1 Knowing Our Numbers

Key Concepts

1. 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are the digits used in forming a number.

2. The numbers 1, 2, 3, 4, 5, ... are called counting numbers or natural numbers.

3. If two numbers are not equal, then one is either greater than or lesser than the other.

4. If different digits are given, we can form numbers by keeping the digits in different places.

5. To make the largest number using the given digits, arrange the digits in descending order.

6. To make the smallest number using the given (non-zero) digits, arrange the digits in ascending order. If given digits contains 0, then put 0 at the second position from extreme left and rest of the digits in ascending order.

7. There are two systems of reading and writing numbers – the Indian system of numeration and the International system of numeration.

8. The place value of a digit in a number depends upon the place it occupies in the place value chart. The face value of a digit in a numeral is the value of the digit itself.

9. The Indian place value chart is shown below.

Groups or Periods											
Arabs		Crores			Lakhs		Thousands		Ones		
Ten Arabs 10,00,00,00,000	Arabs 1,00,00,00,000	Ten Crores 10,00,00,000	Crores 1,00,00,000		Ten Lakhs 10,00,000	Lakhs 1,00,000	Ten Thousands 10,000	Thousands 1,000	Hundreds 100	Tens 10	Ones 1

10. In a given numeral, periods are seperated by using commas.

11. In the Indian system of numeration, first comma is placed after three digits from the right and other commas come after every two digits to the left of the first comma.

12. The International place value chart is shown below.

Groups or Periods											
Billions			Millions			Thousands			Ones		
Hundred Billions 100,000,000,000	Ten Billions 10,000,000,000	Billions 1,000,000,000	Hundred Millions 100,000,000	Ten Millions 10,000,000	Millions 1,000,000	Hundred Thousands 100,000	Ten Thousands 10,000	Thousands 1,000	Hundreds 100	Tens 10	Ones 1

13. In the International system of numeration, comma is placed after every three places, starting from the right.

2 Whole Numbers

1. The counting numbers 1, 2, 3, 4, ... together with 0 form the set of whole numbers. i.e., 0, 1, 2, 3, 4, 5, ... are whole numbers.

2. There are infinite whole numbers.

3. The smallest whole number is 0.

4. The predecessor of a given number is the number obtained by subtracting 1 from the given number.

5. The successor of a given number is the number obtained by adding 1 to the given number.

6. Every natural number has a successor, every natural number except 1 has a predecessor.

7. Every whole number has a successor, every whole number except 0 has a predecessor.

8. All natural numbers are whole numbers but all whole numbers are not natural numbers.

9. Addition, subtraction, multiplication and division of whole numbers can be represented on a number line.

10. The sum of two whole numbers is also a whole number, i.e., whole numbers are closed under addition.

11. The result of subtraction of whole numbers is not necessarily a whole number, i.e., whole numbers are not closed under subtraction.

12. Product of whole numbers is a whole number, i.e., whole numbers are closed under multiplication.

13. The result of division of two whole numbers is not necessarily a whole number.

14. The division of a whole number by 0 is not defined.

15. Changing the order of the whole numbers in addition does not change their sum, i.e., addition is commutative for whole numbers.

16. Changing the order of the whole numbers in multiplication does not change the product, i.e., multiplication is commutative for whole numbers.

17. Addition and Multiplication are associative for whole numbers.

18. Multiplication is distributive over Addition (Subtraction) for whole numbers.

19. 0 is the Additive Identity for whole numbers.

20. 1 is the Multiplicative Identity for whole numbers.

3 Playing with Numbers

Key Concepts

1. A factor of a number is an exact divisor of that number.

2. Every number is a factor of itself. 1 is a factor of every number.

3. Every factor is less than or equal to the given number.

4. Number of factors of a given number are finite.

5. A number whose ones digit is 0, 2, 4, 6 or 8 is an even number. Alternatively, a number which is divisible by 2 is also an even number.

6. A number which is not an even number is called an odd number.

7. A number is a multiple of each of its factors. Every number is a multiple of itself.

8. Every multiple of a given number is greater than or equal to that number.

9. The numbers other than 1 which have exactly two factors, 1 and the number itself, are called prime numbers.

10. A number with more than two factors is called a composite number.

11. The number 1 is neither prime nor composite.

12. 2 is the smallest even prime number.

13. Every prime number other than 2 is an odd number.

14. Two numbers with only 1 as a common factor are called co-prime numbers.
    For example, (2, 3) and (4, 9)

15. Two prime numbers whose difference is 2 are called twin primes.

    For example, (3, 5) and (5, 7)

16. A number in which the sum of all its factors is equal to twice the number is called a perfect number.

    6 is a perfect number. Factors of 6 are 1, 2, 3 and 6.

    So, $1 + 2 + 3 + 6 = 12 = 2 \times 6$

17. Divisibility rule for 2, 3, 4, 5, 6, 8, 9, 10 and 11

A number is divisible by	Rule
2	if its ones digit is either of 0, 2, 4, 6, 8.
3	if the sum of all its digits is a multiple of 3.
4	if the last two digits are either 0 or form a number divisible by 4.
5	if its ones digit is either 0 or 5.
6	if the number is divisible by both 2 and 3.
8	if the last three digits are either 0 or form a number divisible by 8.
9	if the sum of its digits is divisible by 9.
10	if the ones digit is 0.
11	if the difference of sums of the digits at the alternate places is either 0 or divisible by 11.

18. Divisibility test for 7

From the given number, remove the digit at ones place. Multiply the removed digit by 5 and add the product so obtained to the depleted number. If the number so obtained is divisible by 7, then the given number is divisible by 7.

(If the number obtained is large, the process continues till we arrive at a two digit or a single digit number).

19. If a number is divisible by another number, then it is divisible by each of the factors of that number.

20. A number divisible by two co-prime numbers is divisible by their product also.

21. If two numbers are divisible by a number, then their sum or difference is also divisible by that number.

22. To express a given number as a product of prime factors is called prime factorisation.

23. HCF of two or more given numbers is the highest of their common factors.

24. LCM of two or more given numbers is the lowest of their common multiples.

25. Product of two numbers = HCF × LCM.

4 Basic Geometrical Ideas

Key Concepts

1. A point determines a location/position. A point is represented by a dot and capital letters are used to name the points.

2. A plane is any flat and smooth surface which extends endlessly in all directions.

3. A plane has length and width but no height. It has no boundary.

4. A line segment corresponds to the shortest distance between the two points in a plane.

5. A line segment that extends endlessly on both sides (directions) is called a line.

6. A ray is part of a line which starts from a point called the initial point and extends in one side (direction).

7. Infinite number of rays can be drawn from an initial point in different directions.

8. Two lines are called intersecting lines, if they have one common point.

9. Two lines in a plane which do not meet when produced indefinitely in either direction are called parallel lines. Here, AB || PQ.
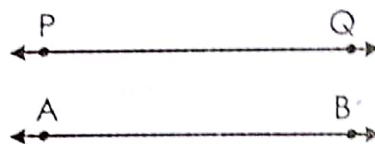
10. Any drawing (straight or not-straight) done with a pen or pencil without lifting it is a curve. In this sense, line is also a curve.

11. A curve that has no end points and which completely encloses a certain area is called a closed curve.

12. A curve that is not closed is called an open curve.

13. A curve that does not cross itself is called a simple curve.

14. A curve that is simple as well as closed is called a simple closed curve.

15. A polygon is a simple closed curve formed by three or more line segments only.

16. The line segments forming a polygon are called the sides of the polygon.

17. The point of intersection of two sides of a polygon is called a vertex.

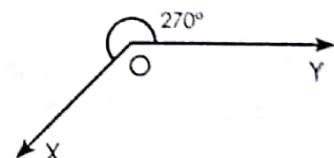18. The end points of the same side of a polygon are called adjacent vertices.
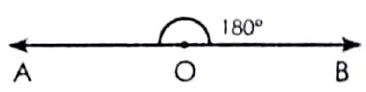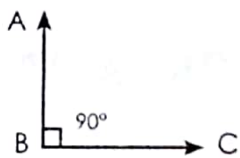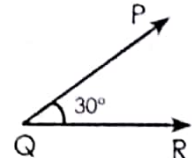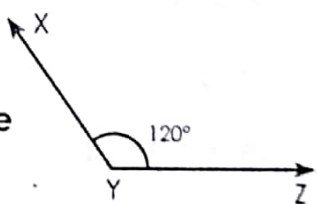
19. Any two sides of a polygon having a common end point are called its adjacent sides.

20. A diagonal of a polygon is a line segment whose end points are two non-adjacent vertices.

21. An angle is formed by two rays having a common initial point called the vertex.

22. The rays forming the angle are called its arms or sides.

23. Any two points, one on each of the two arms of the angle along with its vertex can be used to name an angle.

24. An angle can also be denoted by the single letter as its vertex or by some different letter or symbol designated for this purpose.

25. A triangle is a polygon having three sides, and is usually named by its vertices, taken clockwise or anticlockwise.

26. A quadrilateral is a polygon having four sides and is usually named by its vertices taken in clockwise or counter-clockwise order. In the given figure, PQRS is a quadrilateral.
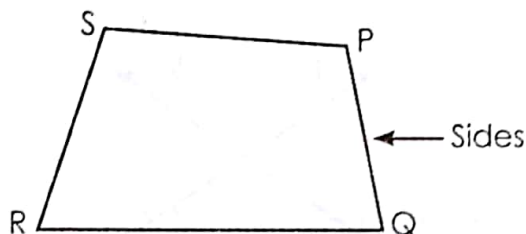
27. A circle is a simple closed curve. It is the collection of all points in a plane, equidistant from a given point called its centre.

28. A radius of a circle is a line segment joining the centre of the circle to a point on the circle.

29. A diameter of a circle is a line segment, passing through the centre, joining two points on the circle.

30. Diameter = 2 × radius.

31. The end points of any diameter of a circle divides it into two semicircles.

32. A chord of a circle is a line segment joining any two points on the circle.

33. The diameter is the longest chord of a circle.

34. If A and B are two points on a circle, then we get an arc AB and BA, written as $\overset{\frown}{AB}$ and $\overset{\frown}{BA}$ respectively.

35. A region that is bounded by arc AB and radii, with endpoints at A and B respectively, is called a sector.

36. A region that is bounded by a chord AB and an arc is called a segment.

37. The distance around a circle is its circumference.

5 Understanding Elementary Shapes

Key Concepts

1. The distance between the end points of a line segment is called its length.

2. A graduated ruler or the divider is used to compare the lengths of the given line segments.

3. A protractor is an instrument used for measuring a given angle in degrees or for constructing an angle of given magnitude.

4. An angle of measure 180° is called a **straight angle**. ∠AOB is a straight angle.

5. An angle of measure 90° is called a **right angle**. ∠ABC is a right angle.

6. An angle less than 90° but greater than 0° is called an **acute angle**. ∠PQR is an acute angle.

7. An angle greater than 90° but less than 180° is called an **obtuse angle**. ∠XYZ is an obtuse angle.

8. An angle which is greater than 180° but less than 360° is called a **reflex angle**. ∠XOY is a reflex angle.

9. Turning a ray by four right angles in the same direction (clockwise or anticlockwise), it makes complete one turn around its initial point and is coincident with its original position. The complete turn is called one revolution.

10. A right angle is $\frac{1}{4}$ of revolution and a straight angle is $\frac{1}{2}$ of a revolution.

11. Two intersecting lines are perpendicular, if the angle between them is 90°.

12. A triangle is a polygon with three sides. It has three sides and three angles.

13. Triangles can be classified in two ways:

    (a) on the basis of their angles.   (b) on the basis of their sides.

14. A triangle in which all the three angles are less than 90° is called an **acute-angled triangle.**

15. A triangle in which one of the angle is 90° is called a **right-angled triangle.**

16. A triangle in which one of the angle is greater than 90° is called an **obtuse-angled triangle.**

17. A triangle whose all the sides and angles are equal is called an **equilateral triangle.**

18. A triangle whose any of the two sides have equal length is called an **isosceles triangle.**

19. A triangle whose no two sides have equal length is called a **scalene triangle.**

20. A parallelogram is a quadrilateral in which opposite sides are parallel.

21. A rectangle is a parallelogram whose each angle is a right angle.

22. A square is parallelogram in which all sides are equal and each angle is of 90°.

23. A rhombus is a parallelogram with all four sides equal.

24. A trapezium is a quadrilateral with one pair of parallel sides.
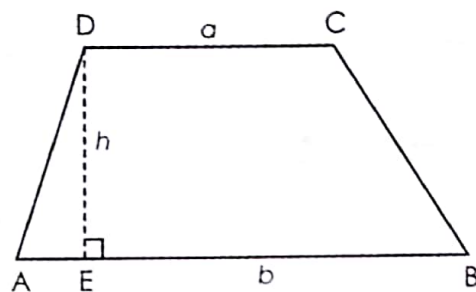
Trapezium

25. A polygon which has five sides is known as pentagon.

26. A polygon which has six sides is known as hexagon.

27. A polygon which has seven sides is called heptagon.

28. A polygon which has eight sides is called octagon.

29. A cuboid is a 3-dimensional figure formed by six rectangular surfaces or faces.

30. A cuboid has three distinct dimensions known as length, breadth and height.

31. A cuboid in which length, breadth and height are equal is called a cube.

32. A solid having curved surface with circular ends is a cylinder.

33. A prism is a solid with two indentical polygonal bases and its lateral faces are rectangular.

34. A pyramid is a solid geometric figure that has a polygonal base and whose side faces are triangles having a common vertex.

35. A pyramid whose base is a square is called a square pyramid.

36. A pyramid whose base is a pentagon is called a pentagonal pyramid.
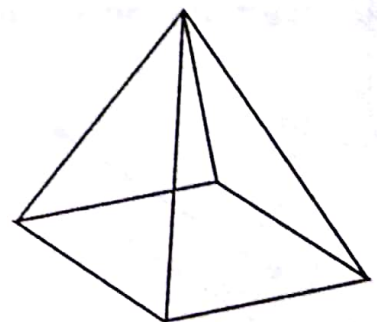
Square Pyramid

6 Integers

1. The collection of numbers ... −4, −3, −2, −1, 0, 1, 2, 3, 4 ... is called integers.

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.....  −9  −8  −7  −6  −5  −4  −3  −2  −1   0   1   2   3   4   5   6   7   8   9  .....
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Negative integers   Zero   Positive integers
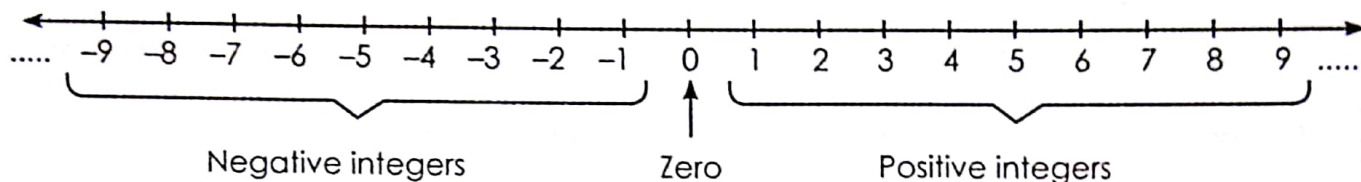
2. 1, 2, 3, 4, ... are positive integers.

3. −1, −2, −3, −4, ... are negative integers.

4. The number 0 is neither positive nor negative.

5. The successor of an integer is obtained by adding 1 to the integer.

6. The predecessor of an integer is obtained by subtracting 1 from the integer.

7. An absolute value of an integer is its numerical value regardless of its sign.

8. To add two or more integers with like signs, add the absolute values of the integers and attach a common sign to the sum.

9. To add two integers with unlike signs, subtract the smaller absolute value from the larger one and then prefix the sign of the integer that has the larger absolute value.

10. The number 0 is the Additive Identity for integers.

11. The opposite of an integer is its Additive Inverse.

12. Addition and Subtraction of integers can also be represented on a number line.

13. Addition and Subtraction of two integers can be performed by using absolute values of the integers.

9 Data Handling

1. Data is a collection of some information in the form of numbers.

2. Data obtained in the original form is called a raw data.

3. To get a particular information from the given data quickly, the data can be arranged in a tabular form using tally marks as given below.

| Tally marks	Number of times
ЖП	5
III	3
IIII	4
IIII	4
ЖП I	6
ЖП III	8

4. A numerical data represented by pictures, picture symbols, objects or part of the objects is called a pictograph.

   A pictograph showing numbers of cars produced by a company is shown below.

Year	Number of cars produced by a company
1999	
2000	
2001	
2002	

   = 1000 cars
   = 500 cars

5. A bar graph is a pictorial representation of numerical data in the form of rectangles (or bars) of uniform width and of different heights, erected horizontally or vertically.

6. The height or length of a bar indicates on a suitable scale the corresponding value of the numerical data.

   The bar graph shows the total sales of a shop from Monday to Friday.

7. If the bars are drawn on the horizontal line, then the scale of heights of the bars is shown along the vertical line. If the bars are drawn on the vertical line, then scale of heights of the bars is shown along the horizontal line.

Weekly sales of TV sets in an Electronics Company
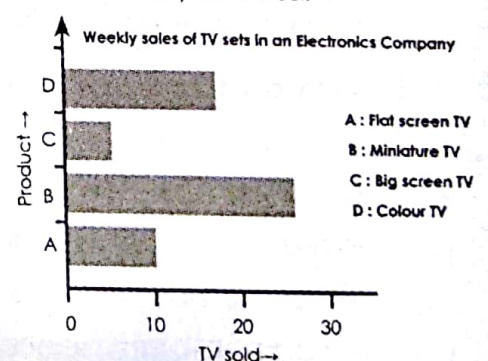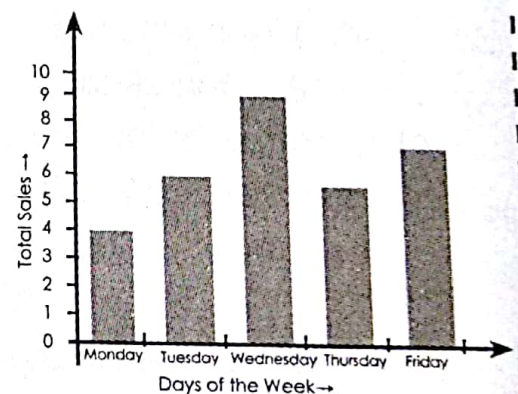
A : Flat screen TV
B : Miniature TV
C : Big screen TV
D : Colour TV