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0580

IGCSE_Maths.

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Geometry

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IG 0580

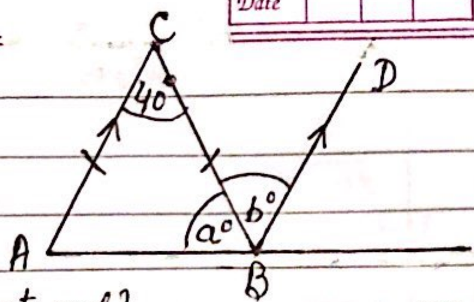
Geometry

Triangles

Page No. P-1

Date

1. Triangle ABC is isoscelese.
AC is parallel to BD.
Find the value of a and the value of b.



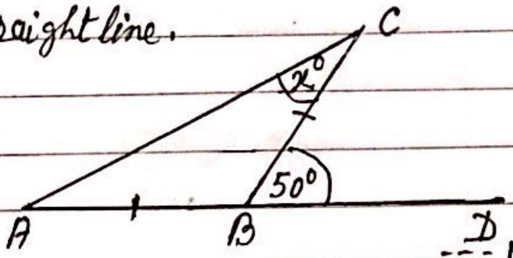
--- [2]

SP-20/02/Q8

Solution: angle CBD = angle ACB (∵ Alternate angle)
$\Rightarrow$ $b = 40°$ ✓

Now Isosceles triangle ABC, AC = BD, the opposite angles,
∴ angle CAB = angle CBA = $a°$
In ΔABC, $a° + a° + 40° = 180°$ (Sum of angles of a triangle is 180°)
$\Rightarrow 2a + 40 = 180$
$\Rightarrow a = \frac{140}{2} = 70°$ ✓
∴ $a = 70°$ and $b = 40°$

2. AB = BC and ABD is a straight line.
Find the value of x.

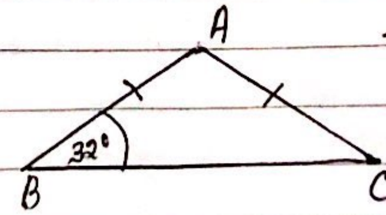


--- [2]

S-20/22/Q3

Solution: AB = BC in ΔABC
the opposite angle are equal
angle BAC = angle ACB = $x°$ (given) —①
Now angle BAC + angle ACB = 50° (∵ Exterior angle CBD is equal to the opp interior angle)
$\Rightarrow x° + x° = 50°$ (from ①)
$2x = 50°$
$x = \frac{50}{2} = 25°$ ∴ $x = 50°$ ✓

3. Triangle ABC is isosceles.
Angle ABC = 32° and AB = AC
Find angle BAC.



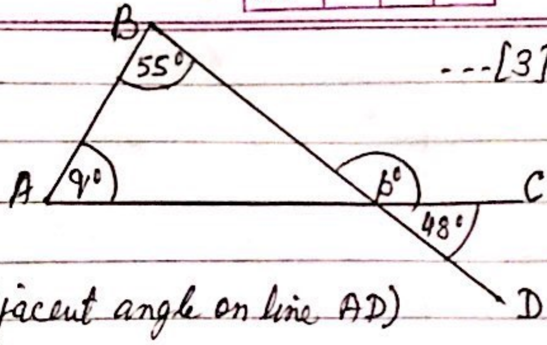
---[2]

S-20/23/Q3

Solution: In ΔABC, AB = AC, the opposite angles $\angle ACB = \angle ABC = 32°$ —①
Now in ΔABC,
angle BAC + angle ACB + angle ABC = 180° (Angle sum property in a Triangle)
∴ angle BAC + 32° + 32° = 180°
∴ angle BAC = 180 − 32° − 32° = 116° ∴ angle BAC = 116°

Triangles/ Quadrilaterals

4.(a) In the diagram, AC and BD are straight lines.
Find the value of p and the value of q. ---[3]



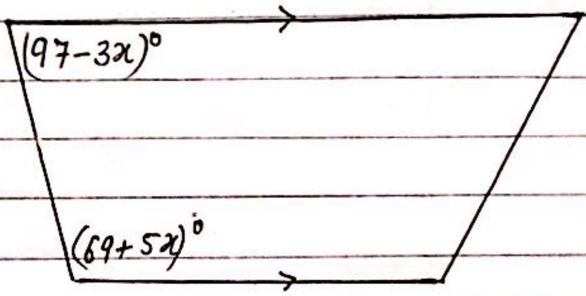
Solution: $p° + 48° = 180°$ (Adjacent angle on line AD)
$\therefore p = 180° - 48 = 132°$ ——— ①
Now $q° + 55° = p$ (Exterior angle theorem in a triangle)
$q + 55° = 132°$ from ①
$\Rightarrow q = 132 - 55° = 77°$ $\therefore$ $p = 132°$ and $q = 77°$

(b) The angles of a quadrilateral are $x°$, $(x+5°)$, $(2x-25)°$ and $(x+10°)$. Find the value of x. ---[3]

W-19 | 41 | Q 1(a)(b)

Solution: $x + (x+5) + (2x-25°) + (x+10) = 360°$ (Sum of interior angles of a quad. is 360°)
$\Rightarrow 5x - 10 = 360°$
$\Rightarrow 5x = 360 + 10 = 370 \Rightarrow x = \frac{370}{5} = 74°$
$\therefore x = 74°$

5. Work out the value of x.



S-20 | 21 | Q6 ---[3]

Solution:
$97 - 3x + 69 + 5x° = 180°$ (Sum of interior angle between two parallel lines made by by a transversal on of the same side of it is 180°)
$166 + 2x = 180°$
$2x = 180 - 166 = 14$
$x = \frac{14}{2} = 7$

$\therefore x = 7°$

Polygons.

6. A hexagon has five angles that each measure 115°.
Calculate the size of sixth angle. ---[3]
[SP-20/02/Q16]

Solution: Let the sixth angle $= x^\circ$

$\therefore \; x + 5 \times 115^\circ = (6-2) \times 180^\circ$

$x + 575^\circ = 720$

$x = 720 - 575$

$\therefore \; x = 145^\circ$

sum of interior angles of an n-sided polygon $= (n-2) \times 180^\circ$

7. Find the interior angle of a regular polygon of 24 sides. --[2]
[M-20/22/Q4]

Solution: Interior angle of a n-sided regular polygon $= \frac{(n-2) \times 180^\circ}{n}$

$\therefore$ Interior angle of a 24-sided regular polygon:

$= \frac{(24-2) \times 180^\circ}{24}$

$= \frac{22 \times 180^\circ}{24} = 165^\circ$ ✓

8. A regular polygon has an interior angle 176°. ---[3]
Find the number of sides of this polygon. [W-19/22/Q12]

Solution: Let the number of sides of the polygon $= n$

Interior angle $= \frac{(n-2) \times 180^\circ}{n} = 176^\circ$ (given)

$\Rightarrow (n-2) \times 180^\circ = 176n$

$\Rightarrow 180n - 360 = 176n$

$\Rightarrow 180n - 176n = 360$

$4n = 360^\circ$

$n = \frac{360}{4} = 90$

$\therefore \; n = 90$

9. The interior angle of a regular polygon with n-sides is $150°$. Calculate the value of n. [S-20/43/Q8(a)] --[2]

Solution: Interior angle $\frac{(n-2)\cdot 180°}{n} = 150°$ (given)

$\Rightarrow (n-2)\cdot 180° = 150 \cdot n$

$\Rightarrow 180n - 360° = 150°$

$\Rightarrow 180n - 150n = 360°$

$\Rightarrow 30n = 360° \Rightarrow n = \frac{360°}{30} = 12$

$\therefore n = 12$

10. A regular polygon has 72 sides. --[3]
Find the size of an interior angle. [W-19/41/1(c)]

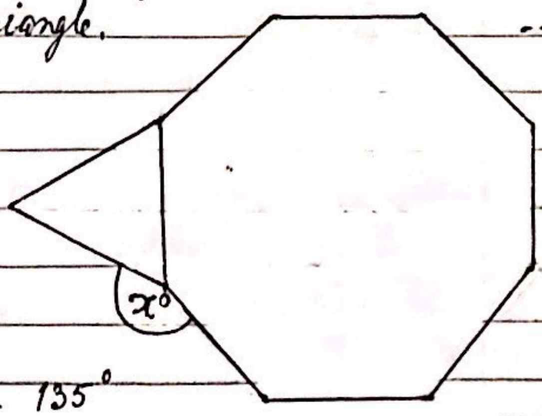
Solution: an interior angle of n-sides polygon $= \frac{(n-2)\cdot 180°}{n}$
for $n = 72$,

$= \frac{(72-2)\times 180°}{72}$

$= \frac{70 \times 180°}{72} = 175°$

$\therefore$ Required angle $= 175°$

11. The diagram shows a regular octagon joined to an equilateral triangle. --[3]
Work out the value of x.



Solution: Interior angle of a octagon $(n = 8)$

$= \frac{(n-8)\times 180°}{n}$

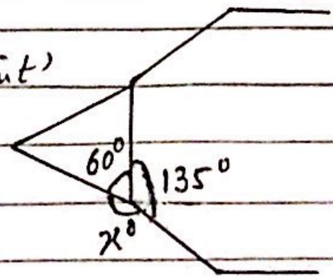
$= \frac{(8-2)\times 180°}{8} = \frac{6\times 180°}{8} = 135°$

Now $x + 60° + 135° = 360°$ (Angles at a point)

$x + 195 = 360°$

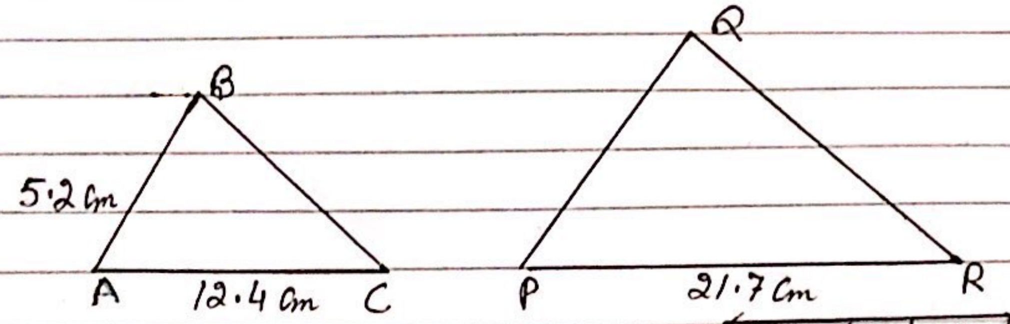
$x = 360 - 195 = 165°$

$\therefore x = 165°$



Similarity

12. Triangle ABC is similar to triangle PQR.
Find PQ. ...[2]



SP-20/02/Q12

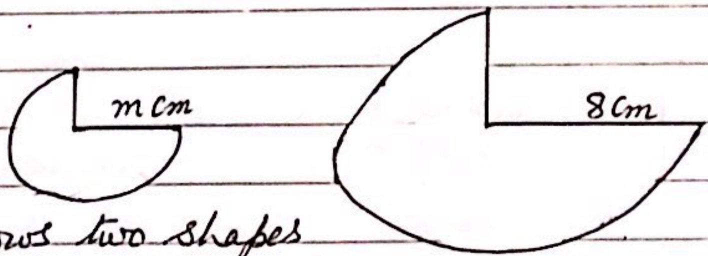
Solution: $\Delta ABC \sim \Delta PQR$

$\frac{PQ}{AB} = \frac{PR}{AC}$ (Corresponding sides of similar triangles are proportional)

$\Rightarrow \frac{PQ}{5.2} = \frac{21.7}{12.4} \Rightarrow PQ = \frac{21.7}{12.4} \times 5.2 = 9.1$

$\therefore$ $PQ = 9.1$ cm.

13.



The diagram shows two shapes that are mathematically similar.
The smaller shape has area $52.5\ cm^2$ and the larger shape has area $134.4\ cm^2$.
Calculate the value of m. S-20/23/Q17 ...[3]

Solution: $\frac{\text{area of smaller shape}}{\text{area of larger shape}} = \left(\frac{m}{8}\right)^2$

$\Rightarrow \frac{52.5}{134.4} = \frac{m^2}{64}$ (The areas of similar shapes are proportional to the square of the corresponding sides of the shapes.)

$\Rightarrow m^2 = \frac{52.5 \times 64}{134.4} = 25$

$\therefore m = \sqrt{25} = 5$

$\therefore$ $m = 5$ cm.

Scanned with CamScanner

14. The scale of a map is 1 : 10 000 000.
On the map, the area of Slovakia is $4.9 cm^2$.
Calculate the actual area of Slovakia.
Give your answer in square kilometres. [W-19/21/Q14] ...[3]

Solution: $\frac{\text{area of the map}}{\text{actual area}} = \left(\frac{1}{10\,000\,000}\right)^2$

$\Rightarrow \frac{4.9}{\text{actual area}} = \frac{1}{10^{14}}$

$\Rightarrow$ Actual area $= 4.9 \times 10^{14}$ sq cm

$= \frac{4.9 \times 10^{14}}{10^{10}}$

$= 4.9 \times 10^{4}$ sq km

$\left\{ \begin{array}{l} 1 \text{ Km} = 1000 \times 100 = 10^5 \text{ cm} \\ 1 \text{ sq Km} = (10^5)^2 = 10^{10} \text{ sq cm} \end{array} \right.$

$\therefore$ Actual area of Slovakia $= \underline{49000 \text{ sq Km.}}$

15. Two mathematical similar container have heights of 30 cm and 75 cm. The larger container has a capacity of 5.5 litres.
Calculate the capacity of the smaller container.
Give your answer in millilitres. [W-19/22/Q13] ...[3]

Solution: $\frac{V_1}{V_2} = \frac{\text{Capacity (volume) of smaller container}}{\text{Capacity (Volume) of larger container}} = \left(\frac{h_1}{h_2}\right)^3$

$\Rightarrow \frac{V_1}{5.5 \times 1000} = \left(\frac{30}{75}\right)^3$ [1 litre = 1000 c.c.

$V_1 = \left(\frac{2}{5}\right)^3 \times 5500 \ cm^3$

$= \frac{8}{125} \times 5500 = 352 \ cm^3$

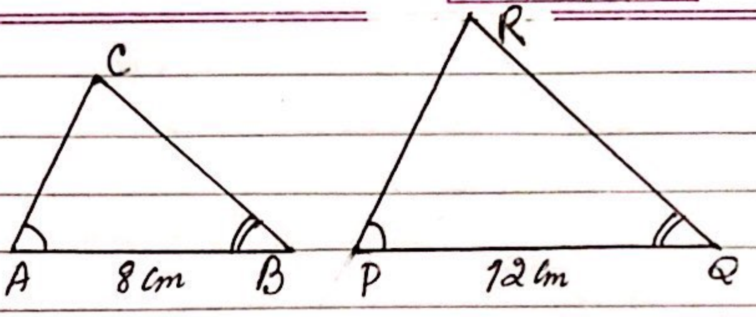
$= 352$ millilitre

$\left\{ \begin{array}{l} 1 \text{ litre} = 1000 \text{ cm}^3 \\ 1000 \text{ millilitres} = 1000 \text{ cm}^3 \\ \Rightarrow 1 \text{ millilitre} = 1 \text{ cm}^3 \end{array} \right.$

$\therefore$ Capacity of the smaller container

$= \underline{352 \text{ millilitres.}}$

16. Triangle ABC is mathematically Similar to triangle PQR.
The area of triangle ABC is 16 cm².



(i) Calculate the area of triangle PQR. ---[2]

(ii) The triangles are the cross-sections of prisms which are also mathematically similar. The volume of the smaller prism is 320 cm³. Calculate the length of the larger prism. ---[3]

S-20 / 42 / Q8(a)

Solution (i) $\frac{\text{area of triangle PQR}}{\text{area of triangle ABC}} = \left(\frac{PQ}{AB}\right)^2$

$\Rightarrow \frac{\text{area of triangle PQR}}{16} = \left(\frac{12}{8}\right)^2$ [∵ Area $\Delta ABC = 16\text{ cm}^2$]

$\Rightarrow$ area of triangle PQR $= \frac{144}{4} \times 16 = \underline{36 \text{ cm}^2}$

(ii) length of the smaller prism $= \frac{\text{Volume of small prism}}{\text{area of cross of cross-section}} = \frac{320}{16}$

$= 20\text{ cm}$ ——— ①

$\frac{\text{length of larger prism}}{\text{length of small prism}} = \frac{PQ}{AB}$

$\Rightarrow \frac{\text{length of larger prism}}{20\text{ cm}} = \frac{12}{8}$

from ①

∴ length of larger prism $= \frac{12}{8} \times 20 = 30\text{ cm}$

$= \underline{30 \text{ cm.}}$

17. Two cones are mathematically similar.
The total surface area of the smaller cone is $80 cm^2$.
The total surface area of the larger cone is $180 cm^2$.
The volume of the smaller cone is $168 cm^3$. ---[3]
Calculate the volume of the larger cone. [W-19/41/Q4(c)]

Solution: $\frac{\text{area of smaller cone}}{\text{area of larger cone}} = \left(\frac{r_1}{r_2}\right)^2$ { r_1 and r_2 are the radii of the smaller and larger cones resp.

$\Rightarrow \frac{80}{180} = \left(\frac{r_1}{r_2}\right)^2 = \frac{4}{9}$

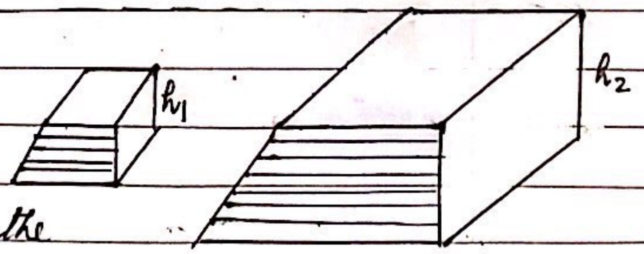
$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 = \frac{4}{9} \Rightarrow \frac{r_1}{r_2} = \sqrt{\frac{4}{9}} = \frac{2}{3}$ —— (1)

Now $\frac{\text{Volume of of smaller cone}}{\text{Volume of larger cone}} = \left(\frac{r_1}{r_2}\right)^3$

$\Rightarrow \frac{168}{\text{Volume of larger cone}} = \left(\frac{2}{3}\right)^3 = \frac{8}{27}$

$\Rightarrow$ Volume of larger cone $= \frac{168}{8} \times 27 = \underline{567}$ ✓

18. The diagram shows two mathematically similar solid prisms. The volume of the smaller prism is $648 cm^3$ and the volume of the larger prism is $2187 cm^3$. The area of cross-section of the smaller prism is $36 cm^2$. [W-19/43/Q6(b)(i)]
Calculate the area of cross-section of the larger prism. ---[3]



Solution: $\frac{\text{Volume of larger prism}}{\text{Volume of smaller prism}} = \frac{2187}{648} = \left(\frac{h_1}{h_2}\right)^3 \rightarrow \frac{h_1}{h_2} = \left(\frac{2187}{648}\right)^{1/3} = \frac{3}{2}$ —— (1)

Now $\frac{\text{area of cross-section of larger cone}}{\text{area of cross-section of smaller cone}} = \left(\frac{h_1}{h_2}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

$\frac{\text{area of cross-section of larger cone}}{36} = \frac{9}{4}$

$\Rightarrow$ Area of cross-section of larger cone $= \frac{9}{4} \times 36 = \underline{81 \text{ cm}^2}$ ✓

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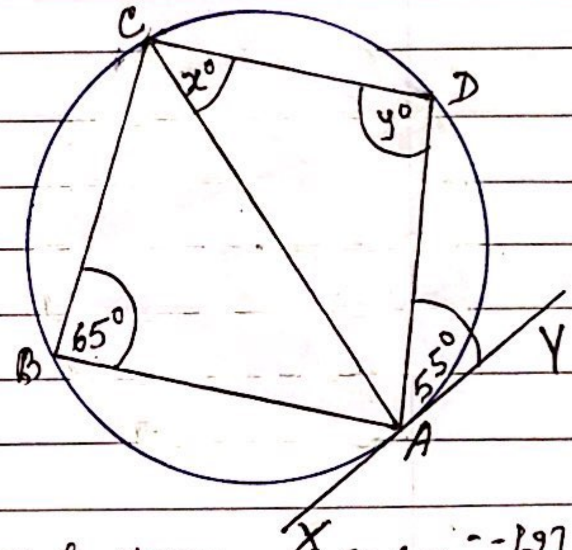
Circles

19. A, B, C and D are points on the circumference of the circle.
The line XY is a tangent to circle at A.



(a) Find the value of x, giving the reason for your answer. ---[2]

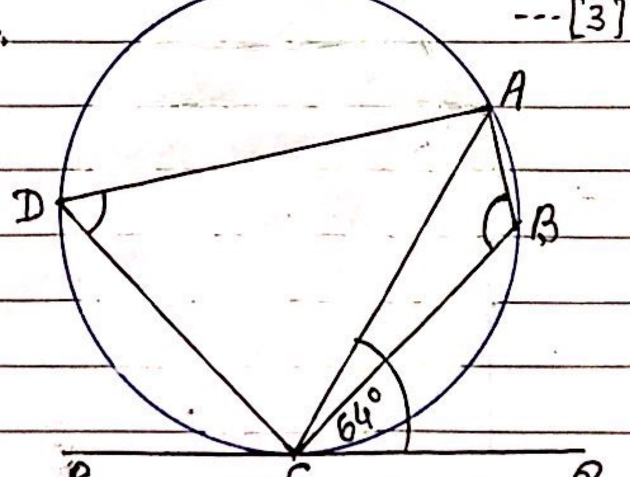
Solution: $x = 55^\circ$ ✓ because angles in the alternate segment of circle are equal.

(b) Find the value of Y, giving a reason for your answer. ---[2]

Solution: $Y = 115^\circ$ because the opposite angles in the cyclic quadrilateral ABCD are supplementary. $y + 65 = 180^\circ \Rightarrow y = 115^\circ$ ✓

[SP-20 | 02 | Q26]

20. A, B, C and D lie on the circle.
PCQ is a tangent to the circle at C. ---[3]
Angle $ACQ = 64^\circ$
Work out angle ABC, giving reasons for your answer.

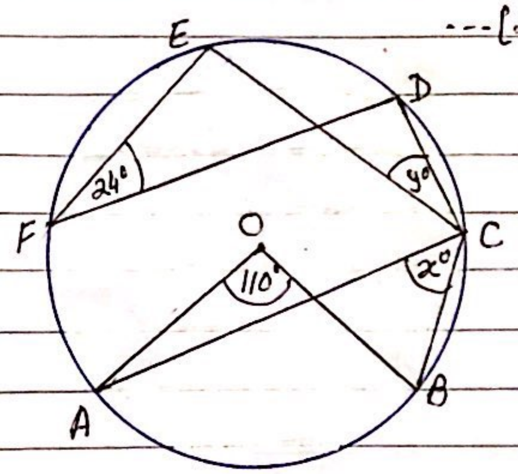


Solution: angle $ABC = 116^\circ$ ✓
because angle $\angle ADC = 64^\circ$
angles in alternate circle.
and $\angle ADC + \angle ABC = 180$, opp. angle in the cyclic quad. ABCD. $\therefore 64^\circ + \angle ABC = 180^\circ$
or angle $ABC = 180 - 64 = 116^\circ$

$\therefore$ Angle $ABC = 116^\circ$ ✓

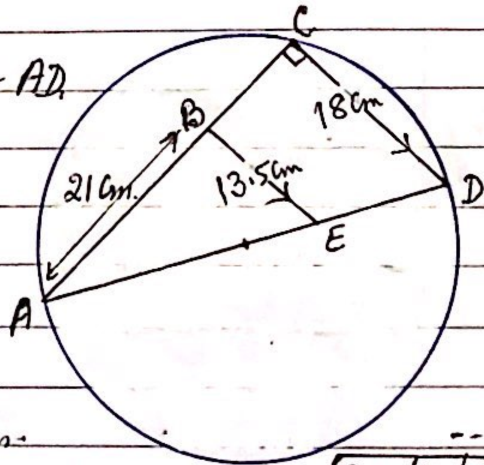
[M-20 | 22 | Q15]

21. A, B, C, D, E and F lie on the circle, centre O. ---[2]
Find the value of x and the Value of y.
S-20/21 | Q10



Solution: Angle subtended by the arc AB in the alternate segment of the circle 'x' is half the angle subtended by it at the centre.
$\therefore\ x = \frac{1}{2} \times 110^\circ = 55^\circ$ $\quad \therefore\ \underline{x = 55^\circ}$
and $\underline{y = 24^\circ}$ ✓ as the angles in the same segment of the circle subtended by arc ED.

22. C lies on a circle with diameter AD.
B lies on AC and E lies on AD,
Such that BE is parallel to CD.
AB = 21 cm, CD = 18 cm and BE = 13.5 cm.
Work out the radius of the circle.



Solution: In ACD, BE ∥ CD ---[5]
$\therefore$ Δ ABC and Δ ACD are similar. S-20/2 | Q13

$\frac{AB}{AC} = \frac{BE}{CD}$ ($\because$ Corresponding sides of the similar triangles are proportional)

$\Rightarrow \frac{21}{AC} = \frac{13.5}{18} \Rightarrow AC = \frac{21 \times 18}{13.5} = 28.$

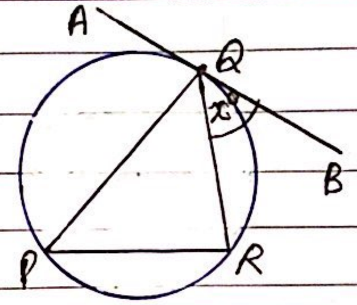
Now using Pythagoras theorem in rt Δ ACD ($\because$ AD is diameter)

$$AD^2 = AC^2 + CD^2$$
$$= 28^2 + 18^2 = 1108$$

diameter $AD = \sqrt{1108} = 33.286 \Rightarrow 2r = 33.28$
$r = 16.64$

$\therefore$ radius = $\underline{16.64\text{ cm}}$

23. P, R and Q are points on the circle.
AB is a tangent to the circle at Q,
QR bisects angle PQB.
angle BQR = x° and $x < 60$
Use this information to show that
triangle PQR is an isosceles triangle.
Give a geometrical reason for each step of your work. ---[3]



[S·20/21/Q15]

Solution: angle PQR = $\angle BQR = x^\circ$ —① (∵ QR bisects angle PQB)
angle QP. = angle BQR = x —② (∵ Angle in the Alternate segment of a circle.
from ① & ② $\angle QPR = \angle PQR = x$
∴ In Triangle PQR opposite sides PR = QR
∴ Triangle PQR is an isosceles Triangle.

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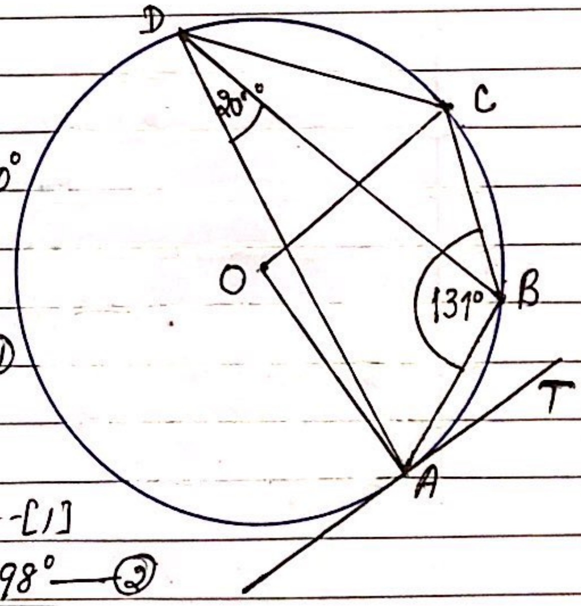
24. A, B, C, D lie on circle, Centre O.
TA is tangent to the circle at A.
Angle ABC = 131° and angle ADB = 20°
Find.



(a) angle ADC. ---[1]
Answer: angle ADC = $180^\circ - 131^\circ = \underline{49^\circ}$ —①
(∵ ABCD is a cyclic quad.
angle ADC + $131^\circ = 180^\circ$)

(b) angle AOC ---[1]
Answer: angle AOC = $2 \times \angle ADC = 2 \times 49^\circ = \underline{98^\circ}$ —②

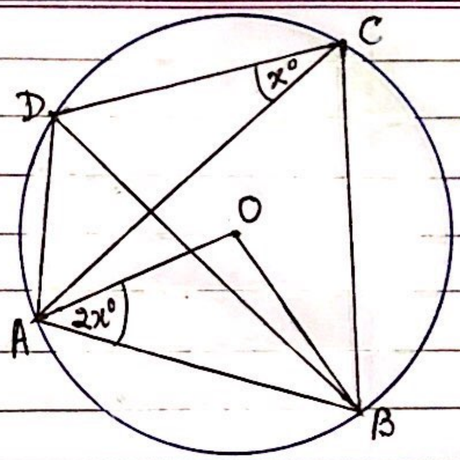
(c) angle BAT ---[1]
Answer: angle BAT = angle ADB = $\underline{20^\circ}$ (angles in the alternate segment) —③

(d) angle OAB
Answer: angle OAB + angle BAT = 90° (∵ OA is perp AT (rad ⊥ tangent) at A.
angle OAB + $20^\circ = 90^\circ$
angle OAB = $90 - 20 = \underline{70^\circ}$ ✓

[S·20/22/Q20]

23. In the diagram, A, B, C and D lie on the circumference of a circle, centre O. Angle ACD = $x°$ and angle OAB = $2x°$

Find an expression, in terms of x, in its simplest form for



(a) angle AOB ---[1]

Answer: angle AOB = $\underline{180-4x}$ ✓ —— ①

(In Δ OAB, OA = OB = r $\Rightarrow \angle OAB = \angle OBA = 2x$ and sum of angles of a triangle is 180°)

(angle AOB + 2x + 2x = 180°.)

W-19 | 22 | Q19

(b) angle ACB. ---[1]

Answer: angle ACB = $\frac{1}{2}$ angle AOB = $\frac{1}{2}(180-4x) = \underline{90-2x°}$

($\because$ Angle AOB at the centre is double the angle in alternate seg. of arc $\widehat{AB}$)

(c) angle DAB ---[2]

Answer: In triangle ABD, $\angle DAB + \angle ADB + \angle ABD = 180°$

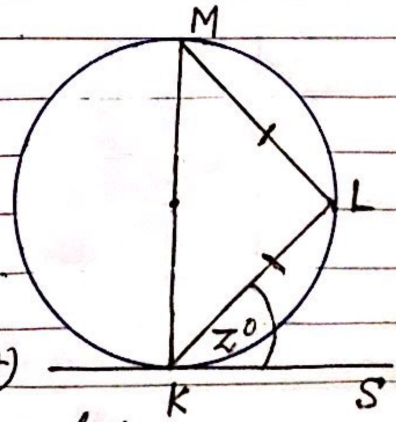
$\Rightarrow \angle DAB = 180 - (\angle ADB + \angle ABD)$

$= 180 - (\angle ACB + \angle ACD)$

$= 180 - (90 - 2x + x) = 180 - (90 - x) = (90 + x)$ ✓

24(a)(i) K, L and M are points on the circle. KS is a tangent to the circle at K. KM is a diameter and triangle KLM is isosceles.

Find the value of z. ----[2]



Solution: z = angle KML (Alternate segment) ①

Now angle KLM = 90° (KM is diameter, angle in the semicircle is right angle)

$\angle KML = \angle MKL$ (Isosceles Δ) —②

$\angle KML + \angle MKL = 90$ —③ from ① (angle sum prop of Δ)

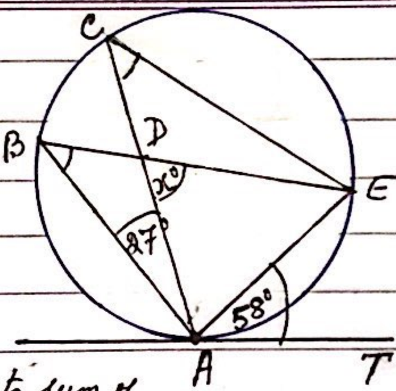
fr ② & ③ $\angle KML + \angle KML = 90 \Rightarrow 2\angle KML = 90 \Rightarrow \angle KML = 45°$ ④

from ① & ② $\underline{z = 45°}$ ✓

(continued →) S.20 | 43 | Q8(b)(c)

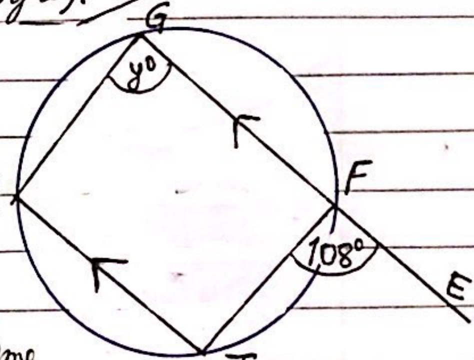
(continued →)

24(a)(ii) AT is a tangent to the circle at A.
Find the value of x. ---[2]



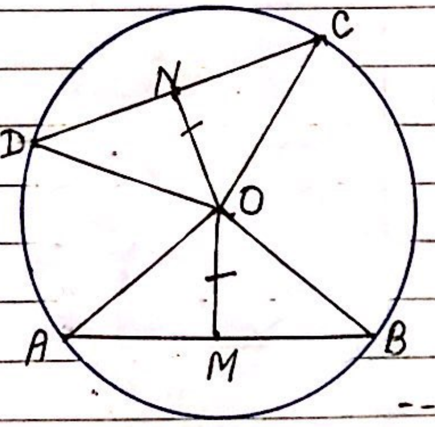
Solution: angle $ACE = 58$ (Alternate segment theorem)
$\angle ABE = ACE$ (angles in the same segment of a circle)
$\therefore \angle ABD = 58^\circ$ —— ①
Now $x = 58 + 27$ (In ΔDAB, x is the exterior angle $\Rightarrow$ equal to sum of opp. interior angles).
$\therefore \underline{x = 85^\circ}$ ✓

(iii) F, G, H and J are points on the circle.
EFG is a straight line parall to JH.
Find the value of y. ---[2]



Solution: angle $H = 108^\circ$
$y +$ angle $H = 180^\circ$ (Interior Angles on the same side of transversal between parall lines)
$\Rightarrow y + 108 = 180^\circ$
$\Rightarrow \underline{y = 72^\circ}$ ✓

(b) A, B, C and D are points on the circle, centre O.
M is the mid point of AB and N is the mid point of CD; OM = ON.
Explain, giving reasons, why triangle OAB is congruent to triangle OCD. ---[3]

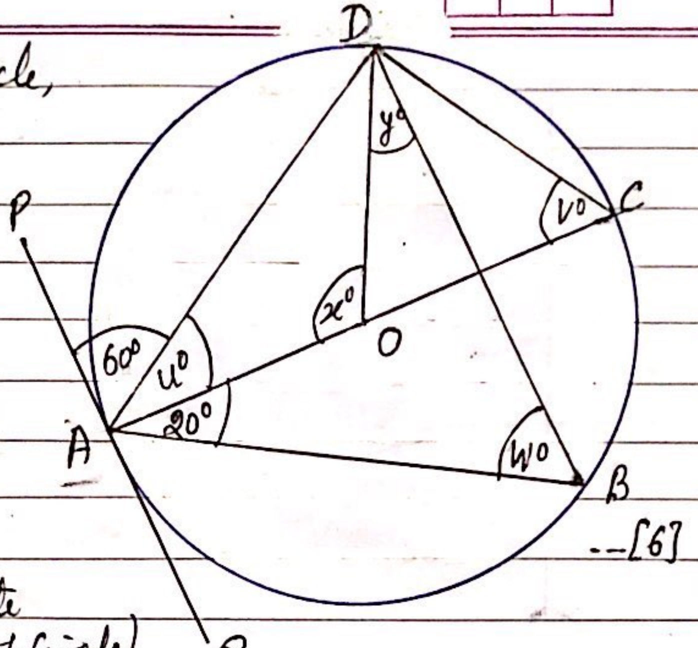


Solution: $OM = ON \Rightarrow AB = CD$ (Chords equidistant from centre are equal)

Now $AB = CD$ —— ①
$OA = OC = r$
$OB = OD = r$
$\therefore$ Triangle $OAB \cong$ Triangle OCD (SSS Theorem of Congruency)

S-20/43/Q8(b)(c)

25(a) A, B, C and D lie on the circle, centre O, with diameter AC. PQ is a tangent to the circle at A. angle PAD = 60° and angle BAC = 20°. Find the value of u, v, w, x and y.



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Solution: $v = w = 60^\circ$ (Alternate segment of circle)

$\left\{ \begin{array}{l} \angle ADC = 90^\circ \text{ (angle in semicircle)} \\ \Rightarrow u + v = 90 \Rightarrow u + 60 = 90 \Rightarrow u = 30^\circ \end{array} \right.$

$x = 2w = 2 \times 60 = 120^\circ$ (angle at the centre is double the angle in the remaining circle)

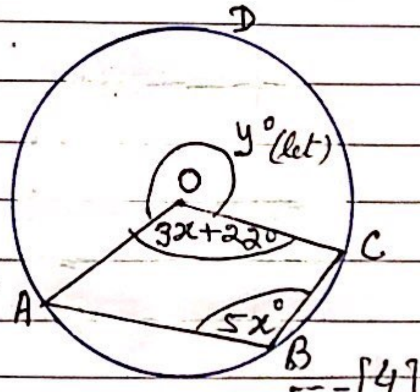
$\therefore x = 120^\circ$

$\angle OAD = \angle ODA$ ($OA = OD$)

$30 = \angle ODA$ and $\angle BDC = 20^\circ$

$\therefore y + 30^\circ + 20^\circ = 90^\circ \Rightarrow y = 40^\circ$

25(b) A, B and C lie on the circle, centre O. Angle AOC = $(3x+22)^\circ$ and angle ABC = $5x^\circ$. Find the value of x.



--[4]

Solution: Angle subtended by arc ADC at the centre angle $y^\circ = 360 - (3x+22)$

$= (338 - 3x)^\circ$

Now $338 - 3 = 2 \times 5x^\circ$ (angle subtended by arc ADC is double the angle in the opp. segment of circle)

$338 - 3x = 10x$

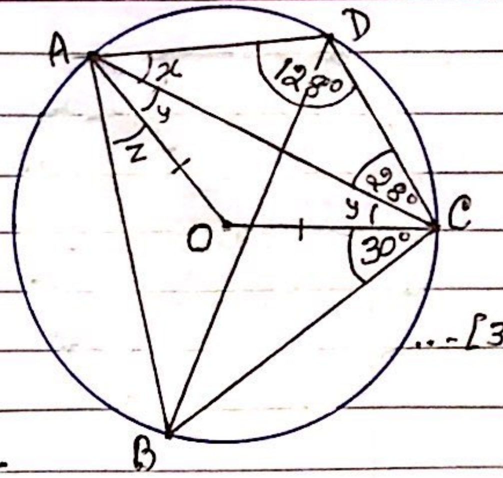
$\Rightarrow 13x = 338$

$x = \frac{338}{13} = 26^\circ$

$\therefore \underline{x = 26^\circ}$

W-19/41/Q1(d)(e)

26. In the diagram A, B, C and D lie on the circle, centre O.
Angle $ADC = 128°$, angle $ACD = 28°$ and angle $BCO = 30°$



(i) Show that obtuse angle $AOC = 104°$
Give a reason for each step. ...[3]

Answer: angle $ABC = 180 - 128 = 52°$ — ①
(∵ the opp. angles of cyclic Quad ABCD are supplementary)
∴ obtuse angle $AOC = 2 \times 52 = \underline{104°}$ ✓ (∵ angle at the centre is double the angle at circumference by an arc $\widehat{ADC}$

(ii) Find angle BAO. ---[2]

Answer: $x = 180 - (128 + 28)$ (angle sum prop in ΔADC)
$x = 24°$ — ②
In isosceles ΔOAC, $2y + 104 = 180 \Rightarrow y = 38°$ — ③
Now $\angle BAD + \angle BCD = 180$ (opp angle of cyclic quad ABCD)
$\Rightarrow (z + 38 + 24) + (28 + 38 + 30) = 180°$
$z + 168 = 180 \Rightarrow z = \angle BAO = 180 - 168 = \underline{22°}$ ✓

(iii) Find angle ABD ---[1]

Answer: angle ABD = angle $ACD = \underline{28°}$ ✓ (Angles in the same segment of circle)

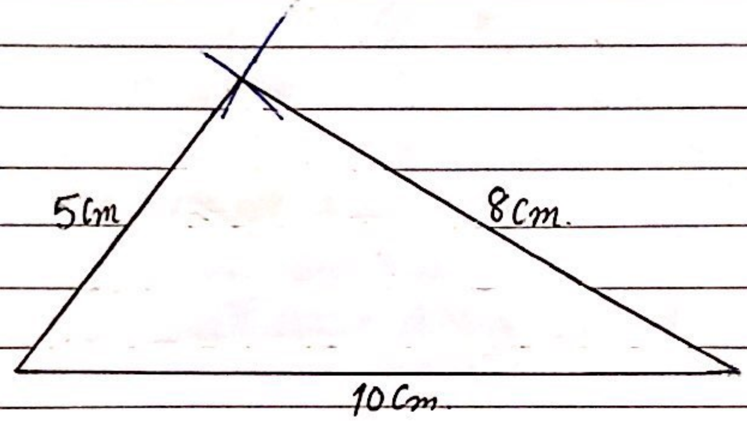
(iv) The radius, OC, of the circle is 9.6 cm.
Calculate the total perimeter of sector OADC. ---[3]

Answer: Perimeter of sector $OADC = OA + OC + \text{arc } \widehat{ADC}$
$= 9.6 + 9.6 + \frac{104}{360} \times 2\pi \times 9.6$
$= 19.2 + 17.425$
$= \underline{36.62 \text{ cm}}$ ✓

[W-19/43/Q6(a)]

27. Using a ruler and pair of compasses only, construct a triangle with sides 5cm, 8cm and 10cm. Leave in your construction arcs. ---[2]

[SP-20/02/Q7]



← X — X →