MATHEMATICS ENGLISH MEDIUM SET01 KEY ANSWERS.

MODEL PAPER-1

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KSEEB SSLC MODEL QUETSION PAPER – 01
MATHEMATICS 81 E
QUESTION PAPER & KEY ANSWERS

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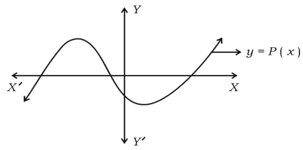
MARKS:80 **DATE: 02-01-2025** **DURATION: 3 Hours 15min**

I. *Four* alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. 1x8=8

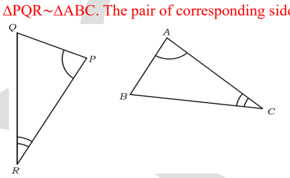
1. The HCF of 5^2x2 and 2^5x5 is
   A) 2x5 B) 2^5x5 C) 5^2x2^6 D) 2^5x5^2
   Solution: A) 2x5
2. The sum of first n natural number is
   A) n(n+1) B) $\frac{n(n+1)}{2}$ C) $\frac{n(n+2)}{2}$ D) *n(n-1)*
   Solution: B) $\frac{n(n+1)}{2}$
3. In the pair of linear equations in two variables $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$. Which of the following situation is cannot be arise?
   A) $\frac{a_1}{a_2} \neq \frac{a_1}{a_2}$, B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c}$ C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ D) $a_1=a_2$, $b_1=b_2$, $c_1=c_2$
   Solution: D) $a_1=a_2$, $b_1=b_2$, $c_1=c_2$
   Explanation: We know that $\frac{a_1}{a_2} \neq \frac{a_1}{a_2}$, there is intersecting lines (Only one solution) – consistent lines
   $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Coincident lines (infinitely many solutions) - consistent lines
   $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c}$ Parallel lines (No solutions) – Inconsistent lines
   So last D) one is not in the list.
4. The number of zeroes of the polynomial in the given figure



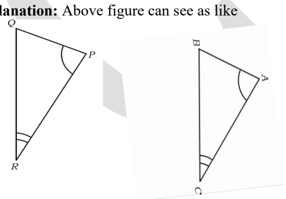
   A) 2 B)3 C)4 D)5
   Solution: B) 3

Explanation: we know that how many times that the curve y=p(x) touches the x-axis is called its zero. In the above graph, it touches 3 times the x-axis, hence the number of zeroes are 3.

5. x(x+2)=6 is a _________
   A) Linear equation B)quadratic equation C)cubic polynomial D)quadratic polynomial
   Solution: B)Quadratic polynomial
   Explanation: Given equation is x(x+2)=6
   x^2+2x=6
   x^2+2x-6=0
   This is a quadratic equation, it is in the form of $ax^2+bx+c=0$ whereas quadratic polynomial not in this form.
6. In the given figure, ΔPQR~ΔABC. The pair of corresponding sides in the following is



   A) PQ & AB B) PR & AB C) QR & AC D) PR & BC
   Solution: A) PQ & AB
   Explanation: Above figure can see as like



   Now we can say that corresponding side of PQ is AB

7. Sin^2A-Cos^2A is equal to
   A)1 B) 1-2Cos^2A C) 1+2Cos^2A D) -1
   Solution: B) 1-2Cos^2A
   Explanation: We know Sin^2A+Cos^2A = 1 ⇒ Sin^2A = 1 - Cos^2A

Taking option B, 1-2Cos^2A
1-Cos^2A-Cos^2A
= (Sin^2A)- Cos^2A (Sin^2A = 1 - Cos^2A)
= Sin^2A- Cos^2A

Note: Options is also important

8. The sum of the probability of all elementary events of a random experiment is _____ .
   A) 0 B) $\frac{1}{2}$ C) 1 D) -1
   Solution: C) 1
   Explanation: We know that the probability of sure events is always 1

II. Answer the following questions 1x8=8

9. Find the value of b if the pair of linear equations 2x+by=8 and 2(2x+3y)=16 has infinite solutions.
   Solution: b=3
   Explanation: As we know that $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Coincident lines (infinitely many solutions) - consistent lines, thus given equations are 2x+by=8 and 2(2x+3y)=16
   2x+by=8 and (2x+3y)= 8
   b=3
10. Write the degree of the polynomial p(x)= $5x^3-3x^2+12x-8$.
    Solution: Degree is 3.
11. If sinA=$\frac{\sqrt{3}}{2}$, and cosA=$\frac{1}{2}$ then find the value of tanA.
    Solution: TanA= $\sqrt{3}$.
    Explanation: We know $\frac{SinA}{CosA}$= TanA
    $\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}$= TanA
    TanA= $\sqrt{3}$
12. Write the empirical relationship between three measures of central tendency mean, median and mode.
    Solution: 3 median = 2 mean+ mode.
13. Express the quadratic equation $\frac{x+1}{2} = \frac{3}{x}$ in the quadratic form.
    Solution: we have $\frac{x+1}{2} = \frac{3}{x}$
    x^2+x=6
    x^2+x-6=0
14. Find the distance of the point (6, 8) from the origin.
    Solution: 10 units
    Explanation: we know that By distance formula, the points are (6, 8) and (0, 0)

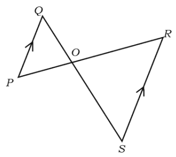
$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$=\sqrt{(0-6)^2+(0-8)^2}$

$=\sqrt{36+64}$

$=\sqrt{100}$ = 10 units

15. In the given figure , $\Delta\ POQ \sim \Delta\ ROS$ and $PQ \parallel SR$. If $PQ : SR = 1 : 2$, then find $OS : OQ$.



Solution: 2:1

Explanation: Given $\Delta\ POQ \sim \Delta\ ROS$

$\frac{PQ}{SR}=\frac{OQ}{OS}$

$\frac{1}{2}=\frac{OQ}{OS}$

$\frac{2}{1}=\frac{OS}{OQ}$

OS:OQ=2:1

16. The circumference of the base of a cylinder is 44cm and its height is 10cm. find the curved surface area of the cylinder.

Solution: 440 sq cm.

Explanation: we know that C.S.A of cylinder is =2πrh

= 44x10 (Given 2πr=44, and h=10)

= 440

III. Answer the following questions **2x8=16**

17. Show that 3+2 is an irrational number.

Solution:

Let 3 + √2 = p/q be a rational number, where p and q are co-prime and q ≠ 0.
Then, √2 = p/q – 3 = p–3q / q
⇒ √2 = p–2q/3q
since p–2q/3q is a rational number,
therefore, √2 is a rational number. But, it is a contradiction.
Hence, 3 + √2 is irrational. Hence, proved.

18. What is composite number? Which is the composite number among 23 and 24?.

Solution: A composite number is a natural number or a positive integer which has more than two factors. Among 23 and 24, 24 is the composite number because it has more than two factors.

Factors of 24 is 1, 2, 3, 4, 6, 8, 12 and 24 where as 23 has only two factors i,e 1 and 23.

OR

State the fundamental theorem of arithmetic. Write the composite number which has 7 and 3 as its only prime factors.

Solution: Fundamental theorem of arithmetic states that "every integer greater than 1 can be represented as a product of prime numbers in a unique way".

210 can be written as 2x3x5x7, so the composite number 210 has 7 and 3 as its prime factors.

19. Find the 21st term of the A.P 5, 9, 13…………..

Solution: a=5, d=9-5 = 4 and n=20

We have to find a21=a+20d

= 5+20x4

=5+80

= 85

So 21st term of this A.P is 85

20. Solve x+y=4 and 2x+y=6.

Solution: we have x+y=4 --------→(1) and 2x+y=6-----------→(2)

By elimination method x+y=4

2x+y=6

by subtracting above two we get **x=2**

Put this x value in any one of the above equation we get **y=2**

21. If the quadratic equation $x^2+bx+9=0$ has two equal real roots, then find the equation (b<1).

Solution: the given equation is $x^2+bx+9=0$

a=1, b=b, c=9

We know that if Δ=0, then roots are equal and real.

$b^2-4ac=0$

$b^2-4x1x9=0$

$b^2-36=0$

$b^2=36$

b=+6 or -6

In question, b<1 means b=- 6

By putting b= -6 in the above equation we get $x^2+bx+9=0$

$x^2-6x+9=0$ which is the required equation

22. Find the coordinates of the point which divides the line segment joining the two points A(1, -3) and B(8, 5) in the ratio of 3:1 internally.

Solution: Given points are A(4, -3) and B(8, 5) ratio 3:1.

$(x_1, y_1)$and (x_2, y_2) m:n

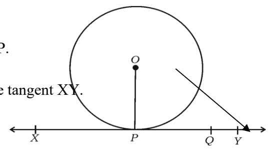
By section formula, P(x, y) = $\left[\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right]$

P(x, y) = $\left[\frac{3(8)+1(1)}{3+1}, \frac{3(5)+1(-3)}{3+1}\right]$

= $\left[\frac{24+1}{4}, \frac{15-3}{4}\right]$

= $\left[\frac{25}{4}, \frac{12}{4}\right]$ = $(\frac{25}{4}, 3)$

23. In the given figure, XY is the tangent at the point P to a circle with centre O. Q is a point on XY. Show that OQ>OP.



Solution:

Given: a circle C(0, r) and a tangent XY at point P.

To prove: OQ >OP

Construction: Take a point Q, other than P, on the tangent XY.

join OQ. Suppose OQ meets the circle in C.

Proof: In figure

OP=OC (Radius of the same circle)

Now, OQ=OC+CQ.

∴ OQ>OC

⇒OQ>OP

Hence the proof

24. A toy is in the form of a cone of radius 3.5cm, mounted on a hemisphere of same radius. The total height of the toy is 15.5cm, find the total surface area of the toy.

Solution: Given Radius of both solid is r=3.5cm,

Height of the cylinder H=Height of toy-radius of hemisphere

H=15.5-3.5

= 12cm

Slant height, l=$\sqrt{144+12.25}$ = $\sqrt{156.25}$ = 12.5 cm

Total surface area of the toy = C.S.A of cone + surface area of hemisphere

= $\pi rl+3\pi r^2$.

= πr(l+3r)

=$\frac{22}{7}$x3.5(12.5+3x3.5)

= 22x0.5(12.5+7)

= 11(19.5)

= 214.5 cm^2.

OR

The volume of a sphere is $\frac{539}{3}$ cm^3, find its surface area.

Solution: Given that volume of sphere = $\frac{539}{3}$ cm^3

$\frac{4}{3}\pi r^3=\frac{539}{3}$

4x$\frac{22}{7}$x r^3=539

r^3= 6.125x7

r=3.5cm

Now we have to find surface area of sphere = $4\pi r^2$.

= 4x3.14x3.5x3.5

= 153.958 cm^2. ~ 154 sq cm.

IV. Answer the following questions **3x9=27**

25. One zeroes of the polynomial $p(x)=x^2-5x+k$ is one more than the other. Find the value of k.

Solution: we have $p(x)=x^2-5x+k$

Let first zero as α and second zero as β.

According to question α=1+β ------------→(1)

And we know α+β=$\frac{-b}{a}$ and αβ=$\frac{c}{a}$

α+β=$\frac{-(-5)}{1}$ and αβ=$\frac{k}{1}$

1+β+β=5 (α taken as 1+β)

2β=4 and β=2

put β=4 in equation 1, we get α=1+2

α=3

Then k= 2x3 = 6

26. Find the two numbers whose sum is 27 and product is 182.

Solution: we have x^2- (sum of numbers)x+product of numbers=0

x^2-(27)x+182=0

By factorisation method

x^2-13x-14x+182=0

x(x-13) -14(x-13) = 0

x= 13 and x=14

Thus two numbers are 13 and 14.

OR

The altitude of a right angled triangle is 7cm less than its base. If the hypotenuse side is 13cm, then find the other two sides.

Solution:

In a right triangle, altitude is one of the sides.
Let the base be x cm.
The altitude will be (x - 7) cm.
We can now apply the Pythagoras theorem to the given right triangle.
Pythagoras theorem: $Hypotenuse^2 = (side\ 1)^2 + (side\ 2)^2$
$13^2 = x^2 + (x - 7)^2$
$13^2 = x^2 + (x - 7)^2$
$169 = x^2 + x^2 - 14x + 49$
$169 = 2x^2 - 14x + 49$
$2x^2 - 14x + 49 -169 = 0$
$2x^2 - 14x - 120 = 0$
$(2x^2 - 14x - 120) / 2 = 0$
$x^2 - 7x - 60 = 0$
$x^2 - 12x + 5x - 60 = 0$
x(x - 12) + 5 (x - 12) = 0
(x + 5) (x - 12) = 0
x - 12 = 0 and x + 5 = 0
x = 12 and x = - 5
Side of a triangle cannot be a negative, hence base is 12cm and altitude is 12-7= 5cm.

27. Prove that $(\sin A+\text{cosec}A)^2+(\cos A+\sec A)^2=7+\tan^2 A+\cot^2 A$.

Solution:

LHS $= (\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2$

$= \sin^2 A + \text{cosec}^2 A + 2\sin A \text{ cosec } A$

$+ \cos^2 A + \sec^2 A + 2 \cos A \sec A$

$= (\sin^2 A + \cos^2 A) + 2 + \text{cosec}^2 A$

$+ \sec^2 A + 2$

$= 1 + 4 + (1 + \cot^2 A) + (1 + \tan^2 A)$

$= 7 + \tan^2 A + \cot^2 A =$ RHS.

28. Find a relationship between x and y such that the point P(x, y) is equidistant from the points A(7, 1) and B(3, 7). Also find coordinates of the point P if A, P and B are collinear.

Solution:

Let P(x,y) be equidistant from the points A(7,1) and B(3,5).

AP=BP

AP2=BP2

$(x-7)^2+(y-1)^2=(x-3)^2+(y-5)^2$

$x^2-14x+49+y^2-2y+1=x^2-6x+9+y^2-10y+25$

x−y=2

OR

If the points A(4, 5), B(7, y), C(4, 3) and D(x, 2) are the vertices of parallelogram. Then find the value of x and y.

Solution: Given that ABCD is a parallelogram as its in order.

Midpoint of AC=Midpoint of BD

By section formula

$\left[\frac{4+4}{1+1},\frac{3+5}{1+1}\right]=\left[\frac{x+7}{1+1},\frac{2+y}{1+1}\right]$

$\left[\frac{8}{2},\frac{8}{2}\right]=\left[\frac{x+7}{2},\frac{y+2}{2}\right]$

$[4,4]=\left[\frac{x+7}{2},\frac{y+2}{2}\right]$

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

x+7=8 and y+2=8

x=1 and y=6

29. Find the mean for the following grouped data by direct method.

Class interval	Frequency
10-20	2
20-30	3
30-40	5
40-50	7
50-60	3

	N=20

Solution: We have formula by direct method,

mean $\bar{x}=\frac{\sum fx}{n}$

C.I	f	x (midpoint of C.I)	fx
10-20	2	15	30
20-30	3	25	75
30-40	5	35	175
40-50	7	45	315
50-60	3	55	165
	N=20		$\sum fx=760$

mean $\bar{x}=\frac{\sum fx}{n}$

$=\frac{760}{20}$

Mean= 38.

OR

Find the median for the following grouped data.

Class interval	Frequency
15-20	2
20-25	3
25-30	6
30-35	4
35-40	5
	N=20

Solution: we know

Median $=l+\left\{\frac{\frac{N}{2}-fc}{f}\right\}$xh.

Class interval	Frequency	fc
15-20	2	2
20-25	3	5
25-30	6	11
30-35	4	15
35-40	5	20
	N=20	

l=25 and h=5, f=6, fc=5 and n/2=10 then by formula

Mode$==l+\left\{\frac{\frac{N}{2}-fc}{f}\right\}$xh.

$=25+\left\{\frac{10-5}{6}\right\}$x5.

$=25+\frac{5}{6}$ x 5

= 25+4.16

Median = 29.16

30. A boy and a girl are born in a same month of September. Find the probability that both will have

i)Different birthdays ii)same birthdays

Solution: Let's assume that the boy and girl are born in the month of September, which has 30 days.

1. Probability that both will have different birthdays:

The first person (boy) can be born on any of the 30 days of September. The second person (girl) must then be born on a different day, so there are 29 possible days for her birthday.

The total number of possible birthday combinations (without any restrictions) for both the boy and girl is:

30 \times 30 = 900

Now, the number of favorable outcomes where both the boy and girl have different birthdays is:

30 \times 29 = 870

Thus, the probability that both will have different birthdays is:

Probability is P(E) $=\frac{n(E)}{n(S)}=\frac{870}{900}=\frac{29}{30}$

2. Probability that both will have the same birthday:

For both to have the same birthday, the girl must be born on the same day as the boy, so there are 30 favorable outcomes (one for each possible day).

Thus, the probability that both will have the same birthday is:

Probability is P(E) $=\frac{n(E)}{n(S)}=\frac{30}{900}$

$=\frac{1}{30}$

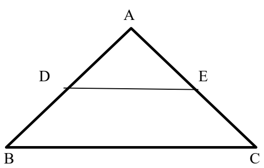
Final Answer:

The probability that both will have different birthdays: 29/30

The probability that both will have the same birthday: 1/30

31. In a scalene triangle ABC draw a line parallel to BC, Let this line intersect AB at D and AC at E. If DE:BC=2:5, AD=2cm, AE=3cm, and DE=4cm. Then find the perimeter of triangle ABC.

Solution:



Given, AD=2cm, AE=3cm, DE=4cm and $\frac{DE}{BC}=\frac{2}{5}$

By Thales theorem, $\frac{AD}{DB}=\frac{AE}{EC}$ and $\frac{DE}{BC}=\frac{2}{5}$

$\frac{2}{DB}=\frac{3}{EC}$ and $\frac{4}{BC}=\frac{2}{5}$ then BC=10cm

$\frac{EC}{DB}=\frac{3}{2}$

EC$=\frac{3}{2}$DB

In figure, AC=AE+EC and AB=AD+DB

$=3+\frac{3}{2}$DB $=2+$DB

$=\frac{6+3DB}{2}$

Perimeter of triangle ABC=AB+BC+CA

$=2+DB+10+\frac{6+3DB}{2}$

$=12+\frac{2DB+3DB+6}{2}$

$=12+3+\frac{5DB}{2}$ ------------.(2)

And we know ΔABC ~ΔDEF

Then $\frac{AD}{AB}=\frac{DE}{BC}$

$\frac{AD}{2}=\frac{2}{5}$ AD$=\frac{4}{5}$

AB-DB$=\frac{4}{5}$

2-DB$=\frac{4}{5}$

$2-\frac{4}{5}=$ DB

$\frac{6}{5}=$ DB

Then equation 1 becomes

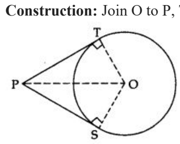
$=12+3+\frac{5x\frac{6}{5}}{2}=15+3=18$cm

32. Prove that "the lengths of the tangents drawn from an external point to the circles are equal".

Given: PT and PS are tangents from an external point P to the circle with centre O.

To prove: PT = PS

Construction: Join O to P, T and S.



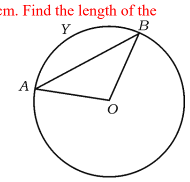
Proof: In ΔOTP and ΔOSP.

OT = OS …[radii of the same circle]

OP = OP …[common]

∠OTP = ∠OSP …[each 90°]
ΔOTP ≡ ΔOSP …[R.H.S.]
PT = PS …[c.p.c.t.]

33. The area of the sector OAYB as shown in the figure is 462 sq cm. Find the length of the arc AYB if ⌊AOB=120^0.



Solution: Given that ⌊AOB=120^0.
area of the sector OAYB = 462 sq cm

Then $\frac{\theta}{360} x \pi r^2 = 462$

$\frac{120}{360} x \frac{22}{7} r^2 = 462$

$r^2 = 21^2$

r=21cm

Now we have to find the length of the arc AYB

We know length of the arc of the circle= $\frac{\theta}{360} x 2\pi r$

$= \frac{120}{360} x 2 x \frac{22}{7} x 21$

= 2x22

= 44cm

OR

The area of the sector of a circle is numerically equal to the length of the arc of the same sector. If the length of the arc is $\frac{44}{21}$ cm. Find the radius of the circle and also find the angle subtended by the arc at the centre.

Solution: Given that Area of sector = length of the arc

$\frac{\theta}{360} x \pi r^2 = \frac{\theta}{360} x 2\pi r$

r=2

and also they are given $\frac{\theta}{360} x 2\pi r = \frac{44}{21}$

$\frac{\theta}{360} x 2 x \frac{22}{7} x 2 = \frac{44}{21}$

Θ=180/3

Θ=60^0.

V. Answer the following questions 4x4=16

34. Find the solution of the pair of linear equations by graphical method.
x+y=6 and 2x+y=10

Solution:

We have x+y=6

For this we should have to find some solutions

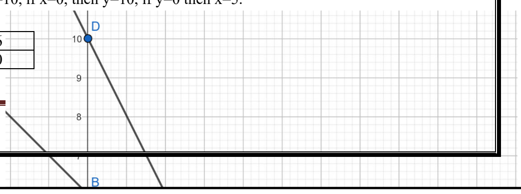
If x=0, then y=6, and y=0, then x=6

Similarly for 2x+y=10, if x=0, then y=10, if y=0 then x=5.

Tables are

x	0	6
y	6	0

And



x	0	5
y	10	0

Then by graphical method

x=4 and y=2

35. The ratios of the 11^{th} and 8^{th} term of an arithmetic progression is 3:2. Find the ratio of the sum of the first 5 terms to sum of first 21 terms of it.

Solution: Given $a_{11}:a_8=3:2$

$\frac{a+10d}{a+7d} = \frac{3}{2}$

2a+20d=3a+21d

a=d -----------→(1)

Now we have to find $S_5:S_{21}$,

$\frac{S_5}{S_{21}} = \frac{\frac{5}{2}\{2a+(4)d\}}{\frac{21}{2}\{2a+(20)d\}}$

$= \frac{\frac{5}{2}\{2a+(4)a\}}{\frac{21}{2}\{2a+(20)a\}}$ **by putting d=a (by equation 1)**

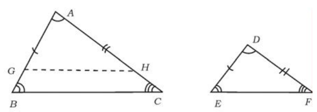
$= \frac{\frac{5}{2}\{6a\}}{\frac{21}{2}\{22a\}}$

$= \frac{15}{231}$

$= \frac{5}{77}$

36. Prove that "If in two triangles, corresponding angles are equal then corresponding sides are in the same ratio(proportion) and hence the two triangles are similar".

Solution:



Given: ∠BAC=∠EDF

∠ABC=∠DEF

To prove: $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$

Construction: Mark points G and H on the side AB and AC such that

AG=DE , AH=DF

proof: in triangle AGH and DEF

AG=DE.....by construction

AH=DF ..... by contsruction

∠GAH=∠EDF...Given

therefore ,

$\triangle AGH \cong \triangle FED$ by SAS congruency thus

∠AGH=∠DEF ....by CPCT

but

∠ABC=∠DEF

∠AGH=∠ABC

thus

GH∥BC

Now , In triangle ABC

$\frac{AB}{AG} = \frac{BC}{GH} = \frac{CA}{HA}$

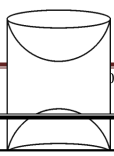
Hence ,

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$

hence proved .

37. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Fig. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.

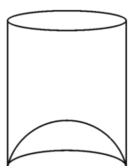
Solution:



From the figure, it can be seen that the radius of the hemispheres scooped out is the same as the radius of the base of the cylinder since both the hemispheres are of equal radius.
Therefore, the total surface area of the article only includes the CSA of both the hemispheres and the cylinder.
TSA of the article = 2 × CSA of the hemispherical part + CSA of the cylindrical part.
We will find the TSA of the article by using formulae;
CSA of the hemisphere = $2\pi r^2$, where r is the radius of the hemisphere.
CSA of the cylinder = 2πrh, where r and h are the radius and height of the cylinder respectively.
Height of the cylinder = h = 10 cm
Radius of the cylinder = radius of the hemisphere = r = 3.5 cm
TSA of the article = 2 × CSA of the hemispherical part + CSA of the cylindrical part
= 2 × $2\pi r^2$ + 2πrh
= 2πr (2r + h)
= 2 × 22/7 × 3.5 cm × (2 × 3.5 cm + 10 cm)
= 22 cm × 17 cm
= 374 cm^2
Thus, the total surface area of the article is 374 cm^2.

OR

A juice seller was serving his customers using glass as shown in the figure. The inner diameter of the cylindrical glass was 5 cm, but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of the glass was 10 cm, then find the apparent capacity of the glass and its actual capacity. (take π=3.142).



Solution: Given that diameter of glass is 5cm, and r=2.5cm
Height of the cylinder is h=10cm
Now we have to find actual capacity of cylinder.
Volume of cylinder = $\pi r^2 h$
= 3.142x2.5x2.5x10
= 196.375 cubic cm.
Now we have to find capacity of the glass,
Volume of cylinder – volume of hemisphere

$\pi r^2 h - \frac{2}{3}\pi r^3$

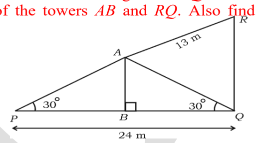
$= \pi r^2 (h - \frac{2}{3} r)$

$= 3.142 x 2.5 x 2.5 (10 - \frac{2}{3} x 2.5)$

= 19.6375(10-1.66)

= 19.6375x8.33334
=**163.6459 cubic cm.**
Alternative method:
Volume of cylinder – volume of hemisphere
$=196.375-\frac{2}{3}\pi r^3$
$= 196.375-\frac{2}{3}x3.142x2.5x2.5x2.5$
$= 196.375-\frac{98.1875}{3}$
= 196.375- 32.7291
= **163.64 cubic cm.**

38. AB and RQ are two vertical towers standing on a level ground. The angle of elevation of the top of the tower from a point P on the same ground and from the foot of the tower QR are 30° as shown in the figure. If $PQ = 24$ m and $AR = 13$ m, then find the heights of the towers AB and RQ. Also find the length of AP.(use $\sqrt{3} = 1.7$).



Solution: Let PB=X m and BQ=24-X
In triangle APB, Tan 30= $\frac{AB}{PB}$
$\frac{1}{\sqrt{3}} = \frac{AB}{X}$
AB=$\frac{X}{\sqrt{3}}$ --------------------.(1)
In triangle ABQ, Tan 60= $\frac{AB}{BQ}$
$\sqrt{3} = \frac{AB}{24-X}$
AB=(24-X) $\sqrt{3}$-------------------.(2)
From 1 and 2
$\frac{X}{\sqrt{3}}$ = (24-X) $\sqrt{3}$
X=(24-X) 3
X=72-3X
4X=72
X = 18 m = PB
Put X=18 in equation 1 we get AB=$\frac{18}{\sqrt{3}}$ m.
In triangle APB, Sin 30= $\frac{AB}{AP}$
$\frac{1}{2} = \frac{\frac{18}{\sqrt{3}}}{AP}$
AP= $\frac{36}{\sqrt{3}}$m = $\frac{36}{1.7}$ = 21.17 ~ 21m
In triangle PRQ, Tan 30= $\frac{RQ}{PQ}$
$\frac{1}{\sqrt{3}} = \frac{RQ}{24}$

RQ= $\frac{24}{\sqrt{3}}$ = 14.11 ~ 14m
So length fo AP is 21m, height RQ is 14m and AB is 10.58m.

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Note: This key answers not by board, its prepared by me.

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