MATHS

Chapterwise Important questions

Chapter 1 - Real numbers

1. Find the HCF & LCM using prime power factorisation.

2. Find the HCF & LCM and verify the relationship.

LCM x HCF = a x b

3. Given 2 positive integers a and n expressed as powers of x and y, finding HCF(a,b) or LCM(a,b).

$$x = a^3b^2, y = a^4b^5$$

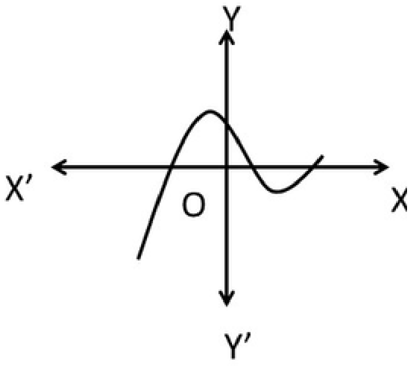
Imp**

4. Proving a given number is irrational - √2, √3, … 2 + 5√3, …

5. Word Problems on HCF or LCM.

Chapter 2 - Polynomials

1. Finding the zeroes & the number of zeroes from the given graph.



2. Finding the zeroes of the given quadratic polynomial & verifying relationship.

$$\alpha + \beta = \frac{-b}{a} \ : \alpha . \beta = \frac{c}{a}$$

3. Finding the quadratic polynomial, given sum & product of zeroes.

$$k[x^2 - (\alpha + \beta)x + \alpha\beta]$$

Imp**

4. If α and β are zeroes of the polynomial, find a polynomial whose zeroes are expressed as various forms of α and β.

$$\textit{Find values of}$$

$$\alpha^2 + \beta^2: \quad \frac{1}{\alpha} + \frac{1}{\beta}: \quad \frac{\alpha}{\beta} + \frac{\beta}{\alpha}$$

Chapter 3 - Pair of linear equation in 2 variables

1. Finding whether the given equations are consistent or not.

Imp**

2. Finding the value of the variable, given that the pair of Linear intersecting, parallel, or coincident.

3. Solving the given pair of Linear equations by substitution or elimination method.
E.g. 99x + 101y = 499, 101x + 99y = 501 Imp**

4. Word problems: fixed charges, train, age, fraction, reversed digits.

Chapter 4 - Quadratic equations

1. Finding the nature of roots of the given quadratic equation.

2. Given the nature of roots, finding the value of variable.
Ex: If -3 is a root of the quadratic equation $2x^2 + px - 15 = 0$, while the quadratic equation $x^2 - 4px + x = 0$ has equal roots. Find the value of k.

3. Solving Quadratic: Simple form or fraction form. Ex:

$$\frac{1}{(x-2)} + \frac{2}{(x-1)} = \frac{6}{x} \quad ; x \neq 0,1,2.$$

4. Word problems: Speed of flight or boat, Time taken by taps to fill water.

Chapter 5- Arithmetic progression

1. Finding the nth term from the beginning or end.

2. Finding the common difference of the given AP.

3. Finding 'n', for which the nth term of 2 given APs are equal.

4. Case study Questions based on finding nth term or sum of n terms.

   Ex - seats in auditorium, production in nth year, saving in nth year, number of steps covered, etc.

Chapter 6 - Triangles

- BPT - statement & theorem
- Finding 'x' using BPT
- Finding 'x' using similarity concept.
- Median related proof question.

1. If ΔABC ~ ΔQRP, ar (ΔABC) / ar (ΔPQR) =9/4 , AB = 18 cm and BC = 15 cm, then find PR.

sol. Given that ΔABC ~ ΔQRP.
ar (ΔABC) / ar (ΔQRP) =9/4
AB = 18 cm and BC = 15 cm

We know that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

ar (ΔABC) / ar (ΔQRP) = BC2/RP2
9/4 = (15)2/RP2
RP2 = (4/9) × 225
PR2 = 100
Therefore, PR = 10 cm

2.If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

sol. Consider a triangle ΔABCand draw a line PQ parallel to the side BC of ΔABC and intersect the sides AB and AC in P and Q, respectively.

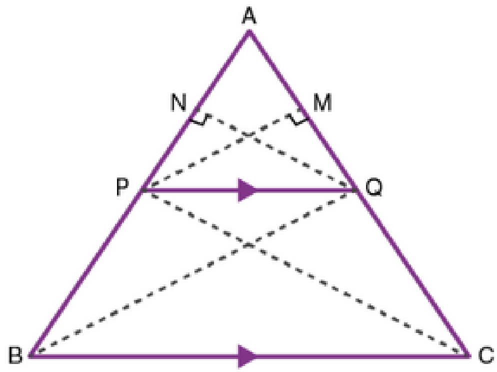
To prove: AP/PB = AQ/QC

Construction:

Join the vertex B of ΔABC to Q and the vertex C to P to form the lines BQ and CP and then drop a perpendicular QN to the side AB and draw PM⊥AC as shown in the given figure.

Proof:

Now the area of ΔAPQ = 1/2 × AP × QN (Since, area of a triangle= 1/2× Base × Height)



Similarly, area of ΔPBQ= 1/2 × PB × QN

area of ΔAPQ = 1/2 × AQ × PM

Also,area of ΔQCP = 1/2 × QC × PM ………… (1)

Now, if we find the ratio of the area of triangles ΔAPQand ΔPBQ, we have

$$\frac{area\ of\ \triangle APQ}{area\ of\ \triangle PBQ} = \frac{\frac{1}{2}\times AP\times QN}{\frac{1}{2}\times PB\times QN} = \frac{AP}{PB}$$

$$Similarly,\ \frac{area\ of\ \triangle APQ}{area\ of\ \triangle QCP} = \frac{\frac{1}{2}\times AQ\times PM}{\frac{1}{2}\times QC\times PM} = \frac{AQ}{QC}\ldots(2)$$

According to the property of triangles, the triangles drawn between the same parallel lines and on the same base have equal areas.

Therefore, we can say that ΔPBQ and QCP have the same area.

area of ΔPBQ = area of ΔQCP …………..(3)

Therefore, from the equations (1), (2) and (3), we can say that,

AP/PB = AQ/QC

3.In the figure ABC and DBC are two right triangles. Prove that AP × PC = BP × PD. (2013)

Solution:

In ΔAPB and ΔDPC,

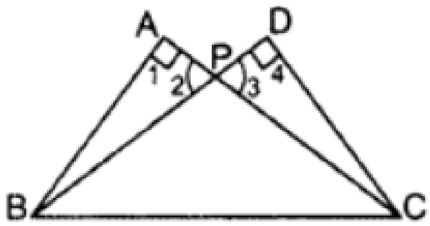
∠1 = ∠4 … [Each = 90°

∠2 = ∠3 …[Vertically opp. ∠s

∴ ΔAPB ~ ΔDPC …[AA corollary

⇒ BPPC=APPD … [Sides are proportional

∴ AP × PC = BP × PD



Chapter 7 - Coordinate geometry

1. Finding the missing coordinate: Ex: If the point P(6,2) divides the line segment joining A(6,5) and B(y,4) in the ratio 3:1 then the value of y is.

2. Application of distance formula - based on types of triangle.

3. Application of section formula - based centroid, median, mid-point, trisection.

4. Case study question based on the above.

Chapter 8 - Introduction to trigonometry

1. Given the value of a trigonometric ratio, finding the others (Pythagoras theorem application)

Q. Given sin A =3/5 find the other trigonometric ratios of the angle A. [CBSE 2016]

Solution:

$sinA$ = 3/5

$\Rightarrow sinA = \frac{p}{h}$, $so\ p$ = 3k & h = 5k

base= $\sqrt{hyp^2 - perp^2}$

$\Rightarrow b = \sqrt{(5k)^2 - (3k)^2} = 4k$

cosA = b/h=4k/5k= 4/5

tanA = p/b=3k/4k= 3/4

cosecA = 1/sinA= 5/3

secA = 1/cosA=5/4

cotA = 1/cotA= 4/3

2. Proof related question based on trigonometric ratios & reciprocals. Imp.***

3. Proof related question based on simply trigonometric table values.

4. Proof related question based on trigonometric identities.

Q.Prove that (1+secθ-tanθ)/(1+secθ-tanθ) =(1-sinθ) /cosθ. [CBSE 2020]

Solution:

We have to prove that

$(1 + \sec\theta - \tan\theta)/(1 + \sec\theta + \tan\theta) = (1 - \sin\theta)/\cos\theta$

Considering LHS,

LHS : $(1 + \sec\theta - \tan\theta)/(1 + \sec\theta + \tan\theta)$

By using , $\sec^2 A - \tan^2 A = 1$

$(1 + \sec\theta - \tan\theta) = \sec\theta - \tan\theta + (\sec^2\theta - \tan^2\theta)$

$= (\sec\theta - \tan\theta) + [(\sec\theta - \tan\theta)(\sec\theta + \tan\theta)]$

Taking out common term,

$= (\sec\theta - \tan\theta)[1 + \sec\theta + \tan\theta]$

Now, $(1 + \sec\theta - \tan\theta)/(1 + \sec\theta + \tan\theta) = (\sec\theta - \tan\theta)[1 + \sec\theta + \tan\theta] / (1 + \sec\theta + \tan\theta)$

$= (\sec\theta - \tan\theta)$

We know that $\sec A = 1/\cos A$ and $\tan A = \sin A/\cos A$

So, $(\sec\theta - \tan\theta) = (1/\cos\theta - \sin\theta/\cos\theta)$

$= (1 - \sin\theta)/\cos\theta$

= RHS

LHS = RHS 3

Therefore, $(1 + \sec\theta - \tan\theta)/(1 + \sec\theta + \tan\theta) = (1 - \sin\theta)/\cos\theta$

Chapter 9 - Some application of trigonometry

1. Finding the angle or height or length based on sun's elevation.

2. Height of tower or building.

3. Distance between cars, ships, or two people.

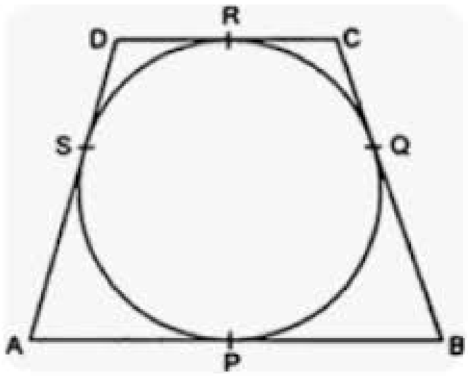
4. Speed related problem - Car, bird, flight.

Case-study problems

Chapter 10 - Circles

1. Finding the length of the radius chord or tangent.

2. Based on the perimeter of the figure circumscribing the circle. Ex; In the given, figure, a circle touches all the four sides of quadrilateral ABCD with AB = 6 cm and CD = 4 cm, the length of AD is



3.Proof related questions.

Chapter 11 - Areas related to circles

1. Problems related to the perimeter or circumference & area of a circle.

2. Area of segment (Major & Minor)

3. Area of segment (Major & Minor)

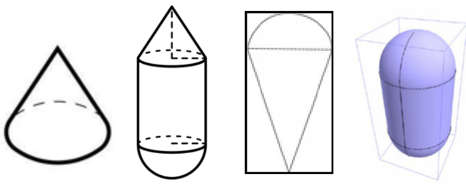
4. Length of arc

5. Related to the ratio of area/perimeter of circle & square.

6. Wheel problems. Ex-The diameter of a wheel is 1.26 m. What is the distance covered in 500 revolutions. The wheel of a motorcycle is of radius 35 cm. How many revolutions to travel a distance of 11m?

Chapter 12 - Surface areas & Volumes

1. Problems related to finding the TSA or CSA or volume of combination of following types of solid.



1. A solid right circular cone is cut into two parts at the middle of its height by a plane parallel to its base. Find the ratio of the volume of the smaller cone to the whole cone. (2012OD)

Solution:

Since the cone is cut from the middle,

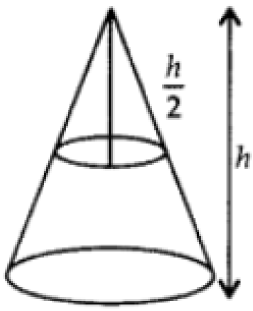
$\therefore$ Radius of small cone $= \frac{r}{2}$

Height $= \frac{h}{2}$

$\therefore$ **Ratio of volumes** $= \frac{V_1}{V_2}$

$$= \frac{\frac{1}{3}\pi\left(\frac{r}{2}\right)^2 \times \frac{h}{2}}{\frac{1}{3}\pi r^2 h} = \frac{\frac{r^2 h}{8}}{r^2 h}$$

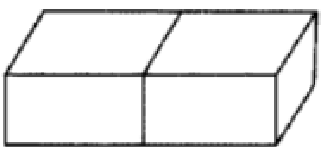
$= \mathbf{1 : 8}$



2. Two cubes, each of side 4 cm are joined end to end. Find the surface area of the resulting cuboid. (2011D)

Solution:

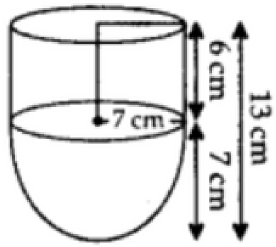
Length of resulting cuboid, I = 2(4) = 8 cm
Breadth of resulting cuboid, b = 4 cm
Height of resulting cuboid, h = 4 cm



Surface area of resulting cuboid
= 2(lb + bh +hl) = 2 [8(4) + 4(4) + 4(8)]
= 2 (32 + 16 + 32) = 2 (80) = 160 cm2

3.A vessel is in the form of a hemispherical bowl surmounted by a hollow cylinder of same diameter. The diameter of the hemispherical bowl is 14 cm and the total height of the vessel is 13 cm. Find the total (inner) suface area of the vessel. (Use π = 227) (2013D)

Solution:



r = 142 = 7 cm

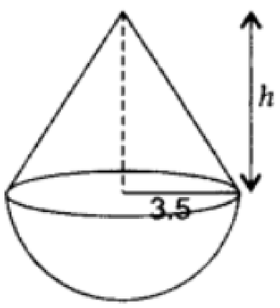
Inner surface area of the vessel = C.S. area of Hemi-sphere + C.S. area of Cylinder

= 2πr2 + 2πrh = 2πr(r + h) ...C.S. area = curved surface area

= 2 × 227 × 77 + 6) = 44 × 13 = 572 cm2

4.A solid wooden toy is in the form of a hemisphere surmounted by a cone of same radius. The radius of hemisphere is 3.5 cm and the total wood used in the making of toy is 16656 cm3. Find the height of the toy. Also, find the cost of painting the hemispherical part of the toy at the rate of ₹10 per cm2. [Use π = 227] (2015D)

Solution:



Let the height of cone = h

Radius of cone = Radius of hemisphere = r = 3.5 cm

Volume of solid wooden toy = Volume of hemisphere + Volume of cone

$\Rightarrow \quad 166\frac{5}{6} = \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$

$\Rightarrow \quad \frac{1001}{6} = \frac{1}{3}\pi r^2 (2r + h)$

$\Rightarrow \quad \frac{1001}{6} = \frac{1}{3} \times \frac{22}{7} \times (3.5)^2 (2 \times 3.5 + h)$

$\Rightarrow \quad \frac{1001}{6} = \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \; (7 + h)$

$\Rightarrow \quad \frac{1001}{6} = \frac{77}{6}(7 + h) \Rightarrow \quad \frac{1001}{77} = 7 + h$

$\Rightarrow \quad 13 = 7 + h \qquad \Rightarrow \quad h = 6$

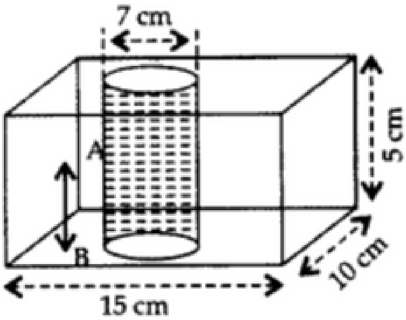
$\therefore$ **Height of toy** $= h + r = 6 + 3.5 =$ **9.5 cm**

Area of hemispherical part of toy $= 2\pi r^2$

$= \left(2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right) \text{cm}^2 = 77 \text{ cm}^2$

$\therefore$ **Cost of painting** = ₹(77 × 10) = **₹770**

5.In Figure, from a cuboidal solid metallic block, of dimensions 15 cm × 10 cm × 5 cm, a cylindrical hole of diameter 7 cm is drilled out. Find the surface area of the remaining block. (Use π =227) (2015D)



Solution:

Let the length, breadth, height of cuboidal block be 15 cm, 10 cm and 5 cm respectively.

Total surface area of solid cuboidal block

= 2(lb + bh + lh)

= 2(15 × 10 + 10 × 5 + 15 × 5) cm2

= 2(150 + 50 + 75) = 2(275) = 550 cm2

Radius of cylindrical hole = $r = \frac{7}{2}$ cm

Area of two circular bases $= \pi r^2 + \pi r^2 = 2\pi r^2$

$$= 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 77 \text{ cm}^2$$

Curved Surface Area of cylinder = $2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{7}{2} \times 5 = 110 \text{ cm}^2$$

Required area = (Area of cuboidal block – Area of two circular bases + Area of cylinder)

= (550 + 110 – 77) cm2 = 583 cm2

Chapter 13 - Statistics

1. Finding the mean using all 3 methods. ⟶ Step

2. Finding mode.

3. Finding median.

4. Finding missing frequencies, given any of the measure of central tendency. ⟶ Median

5. Using empirical relationship to find any of the measure of central tendency, given the other two.

Chapter 14 - Probability

1. Coin-related: single, double, or triple.

Q. A coin is tossed two times. Find the probability of getting both heads or both tails. (2011D)

Solution:

S = {HH, HT, TH, TT) = 4

P (both heads or both tails)

= P (both heads) + P (both tails)

= 14+14=24=12

2. Dice related: single or double, prime, odd, even, doublet.

Q. If two different dice are rolled together, the probability of getting an even number on both dice, is [CBSE 2021, 2014]

Solution: Solve for the favorable outcomes and find the required probability:

Possible outcomes of rolling the two dice are:

{(1, 1), (1,2), (1, 3), (1, 4), (1,5), (1,6),
(2, 1), (2, 2), (2,3), (2, 4), (2, 5), (2, 6),
(3,1), (3, 2), (3,3), (3,4), (3,5), (3, 6),
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5,3), (5, 4), (5,5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

Total number of outcomes = 36

The favorable outcomes are:

{(2,2), (2,4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6, 6)}.

Total number of favorable outcomes = 9

Probability of getting an even number on both dice = 9/36 = 1/4

Hence, the probability of getting an even number on both dice is 1/4

3. Deck of cards related.

Q.A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither an ace nor a king. **(2011OD)**

Solution:

P (neither an ace nor a king)

= 1 – P (either an ace or a king)

= 1 – [P (an ace) + P (a king)]

=1-(8/52)

=11/13

4. Complement - (Defective)

5. Bag of color balls or numbered cards.

Q. A bag contains 4 red, 3 blue and 2 yellow balls. One ball is drawn at random from the bag. Find the probability that drawn hall is [CBSE 2015, 2020]

(i) red

(ii) yellow

Solution:

P(red)= 4/9

p(yellow)= 2/9