given point (3)
- Example: Determine the coordinates of point given in figure (3)
- Example: State quadrant in which given point lies (1)
- Example: Find the coordinates of point according to given condition (5)
- Example: What will be the ordinate of a point if it lies on X-axis
- Example: Find the coordinates of the vertices of the triangle from the graph
- Example: Write the coordinates of the pt. whose ordinate & abscissa are given
- Example: How far is the pt. P from x-axis whose ordinate & abscissa are given?
- Example: From the fig. write the ordinate & abscissa of the point & also its coordinates
- Practice Test: Cartesian System
- Test your Skill: Cartesian System

### **8.2 Plotting Points in the Plane**

- Tutorial: Plotting points in the plane
- Example: Graph/Plot the given point (4)
- Example: Plot the given point on coordinate plane (4)

- Practice Test: Graphing Points in the Plane
- Test your Skill: Graphing Points in the Plane

### 8.3 Graphing a Linear Equation using Points

- Tutorial: Graphing a linear equation using points
- Example: Graph the line (3)
- Example: Graph the line  $x=a$
- Example: Graph the line  $y=b$
- Example: Draw the graph of  $x = -| -a |$  in a Cartesian plane
- Example: Draw the graph of  $x = -| -a |$  in a Cartesian plane
- Example: Solve the linear equation and draw its graph in Cartesian plane
- Example: Draw the graph of  $ax = by$  in the Cartesian plane
- Example: Draw the graph of the line  $x+y=c$ . Also determine the area enclosed by the line & the axes
- Practice Test
- Test your Skill

### 8.4 Relation

- Tutorial: Relation
- Example: Find domain and range
- Example: Find relation
- Example: Find domain and range
- Practice Test1
- Test Your Skill

### 8.5 Function

- Tutorial: Function
- Example: Evaluate function for given value
- Practice Test1
- Test Your Skill

### 8.6 Some Elementary Functions

- Tutorial: Some Elementary Functions
- Example: Find the value of a function for  $x = a$
- Example: Find the values of a function for  $x = a, x = b + c$
- Example: Find  $f(a)$  of a rational function  $f(x)$
- Example: Find  $f(a)$  and  $f(m + n)$  of absolute valued function
- Example: Find  $f(a + h)$  of a rational absolute valued function
- Example: Find  $f(a)$  of a piecewise function at a point
- Example: Find  $f(a)$  and  $f(b)$  of a rational function  $f(x)$
- Example: Find the domain of a rational function
- Example: Find the domain and range of a linear function
- Example: Find the domain of a rational function

### 8.7 Slope of a Line

- Tutorial: Slope of a line

- Tutorial: Slope of a line
- Tutorial: Slope of parallel and perpendicular lines
- Example: Given inclination find the slope of the line
- Example: Given slope find the inclination of the line
- Example: Given 2 points find slope of line through them & graph it
- Example: Given slope of line, identify the graph
- Example: Given slopes as +ve, -ve, zero & n.d., identify lines on graph
- Example: Given linear equation determine the slope
- Example: Given an equation, take 2 points on line & calculate slope
- Example: Given 3 collinear points find k
- Example: Given 3 points check if they are vertices of right triangle
- Example: Given cost & book graph find slope & cost

### 8.8 Various Forms of the Equation of a Line

- Tutorial: Various forms of the equation of a line
- Tutorial: Various forms of the equation of a line
- Tutorial: Various forms of the equation of a line
- Tutorial: Various forms of the equation of a line
- Tutorial: Various forms of the equation of a line
- Tutorial: Various forms of the equation of a line
- Tutorial: Various forms of the equation of a line
- Example: Given slope & y-intercept find equation of the line
- Example: Using slope & y-intercept graph the given line
- Example: Given slope & a point graph the line
- Example1: Given slope & a point find equation of line
- Example: Given a point & parallel line find equation of line
- Example: Given 2 points find equation of line
- Example: Given x & y-intercepts find equation of line
- Example: Given y-intercept & 2 points of parallel line find equation of line
- Example: Find m & c
- Example: Express L in terms of C
- Example: Given a point & equal intercepts along both axes find equation of line

### 8.9 General Equation of a Line

- Tutorial: General equation of a line
- Example: Given equation of line convert into slope intercept & intercept form

### 8.10 Graphical method of solving pair of Linear Equation

- Tutorial: Graphical method of solving pair of linear equation
- Example: Find if given pair of linear equations are consistent/inconsistent (2 Marks)
- Example: Find vertices of triangle formed by the given lines (3 Marks)
- Example: Find if given pair of equations are consistent/inconsistent & solve graphically (2 Marks)
- Example: Find 'p' for system of equations to have infinite solutions (2 Marks)
- Example: Find 'k' for unique solutions, given perimeter (1 Mark)

- Example: Check if given pair of equations is parallel, coincident or intersect (2 Marks)
- Example: Find a,b if given pair of equations have infinitely many solutions (2 Marks)
- Example: Find dimensions of garden (2 Marks)
- Example: Without drawing graph determine whether lines will be parallel/intersecting (1 mark)
- Example: Find 'p' for the system of equations to represent parallel lines (1 mark)
- Example: Find value of 'k' for system of equations to have infinite solutions (1 Mark)
- Example: Without solving find if the pair of equations is consistent (1 Mark)
- Example: Find whether the system of equations has any solutions (1 Mark)
- Example: Find value of 'k' if system has unique solutions (1 Mark)
- Example: Write condition for equations to be parallel/coincident/intersecting (1 Mark)
- Example: Find p for which given pair has infinite solution (1 Mark)
- Practice Test
- Test your skill1
- Test your skill2

### 8.11 Linear Inequalities in One Variable

- Tutorial: Linear Inequation
- Tutorial: Intervals and Their Graphs
- Tutorial: Properties of Inequations
- Tutorial: Solutions of Linear Inequalities
- Example: Find the solution set for given inequation (3)
- Example: Find the solution set for given inequation (2)
- Example: Graph the given interval (inclusive) (2)
- Example: Graph the given interval (exclusive) (2)
- Example: Solve inequality & graph the solution (2)
- Example: Solve inequality & graph the solution (2)
- Example: Solve inequality & graph the solution (3)
- Example: Solve inequality & graph the solution (3)
- Practice Test
- Practice Test1
- Practice Test2
- Practice Test1
- Practice Test2
- Practice Test3
- Practice Test4
- Practice Test1
- Practice Test2
- Test Your Skill
- Test Your Skill

### 8.12 Graphing Linear Inequalities in two Variables

- Tutorial: Graphing linear inequalities in two variables

- Example: Graph the solution of  $(2x - y)$  is greater than  $(3)$

### 8.13 Solving System of Linear Inequalities

- Tutorial: Solving system of linear inequalities
- Example: Graph the solution of the given system of linear system of equations
- Example: Graph the solution of the given system of linear system of equations

### 8.14 Graphing of Feasible Region of a Linear Progr...

- Tutorial: Graphing of feasible region of a linear programming problem
- Example: Find feasible solution of LPP
- Example: Find solution of minimizing type LPP
- Example: Find solution of maximizing type LPP

### 8.15 Graphical Methods for solving a Linear Progra...

- Tutorial: Graphical methods for solving a linear programming problem
- Example: Find feasible solution, bounded of feasible solution and finally solve the LPP
- Example: Find solution of transportation problem using LPP
- Example: Find feasible solution and finally solution of LPP

### 8.16 Composition of two Functions

- Tutorial: Composition of two functions
- Example: Find  $g \circ f(x)$  from the given
- Example: Find  $f \circ g$ ,  $g \circ f$  & their equality given  $f(x)$  &  $g(x)$
- Example: Compute  $g \circ f$  & its domain

### 8.17 Inverse of a Function

- Tutorial: Inverse of a Function
- Example: Check if  $f$  is one-one, onto, invertible & if so find its inverse
- Example: Given  $f(x)$ , answer the following question
- Example: Check if  $f(x)$  is invertible & if so find its inverse

### 8.18 Graphing A Quadratic Function

- Tutorial: Graphing A Quadratic Function
- Example: Sketch the graph of  $f(x) = ax^2 + c$
- Example: Sketch the graph of  $f(x) = ax^2 + bx + c$ ,  $a = 1, -1$
- Example: Find the vertex of the parabola  $y = ax^2 - bx$

### 8.19 Maximum or Minimum Value of a Quadratic Function

- Tutorial: Maximum or Minimum Value of a Quadratic Function
- Example: Max or Min value of  $f(x) = ax^2 + bx + c$  - application problem
- Example: Max value of  $h(t) = -16t^2 + bt + c$  - application problem

## 9. Geometry I

### 9.1 Introduction

- Tutorial: Introduction
- Example: Identify type of angle (2)
- Example: Count no. of acute & right angles (2)
- Practice Test

## 9.2 Types of Angles

- Tutorial: Types of Angles
- Example: Find the complement of given angle (1)
- Example: Find the supplement of given angle (1)
- Example: Measure the unknown angles from the given figure (5)
- Example: Can two obtuse/right/acute angles be supplementary?
- Example: Find the measure of unknown angles from the given figure
- Example: Identify two pairs of vertically opp. angles from the figure
- Example: Find an angle which is equal to its supplement / complement
- Example: Find the measure of each angle, given relation among supplementary angles
- Example: Find the measure of each angle, given relation among complementary angles
- Example: Find the complement of the given angle
- Example: Find the supplement of the given angle
- Example: State the type of pairs of angles
- Example: Find the measure of other angle, given the angle of linear pair
- Example: AB & CD intersect at a point O. Given angle AOD, find the measure of other 3 angles
- Example: Find the pairs of vertically opp. angles & linear pairs
- Example: Find the pairs of vertically opp. angles & linear pairs
- Application: Yes/No (2)
- Application: Word Problem based on supplementary angles (3)
- Application: Find the angles when difference of two complementary angles is given (3)
- Practice Test
- Test your Skill

## 9.3 Transversal and Angle Pairs

- Tutorial: Transversal and Angle Pairs
- Example: Identify the pair of angles in the given figure
- Example: State whether the given lines are parallel or not
- Example: State which line is a transversal of the other two lines
- Example: State the pairs of alt. / corresp. / interior angles
- Practice Test
- Test your Skill

## 9.4 Parallel lines and Special Angle Pairs

- Tutorial: Parallel lines and Special Angle Pairs
- Example: Measure the unknown angle from the given figure (4)
- Example: Measure the unknown angles from the given figure (3)
- Example: Measure the unknown angles from the given figure (2)
- Example: Identify one pair of corresponding angles
- Example: In given figure,  $p \parallel q$ , find  $x$
- Example: In given figure,  $p \parallel q$ , find  $x$
- Example: In given figure,  $p \parallel q$  and  $m \parallel n$ , find the values of  $x, y, z$

- Example: In given figure,  $m \parallel BC$ , find the values of  $x$  &  $y$
- Example: In given figure,  $AB \parallel CD$  &  $PQ$  is transversal. Find the measure of unknown angles
- Practice Test1
- Practice Test2
- Practice Test3
- Practice Test4
- Practice Test5
- Test your Skill

### 9.5 Check for Parallel lines

- Tutorial: Check for Parallel lines
- Example: Check whether the lines are parallel or not
- Example: Check whether the lines are parallel or not
- Practice Test

### 9.6 Constructions

- Tutorial: Introduction
- Tutorial: Constructing Circle and Line Segment
- Tutorial: Constructing Perpendicular and Perpendicular Bisector
- Tutorial: Constructing Angle and Angle Bisector
- Tutorial: Constructing Angles:  $60^\circ$ ,  $30^\circ$ ,  $120^\circ$ ,  $90^\circ$ ,  $45^\circ$

### 9.7 Triangles

- Tutorial: Introduction
- Tutorial: Classification of Triangle
- Tutorial: Properties of Triangles
- Example: Find side opposite vertex & vice-a-versa (1)
- Example: Find the median and altitude of the given triangle
- Example: Find the value of  $x$  in the given isosceles triangle
- Example: Find the value of  $x$  in the given isosceles triangle
- Example: Find the value of  $x$  in the given figure
- Example: Find the value of  $x$  in the given figure
- Example: Determine the type of triangle
- Example: Does the given set of angles form a triangle
- Example: Problem based on interior opposite angles and exterior angle of triangle (2)
- Example: Problem based on interior opposite angles and exterior angle of triangle (2)
- Example: Find the value of  $x$  from the given figure
- Example: Find the value of  $x$  from the given figure
- Example: Can we have triangle with given sides (3)
- Example: Measure the third side of a triangle when two of its sides are given (2)
- Example: Find 2 angles of isosceles triangle given 1 angle (2)
- Example: Problem based on isosceles triangles (1)
- Example: Find the value of  $x$  from the given figure (5)

- Example: Find the value of x and y from the given figure (2)
- Example: Find x, y in given figure (2)
- Example: Find x, y from the given figure (4)
- Example: Find the value of x (exterior angle) from the given figure
- Example: Find the value of x from the given figure
- Example: Find the value of x and y from the given figure
- Example: Find the angles of a triangle given their ratios
- Example: Find the angles of a triangle given relation among them
- Example: Find the measure of angle A of  $\triangle ABC$  given  $\angle A = \angle B + \angle C$
- Example: Find the angles of a triangle given one angle & two of its angles are equal
- Example: Find the acute angle of a right angled triangle given one angle
- Example: Find the measure of third angle of a triangle given other two angles
- Example: Find the vertical angle of an isosceles triangle given base angles
- Example: Find the angles of a triangle given one angle & ratio of other two angles
- Example: Find the angles of a triangle
- Example: Find the angles of a triangle
- Practice Test
- Practice Test
- Practice Test1
- Practice Test2
- Practice Test3
- Practice Test4
- Test your Skill

## 9.8 Congruent Triangles

- Tutorial: Introduction of Congruence
- Tutorial: Congruence of Triangles
- Tutorial: Condition for Congruence of Triangles
- Tutorial: Construction of Triangles
- Example: To establish a correspondence between 2 congruent triangles (2)
- Example: To establish a correspondence between 2 congruent triangles (2)
- Example: Which angle is included between the given sides of triangle
- Example: Write the congruence in symbolic form
- Example: Write the pair of congruent triangles in symbolic form & identify the congruence rule
- Example: Identify the congruence rule
- Example: Name a pair of triangles which are congruent by RHS
- Example: Choose correct statement for showing the congruence of triangles by ASA
- Example: Find 3 pairs of corresponding parts that makes triangles congruent by SSS condition
- Example: State whether the given triangles are congruent. Write the congruence relation
- Example: Write the congruence criterion used in the given figure
- Example: Complete the congruence statement

- Example: State the three pairs of equal parts in two triangles
- Example: Find 3rd pair of corresponding parts that makes triangles congruent by SSS condition (3)
- Example: Find 3rd pair of corresponding parts that makes triangles congruent by ASA condition (3)
- Example: Name a pair of triangles which are congruent by SAS
- Example: Name a pair of triangles which are congruent by ASA
- Example: Write the congruence criterion used in the given figure (1)
- Example: In the given figure, state if pair of triangles are congruent by RHS
- Example: State whether the given triangles are congruent by SSS condition (1)
- Practice Test
- Practice Sheet
- Test Your Skill

### 9.9 Similar Triangles

- Tutorial: Concept of similarity
- Tutorial: Basic Proportionality Theorem
- Tutorial: Criteria/Conditions for similarity
- Example: Fill in the blanks (1 Mark)
- Example: Find angles if two triangles are similar (1 Mark)
- Example: Find x if two triangles are similar (1 Mark)
- Example: Find x if two quadrilaterals are similar (1 Mark)
- Example: Find side using Thales theorem (1 Mark)
- Example: Find side using Thales theorem (1 Mark)
- Example: Find the value of x (2 Marks)
- Example: Find EC from given figure (2 Marks)
- Example: Find a side if two triangles are similar (1 Mark)
- Example: Find the angle (2 Marks)
- Example: Find PB from the given figure (2 Marks)
- Example: Find a side if two triangle's are similar (1 Mark)
- Example: Find side if perimeter of two similar triangles are given (1 Mark)
- Example: Find side if two triangles are similar (1 Mark)
- Example: Find side if two triangles are similar (2 Marks)
- Example: Find side if two triangles are similar (1 Mark)
- Example: Find side if three lines are parallel (1 Mark)
- Example: Find side of quadrilateral if ratio of diagonals are given (2 Marks)
- Example: Find side if two triangles are similar (1 Mark)
- Example: Find 2 segments from the given (2 Marks)
- Example: Find ratio of sides of similar triangles (1 Mark)
- Example: Find height of tower using similarity (1 Mark)
- Example: Find x from figure diagonals of quadrilateral (2 Marks)
- Practice Test
- Practice Test

- Practice Test
- Test Your Skill

### 9.10 Pythagoras Theorem

- Tutorial: Pythagoras Theorem
- Example: Applications of Pythagoras on distance problem (1 Mark)
- Example: Find length of ladder (2 Marks)
- Example: Find width of street (2 Marks)
- Example: Find length of cable to uproot tree (2 Marks)
- Example: Find length of diagonal of square of given side (1 Mark)
- Example: Find 3rd side of a right angled triangle (1 Mark)
- Example: Find length of isosceles right angled triangle whose hypotenuse is given (1 Mark)
- Example: Find distance between two planes using Pythagoras theorem (3 Marks)
- Example: Find distance of foot of ladder from base of the wall (1 Mark)
- Example: Find sides of right angled triangle (1 Mark)
- Example: Find length of side (1 Mark)
- Example: Find hypotenuse (1 Mark)
- Example: Find radius of incircle (1 Mark)
- Example: Find distance between tops of poles (1 Mark)
- Practice Test
- Test Your Skill

### 9.11 Quadrilaterals

- Tutorial: Quadrilaterals
- Tutorial: Type of Quadrilaterals
- Example: Find the number of vertices of a quadrilateral.(1)
- Example: Find the number of vertices of a quadrilateral, when one of the angle is given.(3)
- Example: Find the unknown angle of a quadrilateral, when three angles are given.(2)
- Example: Find the angles of a quadrilateral, when their ratio is given.(3)
- Example: Identify the given figure.(1)
- Example: Find the unknown angles of a parallelogram, when one angle is given.(2)
- Example: Find the unknown sides of a parallelogram, when its perimeter & one side is given.(3)
- Example: Find the unknown angle of a parallelogram.(3)
- Example: Application: Based on parallelogram.(4)
- Example: Find x and y from the given figure.(4)
- Example: Find the angles of a parallelogram, when ratio of its adjacent angles are given.(4)
- Example: Find the perimeter of a parallelogram, when its adjacent sides are given.(3)
- Example: Find the unknown angle of the given square.(2)
- Example: Find the unknown angle of a given rectangle.(2)
- Example: Find the diagonals of a rectangle.(3)
- Example: Find the sides of a rhombus, when its diagonals are given.(3)
- Example: Find the value of x from the given rectangle.(4)

- Practice Test1
- Practice Test2
- Practice Test1
- Practice Test2
- Practice Test3
- Test Your Skill
- Test Your Skill

### 9.12 Construction of Quadrilaterals

- Tutorial: Construction of Quadrilaterals
- Tutorial: Construction of Quadrilaterals when its four sides and one angle are given
- Tutorial: Construction of Quadrilaterals when three sides and two diagonals are given

### 9.13 Polygons

- Tutorial: Polygons
- Tutorial: Sum of the measures of interior and exterior angles of Polygon
- Example: Find the diagonal of a regular hexagon (2)
- Example: Find the number of sides of hexagon (1)
- Example: Find the angle sum of convex polygon when number of sides is given
- Example: Find the angle measure of  $x$  in the given figure
- Example: Find the angle measure of  $x$  in the given figure
- Example: Find the angle measure of  $x$  in the given figure
- Example: Find the angle measure of  $x$  in the given figure
- Example: Find the unknown angles  $x$ ,  $y$  &  $z$  in the given figure
- Example: Find the unknown angles  $x$ ,  $y$  &  $z$  in the given figure
- Example: Find the sides of a regular polygon where its exterior angles are given (1)
- Example: Find all the angles of a polygon having  $n$  sides (2)
- Example: Find  $x$  from given figure (4)
- Example: Find all interior angles of a  $n$  sided polygon (2)
- Example: 1 angle of quadrilateral is given then find remaining three equal angles (3)
- Example: Find sides of a regular polygon when interior angles are given (1)
- Example: Find the angle measure of  $x$  in the given figure
- Example: Find number of sides or regular polygon if exterior angle is  $x/y$  of its interior angle
- Practice Test
- Practice Test
- Test Your Skill
- Test Your Skill

### 9.14 Area of Plane Figures

- Tutorial: Area of Plane Figures
- Example: Find area enclosed by given triangle
- Example: Find height of a right triangle whose area & base are given
- Example: Find altitude drawn from vertex of right angled  $\Delta$  on its hypotenuse

- Example: A square is placed inside rectangle, find area of region inside rectangle that surrounds square
- Example: Find area of region given in figure
- Example: The perimeter & breadth of rectangle are given, find its length & area
- Example: Find breadth of rectangular park if area of square & rectangular park are same
- Example: Base of //gm is twice its ht., if area is given, find base and ht.
- Example: Ht. corresp. to base AB of //gm ABCD is given, find ht. corresp. to base BC
- Example: Perimeter of triangular field & ratio of its sides are given, find its area
- Example: Find length of altitude in given triangle
- Example: Find the area of a triangle, whose sides are given
- Example: Find area of triangle, whose two sides and perimeter are given
- Practice Test1
- Practice Test2
- Practice Test3
- Test Your Skill1
- Test Your Skill2
- Test Your Skill3

### 9.15 Circle and its Properties

- Tutorial: Circle and its Related Terms
- Tutorial: Angle Subtended by a Chord at a Point
- Tutorial: Chords of a Circle and its related theorems
- Tutorial 1: Angles Subtended by an arc of a Circle
- Tutorial 2: Angles Subtended by an arc of a Circle
- Example: Find chord's distance from centre, given its length & radius of circle (1)
- Example: Find chord's length, given its distance from centre & radius of circle (2)
- Example: Find distance between two parallel chords on same side of centre (5)
- Example: Find distance between parallel chords on opposite sides of centre (4)
- Example: Find radius, given length of parallel chords & distance between them (5)
- Example: Find length of chord using similarity (3)
- Example: Find length of common chord given radii of 2 circles & distance b/w centres
- Example: Application: Find distance b/w 2 girls given 3 girls standing on circle with given radius & distance b/w rest of girls
- Application: Find length of string of each phone given 3 boys sitting at equal distance on a circle with given radius
- Example: Find the value of x, in the given figure (1)
- Example: Find value of x (3)
- Example: Find value of x (2)
- Example: Find value of x (3)
- Example: Find value of x (4)
- Example: Find angle given chord | | diameter (5)
- Example: Find angle OPR in figure, given angle PQR where P,Q,R points on circle with centre O (4)

- Example: Find the value of  $x$ , in the given figure (4)
- Example: Find angle  $ADC$  in figure, given angles  $BOC$  &  $AOB$  where  $A, B, C, D$  points on circle with centre
- Example: Find angle  $BDC$  in figure, given angles  $ABC$  &  $ACB$
- Example: Find angle  $BAC$  in figure, given angles  $BEC$  &  $ECD$  where  $A, B, C, D$  points on circle &  $AC, BD$
- Practice Test
- Practice Test
- Practice Test
- Test your Skill
- Test your Skill

### 9.16 Three Dimensional Shapes

- Tutorial: Three Dimensional Shapes
- Tutorial: Nets for building Three Dimensional (3D) shapes
- Example: Find no. of faces, edges & vertices (2)
- Example: Identify the solid which can be formed by the net (2)
- Example: Can the given net be used to make a cube (2)

## 10. Geometry: Symmetry and Transformation

### 10.1 Understanding Symmetry

- Tutorial: Understanding Symmetry
- Example: Identify the line(s) of symmetry in the given figure (1)
- Practice Test1

### 10.2 Number of lines of Symmetry

- Tutorial: Number of lines of Symmetry
- Example: Problems based on lines of Symmetry (2)
- Example: Identify the line of symmetry in the given alphabet
- Practice Test

### 10.3 Reflection and Symmetry

- Tutorial: Reflection and Symmetry

### 10.4 Rotational Symmetry

- Tutorial: Rotational Symmetry
- Example: Application: Based on order of rotational symmetry for the given figure (1)
- Practice Test
- Test your Skill

### 10.5 Reflection

- Tutorial: Reflection
- Example: Reflection in x-axis
- Example: Reflection in y-axis
- Example: Reflection in x-axis & y-axis
- Example: Coordinates of triangle reflected in x-axis
- Example: Find  $a, b$  if reflected point is known
- Practice Test1

- Practice Test2
- Practice Test3
- Test Your Skill

## 10.6 Rotation

- Tutorial: Rotation
- Example: Find point if rotated 90 degree anticlockwise about origin
- Example: Find point if rotated 90 degree clockwise about origin
- Example: Find coordinates of  $\Delta$  if rotated 90 degree anticlockwise about origin
- Practices Test1
- Test Your Skill

## 11. Geometry: Trigonometry

### 11.1 Trigonometric Ratios

- Tutorial: Trigonometric ratios
- Example: Determine all trigonometric ratio if sides are given (2 Marks)
- Example: Determine all trigonometric ratio if sides are given (2 Marks)
- Example: Determine all trigonometric ratio of indicated angle (2 Marks)
- Example: Find  $\theta$  if  $\sin\theta = n \cos\theta$  (1 Mark)
- Example: Find value of trigonometric ratio (1 Mark)
- Example: Evaluate (2 Marks)
- Example: Given a side and sum of other two sides find trigonometric ratios (3 Marks)
- Example: Given  $\sec\theta = a/b$ , find all trigonometric ratio of  $\theta$
- Example: Given  $\operatorname{acot}\theta = b$ , find  $\sin\theta$  and  $\sec\theta$
- Example: If  $\cos\alpha = a/b$ , evaluate the given expression

### 11.2 Trigonometric Ratios of Specific Angles

- Tutorial: Trigonometric ratios of specific angles
- Example: Find sides of triangle if a side and angle are known (1 Mark)
- Example: Find A and B, if  $\sin(A - B)$  and  $\cos(A - B)$  are known (2 Marks)
- Example: Find value of expression (1 Mark)
- Example: Find value of  $\theta$ , given equation in  $\tan\theta$  (1 Mark)
- Example: Find value of  $\theta$ , given equation in  $\tan\theta$  (2 Marks)
- Example: Find value of  $\theta$ , given equation in  $\cos\theta$  (2 Marks)
- Example: Find angles if sides are known (2 Marks)
- Example: Find value of expression (1 Mark)
- Example: Find value of  $\theta$ , given equation in sine (2 Marks)
- Example: Given a side and an angle find the length of other side (1 Mark)
- Example: Find value of trigonometric ratio if  $\theta$  is given (1 Mark)
- Example: Find value of 'A' from an equation in trigonometric ratios (1 mark)
- Example: Given a side and an angle find the length of other side (1 Mark)
- Example: Find side of a triangle inscribed in a circle of given radius (3 Marks)
- Example: Find length of diagonal of rhombus of given side (3 Marks)

- Example: If  $\sin A = a/b$ , find the value of  $\sec 2A$
- Practice Test

### 11.3 Trigonometric Identities

- Tutorial 1: Trigonometric Identities
- Tutorial 2: Some Use Full Results Derived from Trigonometric Identities
- Example: Evaluate expression using trigonometric identities (2 Marks)
- Example: Write expression as integer (1 Mark)
- Example: Write expression as integer (2 Marks)
- Example: Simplify expression (1 Mark)
- Example: Simplify expression (2 Marks)
- Example: Simplify expression (2 Marks)
- Example: Simplify expression (2 Marks)
- Example: Write expression in terms of  $\sin x$  (2 Marks)
- Example: Simplify expression (1 Mark)
- Example: Simplify expression in term of  $\cos \theta$  (2 Marks)
- Example: Simplify expression (2 Marks)
- Example: Simplify expression (2 Marks)
- Example: If  $m$  and  $n$  are two trigonometric expressions, find value of  $\sin mn$  (1 Mark)
- Example: Find value of  $\theta$  from trigonometric expression (1 Mark)
- Example: Express a trigonometric ratio in terms of other (1 Mark)
- Example: Evaluate an expression (1 Mark)
- Example: Find value of 'k' from a trigonometric expression (1 Mark)
- Example: Find value of an expression (1 Mark)
- Example: Evaluate trigonometric expression (1 Mark)
- Example: Find the value of trigonometric expression from given (2 Marks)
- Example: If  $\sin \theta + (\sin^2) \theta = 1$ , find  $(\cos^2) \theta + (\cos^4) \theta$  (1 Mark)
- Example: Simplify expression (2 Marks)
- Example: Simplify expression (3 Marks)
- Practice Test
- Test Your Skill

### 11.4 Trigonometric Ratios of Complementary Angles

- Tutorial: Trigonometric ratios of complementary angles
- Example: Find value of trigonometric ratio (1 Mark)
- Example: Find  $\theta$  given  $\tan n\theta = \cot m\theta$  (2 Marks)
- Example: Evaluate expression (2 Mark)
- Example: Evaluate expression (1 Mark)
- Example: Evaluate expression (1 Mark)
- Example: Evaluate expression (1 Mark)
- Example: Evaluate expression in  $\tan$  (2 Marks)
- Example: Evaluate expression (1 Mark)

- Example: Find  $\theta$  from given equation (3 Marks)
- Example: Find the value without using trigonometric table (2 Marks)
- Example: Find value of complementary trigonometric ratio (1 Mark)
- Example: Find value of expression using complementary angles (1 Mark)
- Example: Find value of expression using complementary angles (1 Mark)
- Example: Find value of trigonometric ratio (1 Mark)
- Example: Find  $a + b$  if  $\cos a = \sin b$  (1 Mark)
- Example: Find value of 'k' from trigonometric expression (1 Mark)
- Example: Express trigonometric ratio in terms of third angle of a triangle (2 Marks)
- Example: Write given expression in terms of angles between 0 and 45 degrees (1 Mark)
- Practice Test
- Test Your Skill

### 11.5 Heights and Distances

- Tutorial: Heights and distances
- Example: Distance of ship from lighthouse (6 Marks)
- Example: Distance between cars on opposite sides of tower given angles of depression (6 Marks)
- Example: Find height of tree and width of road (6 Marks)
- Example: Find angle of elevation (1 Mark)
- Example: Find vertical distance between 2 airplanes (6 Marks)
- Example: Given angles of depression and distance between 2 ships, find height of light house (6 Marks)
- Example: Find height of tower given angles of elevation which are complementary (6 Marks)
- Example: Find speed of airplane (6 Marks)
- Example: Find height of building (1 Mark)
- Example: Find distance of boat from a point on surface (1 Mark)
- Example: Find height of tower (2 Marks)
- Example: Find height of pole (1 Mark)
- Example: Determine height of billboard (3 Marks)
- Example: Find angle of elevation of a tower (1 Mark)
- Example: Find height of tower (1 Mark)
- Example: Find height of building if observed from tower (6 Marks)
- Example: Find width of river as observed from helicopter (6 Marks)
- Example: Find height of tower (Observer height is given) (6 Marks)
- Example: Find height of pedestal on which a statue is placed (6 Marks)
- Example: Find height of pillar as seen from other pillar (6 Marks)
- Example: Find height of tower from top of a building (6 Marks)
- Example: Find height of the tree
- Example: Find distance between 2 ships as seen from an airplane (6 Marks)
- Example: Find height of poles on either side of road & distance from point of observation (6 Marks)
- Example: Find height of tower
- Example: Find the distance traveled by the balloon during the interval

- Example: Find the length of the slide
- Example: Find the length of the string
- Practice Test
- Test Your Skill

## 12. Geometry II

### 12.1 Angles Subtended by an arc of a Circle

- Tutorial 1: Angles Subtended by an arc of a Circle
- Tutorial 2: Angles Subtended by an arc of a Circle
- Example: Find the value of  $x$ , in the given figure (1)
- Example: Find value of  $x$  (3)
- Example: Find value of  $x$  (2)
- Example: Find value of  $x$  (3)
- Example: Find value of  $x$  (4)
- Example: Find angle given chord | diameter (5)
- Example: Find angle OPR in figure, given angle PQR where P,Q,R points on circle with centre O (4)
- Example: Find the value of  $x$ , in the given figure (4)
- Example: Find angle ADC in figure, given angles BOC & AOB where A, B, C, D points on circle with centre
- Example: Find angle BDC in figure, given angles ABC & ACB
- Example: Find angle BAC in figure, given angles BEC & ECD where A, B, C, D points on circle & AC, BD
- Practice Test
- Test your Skill

### 12.2 Cyclic Quadrilaterals

- Tutorial 1 : Cyclic Quadrilaterals
- Tutorial 2 : Cyclic Quadrilaterals
- Example: Find measure of angles of cyclic quadrilateral ABCD, given its angles in terms of  $x$  &  $y$  (1)
- Example: Find angle in cyclic quadrilateral whose diagonals intersect (2)
- Example: Find angle in cyclic quadrilateral ABCD with AB diameter of circle (4)
- Example: Find  $x$  &  $y$  in the figure, two intersecting circles (3)
- Example: Find angles subtended by some chord & cyclic quadrilateral property (5)
- Practice Test
- Test your Skill

### 12.3 Tangent to a Circle

- Tutorial: Tangent to a Circle
- Example: Find radius if distance of point from centre & length of tangent are known (1).
- Example: Given angle made by chord with tangent, find  $x$  (3)
- Example: If radii of concentric circles are known, find length of chord which touches inner circle (4)
- Example: Find angle between the tangents if central angle is known (2)
- Example: Find angle between radius and tangent (1)
- Example: Given length of tangent PB & radius, find length of PA passing through O (3)
- Example: Find  $x + y$  from given figure (2)

- Example: Find distance of external point from centre (3)
- Example: Find value of angle from given figure (2)
- Example: Find length of chord if angle between tangents is known (5)
- Practice Test
- Test Your Skill

#### 12.4 Number of Tangents to a Circle

- Tutorial: Number of Tangents to a Circle
- Example: Find angle between tangents (1)
- Example: Find length of tangent (1)
- Example: Find length of line segments if a circle is inscribed in a triangle (3)
- Example: Find radius of a circle inscribed in a triangle (4)
- Example: Find radius of a circle inscribed in a quadrilateral (5)
- Example: Find length of a pendulum (3)
- Example: Find length of a tangent (4)
- Example: Find perimeter of a triangle formed by tangents to a circle (4)
- Example: Find length of a side of a quadrilateral which circumscribes a circle (4)
- Example: Given radius of 2 concentric circles, find length of a tangent to inner circle (3)
- Example: Find side of a quadrilateral circumscribing a circle (4)
- Example: Find angle between the tangents (3)
- Example: Find distance btw point of contacts of common tangent to two circles (2)
- Example: Find length of tangent (1)
- Example: Find length of side of triangle circumscribing a circle (3)
- Example: Find perimeter of a triangle formed by tangents to a circle (3)
- Practice Test
- Test Your Skill

#### 12.5 Intersecting Chords and Tangents

- Tutorial: Intersecting Chords and Tangents
- Example: Find length of line segment formed by intersecting chords (2)
- Example: Find length of line segment formed by intersecting chords (2)
- Example: Find length of line segment formed by intersecting chords (2)
- Example: Given length of tangent, find length of chord which is a part of a secant (3)
- Example: Find unknown length from given figure(a tangent and a secant) (2)
- Example: Find measure of angles from given figure (3)
- Practice Test
- Test Your Skill

### 13. Vector and Matrices

#### 13.1 The Position Vector

- Tutorial: The Position Vector

#### 13.2 The Representations of a Position Vector

- Tutorial: The Representations of a Position Vector

### 13.3 The Magnitude (Norm) of a Vector

- Tutorial: The Magnitude (Norm) of a Vector
- Example1: Find the magnitude of the given vector in component form
- Example2: Find the magnitude of the given vector in vector form

### 13.4 Vectors with Magnitude and Inclination

- Tutorial: Vectors with Magnitude and Inclination
- Example1: Given the magnitude and inclination of a vector, find the vector

### 13.5 Multiplication by a Scalar

- Tutorial: Multiplication by a Scalar
- Example1: Given vectors  $u$ ,  $v$  find  $au + bv$

### 13.6 Vectors with Initial Points not at the Origin

- Tutorial: Vectors with Initial Points not at the Origin
- Example: Given points  $P$ ,  $Q$ ; write the vector  $PQ$  in numeric form

### 13.7 The Unit Vector

- Tutorial: The Unit Vector
- Example: Find the unit vector in the same direction as a given vector
- Example: Find a unit vector parallel to a given vector
- Example: Find the resultant force acting on the object

### 13.8 Introduction to Matrices

- Tutorial: Introduction to matrices
- Example: Find possible orders of a matrix with  $n$  elements
- Example: Construct  $(2 \times 3)$  matrix when  $a_{ij}$  is defined for no. of rows or columns
- Example: Construct  $(2 \times 3)$  matrix when  $a_{ij}$  is defined for no. of rows or columns
- Example: Construct  $(2 \times 2)$  matrix when  $a_{ij}$  is defined for no. of rows or columns
- Example: Construct  $(3 \times 2)$  matrix when  $a_{ij}$  is defined for no. of rows or columns
- Example: Construct  $(3 \times 2)$  matrix when  $a_{ij}$  is defined for no. of rows or columns

### 13.9 Types of Matrices

- Tutorial: Types of matrices
- Example: Find values of  $x$  and  $y$  for which the two matrices are equal
- Example: Find values of  $x$  and  $y$  for two equal matrices
- Example: Find values of  $x$  and  $y$  for two equal matrices
- Example: Find values of  $x$  and  $y$  for two equal matrices
- Example: Find values of  $x$  and  $y$  for two equal matrices
- Example: Find the values of  $x$  and  $y$  from  $(2 \times 2)$  two equal matrices
- Example: Find the values of  $x$  and  $y$  from  $(3 \times 3)$  two equal matrices

### 13.10 Addition of Matrices

- Tutorial: Addition of matrices
- Example: Find the sum of  $2 \times 2$  matrices
- Example: Find  $C$  if  $A + B - C = 0$
- Example: Find the sum of three matrices

### 13.11 Multiplication of a Matrix by a Scalar

- Tutorial: Multiplication of a matrix by a scalar
- Example: Multiply a matrix by constant
- Example: Find a matrix from a given sum
- Example: Find sum of two matrices
- Example: Find the values of the unknown from matrices
- Example: Solve (2x2) matrix equation
- Example: Solve (2x3) matrix equation
- Example: Find C, if  $A + B + C = 0$
- Example: Find the sum of two matrices
- Example: Find matrix A from  $2A - 3B + 5C = 0$
- Example: Find two matrices if  $X + 2Y$  and  $X + Y$  are given
- Example: Find  $a_{ij}$  in a matrix equation

### 13.12 Minors and Co-Factors

- Tutorial 1: Determinant
- Example: Find co-factors of (2x2) determinant
- Example: Find co-factors of (3x3) determinant

### 13.13 Properties of Determinants

- Tutorial: Properties of determinants
- Example: Find the value of given determinant
- Example: Find the value of given determinant without expanding
- Example: Find the value of given determinant using properties of determinants
- Example: Express determinant as product of linear factor & square of linear factor
- Example: Find the value of x
- Example: Find the value of xyz

### 13.14 Adjoint and Inverse of a Square Matrix

- Tutorial: Adjoint and inverse of a square matrix
- Example: Find adj A, given matrix A
- Example: Find inverse of A, given matrix A
- Example: Find inverse of A from the given

### 13.15 Matrix Multiplication

- Tutorial: Matrix multiplication
- Example: Find the values of x and y from a matrix equation
- Example: Find the value of k from the given matrix equation
- Example: Find  $f(A)$  for the given function
- Example: Find the values of a and b from the given matrix equation
- Example: Show  $f(A) = 0$  and evaluate  $A^4$  matrix
- Example: Operations on matrices
- Example: Find the values x and y from the matrix equation
- Example: Find the value of x and y from a matrix equation

- Example: Evaluate  $(A^2) - 7A - 2I$  for matrix A
- Example: Find alpha, if  $(A^2) = B$
- Example: Find x from given equation
- Example: Find x and y from  $(A^2) + xI = yA$
- Example: Find product of two matrices A and B
- Example: Find x and y from  $(A^2) + xI = yA$

### **13.16 Applications of Determinants and Matrices**

- Tutorial: Applications of determinants and matrices
- Example: Solve the system of equations using matrix method
- Example: Examine consistency of given system of equations