Previous Year Question Paper
2010

General Instuctions *:*

(i) All questions are compulsory.

(ii) The question paper consists of 30 questions divided into four sections - A, B, C and D. Section A comprises often questions of 1 mark each, Section B comprises of five questions of 2 marks each, Section C comprises often questions of 3 marks each and Section D comprises of five questions of 6 marks each.

(iii) All questions in Section A are to be answered in one word, one sentence. or as per the exact requirement of the question.

(iv) There is no overall choice. However, an internal choice has been provided in one question of 2 marks each. three questions of 3 marks each and two questions of 6 marks each. You have to attempt only one of the alternative in all such questions.

(v) In question on construction, the drawings should be neat and exactly as per the given measurements.

(vi) Use of calculators is not permitted.

SECTION – A

Question Numbers 1 to 10 carry 1 mark each.

1. Has the rational number $\frac{441}{2^2.5^7.7^2}$ a terminating or a non-terminating decimal representation?

Solution:

Given a rational number $\frac{441}{2^2.5^7.7^2}$

Since the denominator is not in the form of 2m×5n. the rational number has non terminating repeating decimal expansion

2. If α, β are the zeroes of a polynomial, such that $\alpha+\beta=6$ and $\alpha\beta=4$, then write the polynomial.

Solution:

Given ∝ and β are the zeroes of quadratic polynomial with ∝+β = 6

∝β = 4

Quadratic polynomial =x^2-6x+4

=x^2-6x+4

3. If the sum of first p terms of an A.P., is $ap^2 + bp$, find its common difference.

Solution:

Given an AP which has sum of first P terms =ap^2+bp

Lets say first term=k & common difference =d

$\therefore ap^2+bp=\frac{p}{2}\left[2k+(p-1)d\right]$

$$2ap+2b=2k+(p-1)d$$

$$2b+2ap=(2k-d)+pd$$

Comparing terms (r) both sides

$\Rightarrow \boxed{2a = d}$

$2k - d = 2b$

$2k = 2b + 2a$

$\boxed{k = a + b}$

Common difference $=2a$

First term = a + b

4. In Fig. 1, S and T are points on the sides PQ and PR, respectively of Δ PQR, such that PT = 2 cm, TR = 4 cm and ST is parallel to QR. Find the ratio of the areas of Δ PST and Δ PQR.

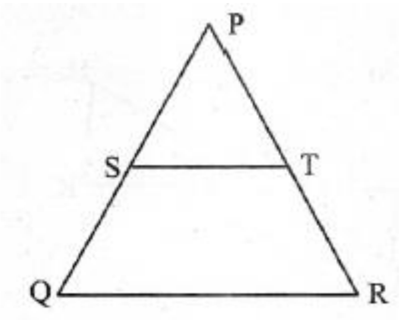
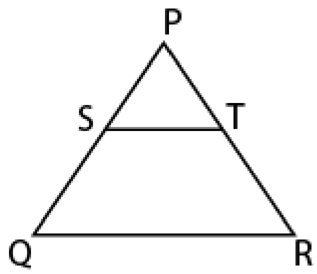


Fig. 1

Solution:



Given : $PT = 2cm, TR = cm$

$ST \; 11QR$

solution :AS itisgiven that $ST \; 11 \; QR$

$\Delta PST \sim \Delta PQR$

$\because \frac{PS}{PQ} = \frac{PT}{PR} = \frac{ST}{QR}$

$Also, \frac{ar(\Delta PST)}{ar(PQR)} = \left(\frac{PS}{PQ}\right)^2 = \left(\frac{PT}{TR}\right)^2 = \left(\frac{ST}{QR}\right)^2$

$\therefore \frac{ar(\Delta PST)}{ar(\Delta PQR)} = \left(\frac{PT}{TR}\right)^2 \left(\frac{2}{4}\right)^2$

$ratio = 1 : 4$

5. In fig. 2, Δ AHK is similar to Δ ABC. If AK = 10 cm, BC = 3.5 cm and HK = 7 cm, find AC.

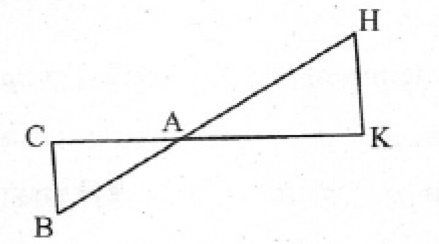
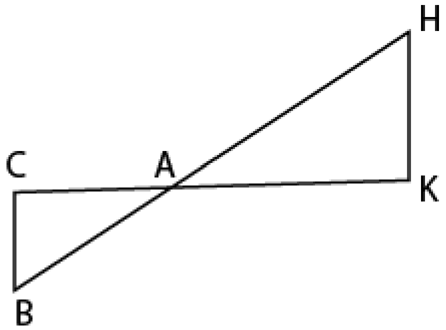


Fig. 2

Solution:



Given ΔAHK ~ ΔABC

$$\Rightarrow \frac{AH}{AB} = \frac{HK}{BC} = \frac{AK}{AC}$$

Also we know AK=10cm, BC=3.5cm and HK=7cm

$$\Rightarrow \frac{AK}{AC} = \frac{HK}{BC}$$

$$\Rightarrow \frac{10}{AC} = \frac{7}{3.5}$$

$$\boxed{AC = 5cm}$$

6. If 3x = cosec 9 and $\frac{3}{x} = \cot\theta$, find the value of $3\left(x^2 - \frac{1}{x^2}\right)$.

Solution:

Given 3x=cosec θ

$$\frac{3}{x} = cot\ \theta$$

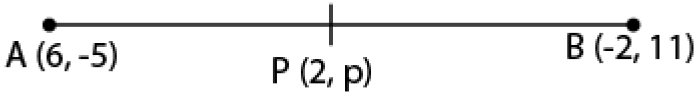
We know that $\text{cosec}^2\theta - \cot^2\theta = 1$

$$\Rightarrow 9x^2 - \frac{9}{x^2} = 1$$

$$\Rightarrow 9\left(x^2 - \frac{1}{x^2}\right) = 1$$

$$\Rightarrow \boxed{3\left(x^2 - \frac{1}{x^2} = \frac{1}{3}\right)}$$

7. If P(2, p) is the mid-point of the line segment joining the points A(6, -5) and B(-2, 11). find the value of p.
Solution:



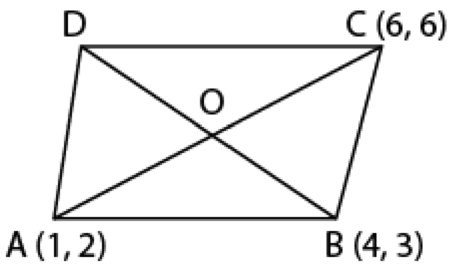
Given P is midpoint of AB

$\therefore$(2,P)=$\left(\frac{6-2}{2},\frac{-5+11}{2}\right)$

$(2,p)=(2,3)$

$\therefore \boxed{p=3}$

8. If A(1, 2), B(4, 3) and C(6, 6) are the three vertices of a parallelogram ABCD, find the coordinates of the fourth vertex D.
Solution:



Given ABCD is a parallelogram
In a parallelogram diagonals each other.
$\Rightarrow$ 0 is midpoint to AC and BD

$\therefore 0=\left(\frac{1+6}{2},\frac{2+6}{2}\right)$

$0=\left(\frac{1}{2},4\right)$

Lets say D=(x,y)

$0=\left(\frac{x+4}{2},\frac{3+4}{2}\right)$

But we know $0=\left(\frac{7}{2},4\right)$

$\therefore \frac{7}{2}=\frac{x+4}{2} \text{ and } 4=\frac{3+y}{2}$

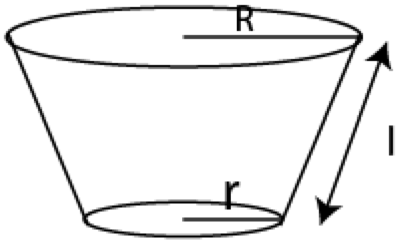
$x=3, y=5$

$\therefore D=(3,5)$

9. The slant height of a frustum of a cone is 4 cm and the perimeters (circumferences) of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

[Use $\pi = \frac{22}{7}$]

Solution:



Given slant height (ℓ)=4cm
Perimeters of circular ends:
2πr=6cm
2πR=18cm
C.S.A=πℓ(r+R)=4×12
=48cm^2

10. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting a red face card.

Solution:

A card is drawn from 52 card total no of possible outcomes =52
No of face cards =12
No of Red face cards =6

Probability of drawing = $\frac{6}{52}$

A Red face card = $\frac{3}{26}$

Section B

Question Numbers 11 to 15 carry 2 marks each.

11. If two zeroes of the polynomial x^3 -4x^2 - 3x + 12 are $\sqrt{3}$ and $-\sqrt{3}$, then find its third zero.

Solution:

Given a polynomial
X^2-4x^2-3x+12=0
Sum of all the zeroes of polynomial =(-4)=4
Given two zeroes of $\sqrt{3}, -\sqrt{3}$
Say the third zero = ∝

$\Rightarrow \infty + \sqrt{3} - \sqrt{3} = 4$

$\therefore \boxed{\infty = 4} \Rightarrow$ third zero is 4

12. Find the value of k for which the following pair of linear equations have infinitely many solutions
2x + 3y = 7;   (k-1)x + (k + 2)y = 3k

Solution:

2x+3y=7

(k-1)x+(k+2)y =3k

For this pair of linear equations to have infinitely many solution, they need to be concident

$$\Rightarrow \frac{2}{k-1}=\frac{3}{k+2}=\frac{7}{3k}$$

Upon solving we get

$\boxed{k=7}$

13. In an A.P., the first term is 2, the last term is 29 and sum of the terms is 155. Find the common difference of the A.P.

Solution:

Given an AP with first term (a)=2

Last term (ℓ)=29

Sum of the term =155

Common difference (d)=?

Sum of the n term = $\frac{n}{2}(a+\ell)$

$$\Rightarrow 155=\frac{n}{2}(2+29)$$

$$\Rightarrow \boxed{n=10}$$

Last term which is Tn

= a +(n-1)d

= a +(9)d

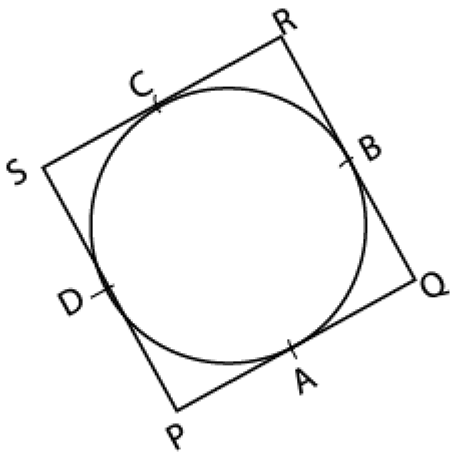
∴29=2+9d

$\boxed{d=3}$

Common difference=3

14. If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.

Solution:



Given a parallelogram PQRS in which a circle is inscribed

We know PQ=RS

QR=PS

DP=PA {tangents to the circle from external point have equal length}

QA=BQ

BR=RC

DS=CS

Adding above four equations

DP+QA+BR+DS=PA+BQ+RC+CS

(DP+DS)+(QA+BR)=(PA+QA)+(SR)

2QR=2(PQ)

∴PQ=QR

⇒PQ=QR=RS=QS

∴PQRS is a rhombus

15. Without using trigonometric tables, find the value of the following expression

$$\frac{\sec(90^\circ-\theta).\mathrm{cosec}\theta-\tan\theta(90^\circ\text{-}\theta)\cot\theta+\cos^2 25^\circ+\cos^2 65^\circ}{3\tan 27^\circ\cdot\tan 63^\circ}$$

Or

Find the value of cosec 30°, geometrically.

Solution:

$$\frac{sec(90-\theta)cos ec\theta - tan(90-\theta)cot\theta + cos^2 25 + cos^2 65}{3tan 27.tan 63}$$

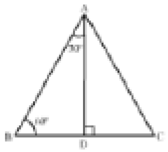
$$\Rightarrow \frac{cos ec^2\theta - cot^2 + (sin(90-25))^2 + cos^2 65}{3tan 27.tan 63}$$

$$\Rightarrow \frac{1+sin^2 65 + cos^2 65}{3cot(90-27)tan 63}$$

$$\Rightarrow \frac{2}{3cot 63\, tan 63}$$

$$\Rightarrow \frac{2}{3}$$

15)(or)



∠A=∠B=∠C=60^0

Draw AD⊥BC

In ΔABD and ΔACD,

AD=AD (common)

∠ADB=∠ADC (90^0)

AB=AC (ΔABC is equalateralΔ)

∴ΔABD≥ΔACD (RHS congruence criterion)

BD=DC (C.P.C.t)

∠BAD=∠CAD (C.P.C.t)

BD=$\frac{2a}{2}$=a and ∠BAD=$\frac{60^0}{2}$=30^0

In right ΔABD,

Sin 30^0=$\frac{BD}{AB}$ $\left(\because sin\theta = \frac{Perpendicular}{Hypotenuse}\right)$

$$\Rightarrow sin 30^0 = \frac{a}{2a}$$

$$\Rightarrow sin 30^0 = \frac{1}{2} \Rightarrow \frac{1}{sin 30^0} = 2$$

$$\Rightarrow \boxed{cos ec\, 30^0 = 2}$$

Section C

Question Numbers 16 to 25 carry 3 marks each.

16. Prove that $2-3\sqrt{5}$ is an irrational number.

Solution:

lets assume 2-3$\sqrt{5}$ is a rational number

$\Rightarrow 2-3\sqrt{5}=\frac{p}{q},(where\ p,q\ are\ integers\ pq \pm 0)$

$\Rightarrow 2\frac{-p}{q}=3\sqrt{5}$

$\Rightarrow \frac{2q-p}{3q}=\sqrt{5}$

$\frac{2q-p}{3q}$ is a rational number but we also know $\sqrt{5}$ is an irrational

Rational ± irrational

$\Rightarrow$ our assumption is wrong

∴2-3 $\sqrt{5}$ is an irrational number

17. The sum of numerator and denominator of a fraction is 3 less than twice the denominator. If each of the numerator and denominator is decreased by 1, the fraction becomes $\frac{1}{2}$. Find the fraction.

Or

Solve the following pair of equations

$\frac{4}{x}+3y=8, \frac{6}{x}-4y=-5$

Solution:

lets say numerator=x

Denominator=y

Given x+y=2y-3

$\Rightarrow \boxed{x-y+3=0}-(1)$

From the next condition

$\frac{x-1}{y-1}=\frac{1}{2}$

$\boxed{2x-y-1=o}-(2)$

Solving (1) and (2)

X=4

Y=7

∴ fraction=$\frac{4}{7}$

17)(or)

$\frac{4}{x}+3y=8-(1)$

$\frac{6}{x}-4y=-5-(2)$

Multiplying 4 to (1) and 3 to (2)

$\frac{16}{x}+12y=32$

$\frac{18}{x}-12y=-15$

$\frac{34}{x}=17$

$\boxed{x=2}$

Substitute

X in (1)

2+3y=8

3y=6

Y=2

∴x=2

Y=2

18. In an A.P., the sum of first ten terms is -150 and the sum of its next ten terms is -550. Find the A.P.

Solution:

sum of first ten terms =-150

Sum of next ten terms =550

Lets say first term of A.P=*a*

Common difference =d

Sum of first ten terms = $\frac{10}{2}\left[2a+9d\right]$

$-150=5\left[2a+9d\right]$

$\boxed{2a+9d=-30}-(1)$

For sum of next ten terms the first term would be T_{11}=*a*+10d

$\Rightarrow -550=\frac{10}{2}\left[2\left(a+10d\right)+9d\right]$

$\Rightarrow \boxed{-110=2a+29d}-(2)$

Solving (1) and (2)

D= - 4

A=3

∴A.P will be 3,-1,-5,-9,-13,………..

19. In Fig. 3, ABC is a right triangle, right angled at C and D is the mid-point of BC. Prove that $AB^2 = 4AD^2 - 3AC^2$.

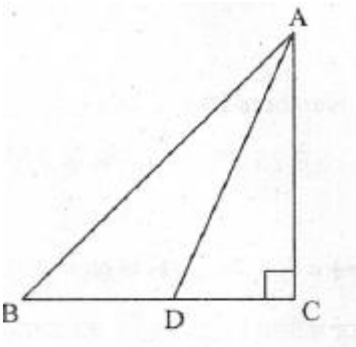
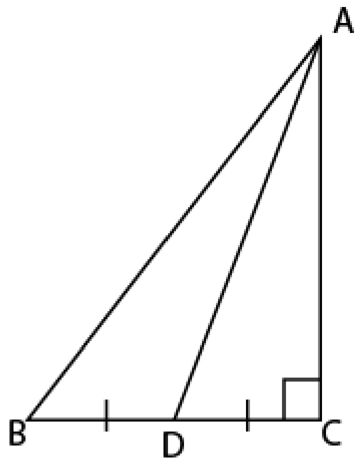


Fig. 3

Solution:



Given that BD = CD

AC ⊥ BC

In ΔABC $AB^2 = BC^2 + AC^2$

$AB^2 = (BD+CD)^2 + AC^2$

$AB^2 = (2CD)^2 + AC^2$

$AB^2 = 4CD^2 + AC^2$-----(1)

In ΔADC $AD^2 = CD^2 + AC^2$

$CD^2 = AD^2 - AC^2$

Substituting CD^2 in-------(2)

$\Rightarrow AB^2 = 4AD^2 - 4AC^2 + AC^2$

$\Rightarrow \boxed{AB^2 = 4AD^2 - 3AC^2}$

Hence proved

20. Prove the following:

$$\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = 1 + \tan A + \cot A$$

OR

Prove the following:

$$\left(\operatorname{cosec} A - \sin A\right)\left(\sec A - \cos A\right) = \frac{1}{\tan A + \cot A}$$

Solution:

Proved that

$$\frac{\tan\ A}{1-\cot\ A}+\frac{\cot\ A}{1-\tan\ A}=1+\tan\ A+\cot\ A$$

$$\underline{\text{L.H.S}}\frac{\tan\ A}{1-\cot\ A}+\frac{\cot\ A}{1-\tan\ A}$$

Þ $$\frac{\tan\ A}{\left(1-\frac{1}{\tan\ A}\right)}+\frac{\cot\ A}{1-\tan\ A}$$

Þ $$\frac{-\tan^2\ A}{1-\tan\ A}+\frac{\cot A}{1-\tan A}$$

$$\frac{1}{1-\tan}\left(-\tan^2\ A+\cot A\right)$$

$$=\frac{1}{1-\tan A}\left(-\tan^2\ A+\frac{1}{\tan A}\right)$$

$$=\frac{1-\tan^3\ A}{\tan A\left(1-\tan A\right)}$$

$$=\frac{\left(1-\tan A\right)\left(1+\tan^2\ A+\tan A\right)}{\tan A\left(1-\tan A\right)}$$

$$=\cot A+\tan A+1$$

Hence proved

OR

Proved that :

(cosec A- sin A) (sec A- cos A)= $\frac{1}{\tan A+\cot A}$

$$\underline{\text{LHS}}\left(\frac{1}{\sin A}-\sin A\right)\left(\frac{1}{\cos A}-\cos A\right)$$

$$=\frac{\left(1-\sin^2\ A\right)\left(1-\cos^2\ A\right)}{\sin A\cos A}$$

=sin A cos A

Multiply & divide by 2

$= \frac{2\text{siA} \cos A}{2}$

$= \frac{\sin 2A}{2}$

$= \frac{2 \tan A}{2\left(1 + \tan^2 A\right)}$

$= \frac{1}{\frac{1}{\tan A} + \tan A}$

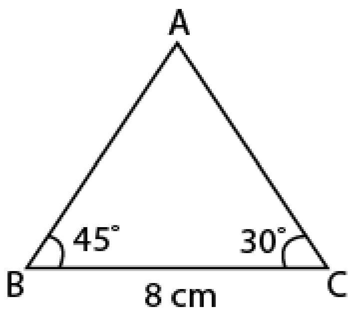
$= \frac{1}{\tan A + \cot A}$

Hence proved

21. Construct a triangle ABC in which BC = 8 cm, $\angle$ B = 45° and $\angle$ C = 30°.

Construct another triangle similar to Δ ABC such that its sides are $\frac{3}{4}$ of the corresponding sides of Δ ABC.

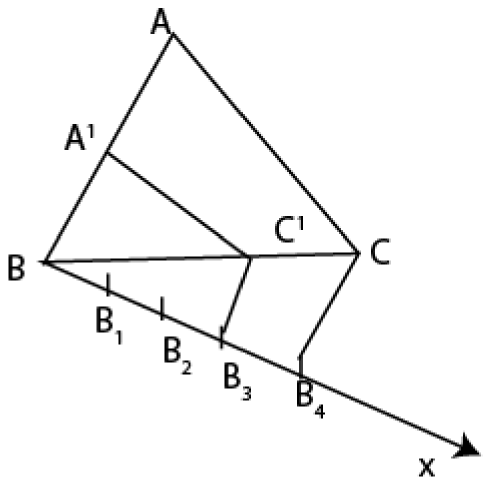
Solution:



steps :

1) Draw a ΔABC with BC =8cm, ∠B=45^0 &∠C=30^0
2) Draw a ray BX making acute angle with BC on the opposite side of vertex A
3) mark four points B_1,B_2,B_3B_4 on BX such that $BB_1=B_1B_2=B_2B_3=B_3B_4$
4) join B_4toc and draw a line parallel to B_4C from B_3 such it luts BC at C^1
5) form C^1draw another line parallel to AC such that it cuts AC at A^1.
6) ΔA^1BC^1 is the required triangle

Tustification :



In ΔABC and ΔA^1BC^1

$\angle ABC = \angle A^1BC^1$

$\angle ACB = \angle A^1C^1B$

$\therefore$by AA criterion $\Delta ABC \sim \Delta A^1BC^1$

$$\Rightarrow \frac{AB}{A^1B} = \frac{BC}{BC^1} = \frac{AC}{A^1C^1}$$

In ΔBB_4C and ΔBB_3C^1

$B_4C \ || \ B_3C^1$

$\therefore \Delta BB_4C \sim \Delta BB_3C^1$

$$\Rightarrow \frac{BC}{BC^1} = \frac{BB_4}{BB_3} = \frac{4}{3}$$

$$\therefore \frac{AB}{A^1B} = \frac{BC}{BC^1} = \frac{AC}{A^1C^1} = \frac{4}{3}$$

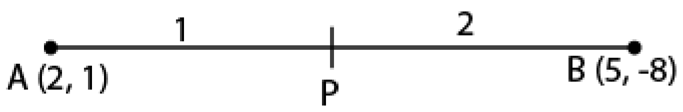
$$A^1B = \frac{3}{4}AB$$

$$BC^1 = \frac{3}{4}BC$$

$$A^1C^1 = \frac{3}{4}BC.$$

22. Point P divides the line segment joining the points A(2, 1) and B(5, -8) such that $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line 2x -y + k = 0, find the value of k.

Solution:



Given :

$$\frac{AP}{AB}=\frac{1}{3}\Rightarrow\frac{AP}{AP+PB}=\frac{1}{3}\ PB=2AP\Rightarrow AP:PB=1:2$$

by section formula

$$\therefore P=\left(\frac{2\times 2+5}{3},\frac{2-8}{3}\right)$$

$$P=(3,2)$$

Also it is given that P lines on 2x-y+k=0

$$\therefore (3)-2+k=0$$

$$\boxed{k=-4}$$

23. If R(x, y) is a point on the line segment joining the points P(a, b) and Q(b, a), then prove that x + y = a + b.

Solution:

Since R(x,y) is a point on the line segment joining the point, (a,b) and Q(b,a)

∴P(a,b) ,Q(b,a) and R(x,y) are the collinear.

$\Rightarrow$ Area of $\Delta PQR=0$

Area of triangle whose vertices are $(x_1,y_1),(x_2,y_2)$ and (x_3,y_3)

is $\frac{1}{2}\left[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right]$

$$\therefore \frac{1}{2}\left[a(a-y)+b(y-b)+x(b-a)\right]=0$$

$$\Rightarrow a^2-ay+by-b^2+x(b-a)=0$$

$$\Rightarrow y(b-a)+x(b-a)=0$$

$$\Rightarrow (x+y)(b-a)=(b-a)(b+a)$$

$$\Rightarrow x+y=a+b$$

24. In Fig; 4, the boundary of shaded region consists of four semicircular arcs, two smallest being equal. If diameter of the largest is 14 cm and that of the smallest is 3.5 cm, calculate the area of the shaded region.

$\left[Use\ \pi=\frac{22}{7}\right]$

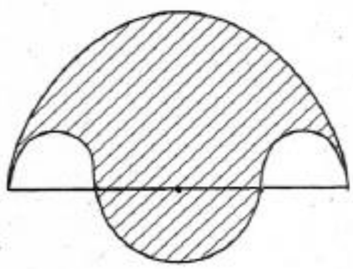


Fig. 4

Or

Find the area of the shaded region in Fig. 5, if AC = 24 cm, BC = 10 cm and O is the centre of the circle. [Use π = 3.14]

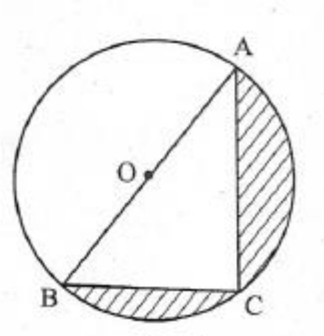
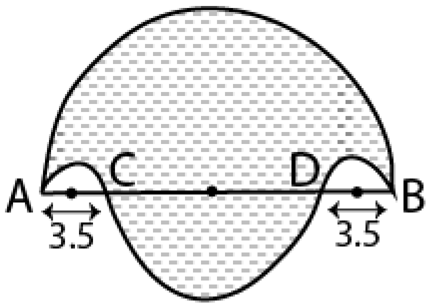


Fig. 5

Solution:



Given AB=14cm and AC =BD = 3.5cm

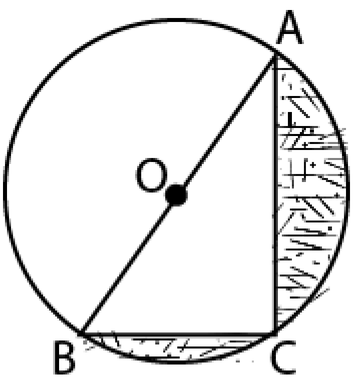
$\Rightarrow \text{DC} = 7\text{cm}$

Area of shaded region =Area of semicircle AB +Area of semicircle CD -2(Area of semicircle AC)

$$= \frac{\pi}{2}\left(\frac{14}{2}\right)^2 + \frac{\pi}{2}\left(\frac{7}{2}\right)^2 - 2\left(\frac{\pi}{2}\left(\frac{3.5}{2}\right)^2\right)$$

Area of shaded region $= \frac{\pi}{4}\left[\frac{196}{2} + \frac{49}{2} - \frac{49}{4}\right] = 86.625\text{cm}^2$

24)(or)



AC=24cm, BC= 10cm

$\text{AB} = \sqrt{24^2 + 10^2}$

AB=26cm
Diameter of circle =26cm Area of shaded region
=Area of semicircle – Area of ΔABC

$$= \frac{\pi}{2}(13)^2 - \frac{1}{2} \times 24 \times 10$$

$$= 145.33\text{cm}^2$$

25. Cards bearing numbers 1, 3, 5, _ _ _ , 35 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card bearing
(i) a prime number less than 15.
(ii) a number divisible by 3 and 5.

Solution:
Total possible outcomes when a cord is drawn = 35

i) Total prime numbers from 1 to 15 = 6 probability that a prime numbered card is drawn = $\frac{6}{35}$

ii) Total numbers between 1 to 35 divisible by 3 and 5 = 2

∴ probability that when a card is drawn it has a number divisible by 3 &5 = $\frac{2}{35}$

Section D

Question Numbers 26 to 30 carry 6 marks each.
26. Three consecutive positive integers are such that the sum of the square of l the first and the product of the other two is 46. find the integers.

Or

The difference of squares of two numbers is 88. If the larger number is 5 less than twice the smaller number. then find the two numbers.

Solution:
Let the required three integers be $(x-1)$, x and $(x+1.)$

$$\text{Now,} (x-1)^2 + [x.(x+1)] = 46$$

$$(x^2 - 2x + 1) + [x^2 + x] = 46$$

$$2x^2 - x - 45 = 0$$

$$2x^2 - 10x + 9x - 45 = 0$$

$$2x(x-5) + 9(x-5) = 0$$

$$(x-5)(2x+9) = 0$$

$$x = 5 \text{ or } x = .9/2$$

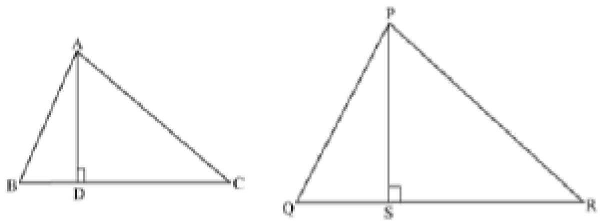
$$\text{So, } x = 5 \, [\text{because it is given that x is a positive int eger}]$$

$$\text{Thus, the required int egers are } (5-1), \text{ i. e. } 4, 5 \text{ and } 6.$$

26)(or)
Let the smaller no. be x and larger no. be y
$Y^2 - x^2 = 88$..........(1)

Y=2x-5…………(2)
In equation 1
$(2x-5)^2-x^2=88$
$4x^2-20x+25-x^2=88$
$3x^2-20x-63=0$
By splitting the middle term,
$3x^2-27x+7x-63=0$
$3x(x-9)+7(x-9)$
$(x-9)(3x+7)$
=>x=9 and x =-7/3
Since no. cannot be negative therefore the nos. are smaller no. =9
And larger no. =2x-5 =18-5=13

27. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
Using the above, prove the following
If the areas of two similar triangles are equal, then prove that the triangles are congruent.
Solution:



proof : Given ΔABC ~ ΔPQR
$\Rightarrow \angle A=\angle P, \angle B=\angle Q, \angle C=\angle R$

$$\frac{AB}{PQ}=\frac{BC}{QR}=\frac{AC}{PR} \qquad (1)$$

Ratio of areas of ΔABC & ΔPQR will be

$$\frac{ar(\Delta ABC)}{ar(\Delta PQR)}=\frac{\frac{1}{2}\times BC\times AD}{\frac{1}{2}\times QR\times PS} \qquad (2)$$

In ΔABD & ΔPQS
$\angle B=\angle Q$
$\angle ADB=\angle PSQ=90^0$
by AA similarity ΔABD ~ ΔPQS

$$\Rightarrow \frac{AB}{PQ}=\frac{AD}{PS}=\frac{BD}{QS} \qquad (3)$$

From (1) and (3) we get

$$\frac{AB}{PQ}=\frac{BC}{QR}=\frac{CA}{PR}=\frac{AD}{PS}$$

$$\therefore \frac{BC}{QR}=\frac{AD}{PS} \qquad (4)$$

from (2) and (4)

$$\frac{ar(\Delta ABC)}{ar(\Delta PQR)}=\frac{BC\times BC}{QR.QR}$$

$$\therefore \frac{ar(\Delta ABC)}{ar(\Delta PQR)}=\frac{(BC)^2}{(QR)^2}=\frac{(AB)^2}{(PQ)^2}=\frac{(CA)^2}{(PR)^2}$$

if $ar\ (\Delta ABC)=ar(PQR)$

then $BC=QR$

$AB=PQ$

$AC=PR$

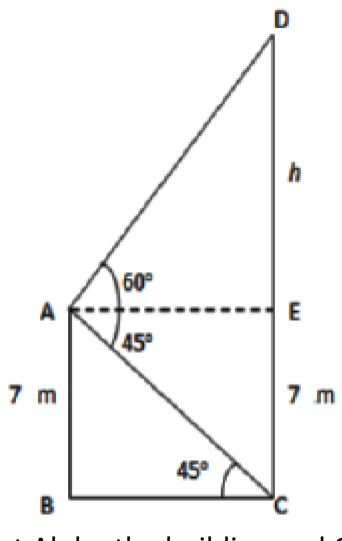
All corresponding sides equal in these similar triangles

$\therefore \Delta ABC\cong\Delta PQR$

Triangle are congruent

28. From the top of a 7 m high building, the angle of elevation of the top of a tower is 60° and the angle of depression of the foot of the tower is 30°. Find the height of the tower.

Solution:



Let Ab be the building and CD be the tower such that <EAD=60^0 and <EAC=<ACB =45^0

Now, in triangle ABC, tan 45 =1 =AB/BC

So,Ab=AE=7m

Again in triangle AED,

Tan 60=root 3=DE/AE

So, DE=AE root 3=7 root 3 m

$\Rightarrow h = 7\sqrt{3}m$

$\text{Height of tower} = h + 7 = 7\left(1+\sqrt{3}\right)\text{mt}$

29. A milk container is made of metal sheet in the shape of frustum of a cone whose volume is $10459\frac{3}{7}$ cm^3. The radii of its lower and upper circular ends are 8 cm and 20 cm respectively. Find the cost of metal sheet used in making the container at the rate of Rs. 1.40 per square centimeter.

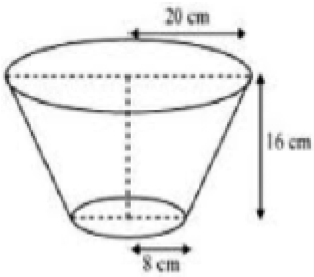
[Use $\pi = \frac{22}{7}$]

Or

A toy is in the form of a hemisphere surmounted by a right circular cone of the same base radius as that of the hemisphere. If the radius of base of the cone is 21 cm and its volume is $\frac{2}{3}$ of the volume of the hemisphere, calculate the height of the cone and the surface area of the toy.

[Use $\pi = \frac{22}{7}$]

Solution:



Let the rad11 of lower end of the frustum be r=8 cm

Let the rad11 of upper end of the frustum be R=20 cm

Let the height of the frustum be h cm

Volume of the frustum =

$$\frac{\pi}{3}h\left(R^2 + r^2 + Rr\right) = 10459\frac{3}{7} = \frac{73216}{7}$$

Therefore substituting the value of R and r.

$$\frac{22}{7} * \frac{1}{3}h\left(20^2 + 8^2 + 20*8\right) = \frac{73216}{7}$$

$$h\left(400 + 64 + 160\right) = \frac{73216}{7} * \frac{7}{22} * 3$$

$$h * 624 = 9984$$

$$h = \frac{9984}{624} = 16 \text{ cm}$$

Total surface area of the container =

$$\pi\left(R+r\right)\sqrt{\left(R-r\right)^{2}+h^{2}+\pi r^{2}}$$

$$\frac{22}{7}\left(20+8\right)\sqrt{\left(20-8\right)^{2}+16^{2}}+\frac{22}{7}*8^{2}$$

$$=\frac{22}{7}*28\sqrt{12^{2}+16^{2}}+\frac{22}{7}*64$$

$$=\frac{22}{7}*28\sqrt{144+256}+\frac{22}{7}*64$$

$$=\frac{22}{7}\left(28*\sqrt{400}+64\right)=\frac{22}{7}\left(28*20+64\right)$$

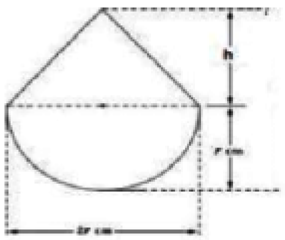
$$=\frac{22}{7}\left(560+64\right)=\frac{22}{7}*624$$

Cost of 1 cm square metal sheet is 1. 40 Rs

Cost of required sheet =

$$\frac{22}{7}*624*1.40=2745.\ 60\text{Rs}$$

OR



Let the radius of base of the cone be r=21 cm

Let the height of the cone be h cm

Volume of the cone = 2/3 volume of the hemisphere

$$\frac{1}{3}\pi r^{2}h=\frac{2}{3}*\frac{2}{3}\pi r^{3}$$

$$\Rightarrow h=\frac{4}{3}r=\frac{4}{3}*21=28\text{ cm}$$

Surface area of cone = lateral surface area of cone + curved surface area of sphere =

$$\pi r\sqrt{r^{2}+h^{2}}+2\pi r^{2}$$

$$=\frac{22}{7}*21*\sqrt{21^{2}+28^{2}}+2*\frac{22}{7}*21*21$$

$$=66*\sqrt{441+784}+2772$$

$$=66*35+2772$$

$$=2310+2772=5082\text{cm}^{2}$$

30. Find the mean, mode and median of the following frequency distribution:

Class:	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency:	4	4	7	10	12	8	5

Solution:

class	f_i	Class mark(x_i)	F_ix_i
0-10	4	5	20
10-20	4	15	60
20-30	7	25	175
30-40	10	35	350
40-50	12	45	540
50-60	8	55	440
60-70	5	65	325
	$Ef_i=50$		$Ef_ix_i=1910$

$$\text{mean} = \frac{1910}{50} = 38.2$$

Class	frequency	cumulative frequency
0-10	4	4
10-20	4	8
20-30	7	15
30-40	10	20
40-50	12	32
50-60	8	40
60-70	5	45
	n = 45	

$$\frac{n}{2} = 22.5$$

Cumulative frequency greater than 22.5 is 32.

Medium class 40-50

$$\text{m} = \ell + \left(\frac{\frac{\text{n}}{2} - \text{c.f}}{\text{f}} \right)$$

$$\text{her} \quad \ell = 40$$

$$\text{n} = 45$$

$$\text{c.f} = 20, \text{f} = 32, \text{f} = 10$$

$$\text{m]}40 + \left(\frac{22.5 - 20}{32} \right) 10$$

$$\boxed{\text{mediam} = 40.781}$$

<u>mod e :</u>

Maximum frequency = 12 so modal class 40-50

$$\text{mode} = \ell + \left(\frac{f_i - f_o}{2f_i - f_o - f_2}\right)$$

here $\ell = 40, \quad h = 10$

$f_o = 10 \quad f_i = 12 \quad f_2 = 8$

$$\text{mode} = 40 + \left(\frac{12-10}{2\times 12 - 10 - 8}\right)\times 10$$

Mode =40 + 3.33

=43.33