

# CONTENTS

CHAPTER	TITLE	PAGE No.	MONTH
<b>1</b>	<b>Relations and Functions</b>	<b>1-35</b>	
1.1	Introduction	1	June
1.2	Ordered Pair	2	
1.3	Cartesian Product	2	
1.4	Relations	6	
1.5	Functions	10	
1.6	Representation of Functions	15	
1.7	Types of Functions	17	
1.8	Special Cases of Functions	22	
1.9	Composition of Functions	26	
1.10	Identifying the Graphs of Linear, Quadratic, Cubic and Reciprocal Functions	29	
<b>2</b>	<b>Numbers and Sequences</b>	<b>36-84</b>	
2.1	Introduction	37	June
2.2	Euclid's Division Lemma	37	
2.3	Euclid's Division Algorithm	39	
2.4	Fundamental Theorem of Arithmetic	43	
2.5	Modular Arithmetic	46	
2.6	Sequences	52	
2.7	Arithmetic Progression	55	July
2.8	Series	62	
2.9	Geometric Progression	67	
2.10	Sum to $n$ terms of a Geometric Progression	73	
2.11	Special Series	76	
<b>3</b>	<b>Algebra</b>	<b>85-160</b>	
3.1	Introduction	85	July
3.2	Simultaneous Linear Equations in Three Variables	87	
3.3	GCD and LCM of Polynomials	93	
3.4	Rational Expressions	98	August
3.5	Square Root of Polynomials	103	
3.6	Quadratic Equations	106	
3.7	Graph of Variations	123	September
3.8	Quadratic Graphs	130	October
3.9	Matrices	137	



<b>4</b>	<b>Geometry</b>	<b>161-202</b>	
4.1	Introduction	161	July
4.2	Similarity	162	
4.3	Thales Theorem and Angle Bisector Theorem	171	August
4.4	Pythagoras Theorem	183	October
4.5	Circles and Tangents	188	
4.6	Concurrency Theorems	195	
<b>5</b>	<b>Coordinate Geometry</b>	<b>203-238</b>	
5.1	Introduction	203	August
5.2	Area of a Triangle	205	
5.3	Area of a Quadrilateral	207	
5.4	Inclination of a Line	212	
5.5	Straight Line	221	
5.6	General Form of a Straight Line	230	
<b>6</b>	<b>Trigonometry</b>	<b>239-268</b>	
6.1	Introduction	239	September
6.2	Trigonometric Identities	242	November
6.3	Heights and Distances	250	
<b>7</b>	<b>Mensuration</b>	<b>269-300</b>	
7.1	Introduction	269	November
7.2	Surface Area	270	
7.3	Volume	282	
7.4	Volume and Surface Area of Combined Solids	290	
7.5	Conversion of Solids from one Shape to another with no change in Volume	295	
<b>8</b>	<b>Statistics and Probability</b>	<b>301-334</b>	
8.1	Introduction	301	December
8.2	Measures of Dispersion	303	
8.3	Coefficient of Variation	314	
8.4	Probability	316	
8.5	Algebra of Events	324	
8.6	Addition Theorem of Probability	326	
	<b>Answers</b>	<b>335-343</b>	
	<b>Mathematical Terms</b>	<b>344-345</b>	



E-book



Evaluation



DIGI Links





5. Find the domain of the function  $f(x) = \sqrt{1 + \sqrt{1 - \sqrt{1 - x^2}}}$
6. If  $f(x) = x^2$ ,  $g(x) = 3x$  and  $h(x) = x - 2$ , Prove that  $(f \circ g) \circ h = f \circ (g \circ h)$ .
7. Let  $A = \{1, 2\}$  and  $B = \{1, 2, 3, 4\}$ ,  $C = \{5, 6\}$  and  $D = \{5, 6, 7, 8\}$ . Verify whether  $A \times C$  is a subset of  $B \times D$ ?
8. If  $f(x) = \frac{x-1}{x+1}$ ,  $x \neq -1$  show that  $f(f(x)) = -\frac{1}{x}$ , provided  $x \neq 0$ .
9. The functions  $f$  and  $g$  are defined by  $f(x) = 6x + 8$ ;  $g(x) = \frac{x-2}{3}$
- (i) Calculate the value of  $gg\left(\frac{1}{2}\right)$
- (ii) Write an expression for  $gf(x)$  in its simplest form.
10. Write the domain of the following real functions
- (i)  $f(x) = \frac{2x+1}{x-9}$  (ii)  $p(x) = \frac{-5}{4x^2+1}$  (iii)  $g(x) = \sqrt{x-2}$  (iv)  $h(x) = x + 6$

### Points to Remember



- The Cartesian Product of  $A$  with  $B$  is defined as  $A \times B = \{(a, b) \mid \text{for all } a \in A, b \in B\}$
- A relation  $R$  from  $A$  to  $B$  is always a subset of  $A \times B$ . That is  $R \subseteq A \times B$
- A relation  $R$  from  $X$  to  $Y$  is a function if for every  $x \in X$  there exists only one  $y \in Y$ .
- A function can be represented by
  - (i) an arrow diagram
  - (ii) a tabular form
  - (iii) a set of ordered pairs
  - (iv) a graphical form
- Some types of functions
  - (i) One-one function
  - (ii) Onto function
  - (iii) Many-one function
  - (iv) Into function
- Identity function  $f(x) = x$
- Reciprocal function  $f(x) = \frac{1}{x}$



- Constant function  $f(x) = c$
- Linear function  $f(x) = ax + b$ ,  $a \neq 0$
- Quadratic function  $f(x) = ax^2 + bx + c$ ,  $a \neq 0$
- Cubic function  $f(x) = ax^3 + bx^2 + cx + d$ ,  $a \neq 0$
- For three non-empty sets  $A$ ,  $B$  and  $C$ , if  $f: A \rightarrow B$  and  $g: B \rightarrow C$  are two functions, then the composition of  $f$  and  $g$  is a function  $g \circ f: A \rightarrow C$  will be defined as  $g \circ f(x) = g(f(x))$  for all  $x \in A$ .
- If  $f$  and  $g$  are any two functions, then in general,  $f \circ g \neq g \circ f$
- If  $f$ ,  $g$  and  $h$  are any three functions, then  $f \circ (g \circ h) = (f \circ g) \circ h$

## ICT CORNER

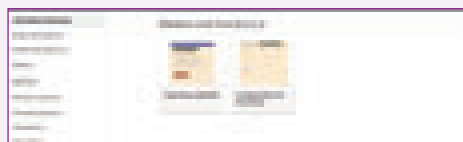


### ICT 1.1

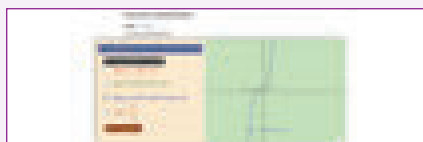
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “**Relations and Functions–X**” will open. In the left side of the work book there are many activity related to Relations and Functions chapter. Select the work sheet “**Functions Identification**”

**Step 2:** In the given worksheet click on the check boxes corresponding to each function on left hand side. You can see the graph of respective function on Right hand side. Analyse each graph and then click “**New Functions**” and continue till you understand.

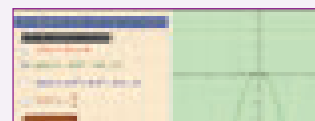
Step 1



Step 2



Expected results

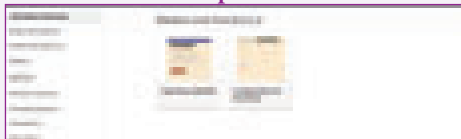


### ICT 1.2

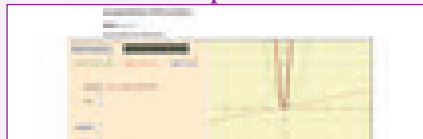
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “**Relations and Functions–X**” will open. In the left side of the work book there are many activity related to Relations and Functions chapter. Select the work sheet “**Composition of Functions**”

**Step 2:** In the given worksheet click on the check boxes corresponding to each function on left hand side. You can see the graph of respective function on Right hand side. Analyse each graph and then click “**New Functions**” and continue till you understand.

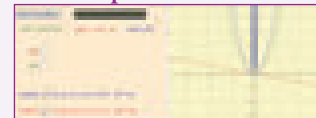
Step 1



Step 2



Expected results



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/356191>  
or Scan the QR Code.





13. The next term of the sequence  $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$  is  
(A)  $\frac{1}{24}$  (B)  $\frac{1}{27}$  (C)  $\frac{2}{3}$  (D)  $\frac{1}{81}$
14. If the sequence  $t_1, t_2, t_3, \dots$  are in A.P. then the sequence  $t_6, t_{12}, t_{18}, \dots$  is  
(A) a Geometric Progression (B) an Arithmetic Progression  
(C) neither an Arithmetic Progression nor a Geometric Progression  
(D) a constant sequence
15. The value of  $(1^3 + 2^3 + 3^3 + \dots + 15^3) - (1 + 2 + 3 + \dots + 15)$  is  
(A) 14400 (B) 14200 (C) 14280 (D) 14520

### Unit Exercise - 2



1. Prove that  $n^2 - n$  divisible by 2 for every positive integer  $n$ .
2. A milk man has 175 litres of cow's milk and 105 litres of buffalow's milk. He wishes to sell the milk by filling the two types of milk in cans of equal capacity. Calculate the following (i) Capacity of a can (ii) Number of cans of cow's milk (iii) Number of cans of buffalow's milk.
3. When the positive integers  $a, b$  and  $c$  are divided by 13 the respective remainders are 9, 7 and 10. Find the remainder when  $a + 2b + 3c$  is divided by 13.
4. Show that 107 is of the form  $4q + 3$  for any integer  $q$ .
5. If  $(m + 1)^{\text{th}}$  term of an A.P. is twice the  $(n + 1)^{\text{th}}$  term, then prove that  $(3m + 1)^{\text{th}}$  term is twice the  $(m + n + 1)^{\text{th}}$  term.
6. Find the 12<sup>th</sup> term from the last term of the A. P  $-2, -4, -6, \dots -100$ .
7. Two A.P.'s have the same common difference. The first term of one A.P. is 2 and that of the other is 7. Show that the difference between their 10<sup>th</sup> terms is the same as the difference between their 21<sup>st</sup> terms, which is the same as the difference between any two corresponding terms.
8. A man saved ₹16500 in ten years. In each year after the first he saved ₹100 more than he did in the preceding year. How much did he save in the first year?
9. Find the G.P. in which the 2<sup>nd</sup> term is  $\sqrt{6}$  and the 6<sup>th</sup> term is  $9\sqrt{6}$ .
10. The value of a motor cycle depreciates at the rate of 15% per year. What will be the value of the motor cycle 3 year hence, which is now purchased for ₹ 45,000?

### Points to Remember



- **Euclid's division lemma**

If  $a$  and  $b$  are two positive integers then there exist unique integers  $q$  and  $r$  such that  $a = bq + r$ ,  $0 \leq r < |b|$

- **Fundamental theorem of arithmetic**

Every composite number can be expressed as a product of primes and this factorization is unique except for the order in which the prime factors occur.



### ● Arithmetic Progression

- (i) Arithmetic Progression is  $a, a + d, a + 2d, a + 3d, \dots$ .  $n^{\text{th}}$  term is given by  $t_n = a + (n - 1)d$
- (ii) Sum to first  $n$  terms of an A.P. is  $S_n = \frac{n}{2}[2a + (n - 1)d]$
- (iii) If the last term  $l$  ( $n^{\text{th}}$  term) is given, then  $S_n = \frac{n}{2}[a + l]$

### ● Geometric Progression

- (i) Geometric Progression is  $a, ar, ar^2, \dots, ar^{n-1}$ .  $n^{\text{th}}$  term is given by  $t_n = ar^{n-1}$
- (ii) Sum to first  $n$  terms of an G.P. is  $S_n = \frac{a(r^n - 1)}{r - 1}$  if  $r \neq 1$
- (iii) Suppose  $r = 1$  then  $S_n = na$
- (iv) Sum to infinite terms of a G.P.  $a + ar + ar^2 + \dots$  is  $S_\infty = \frac{a}{1 - r}$ , where  $-1 < r < 1$

### ● Special Series

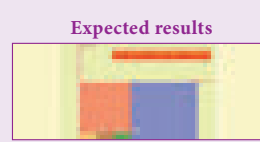
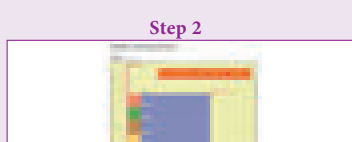
- (i) The sum of first  $n$  natural numbers  $1 + 2 + 3 + \dots + n = \frac{n(n + 1)}{2}$
- (ii) The sum of squares of first  $n$  natural numbers  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n + 1)(2n + 1)}{6}$
- (iii) The sum of cubes of first  $n$  natural numbers  $1^3 + 2^3 + 3^3 + \dots + n^3 = \left[ \frac{n(n + 1)}{2} \right]^2$
- (iv) The sum of first  $n$  odd natural numbers  $1 + 3 + 5 + \dots + (2n - 1) = n^2$

## ICT CORNER

### ICT 2.1

**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “Numbers and Sequences” will open. In the left side of the work book there are many activity related to mensuration chapter. Select the work sheet “Euclid’s Lemma division”

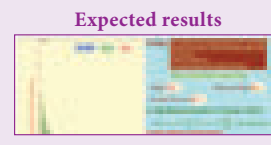
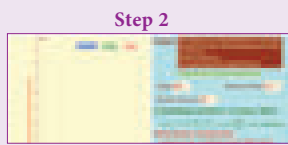
**Step 2:** In the given worksheet Drag the point mentioned as “Drag Me” to get new set of points. Now compare the Division algorithm you learned from textbook.



### ICT 2.2

**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “Numbers and Sequences” will open. In the left side of the work book there are many activity related to mensuration chapter. Select the work sheet “Bouncing Ball Problem”.

**Step 2:** In the given worksheet you can change the height, Number of bounces and debounce ratio by typing new value. Then click “Get Ball”, and then click “Drop”. The ball bounces as per your value entered. Observe the working given on right hand side to learn the sum of sequence.



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/356192>  
or Scan the QR Code.





April sale in ₹

	rice	wheat	ragi	
$A =$	500	1000	1500	Thilagan
	2500	1500	500	Kausigan

and the May month sale (in ₹) is exactly twice as that of the April month sale for each variety.

- (i) What is the average sales of the months April and May.
- (ii) If the sales continues to increase in the same way in the successive months, what will be sales in the month of August?
18. If  $\cos \theta \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} + \sin \theta \begin{pmatrix} x & -\cos \theta \\ \cos \theta & x \end{pmatrix} = I_2$ , find  $x$ .
19. Given  $A = \begin{pmatrix} p & 0 \\ 0 & 2 \end{pmatrix}$ ,  $B = \begin{pmatrix} 0 & -q \\ 1 & 0 \end{pmatrix}$ ,  $C = \begin{pmatrix} 2 & -2 \\ 2 & 2 \end{pmatrix}$  and if  $BA = C^2$ , find  $p$  and  $q$ .
20.  $A = \begin{pmatrix} 3 & 0 \\ 4 & 5 \end{pmatrix}$ ,  $B = \begin{pmatrix} 6 & 3 \\ 8 & 5 \end{pmatrix}$ ,  $C = \begin{pmatrix} 3 & 6 \\ 1 & 1 \end{pmatrix}$  find the matrix  $D$ , such that  $CD - AB = 0$

### Points to Remember



- A system of linear equations in three variables will be according to one of the following cases.  
(i) Unique solution (ii) Infinitely many solutions (iii) No solution
- The least common multiple of two or more algebraic expressions is the expression of lowest degree (or power) such that the expressions exactly divides it.
- A polynomial of degree two in variable  $x$  is called a quadratic polynomial in  $x$ . Every quadratic polynomial can have atmost two zeroes. Also the zeroes of a quadratic polynomial intersects the  $x$ -axis.
- The roots of the quadratic equation  $ax^2 + bx + c = 0$ , ( $a \neq 0$ ) are given by  $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .
- For a quadratic equation  $ax^2 + bx + c = 0$ ,  $a \neq 0$   
Sum of the roots  $\alpha + \beta = \frac{-b}{a} = \frac{-\text{Co-efficient of } x}{\text{Co-efficient of } x^2}$   
Product of the roots  $\alpha\beta = \frac{c}{a} = \frac{\text{Constant term}}{\text{Co-efficient of } x^2}$
- If the roots of a quadratic equation are  $\alpha$  and  $\beta$ , then the equation is given by  $x^2 - (\alpha + \beta)x + \alpha\beta = 0$ .





- The value of the discriminant ( $\Delta = b^2 - 4ac$ ) decides the nature of roots as follows
  - (i) When  $\Delta > 0$ , the roots are real and unequal.
  - (ii) When  $\Delta = 0$ , the roots are real and equal.
  - (iii) When  $\Delta < 0$ , there are no real roots.

- Solving quadratic equation graphically.

- A matrix is a rectangular array of elements arranged in rows and columns.

- Order of a matrix

If a matrix  $A$  has  $m$  number of rows and  $n$  number of columns, then the order of the matrix  $A$  is (Number of rows)  $\times$  (Number of columns) that is,  $m \times n$ . We read  $m \times n$  as  $m$  cross  $n$  or  $m$  by  $n$ . It may be noted that  $m \times n$  is not a product of  $m$  and  $n$ .

- Types of matrices

- (i) A matrix is said to be a **row matrix** if it has only one row and any number of columns. A **row matrix** is also called as a **row vector**.
- (ii) A matrix is said to be a **column matrix** if it has only one column and any number of rows. It is also called as a **column vector**.
- (iii) A matrix in which the **number of rows** is **equal to** the **number of columns** is called a **square matrix**.
- (iv) A matrix is said to be a **zero matrix** or **null matrix** if all its elements are zero.
- (v) If  $A$  is a matrix, the matrix obtained by interchanging the rows and columns of  $A$  is called its transpose and is denoted by  $A^T$ .
- (vi) A square matrix, all of whose elements, except those in the leading diagonal are zero is called a **diagonal matrix**.
- (vii) A diagonal matrix in which all the leading diagonal elements are same is called a **scalar matrix**.
- (viii) A square matrix in which elements in the leading diagonal are all "1" and rest are all zero is called an **identity matrix** (or) **unit matrix**.
- (ix) A square matrix in which all the entries above the leading diagonal are zero is called a **lower triangular matrix**.  
If all the entries below the leading diagonal are zero, then it is called an **upper triangular matrix**.
- (x) Two matrices  $A$  and  $B$  are said to be equal if and only if they have the same order and each element of matrix  $A$  is equal to the corresponding element of matrix  $B$ . That is,  $a_{ij} = b_{ij}$  for all  $i, j$ .





- The negative of a matrix  $A_{m \times n}$  denoted by  $-A_{m \times n}$  is the matrix formed by replacing each element in the matrix  $A_{m \times n}$  with its additive inverse.

- **Addition and subtraction of matrices**

Two matrices can be added or subtracted if they have the same order. To add or subtract two matrices, simply add or subtract the corresponding elements.

- **Multiplication of matrix by a scalar**

We can multiply the elements of the given matrix  $A$  by a non-zero number  $k$  to obtain a new matrix  $kA$  whose elements are multiplied by  $k$ . The matrix  $kA$  is called scalar multiplication of  $A$ .

Thus if  $A = (a_{ij})_{m \times n}$  then ,  $kA = (ka_{ij})_{m \times n}$  for all  $i = 1, 2, \dots, m$  and for all  $j = 1, 2, \dots, n$ .

## ICT CORNER

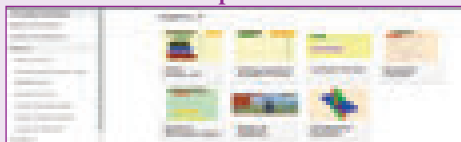


### ICT 3.1

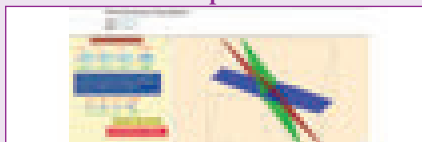
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. Chapter named “Algebra” will open. Select the work sheet “Simultaneous equations”

**Step 2:** In the given worksheet you can see three linear equations and you can change the equations by typing new values for a, b and c for each equation. You can move the 3-D graph to observe. Observe the nature of solutions by changing the equations.

Step 1



Step 2



Expected results

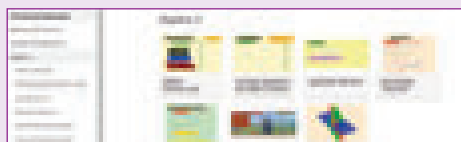


### ICT 3.2

**Step - 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “ALGEBRA” will open. Click on the worksheet named “Nature of Quadratic Equation”.

**Step - 2:** In the given worksheet you can change the co-efficient by moving the sliders given. Click on “New position” and move the sliders to fix the boundary for throwing the shell. Then click on “Get Ball” and click “fire” to hit the target. Here you can learn what happen to the curve when each co-efficient is changed.

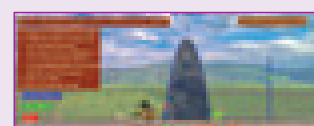
Step 1



Step 2



Expected results



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/356193>  
or Scan the QR Code.





6.  $D$  is the mid point of side  $BC$  and  $AE \perp BC$ . If  $BC = a$ ,  $AC = b$ ,  $AB = c$ ,  $ED = x$ ,  $AD = p$  and  $AE = h$ , prove that
- (i)  $b^2 = p^2 + ax + \frac{a^2}{4}$       (ii)  $c^2 = p^2 - ax + \frac{a^2}{4}$       (iii)  $b^2 + c^2 = 2p^2 + \frac{a^2}{2}$
7. A man whose eye-level is 2 m above the ground wishes to find the height of a tree. He places a mirror horizontally on the ground 20 m from the tree and finds that if he stands at a point  $C$  which is 4 m from the mirror  $B$ , he can see the reflection of the top of the tree. How height is the tree?
8. An Emu which is 8 feet tall is standing at the foot of a pillar which is 30 feet high. It walks away from the pillar. The shadow of the Emu falls beyond Emu. What is the relation between the length of the shadow and the distance from the Emu to the pillar?
9. Two circles intersect at  $A$  and  $B$ . From a point  $P$  on one of the circles lines  $PAC$  and  $PBD$  are drawn intersecting the second circle at  $C$  and  $D$ . Prove that  $CD$  is parallel to the tangent at  $P$ .
10. Let  $ABC$  be a triangle and  $D, E, F$  are points on the respective sides  $AB, BC, AC$  (or their extensions). Let  $AD : DB = 5 : 3$ ,  $BE : EC = 3 : 2$  and  $AC = 21$ . Find the length of the line segment  $CF$ .

### Points to Remember



- Two triangles are similar if
  - (i) their corresponding angles are equal
  - (ii) their corresponding sides are in the same ratio or proportional.
- Any congruent triangles are similar but the converse is not true
- $AA$  similarity criterion is same as the  $AAA$  similarity criterion.
- If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in the same ratio then the triangles are similar. (SAS)
- If three sides of a triangle are proportional to the corresponding sides of another triangle, then the two triangles are similar (SSS)
- If two triangles are similar then the ratio of the corresponding sides is equal to the ratio of the corresponding perimeters.
- The ratio of the area of two similar triangles are equal to the ratio of the squares of their corresponding sides.
- A tangent to a circle will be perpendicular to the radius at the point of contact.
- Two tangents can be drawn from any exterior point of a circle.
- The lengths of the two tangents drawn from an exterior point to a circle are equal.
- Two direct common tangents drawn to two circles are equal in length.



### Unit Exercise - 5



1. PQRS is a rectangle formed by joining the points  $P(-1, -1)$ ,  $Q(-1, 4)$ ,  $R(5, 4)$  and  $S(5, -1)$ .  $A$ ,  $B$ ,  $C$  and  $D$  are the mid-points of  $PQ$ ,  $QR$ ,  $RS$  and  $SP$  respectively. Is the quadrilateral  $ABCD$  a square, a rectangle or a rhombus? Justify your answer.
2. The area of a triangle is 5 sq.units. Two of its vertices are  $(2, 1)$  and  $(3, -2)$ . The third vertex is  $(x, y)$  where  $y = x + 3$ . Find the coordinates of the third vertex.
3. Find the area of a triangle formed by the lines  $3x + y - 2 = 0$ ,  $5x + 2y - 3 = 0$  and  $2x - y - 3 = 0$
4. If vertices of a quadrilateral are at  $A(-5, 7)$ ,  $B(-4, k)$ ,  $C(-1, -6)$  and  $D(4, 5)$  and its area is 72 sq.units. Find the value of  $k$ .
5. Without using distance formula, show that the points  $(-2, -1)$ ,  $(4, 0)$ ,  $(3, 3)$  and  $(-3, 2)$  are vertices of a parallelogram.
6. Find the equations of the lines, whose sum and product of intercepts are 1 and  $-6$  respectively.
7. The owner of a milk store finds that, he can sell 980 litres of milk each week at ₹14/litre and 1220 litres of milk each week at ₹16/litre. Assuming a linear relationship between selling price and demand, how many litres could he sell weekly at ₹17/litre?
8. Find the image of the point  $(3, 8)$  with respect to the line  $x + 3y = 7$  assuming the line to be a plane mirror.
9. Find the equation of a line passing through the point of intersection of the lines  $4x + 7y - 3 = 0$  and  $2x - 3y + 1 = 0$  that has equal intercepts on the axes.
10. A person standing at a junction (crossing) of two straight paths represented by the equations  $2x - 3y + 4 = 0$  and  $3x + 4y - 5 = 0$  seek to reach the path whose equation is  $6x - 7y + 8 = 0$  in the least time. Find the equation of the path that he should follow.

### Points to Remember



- The area of a triangle formed by the points  $(x_1, y_1)$ ,  $(x_2, y_2)$  and  $(x_3, y_3)$  is  $\frac{1}{2} \{ (x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3) \}$  sq.units
- Three points  $A(x_1, y_1)$ ,  $B(x_2, y_2)$  and  $C(x_3, y_3)$  are collinear if and only if
  - (i) area of  $\triangle ABC = 0$  or  $x_1 y_2 + x_2 y_3 + x_3 y_1 = x_2 y_1 + x_3 y_2 + x_1 y_3$
  - (ii) slope of  $AB = \text{slope of } BC$  or slope of  $AC$
- The area of a quadrilateral formed by the four points  $(x_1, y_1)$ ,  $(x_2, y_2)$ ,  $(x_3, y_3)$  and  $(x_4, y_4)$  is  $\frac{1}{2} \{ (x_1 y_2 + x_2 y_3 + x_3 y_4 + x_4 y_1) - (x_2 y_1 + x_3 y_2 + x_4 y_3 + x_1 y_4) \}$  sq.units.
- If a line makes an angle  $\theta$  with the positive direction of  $X$  axis, then its slope  $m = \tan \theta$ .
- If  $A(x_1, y_1)$ ,  $B(x_2, y_2)$  are two distinct points then the slope of  $AB$  is  $\frac{y_2 - y_1}{x_2 - x_1}$ .
- Slope of line  $ax + by + c = 0$  is  $m = \frac{-a}{b}$ .





## Equation of straight line in various forms

Form	Name	Form	Name
$ax + by + c = 0$	General form	$\frac{x}{a} + \frac{y}{b} = 1$	Intercept form
$y - y_1 = m(x - x_1)$	Point-slope form	$x = c$	Parallel to $Y$ axis
$y = mx + c$	Slope-intercept	$y = b$	Parallel to $X$ axis
$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$	Two point form		

- Two straight lines are parallel if and only if their slopes are equal.
- Two straight lines with well defined slopes  $m_1, m_2$  are perpendicular if and only if  $m_1 \times m_2 = -1$ .

## ICT CORNER

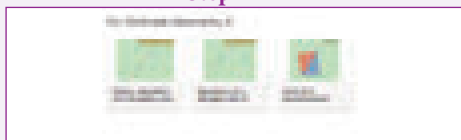


### ICT 5.1

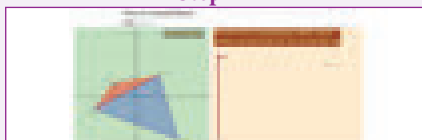
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “Co-Ordinate Geometry” will open. In the left side of the work book there are many activity related to mensuration chapter. Select the work sheet “Area of a Quadrilateral”

**Step 2:** In the given worksheet you can change the Question by clicking on “New Problem”. Move the slider to see the steps. Work out each problem and verify your answer.

#### Step 1



#### Step 2



#### Expected results



### ICT 5.2

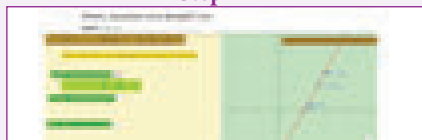
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named “Co-Ordinate Geometry” will open. In the left side of the work book there are many activity related to mensuration chapter. Select the work sheet “Slope\_Equation of a Straight Line”

**Step 2:** In the given worksheet you can change the Line by Dragging the points A and B on graph. Click on the Check boxes on Left Hand Side to see various forms of same straight line.

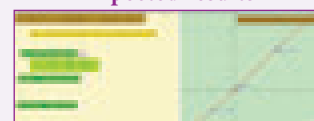
#### Step 1



#### Step 2



#### Expected results



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/356195>

or Scan the QR Code.



## Points to Remember



- An equation involving trigonometric ratios of an angle is called a trigonometric identity if it is true for all values of the angle.
- Trigonometric identities
  - (i)  $\sin^2 \theta + \cos^2 \theta = 1$       (ii)  $1 + \tan^2 \theta = \sec^2 \theta$       (iii)  $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$
- The line of sight is the line drawn from the eye of an observer to the point in the object viewed by the observer.
- The angle of elevation of an object viewed is the angle formed by the line of sight with the horizontal when it is above the horizontal level.
- The angle of depression of an object viewed is the angle formed by the line of sight with the horizontal when it is below the horizontal level.
- The height or length of an object or distance between two distant objects can be determined with the help of trigonometric ratios.

## ICT CORNER

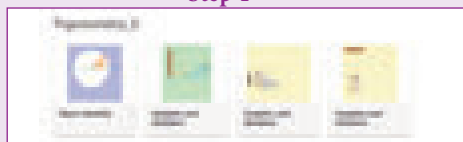


### ICT 6.1

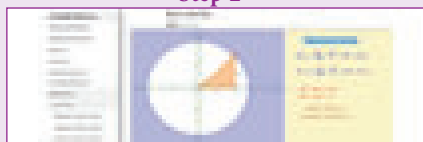
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. Chapter named “Trigonometry” will open. Select the work sheet “Basic Identity”

**Step 2:** In the given worksheet you can change the triangle by dragging the point “B”. Check the identity for each angle of the right angled triangle in the unit circle.

#### Step 1



#### Step 2



#### Expected results

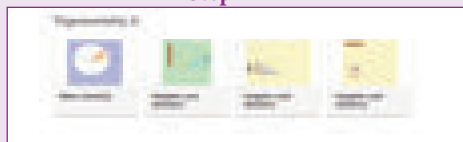


### ICT 6.2

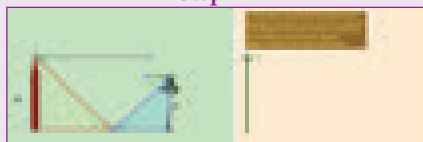
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. Chapter named “Trigonometry” will open. Select the work sheet “Heights and distance problem-1”

**Step 2:** In the given worksheet you can change the Question by clicking on “New Problem”. Move the slider, to view the steps. Workout the problem yourself and verify the answer.

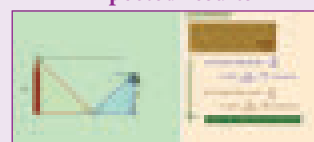
#### Step 1



#### Step 2



#### Expected results



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/356196>

or Scan the QR Code.





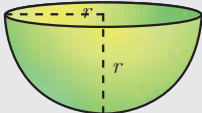
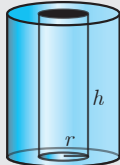
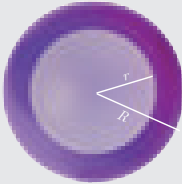
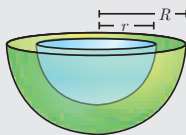
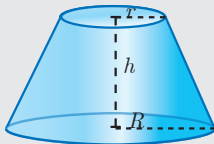
- be 8 cm and the diameter of the top of the funnel be 18 cm, then find the area of the tin sheet required to make the funnel.
- Find the number of coins, 1.5 cm in diameter and 2 mm thick, to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm.
  - A hollow metallic cylinder whose external radius is 4.3 cm and internal radius is 1.1 cm and whole length is 4 cm is melted and recast into a solid cylinder of 12 cm long. Find the diameter of solid cylinder.
  - The slant height of a frustum of a cone is 4 m and the perimeter of circular ends are 18 m and 16 m. Find the cost of painting its curved surface area at ₹100 per sq. m.
  - A hemi-spherical hollow bowl has material of volume  $\frac{436\pi}{3}$  cubic cm. Its external diameter is 14 cm. Find its thickness.
  - The volume of a cone is  $1005\frac{5}{7}$  cu. cm. The area of its base is  $201\frac{1}{7}$  sq. cm. Find the slant height of the cone.
  - A metallic sheet in the form of a sector of a circle of radius 21 cm has central angle of  $216^\circ$ . The sector is made into a cone by bringing the bounding radii together. Find the volume of the cone formed.

### Points to Remember



Solid	Figure	Curved surface Area / Lateral surface Area (in sq. units)	Total surface Area (in sq. units)	Volume (in cubic units)
<b>Cuboid</b>		$2h(l + b)$	$2(lb + bh + lh)$	$l \times b \times h$
<b>Cube</b>		$4a^2$	$6a^2$	$a^3$
<b>Right Circular Cylinder</b>		$2\pi rh$	$2\pi r(h + r)$	$\pi r^2 h$
<b>Right Circular Cone</b>		$\pi rl$ $l = \sqrt{r^2 + h^2}$ $l = \text{slant height}$	$\pi rl + \pi r^2$ $= \pi r(l + r)$	$\frac{1}{3} \pi r^2 h$
<b>Sphere</b>		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3} \pi r^3$



<b>Hemisphere</b>		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$
<b>Hollow cylinder</b>		$2\pi(R+r)h$	$2\pi(R+r)(R-r+h)$	$\pi(R^2-r^2)h$
<b>Hollow sphere</b>		$4\pi R^2 = \text{outer surface area}$	$4\pi(R^2+r^2)$	$\frac{4}{3}\pi(R^3-r^3)$
<b>Hollow hemisphere</b>		$2\pi(R^2+r^2)$	$\pi(3R^2+r^2)$	$\frac{2}{3}\pi(R^3-r^3)$
<b>Frustum of right circular cone</b>		$\pi(R+r)l$ where $l = \sqrt{h^2 + (R-r)^2}$	$\pi(R+r)l + \pi R^2 + \pi r^2$	$\frac{1}{3}\pi h[R^2 + r^2 + Rr]$

## ICT CORNER

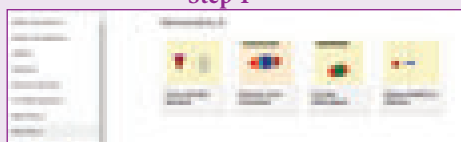


### ICT 7.1

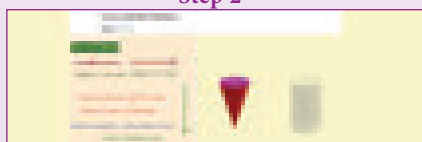
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named "Mensuration \_X" will open. Select the work sheet "Cone-Cylinder relation"

**Step 2:** In the given worksheet you can change the radius and height of the cone-Cylinder by moving the sliders on the left-hand side. Move the vertical slider, to view cone filled in the cylinder and this proves 3 times cone equal to one cylinder of same radius and same height.

#### Step 1



#### Step 2



#### Expected results



### ICT 7.2

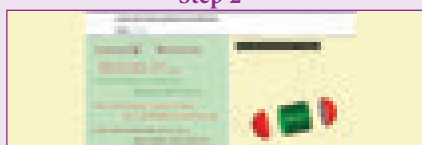
**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. GeoGebra work book named "Mensuration \_X" will open. Select the work sheet "Cylinder Hemispheres"

**Step 2:** In the given worksheet you can change the radius of the Hemisphere-Cylinder by moving the sliders on the left-hand side. Move the slider Attach/Detach to see how combined solid is formed. You can rotate 3-D picture to see the faces. Working is given on the left-hand side. Work out and verify your answer.

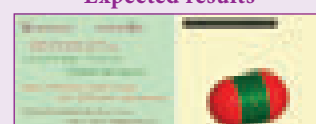
#### Step 1



#### Step 2



#### Expected results



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/356197>

or Scan the QR Code.





8. If two dice are rolled, then find the probability of getting the product of face value 6 or the difference of face values 5.
9. In a two children family, find the probability that there is at least one girl in a family.
10. A bag contains 5 white and some black balls. If the probability of drawing a black ball from the bag is twice the probability of drawing a white ball then find the number of black balls.
11. The probability that a student will pass the final examination in both English and Tamil is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Tamil examination?
12. The King, Queen and Jack of the suit spade are removed from a deck of 52 cards. One card is selected from the remaining cards. Find the probability of getting (i) a diamond (ii) a queen (iii) a spade (iv) a heart card bearing the number 5.

### Points to Remember

- Range =  $L - S$  ( $L$  - Largest value,  $S$  - Smallest value)

- Coefficient of range =  $\frac{L - S}{L + S}$ ;      Variance  $\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$

- Standard deviation  $\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$

- Standard deviation (ungrouped data)

(i) Direct method  $\sigma = \sqrt{\frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2}$       (ii) Mean method  $\sigma = \sqrt{\frac{\sum d_i^2}{n}}$

(iii) Assumed mean method  $\sigma = \sqrt{\frac{\sum d_i^2}{n} - \left(\frac{\sum d_i}{n}\right)^2}$

(iv) Step deviation method  $\sigma = c \times \sqrt{\frac{\sum d_i^2}{n} - \left(\frac{\sum d_i}{n}\right)^2}$

- Standard deviation of first  $n$  natural numbers  $\sigma = \sqrt{\frac{n^2 - 1}{12}}$

- Standard deviation (grouped data)

(i) Mean method  $\sigma = \sqrt{\frac{\sum f_i d_i^2}{N}}$       (ii) Assumed mean method  $\sigma = \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}$

(iii) Step deviation method  $\sigma = C \times \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}$

- Coefficient of variation      C.V =  $\frac{\sigma}{\bar{x}} \times 100\%$

- If the C.V. value is less, then the observations of corresponding data are consistent. If the C.V. value is more then the observations of corresponding are inconsistent.







- In a random experiment, the set of all outcomes are known but exact outcome is not known.
- The set of all possible outcomes is called sample space.
- A, B are said to be mutually exclusive events if  $A \cap B = \phi$
- Probability of event  $E$  is  $P(E) = \frac{n(E)}{n(S)}$ 
  - (i) The probability of sure event is 1 and the probability of impossible event is 0.
  - (ii)  $0 \leq P(E) \leq 1$  ; (iii)  $P(\bar{E}) = 1 - P(E)$
- If  $A$  and  $B$  are mutually exclusive events then  $P(A \cup B) = P(A) + P(B)$ .
- (i)  $P(A \cap \bar{B}) = P(\text{only } A) = P(A) - P(A \cap B)$   
(ii)  $P(\bar{A} \cap B) = P(\text{only } B) = P(B) - P(A \cap B)$
- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ , for any two events  $A, B$ .
- For any three events  $A, B, C$   
$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$$

## ICT CORNER

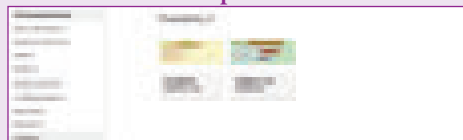


### ICT 8.1

**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. Chapter named “Probability” will open. Select the work sheet “ **Probability Addition law** ”

**Step 2:** In the given worksheet you can change the question by clicking on “New Problem”. Move the slider to see the steps.

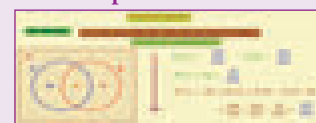
Step 1



Step 2



Expected results

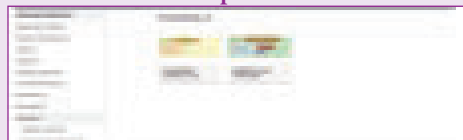


### ICT 8.2

**Step 1:** Open the Browser type the URL Link given below (or) Scan the QR Code. Chapter named “Probability” will open. Select the work sheet “ **Addition law Mutually Exclusive** ”

**Step 2:** In the given worksheet you can change the question by clicking on “New Problem”. Click on the check boxes to see the respective answer.

Step 1



Step 2



Expected results



You can repeat the same steps for other activities

<https://www.geogebra.org/m/jfr2zzgy#chapter/359554>  
or Scan the QR Code.

