IMPORTANT SNAPS BY TEAM PIS CLASS- IX TH

Subject: MATHEMATICS

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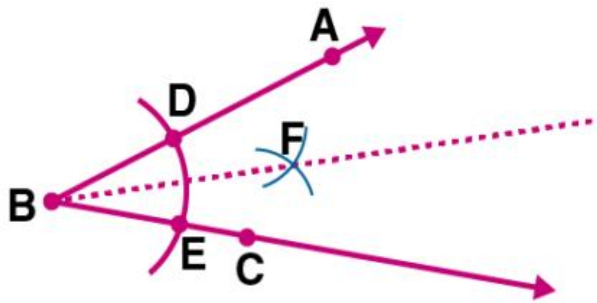
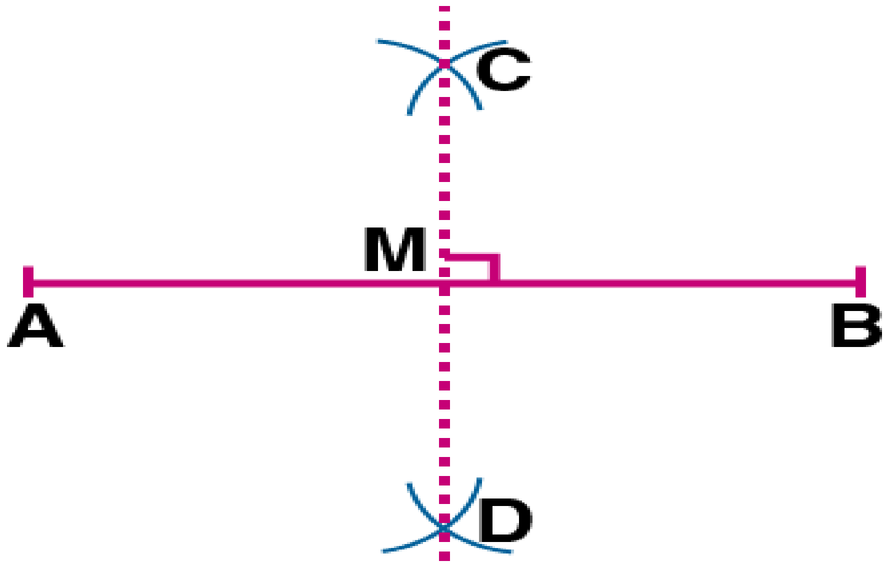
(chapter 11 to 15)

HIGHLIGHTS OF CHAPTER 11 (CONSTRUCTIONS)

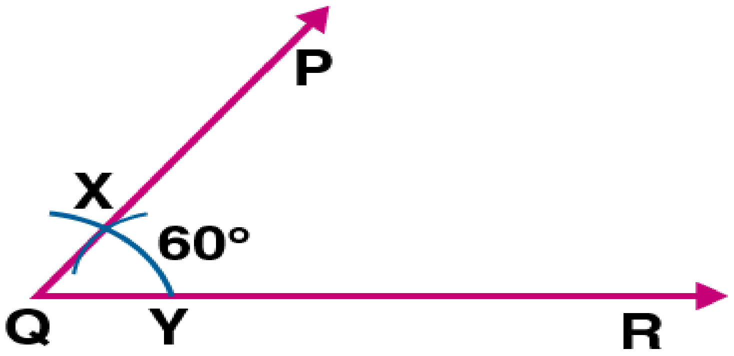
- Construction of an Angle bisector
- Suppose we want to draw the angle bisector of ∠ABC we will do it as follows:
- Taking B as centre and any radius, draw an arc to intersect AB and BC to intersect at D and E respectively.
- Taking D and E as centres and with radius more than DE/2, draw arcs to intersect each other at a point F.
- Draw the ray BF. This ray BF is the required bisector of the ∠ABC.



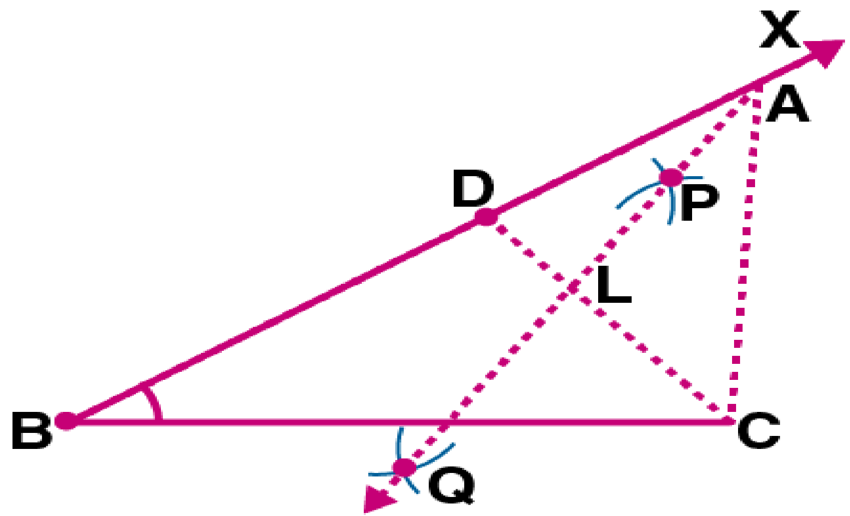
- <u>Perpendicular Bisector</u>
- Construction of a perpendicular bisector
- Steps of construction of a perpendicular bisector on the line segment AB:
- Take A and B as centres and radius more than AB/2 draw arcs on both sides of the line.
- Arcs intersect at the points C and D. Join CD.
- CD intersects AB at M. CMD is the required perpendicular bisector of the line segment AB.



- <u>Construction of an Angle of 60 degrees</u>
- Draw a ray QR.
- Take Q as the centre and some radius draw an arc of a circle, which intersects QR at a point Y.
- Take Y as the centre with the same radius draw an arc intersecting the previously drawn arc at point X.
- Draw a ray QP passing through X
- $\angle PQR = 60^\circ$

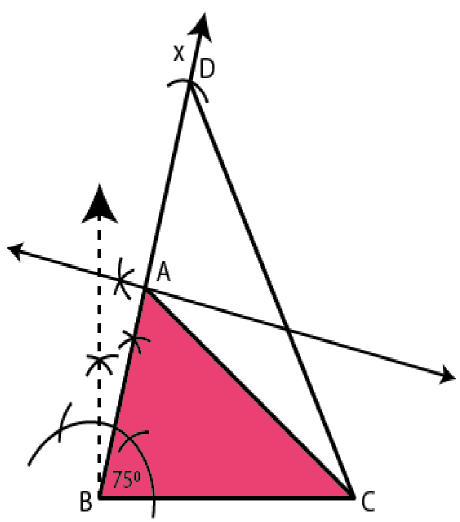


- **<u>Given base(BC), base angle(ABC) and AB-AC</u>**
- Steps of construction of a triangle given base(BC), base angle(∠ABC) and difference of the other two sides (AB-AC):
- Draw base BC and with point B as the vertex make an angle XBC equal to the given angle.
- Cut the line segment BD equal to AB – AC(AB > AC) on the ray BX.
- Join DC and draw the perpendicular bisector PQ of DC.
- Let it intersect BX at a point A. Join AC.
- Then △ABC is the required triangle.

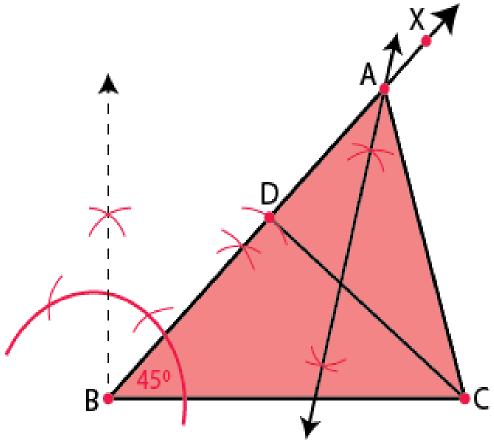


IMPORTANT QUESTIONS

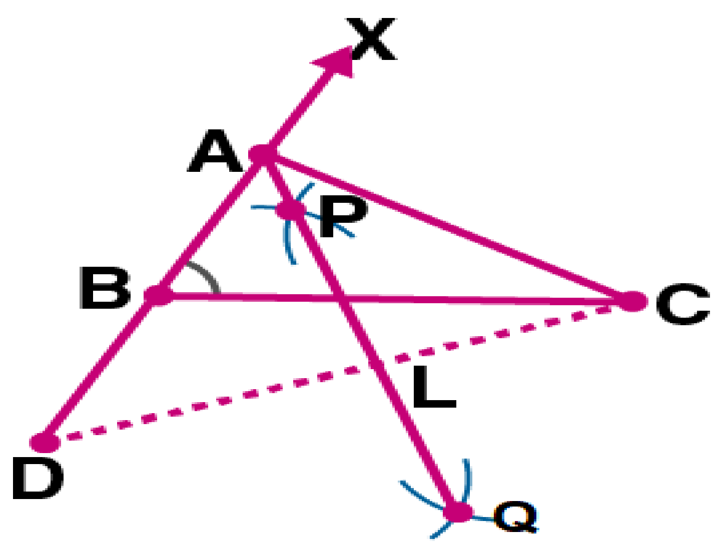
- **Q: Construct a triangle ABC in which BC = 7cm, ∠B = 75° and AB + AC = 13 cm.**
- Solution:
- Construction Procedure:
- The steps to draw the triangle of given measurement is as follows:
- Draw a line segment of base BC = 7 cm
- Measure and draw ∠B = 75° and draw the ray BX
- Take a compass and measure AB + AC = 13 cm.
- With B as a centre and draw an arc at the point be D
- Join DC
- Now draw the perpendicular bisector of the line BD and the intersection point is taken as A.
- Now join AC
- Therefore, ABC is the required triangle.



- **Q Construct a triangle ABC in which BC = 8cm, ∠B = 45° and AB - AC = 3.5 cm.**
- Solution:
- Construction Procedure:
- The steps to draw the triangle of given measurement is as follows:
- Draw a line segment of base BC = 8 cm
- Measure and draw ∠B = 45° and draw the ray BX
- Take a compass and measure AB – AC = 3.5 cm.
- With B as centre and draw an arc at the point be D on the ray BX
- Join DC
- Now draw the perpendicular bisector of the line CD and the intersection point is taken as A.
- Now join AC
- Therefore, ABC is the required triangle.



- **<u>Given base (BC), base angle (ABC) and AC-AB</u>**
- Steps of construction of a triangle given base (BC), base angle (∠ABC) and difference of the other two sides (AC-AB):
- Draw the base BC and at point B make an angle XBC equal to the given angle.
- Cut the line segment BD equal to AC – AB from the line BX extended on the opposite side of line segment BC.
- Join DC and draw the perpendicular bisector, say PQ of DC.
- Let PQ intersect BX at A. Join AC.
- △ABC is the required triangle.



HIGHLIGHTS OF CHAPTER 12 (HERON'S FORMULA)

- The plane closed figure, with three sides and three angles is called as a triangle.
- **Types of triangles:**
  Based on **sides** – a) Equilateral b) Isosceles c) Scalene
  Based on **angles** – a) Acute angled triangle b) Right-angled triangle c) Obtuse angled triangle
- <u>**Area of a triangle**</u>
- Area = (1/2) × base × height
- Area of Equilateral triangle = √3(a^2)/4
- Area of a triangle – By Heron's formula
- <u>Area of a ΔABC, given sides a, b, c by **Heron's formula** (also known as Hero's Formula) is:</u>
- <u>semi perimeter (s) = (a + b + c)/2</u>
- <u>Area = √[s(s – a)(s – b)(s – c)]</u>

IMPORTANT QUESTIONS

- **Q.1: Find the area of a triangle whose two sides are 18 cm and 10 cm and the perimeter is 42cm.**
- Solution:
- Assume that the third side of the triangle to be “x”.
- Now, the three sides of the triangle are 18 cm, 10 cm, and “x” cm
- It is given that the perimeter of the triangle = 42cm
- So, x = 42 – (18 + 10) cm = 14 cm
- ∴ The semi perimeter of triangle = 42/2 = 21 cm
- Using Heron’s formula,
- Area of the triangle,
- $= \sqrt{[s (s-a) (s-b) (s-c)]}$
- $= \sqrt{[21(21 – 18) (21 – 10) (21 – 14)]}\ cm^2$
- $= \sqrt{[21 \times 3 \times 11 \times 7]}\ m^2$
- $= 21\sqrt{11}\ cm^2$

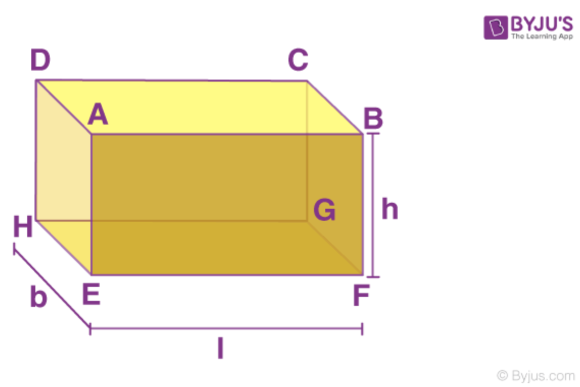
- **Q.2: The sides of a triangle are in the ratio of 12: 17: 25 and its perimeter is 540cm. Find its area.**
- Solution:
- The ratio of the sides of the triangle is given as 12: 17: 25
- Now, let the common ratio between the sides of the triangle be “x”
- ∴ The sides are 12x, 17x and 25x
- It is also given that the perimeter of the triangle = 540 cm
- 12x + 17x + 25x = 540 cm
- => 54x = 540cm
- So, x = 10
- Now, the sides of the triangle are 120 cm, 170 cm, 250 cm.
- So, the semi perimeter of the triangle (s) = 540/2 = 270 cm
- Using Heron’s formula,
- Area of the triangle
- $= 9000\ cm^2$

- **Q.: The perimeter of an isosceles triangle is 32 cm. The ratio of the equal side to its base is 3: 2. Find the area of the triangle.**
- Solution:
- According to the question,
- The perimeter of the isosceles triangle = 32 cm
- It is also given that,
- Ratio of equal side to base = 3 : 2
- Let the equal side = 3x
- So, base = 2x
- Perimeter of the triangle = 32
- $\Rightarrow 3x + 3x + 2x = 32$
- $\Rightarrow 8x = 32$
- $\Rightarrow x = 4$.
- Equal side = $3x = 3\times4 = 12$
- Base = $2x = 2\times4 = 8$
- The sides of the triangle = 12cm, 12cm and 8cm.
- Let $a = 12$, $b = 12$, $c = 8$
- $s = (a + b + c)/2$
- $\Rightarrow s = (12 + 12 + 8)/2$
- $= 32/2$
- $= 16$.
- Area of the triangle = $\sqrt{(s(s-a)(s-b)(s-c))}$
- $= \sqrt{(16(16-12)(16-12)(16-8))}$
- $= \sqrt{(16\times4\times4\times8)}$
- $= 32\sqrt{2}\ cm^2$

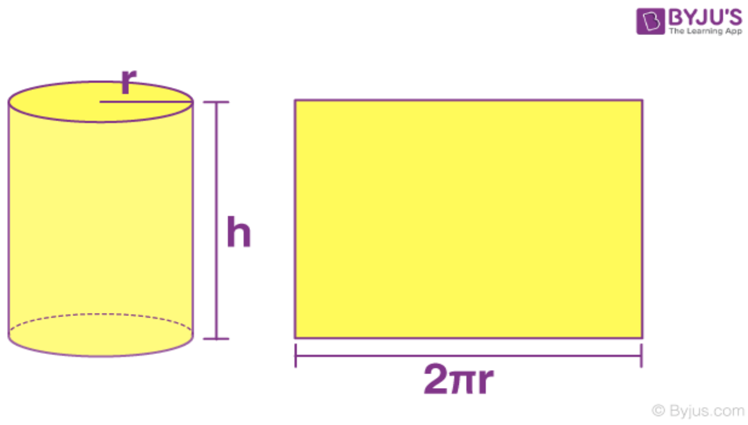
HIGHLIGHTS OF CHAPTER 13 SURFACE AREA AND VOLUME

<u>**Cuboid and its Surface Area**</u>

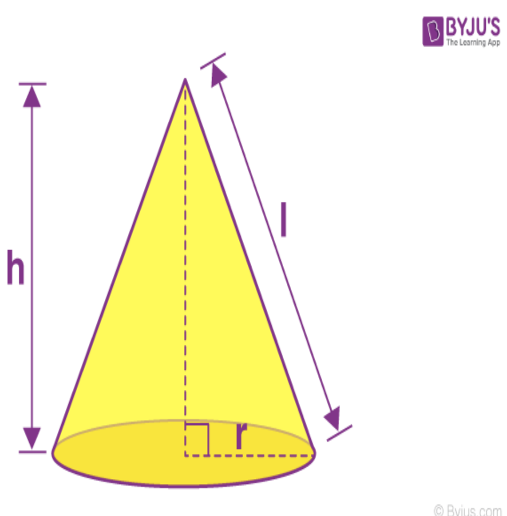
- The surface area of a cuboid is equal to the sum of the areas of its six rectangular faces. Consider a cuboid whose dimensions are $l \times b \times h$, respectively.
- Cuboid with length l, breadth b and height hThe total surface area of the cuboid (TSA) = Sum of the areas of all its six faces
  TSA (cuboid) = $2(l \times b) + 2(b \times h) + 2(l \times h) = 2(lb + bh + lh)$
- Lateral surface area (LSA) is the area of all the sides apart from the top and bottom faces.
  The lateral surface area of the cuboid = Area of face AEHD + Area of face BFGC + Area of face ABFE + Area of face DHGC
  LSA (cuboid) = $2(b \times h) + 2(l \times h) = 2h(l + b)$
- **Length of diagonal of a cuboid =$\sqrt{}$(l^2 + b^2 + h^2)**

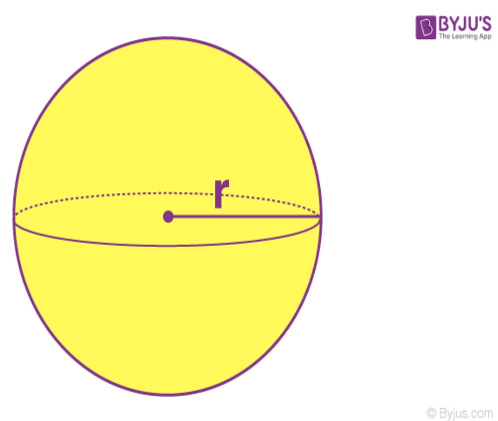


- **Cube and its Surface Area**
- For a cube, length = breadth = height
- Cube with length *l* ,**TSA (cube) =2 × (3l^2) = 6l^2**
- **Lateral surface area of cube = 2(l × l + l × l) = 4l^2**
  Note: **Diagonal of a cube =√3l**
- **Cylinder and its Surface Area**
- Take a cylinder of base radius *r* and height *h* units. The curved surface of this cylinder, if opened along the diameter (*d* = 2*r*) of the circular base can be transformed into a rectangle of length 2πr and height *h* units. Thus,
- Transformation of a Cylinder into a rectangle.
- **CSA of a cylinder = 2π × r × h**
  TSA of a cylinder = 2π × r × h + area of two circular bases
  =2π × r × h + 2πr2
  TSA of a cylinder =2πr(h + r)



- **Right Circular Cone and its Surface Area**
- Consider a right circular cone with slant length *l*, radius *r* and height *h*.
- **CSA of right circular cone = πrl**
  TSA = CSA + area of base = $\pi rl + \pi r2 = \pi r(l + r)$
- **Sphere and its Surface Area**
- For a sphere of radius *r*
- **Curved Surface Area (CSA) = Total Surface Area (TSA) = $4\pi r2$**





Volume of a cuboid = (base area) × height = (lb)h = **lbh**

- **Volume of a cube** = base area × height
  Since all dimensions of a cube are identical, volume = **l^3**
  Where *l* is the length of the edge of the cube.
- **Volume of a cylinder** = Base area × height = (πr2) × h = **πr^2h**
- The volume of a Right circular cone is 1/3 times that of a cylinder of same height and base.
  The volume of a Right circular cone =(1/3)πr^2h
  Where *r* is the radius of the base and *h* is the height of the cone.
- **The volume of a sphere of radius *r* = (4/3)πr^3**
- A hemisphere is half of a sphere.
  ∴ **CSA of a hemisphere of radius *r* = 2πr^2**
  Total Surface Area = curved surface area + area of the base circle
  ⇒**TSA = 3πr^2**
- The volume (V) of a hemisphere will be half of that of a sphere.
  ∴ **The volume of the hemisphere of radius *r* = (2/3)πr^3**

IMPORTANT QUESTIONS

- Q.1: Hameed has built a cubical water tank with lid for his house, with each outer edge 1.5 m long. He gets the outer surface of the tank excluding the base, covered with square tiles of side 25 cm (see in the figure below). Find how much he would spend on the tiles if the cost of the tiles is Rs.360 per dozen.
- Q.2: The paint in a certain container is sufficient to paint an area equal to 9.375 sq.m. How many bricks of dimensions 22.5 cm × 10 cm × 7.5 cm can be painted out of this container?
- Q.3: The length, breadth and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of whitewashing the walls of the room and the ceiling at the rate of Rs.7.50 per sq.m.
- Q.4: The curved surface area of a right circular cylinder of height 14 cm is 88 sq.cm. Find the diameter of the base of the cylinder.
- Q.5: Curved surface area of a right circular cylinder is 4.4 sq.m. If the radius of the base of the cylinder is 0.7 m, find its height.
- Q.6: In a hot water heating system, there is a cylindrical pipe of length 28 m and diameter 5 cm. Find the total radiating surface in the system.
- Q.7: The height of a cone is 16 cm and its base radius is 12 cm. Find the curved surface area and the total surface area of the cone. (Take $\pi = 3.14$)
- Q.8: Find the total surface area of a cone, if its slant height is 21 m and diameter of its base is 24 m.
- Q.9: The slant height and base diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white-washing its curved surface at the rate of Rs.210 per 100 sq.m.
- Q.10: The hollow sphere, in which the circus motorcyclist performs his stunts, has a diameter of 7 m. Find the area available to the motorcyclist for riding.
- Q.11: The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.
- Q.12: A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water will fall into the sea in a minute?

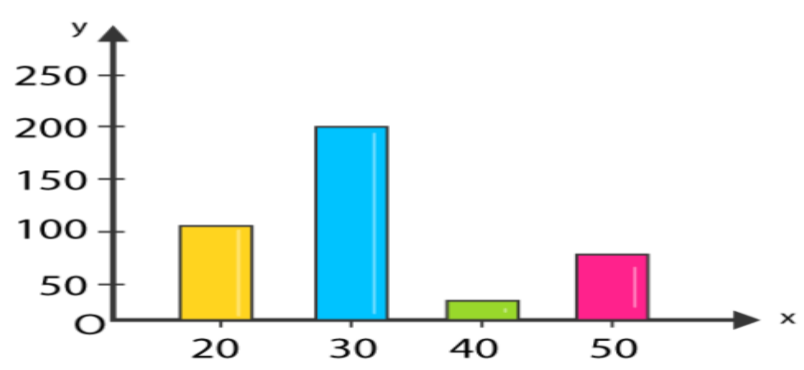
HIGHLIGHTS OF CHAPTER 14 STATISTICS

- **Ungrouped Data**
- Ungrouped data is data in its original or raw form. The observations are not classified into groups.
- For example, the ages of everyone present in a classroom of kindergarten kids with the teacher is as follows:
- 3, 3, 4, 3, 5, 4, 3, 3, 4, 3, 3, 3, 3, 4, 3, 27.
- This data shows that there is one adult present in this class and that is the teacher. Ungrouped data is easy to work when the data set is small.
- **Grouped Data**
- In grouped data, observations are organized in groups.
- For example, a class of students got different marks in a school exam. The data is tabulated as follows:

Mark interval	0-20	21-40	41-60	61-80	81-100
No. of Students	13	9	36	32	10

- This shows how many students got the particular mark range. Grouped data is easier to work with when a large amount of data is present.

- **Frequency** is the number of times a particular observation occurs in data.
- **<u>Class Interval</u>**
- Data can be grouped into class intervals such that all observations in that range belong to that class.
- **Class width** = upper class limit – lower class limit
- Graphical Representation of Data
- **<u>Bar graphs</u>**
- Graphical representation of data using bars of equal width and equal spacing between them (on one axis).



- **Histograms**
- Like bar graphs, but for continuous class intervals.
- Area of each rectangle is $\propto$ Frequency of a variable and the width is equal to the class interval.

IMPORTANT QUESTIONS

- **Question 1 . If the mean of six observations *y*, *y* + 1, *y* + 4, *y* + 6, *y* + 8, y + 5 is 13, find the value of *y*.**
- **Solution:**
- Mean = sum of observation/ total no of observations
- 13 = (*y* + *y* + 1+ *y* + 4+ *y* + 6+ *y* + 8+ y + 5) / 6
- 13 = (6y + 24)/6
- (13 * 6) = 6y +24
- (13 * 6) – 24 = 6y
- (13 * 6) – 6 * 4 = 6y
- 6(13 – 4) = 6y
- y = 9
- **Question 2. The mean weight of a class of 34 students is 46.5 kg. If the weight of the new boy is included, the mean is rises by 500 g. Find the weight of the new boy.**
- **Solution:**
- The mean weight of 34 students = 46.5
- Sum of the weight of 34 students = (46.5 * 34) = 1581
- Change or increase in the mean weight when the weight of a new boy is added = 0.5
- So, the new mean = (46.5 +0.5) = 47
- So, let the weight of the new boy be y.
- So, (sum of weight of 34 students + weight of new boy) / 35 = 47
- (1581+ y)/ 35 = 47
- 1581 + y = 1645
- y = 1645 – 1581 = 64

HIGHLIGHTS OF CHAPTER 15 PROBABILITY

- **Event and outcome**
- An **Outcome** is a result of a random experiment. For example, when we roll a dice getting six is an outcome.
  An **Event** is a set of outcomes. For example when we roll dice the probability of getting a number less than five is an event.
  Note: An Event can have a single outcome.
- Experimental probability can be applied to any event associated with an experiment that is repeated a large number of times.
  A trial is when the experiment is performed once. It is also known as **empirical probability**.

  Experimental or empirical probability: P(E) =Number of trials where the event occurred/Total Number of Trials
- **Theoretical Probability, P(E) = Number of Outcomes Favourable to E / Number of all possible outcomes of the experiment**
- Here we assume that the outcomes of the experiment are **equally likely**.

- **Elementary Event**
- An event having only **one outcome** of the experiment is called an **elementary event.**
  Example: Take the experiment of tossing a coin n number of times. One trial of this experiment has two possible outcomes: Heads(H) or Tails(T). So for an individual toss, it has only one outcome, i.e Heads or Tails.
- **Sum of Probabilities**
- The **sum** of the probabilities of all the **elementary events** of an experiment is **one**.
  Example: take the coin-tossing experiment. P(Heads) + P(Tails)
- = (1/2)+ (1/2) =1
- **Impossible event**
- An event that has **no chance of occurring** is called an **Impossible event**, i.e. P(E) = 0.
  E.g: Probability of getting a 7 on a roll of a die is 0. As 7 can never be an outcome of this trial.
- **Sure event**
- An event that has a **100% probability** of occurrence is called a **sure event**. The probability of occurrence of a **sure event** is **one**.
  E.g: What is the probability that a number obtained after throwing a die is less than 7?
  So, P(E) = P(Getting a number less than 7) = 6/6= 1

- Range of Probability of an event
- The range of probability of an event lies between 0 and 1 inclusive of 0 and 1, i.e. $0 \leq P(E) \leq 1$.
- Geometric Probability
- Geometric probability is the calculation of the likelihood that one will hit a particular area of a figure. It is calculated by dividing the desired area by the total area. In the case of Geometrical probability, there are infinite outcomes.
- Complementary Events
- Complementary events are two outcomes of an event that are the only two possible outcomes. This is like flipping a coin and getting heads or tails. $P(E)+P(\bar{E})=1$, where E and $\bar{E}$ are complementary events. The event $\bar{E}$, representing '**not E**', is called the **complement** of the event **E**.

IMPORTANT QUESTIONS

- **Q.1. Compute the probability of the occurrence of an event if the probability the event not occurring is 0.56.**
- Solution:
- Given,
- P(not E) = 0.56
- We know that,
- P(E) + P(not E) = 1
- So, P(E) = 1 – P(not E)
- P(E) = 1 – 0.56
- Or, P(E) = 0.44
- **Q.2. In a factory of 364 workers, 91 are married. Find the probability of selecting a worker who is not married.**
- Solution:
- Given,
- Total workers (i.e. Sample space) = n(S) = 364
- Total married workers = 91
- Now, total workers who are not married = n(E) = 364 – 91 = 273
- Method 1: So, P(not married) = n(E)/n(S) = 273/364 = 0.75
- Method 2: P(married) + P(not married) = 1
- Here, P(married) = 91/364 = 0.25
- So, 0.25 + P(not married) = 1
- P(not married) = 1 – 0.25 = 0.75

- **Q. 3. From a deck of cards, 10 cards are picked at random and shuffled. The cards are as follows:**
- **6, 5, 3, 9, 7, 6, 4, 2, 8, 2**
- **Find the probability of picking a card having value more than 5 and find the probability of picking a card with an even number on it.**
- Solution:
- Total number of cards = 10
- Total cards having value more than 5 = 5
- i.e. {6, 9, 7, 6, 8}
- Total cards having an even number = 6
- i.e. {6, 6, 4, 2, 8, 2}
- So, the probability of picking a card having value more than 5 = 5/10 = 0.5
- And, the probability of picking a card with an even number on it = 6/10 = 0.6

- **Q.4. From a bag of red and blue balls, the probability of picking a red ball is x/2. Find "x" if the probability of picking a blue ball is ⅔.**
- Solution:
- Here, there are only red and blue balls.
- P(picking a red ball) + P(picking a blue ball) = 1
- $x/2 + 2/3 = 1$
- => $3x + 4 = 6$
- => $3x = 2$
- Or, $x = 2/3$