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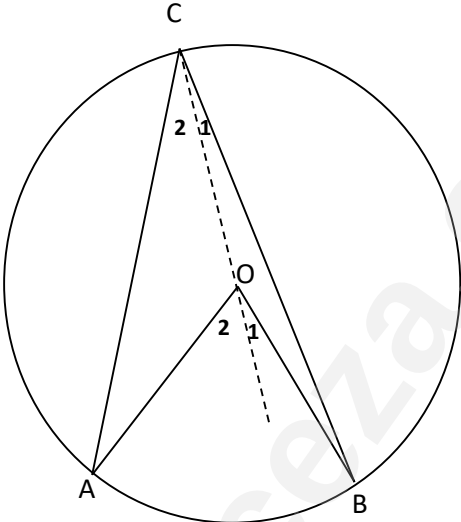
MATHEMATICS

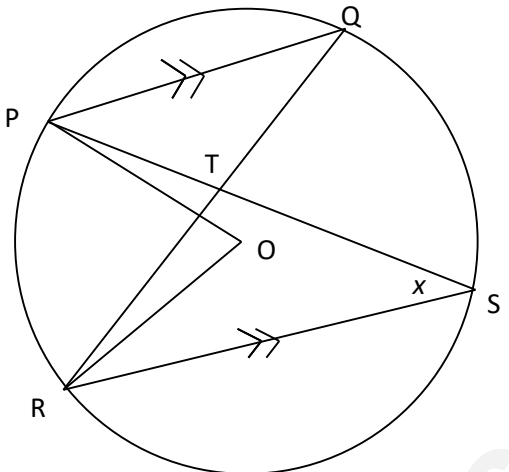
MATERIAL FOR GRADE 12

EUCLIDEAN GEOMETRY

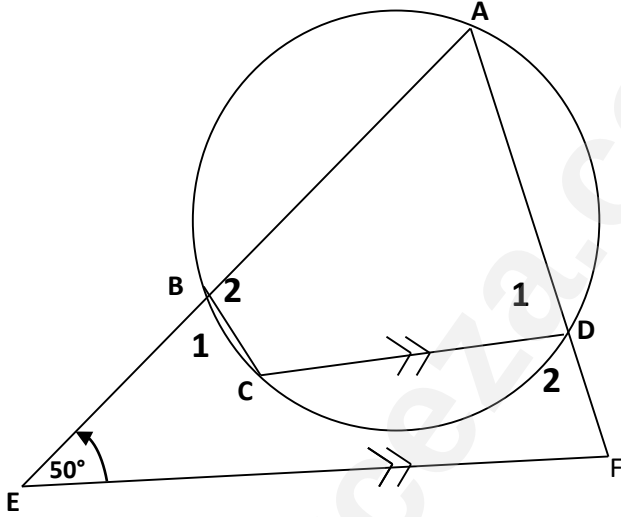
MEMORANDA

QUESTION 1

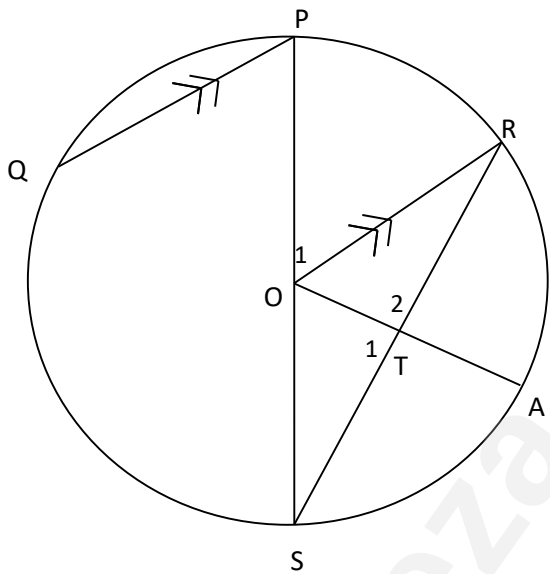
1.1	(a) Sum of two opposite interior angles	✓answer (1)
	(b) The angle on the alternate segment	✓answer (1)
	(c) Supplementary	✓answer (1)
		
1.2	Construction: Join CO and produce it. Proof: In $\triangle ACO$, $\hat{O}_2 = \hat{A} + \hat{C}_2$ (ext. Angle of a $\triangle$) But $\hat{A} = \hat{C}_2$ ($OA = OC = \text{radii}$) $\therefore \hat{O}_2 = \hat{C}_2 + \hat{C}_2$ $\hat{O}_2 = 2\hat{C}_2$ Similarly we can prove that $\hat{O}_1 = 2\hat{C}_1$ $\hat{O}_2 + \hat{O}_1 = 2\hat{C}_2 + 2\hat{C}_1$ $\therefore \hat{AOB} = 2\hat{ACB}$	✓construction ✓$\hat{O}_2 = \hat{A} + \hat{C}_2$ ✓$\hat{A} = \hat{C}_2$ ✓$\hat{O}_2 = 2\hat{C}_2$ ✓$\hat{O}_1 = 2\hat{C}_1$ ✓ $\hat{O}_2 + \hat{O}_1 = 2\hat{C}_2 + 2\hat{C}_1$ (6)

		
1.3.1	$\hat{S} = \hat{Q} = x$ (sub. by same segment PR) $= \hat{QRS} = \hat{Q} = x$ (alt. angle $PQ \parallel RS$) $= \hat{QPS}$ (sub. by same segment QS or alt $\angle$) $= x$	$\checkmark S \quad \checkmark R$ $\checkmark S \quad \checkmark R$ $\checkmark S \quad \checkmark R \quad (6)$
1.3.2	$\hat{PTR} = x + x$ (ext. Angle of a $\triangle PQT$) $= 2x$	$\checkmark S$ $\checkmark 2x \quad (2)$
1.3.3	$\hat{POR} = 2x$ ($\angle$ at the centre = 2 $\angle$ at the circumference) $= \hat{PTR}$ But they are sub. by same segment PR $\therefore PTOR$ is cyclic	$\checkmark S \quad \checkmark R$ $\checkmark$ They are sub. by same segment PR (3)
		[20]

QUESTION 2

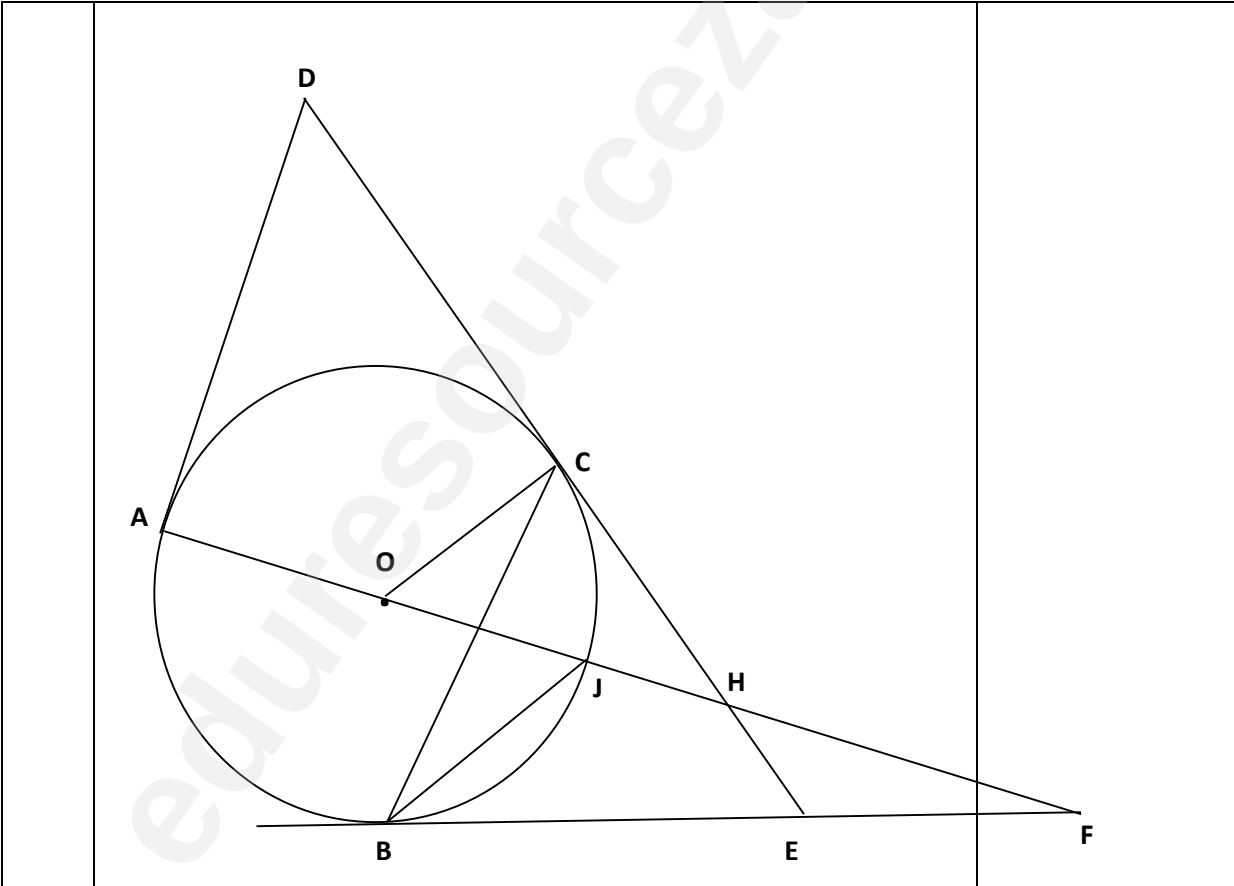
2.1	(a) Opposite angles of a cyclic quad are supplementary.	✓ answer (1)
	(b) Angle at centre is twice angle at circumference.	✓ answer (1)
	(c) $\hat{U} = 30^\circ$	✓ answer (1)
	(d) Tan chord theorem	✓ answer (1)
	(e) Radius is perpendicular to tangent	✓ answer (1)
		
2.2	$\hat{E} = \hat{F} = 50^\circ$ (EA = AF) $\hat{F} = \hat{D}_1 = 50^\circ$ (corr. angles EF // CD) $\hat{B}_2 + \hat{D}_1 = 180^\circ$ (opp. angles of a cyclic) $\hat{B}_2 + 50^\circ = 180^\circ$ $\therefore \hat{B}_2 = 130^\circ$ OR $\hat{E} = \hat{F} = 50^\circ$ given $\hat{F} = \hat{D}_1 = 50^\circ$ corr. angles EF // CD $\hat{D}_1 + \hat{D}_2 = 180^\circ$ adjacent angles on a str line $\hat{D}_2 = 180^\circ - 50^\circ$ $= 50^\circ$ But $\hat{D}_2 = \hat{B}_2$ ext angle of cyclic quad $\therefore \hat{B}_2 = 130^\circ$	✓R ✓S ✓R ✓S ✓R ✓ answer (6) ✓R ✓S ✓R ✓S ✓R ✓ answer (6)
		[11]

QUESTION 3

		
3.1	$\hat{P} = \hat{O}_1$ (alternate angles) $\hat{O}_1 = 2\hat{S}$ (angle at the centre) but $\hat{S} = \hat{R}$ (OS = OR radii) $\hat{P} = 2\hat{R}$ OR $\hat{P} = \hat{O}_1$ (alternate angles) $\hat{Q}_1 = \hat{S} + \hat{R}$ (ext. angle of a Δ) but $\hat{S} = \hat{R}$ (OS = OR radii) $\hat{P} = 2\hat{R}$	$\checkmark \hat{P} = \hat{O}_1$ $\checkmark \hat{O}_1 = 2\hat{S}$ $\checkmark$ angle at the centre $\checkmark \hat{S} = \hat{R}$ $\checkmark \hat{P} = 2\hat{R}$ (5)

		[10]
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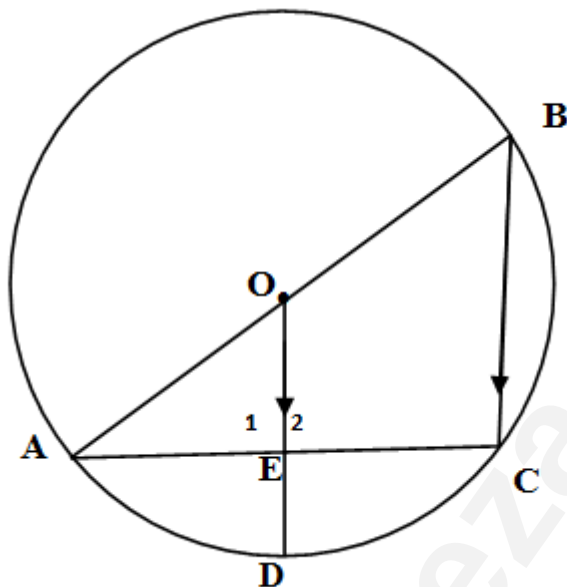
QUESTION 4



SECTION 5	
is perpendicular to the chord	✓
The line from the centre of the circle perpendicular to the chord, bisects the chord	✓ The line from the centre of the circle perpendicular to the chord bisects the chord ✓ The line from the centre of the circle bisects the chord and is perpendicular to the chord

QUESTION 5

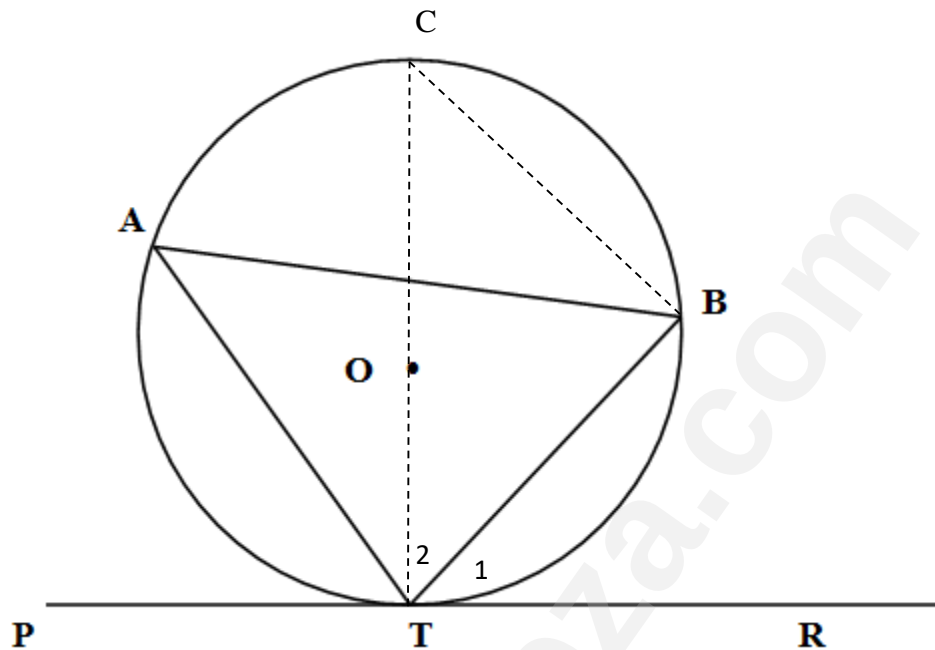
5.3



5.3.1	$\frac{AO}{OB} = \frac{AE}{EC} \dots\dots OE \parallel BC$ $AO = OB \dots\dots \text{Radii}$ $\Rightarrow AE = EC$	$\sqrt{S/R}$ (2)
5.3.2	$\hat{C} = 90^\circ$ (angle in semi $\odot$) $\hat{E}_1 = 90^\circ$ (corr. angles; $OD \parallel BC$)	$\sqrt{S/R}$ $\sqrt{R}$ (2)
5.3.3	$OE^2 = 10^2 - 8^2$ (theorem of Pyth) $OE^2 = 100 - 64 = 36$ $OE = 6 \text{ cm}$ $\therefore ED = 4 \text{ cm}$	$\sqrt{S}$ $\sqrt{OE} = 6 \text{ cm}$ $\sqrt{\text{answer}}$ (3)
		[10]

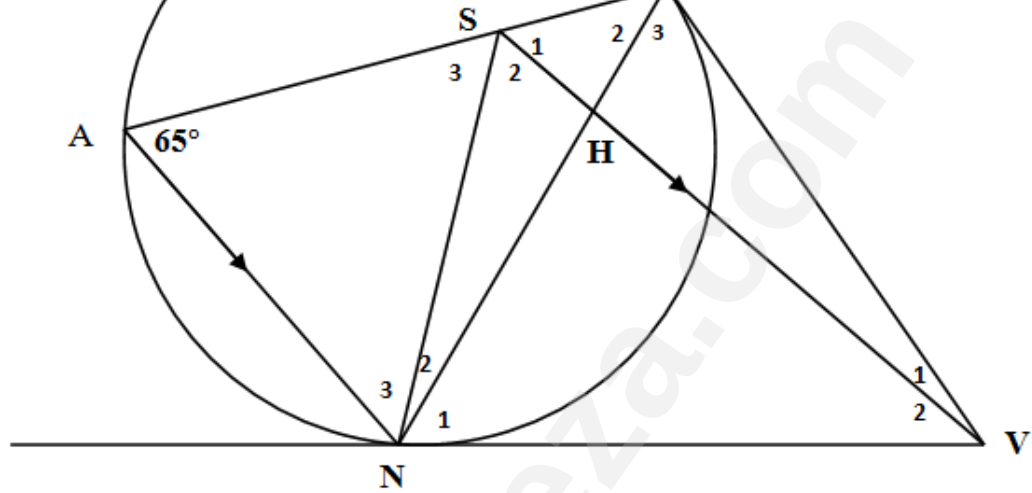
QUESTION 6

6.1



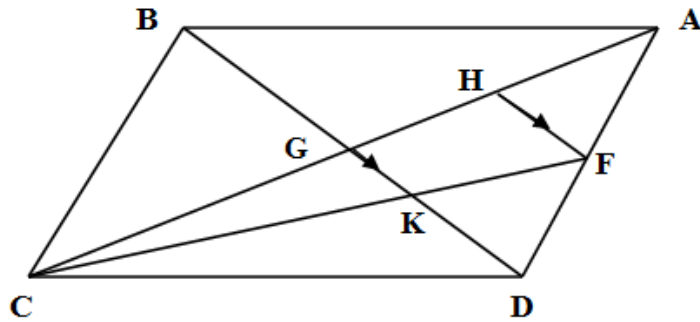
6.1	Construction: Draw diameter TC and join BC. $\angle CBT = 90^\circ$ ($\angle$ in semi $\odot$) $\hat{C} + \hat{T}_2 = 90^\circ$ ($\angle$'s of Δ) $\hat{T}_1 + \hat{T}_2 = 90^\circ$ (tangent $\perp$ r) $\therefore \hat{C} = \hat{T}_1$ But $\hat{C} = \hat{A}$ ($\angle$'s in same segment) $\therefore \hat{T}_1 = \hat{A}$	✓construction ✓S / R ✓S ✓S/ R ✓S/ R ✓conclusion (6)
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6.2.1



6.2.1	$\hat{S}_1 = 65^\circ$ (corr $\angle$'s; AN $\parallel$ SV) $\hat{Y}_3 = 65^\circ$ (tan-chord th) $\hat{N}_1 = 65^\circ$ (tan-chord th)	$\checkmark$ S R $\checkmark$ S R $\checkmark$ S R	(3)
6.2.2	$\hat{S}_1 = \hat{N}_1$ VYSN is a cyclic quad (YV subtends equal angles)	$\checkmark \hat{S}_1 = \hat{N}_1$ $\checkmark$ YV subtends equal angles	(2)
6.2.3	$\hat{S}_2 = 65^\circ$ ($\angle$'s in same segment) $\hat{N}_3 = 65^\circ$ (alt. $\angle$'s; AN $\parallel$ SV) $\therefore \hat{A} = \hat{N}_3$ AS = SN (sides opp equal angles)	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ R	(5)
			[16]

QUESTION 7

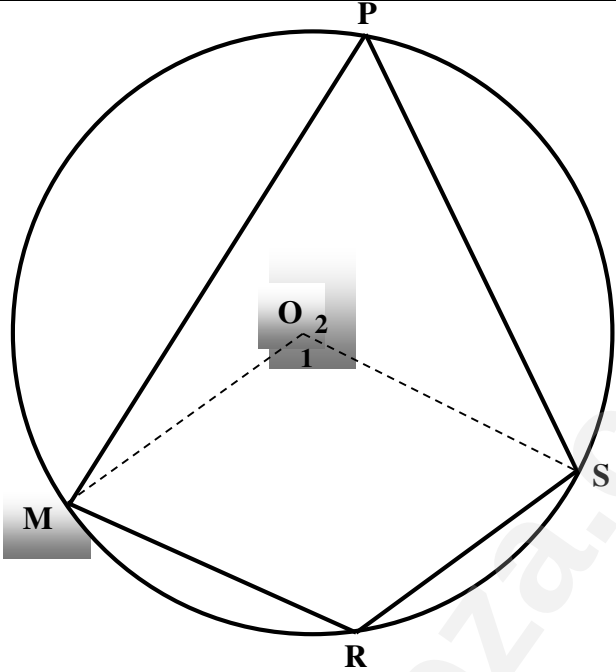


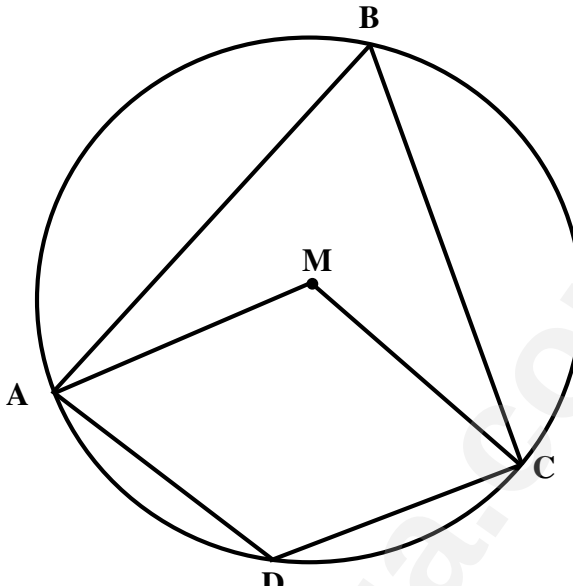
7.1	GA = 72 units (diagonals of parm) $\frac{AF}{FD} = \frac{40}{24} = \frac{5}{3}$ (line one side triangle) $GH = \frac{3}{8} \times 72$ = 27 units OR GA = 72 units (diagonals of parm) $\frac{GH}{72} = \frac{24}{64}$ (line one side triangle) GH = 27	✓ S R ✓ S ✓ R ✓ 27 (4) ✓ S R ✓ S ✓ R ✓ 27 (4)
7.2	$\frac{\text{area } \Delta AHF}{\text{area } \Delta ACD} = \frac{\frac{1}{2}AH.AF.\sin A}{\frac{1}{2}AC.AD.\sin A}$ = $\frac{45.40}{144.64}$ = $\frac{25}{128}$ OR $\frac{\text{area } \Delta AHF}{\text{area } \Delta AGD} = \frac{\frac{1}{2}.45.40}{\frac{1}{2}.72.64} = \frac{25}{64}$ But $\Delta ACD = 2 \times \Delta AGD$ $\therefore \frac{\text{area } \Delta AHF}{\text{area } \Delta ACD} = \frac{25}{24 \times 6} = \frac{25}{128}$	✓ area ΔAHF ✓ area ΔACD ✓ correct substitution ✓ answer (4) ✓ area ΔAHF ✓ area ΔACD ✓ $\Delta ACD = 2 \times \Delta AGD$ ✓ answer (4)
		[8]

QUESTION 8

8.1	$\hat{B}_2 = x$ (radii =) $\hat{B}_4 = x$ (tan-chord th) $\hat{A} = x$ (corr $\angle$'s; $BD \parallel AO$)	$\checkmark$ S $\checkmark$ SR $\checkmark$ S (3)
8.2	$\hat{B}_2 + \hat{B}_3 = 90^\circ$ ($\angle$ in semi $\odot$) $C\hat{B}E = 90^\circ + x$	$\checkmark$ R $\checkmark 90^\circ + x$ (2)
8.3.1	In $\triangle CBD$ and $\triangle CEB$: $\hat{C} = \hat{C}$ $\hat{B}_4 = \hat{E} = x$ $\hat{D}_2 = C\hat{B}E$ $\therefore \triangle CBD \parallel \triangle CEB$ ($\angle\angle\angle$)	$\checkmark$ S $\checkmark$ S (2)
8.3.2	$\frac{CB}{CE} = \frac{BD}{EB}$ ($\parallel$ triangles) $EB \cdot CB = CE \cdot BD$ $\hat{F}_1 = 90^\circ$ (corr $\angle$'s; $BD \parallel AO$) $BF = FE$ (line from centre to mdpt of chord) $\therefore BE = 2EF$ $\therefore 2EF \cdot CB = CE \cdot BD$	$\checkmark$ S $\checkmark$ R $\checkmark$ SR $\checkmark$ SR $\checkmark$ replacing BE (5)
8.3.3	$\frac{2EF}{CE} = \frac{BD}{BC}$ out of / uit 10.4 But/maar $\triangle BCD \parallel \triangle ACO$ ($\angle\angle\angle$) $\therefore \frac{BD}{AO} = \frac{BC}{AC}$ $\frac{BD}{BC} = \frac{AO}{AC}$ $\frac{2EF}{CE} = \frac{AO}{AC}$	$\checkmark$ S $\checkmark$ SR $\checkmark$ S $\checkmark$ S (4)
		[16]

QUESTION 9

9.1	
9.1	Const: Draw radii OM and OS (also accepted on sketch) Proof: $\hat{O}_1 = 2\hat{P} \quad (\angle \text{ at centre} = 2\angle \text{ at the circumference})$ $\hat{O}_2 = 2\hat{R} \quad (\angle \text{ at centre} = 2\angle \text{ at the circumference})$ $\therefore \hat{O}_1 + \hat{O}_2 = 2(\hat{P} + \hat{R})$ but $\hat{O}_1 + \hat{O}_2 = 360^\circ$ (revolution) $\therefore 2(\hat{P} + \hat{R}) = 360^\circ$ $\hat{P} + \hat{R} = 180^\circ$ ✓ construction ✓ statement ✓ reason ✓ statement/reason ✓ $\hat{O}_1 + \hat{O}_2 = 360^\circ$ ✓ $2(\hat{P} + \hat{R}) = 180^\circ$ (6)

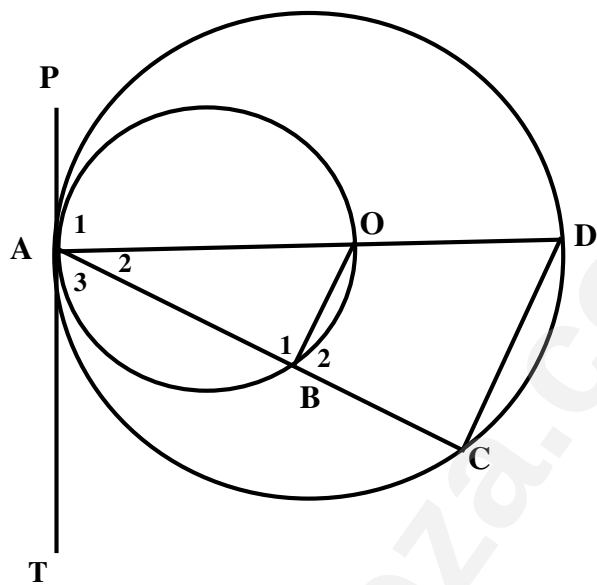
9.2		
9.2	$\hat{B} + \hat{D} = 180^\circ \quad (\text{opp. } \angle\text{s of a cyclic quad.})$ $\hat{B} = \frac{2}{5} \cdot (180^\circ)$ $= 72^\circ$ $\angle AMC = 2\hat{B} \quad (\angle \text{ at the centre})$ $= 2(72^\circ)$ $= 144^\circ$ OR Let $\hat{B} = 2x$ $\therefore \hat{D} = 3x$ $2x + 3x = 180^\circ \quad (\text{opp. } \angle\text{s of a cyclic quad.})$ $5x = 180^\circ$ $x = 36^\circ$ $\angle AMC = 4x \quad (\angle \text{ at the centre})$ $= 4(36^\circ)$ $= 144^\circ$	$\checkmark \hat{B} + \hat{D} = 180^\circ$ $\checkmark \text{ opp. } \angle\text{s of a cyclic quad}$ $\checkmark \hat{B} = \frac{2}{5} \cdot (180^\circ)$ $\checkmark \angle AMC = 2\hat{B}$ $\checkmark \angle \text{ at the centre}$ $\checkmark 144^\circ \quad (6)$ OR $\checkmark \hat{B} = 2x \text{ and}$ $\hat{D} = 3x$ $\checkmark 2x + 3x = 180^\circ$ $\checkmark \text{ opp. } \angle\text{s of a cyclic quad}$ $\checkmark \angle AMC = 4x$ $\checkmark \angle \text{ at the centre}$ $\checkmark \text{ answer}$

9.3		
9.3.1	$\hat{D}_3 = 90^\circ \quad (\text{AB is a diameter})$ $\hat{C}_1 + \hat{C}_2 = 90^\circ \quad (\text{given})$ $\hat{D}_3 = \hat{C}_1 + \hat{C}_2 \quad (\text{both} = 90^\circ)$ $\therefore \text{ACED is a cyclic quadrilateral (ext. } \angle \text{ of a quad} = \text{interior opp } \angle)$	$\checkmark \hat{D}_3 = 90^\circ$ $\checkmark \text{AB is a diameter}$ $\checkmark \hat{C}_1 + \hat{C}_2 = 90^\circ$ $\checkmark \hat{D}_3 = \hat{C}_1 + \hat{C}_2$ $\checkmark \text{ext. } \angle \text{ of a quad} = \text{interior opp } \angle \quad (5)$
9.3.2	In $\triangle ADB$, $\hat{A}_2 + \hat{B} + \hat{D}_3 = 180^\circ \quad (\angle \text{ s in a } \triangle)$ $\hat{D}_1 + \hat{D}_2 + \hat{D}_3 = 180^\circ \quad (\angle \text{ s on a st. line})$ $\hat{A}_2 + \hat{B} + 90^\circ = \hat{D}_1 + \hat{D}_2 + \hat{D}_3$ $\hat{D}_2 = \hat{B} \quad (\angle \text{ between tan. and chord})$ $\therefore \hat{A}_2 = \hat{D}_1$	$\checkmark \hat{A}_2 + \hat{B} + \hat{D}_3 = 180^\circ$ $\checkmark \hat{D}_1 + \hat{D}_2 + \hat{D}_3 = 180^\circ$ $\checkmark \hat{D}_2 = \hat{B}$ $\checkmark \angle \text{ between tan and chord}$ (4)
9.3.3	$\hat{A}_2 = \hat{E} \quad (\text{ext } \angle \text{ of a cyclic quad ACED})$ $\hat{A}_2 = \hat{D}_1 \quad (\text{from above})$ $\hat{D}_1 = \hat{E}$ $EC = DC \quad (\text{side opp of equal angles})$ $\therefore \triangle CDE \text{ is isosceles}$	$\checkmark \hat{A}_2 = \hat{E}$ $\checkmark \text{ext } \angle \text{ of a cyclic quad ACED}$ $\checkmark \hat{A}_2 = \hat{D}_1$ $\checkmark EC = DC \quad (4)$ [25]

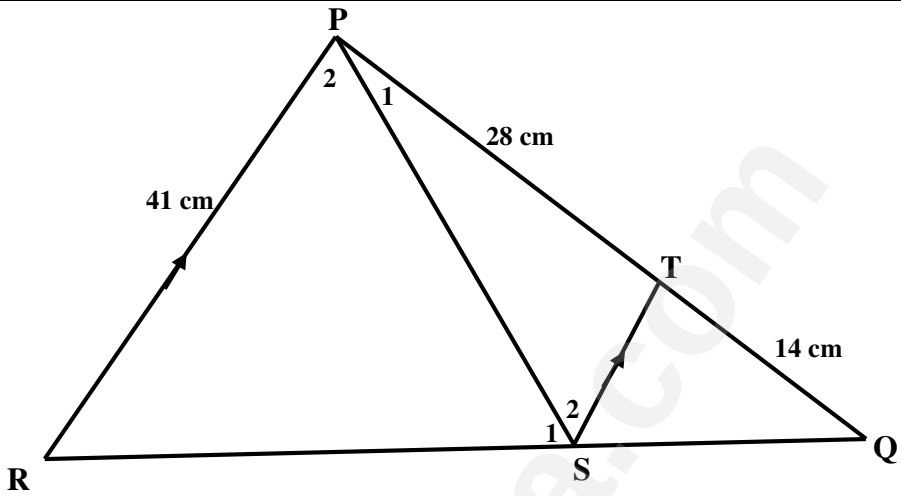
QUESTION 10

10.1	In $\triangle PQR$ and $\triangle PTS$ 1. $\hat{P}$ is common 2. $\hat{Q} = \hat{P} \hat{T} S$ (both = 90°) 3. $\hat{R} = \hat{P} \hat{S} T$ (rem. $\angle$s of a Δ) $\triangle PQR \parallel \triangle PTS$ ($\angle \angle \angle$)	✓ $\hat{P}$ is common ✓ $\hat{Q} = \hat{P} \hat{T} S$ (both = 90°) ✓ $\hat{R} = \hat{P} \hat{S} T$ or ($\angle \angle \angle$) (3)
10.2.1	$\frac{PQ}{PT} = \frac{QR}{TS} = \frac{PR}{PS} \quad (\triangle PQR \parallel \triangle PTS)$ $PQ = \sqrt{16^2 - 14^2} \quad (\text{Pythagoras thm})$ $= \sqrt{60} \quad \text{or} \quad 2\sqrt{15}$ $\frac{PQ}{PT} = \frac{PR}{PS}$ $\frac{\sqrt{60}}{8} = \frac{16}{PS}$ $PS = \frac{16 \cdot 8}{\sqrt{60}}$ $= 16,52 \text{ cm}$	✓ $\frac{PQ}{PT} = \frac{QR}{TS} = \frac{PR}{PS}$ ✓ $\sqrt{16^2 - 14^2}$ ✓ $PQ = 2\sqrt{15} \text{ or } \sqrt{60}$ ✓ $\frac{\sqrt{60}}{8} = \frac{16}{PS}$ ✓ answer (5)
10.2.2	Perimeter of $\triangle PQR = 16 + 14 + \sqrt{60}$ $= 37,75 \text{ cm}$	✓ $16 + 14 + \sqrt{60}$ ✓ answer (2) [10]

QUESTION 11

		
11.1	$\hat{A}_1 = \hat{B}_1$ (tan-chord thm) $\hat{A}_1 = \hat{C}$ (tan-chord thm) $\therefore \hat{B}_1 = \hat{C}$ But they are corresponding $\angle$ s $\therefore OB \parallel DC$	$\checkmark \hat{A}_1 = \hat{B}_1$ $\checkmark$ tan-chord thm $\checkmark \hat{A}_1 = \hat{C}$ $\checkmark \hat{B}_1 = \hat{C}$ $\checkmark$ But they are corresponding $\angle$ s (5)
11.2	$\frac{AB}{AC} = \frac{AO}{AD}$ (line drawn $\parallel$ to one side of a Δ) $= \frac{1}{2}$ (OA = r ; AD = 2r)	$\checkmark \frac{AB}{AC} = \frac{AO}{AD}$ $\checkmark \frac{1}{2}$ (2) [7]

QUESTION 12

		
12.1	$\hat{P}_2 = \hat{S}_2 \quad (\text{alt } \angle\text{s } PR \parallel TS)$ $= \hat{S}_1 \quad (\text{given})$ $\therefore RS = PR = 41 \text{ cm} \quad (\text{side opp. to equal } \angle\text{s})$ $\frac{SQ}{SR} = \frac{QT}{TP} \quad (\text{line drawn } \parallel \text{ to one side of a } \Delta)$ $\frac{SQ}{41} = \frac{14}{28}$ $\therefore SQ = \frac{14}{28}(41) = 20,5 \text{ cm}$	$\checkmark \hat{P}_2 = \hat{S}_2$ $\checkmark RS = 41 \text{ cm}$ $\checkmark \frac{SQ}{41} = \frac{14}{28}$ $\checkmark \text{ line drawn } \parallel \text{ to one side of a } \Delta$ $\checkmark \text{ answer}$ (5)
12.2	In ΔPQR and ΔTQS $\hat{Q} = \hat{Q} \quad (\text{common})$ $\hat{R} \hat{P} \hat{Q} = \hat{S} \hat{T} \hat{Q} \quad (\text{corr. angles, } PR \parallel TS)$ $\Delta PQR \parallel \Delta TQS \quad (\angle\angle\angle)$ $\frac{ST}{41} = \frac{14}{42} \quad (\Delta PQR \parallel \Delta TQS)$ $ST = \frac{41,14}{42}$ $= 13,67 \text{ cm}$	$\checkmark\checkmark \Delta PQR \parallel \Delta TQS$ $\checkmark \frac{ST}{41} = \frac{14}{42}$ $\checkmark \text{ answer}$ (4)

[9]

QUESTION 17

17.1.1	Equal to the angle on the alternating segment.	✓ (1)
17.1.2	Supplementary	✓ (1)
17.2.1	$\hat{A}_2 = 40^\circ$ [tan chord theorem] $\hat{A}_5 = 40^\circ$ [vert. opp. Angles] $\hat{P}_2 = 40^\circ$ [tan chord theorem]	$\checkmark\checkmark$ S /R $\checkmark\checkmark$ S/R $\checkmark\checkmark$ S/R (6)
17.2.2	$\hat{P}_1 = \hat{Q}_1 = 40^\circ$ but these are cor angl. (PN $\parallel$ TQ) $\hat{P}_1 = \hat{A}_4$ given $\hat{A}_1 = \hat{P}_1$ but these are cor. angl. (PT $\parallel$ NR) $\therefore$ PNRT is a parallelogram pair of opp.sides $\parallel$	$\checkmark\checkmark$ S/R $\checkmark\checkmark$ S/R $\checkmark$ S/R (5)
17.3.1	$\hat{B}\hat{E}\hat{D} = \hat{B}_1 = x$ [alt. angle, AB $\parallel$ EC] $\hat{A}\hat{D}\hat{E} = \hat{B}_1 = x$ [angle in same segment] $\hat{A}_2 = \hat{B}\hat{E}\hat{D} = x$ [angle in same segment] $\hat{B}_2 = \hat{E}\hat{A}\hat{B} = x + y$ [tan. chord] $\hat{C} + \hat{B}_1 + \hat{B}_2 = 180^\circ$ [co-int. angles, AB $\parallel$ EC] $\therefore \hat{C} = 180^\circ - 2x - y$	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S (6)
17.3.2	$\hat{B}\hat{F}\hat{D} = 2x$ ext.angle of Δ FED $\hat{C} = 180^\circ - 2x - y$ proven $\hat{B}\hat{F}\hat{D} + \hat{C} = 180^\circ - 2x - y + 2x$ $= 180^\circ - y$ $\therefore \hat{B}\hat{F}\hat{D} + \hat{C} \neq 180^\circ$ opposite angles not supplementary $\therefore$ Becky she is correct.	$\checkmark\checkmark$ S/R $\checkmark$ S $\checkmark$ S $\checkmark$ S (5)
		[24]

QUESTION 18

18.1	Join RO and OP Let $\hat{O}_1 = 2x$ $\hat{O}_2 = 360^\circ - 2x$ angles around a point $\hat{T} = x$ angle at centre = 2 angle at circ. $\hat{S} = 180^\circ - x$ angle at centre = 2 angle at circum $\hat{S} + \hat{T} = x + 180^\circ - x$ $\therefore \hat{S} + \hat{T} = 180^\circ$	✓constr ✓$\hat{O}_1 = 2x$ ✓S ✓S ✓✓S/R (6)
18.2		

18.2.1	$\hat{C}_1 = 90^\circ$ [angle in semi-circle] $\hat{D}_1 = 90^\circ$ [OE $\perp$ BC] $\therefore \hat{C}_1 = \hat{D}_1 = 90^\circ$ $\therefore OE \parallel CA$ [corr. angles equal]	$\checkmark\checkmark$ S/R $\checkmark$ S $\checkmark$ R (4)
18.2.2	$\hat{C}_2 = \hat{A} = x$ [tan. chord] $\hat{A} = \hat{O}_1 = x$ [corr. Angles, OE $\parallel$ CA]	$\checkmark\checkmark$ S/R $\checkmark$ S/R (3)
18.2.3	$\hat{P} + \hat{A} + \hat{C}_1 + \hat{C}_2 = 180^\circ$ [sum of the angles of triangle] $\hat{P} + x + 90^\circ + x = 180^\circ$ $\therefore \hat{P} = 90^\circ - 2x$	$\checkmark\checkmark$ S/R $\checkmark$ answer (3)
		[16]

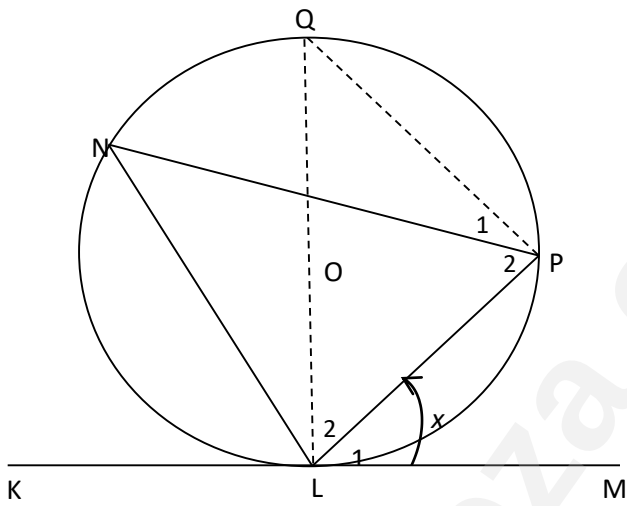
QUESTION 19

19.1	$\hat{A}_1 = \hat{B}_2 = x$ [tan chord] $\hat{A}_3 = \hat{B}_2 = x$ [alternating angles, AC $\parallel$ BT] $\hat{A}_3 = \hat{T}_1 = x$ [angles subt by same chord] But $\hat{T}_1 = \hat{T}_4 = x$ [vert opp. angles] $\therefore \hat{T}_4 = \hat{A}_1 = x$ $\therefore$ PT is a tangent to circle ADT. [Angle between line and chord]	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S (5)
19.2	In Δ APT and Δ TPD $\hat{P} = \hat{P}$ common $\hat{T}_4 = \hat{A}_1 = x$ proven $\hat{A}\hat{T}\hat{P} = \hat{D}_2$ 3 rd angle of triangle $\therefore \Delta$ APT $\parallel\parallel$ Δ TPD angle, angle, angle	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R (3)
19.3	$\frac{AP}{PT} = \frac{PT}{PD}$ [Δ APT $\parallel\parallel$ Δ TPD] $AP \cdot PD = PT \cdot PT$ $AP \cdot \frac{1}{3}AP = PT^2$ $AP^2 = 3PT^2$	$\checkmark\checkmark$ S/R $\checkmark$ DP = $\frac{1}{3}$ AP $\checkmark$ S (4)
		[12]

QUESTION 20

20.1 PT = TQ = 12cm ... (line from center perpendicular to chord PQ) $\therefore PQ = 12 \text{ cm} + 12 \text{ cm} = 24\text{cm}$	A✓ R A✓ answer (2)
20.2 $OT^2 = OQ^2 - QT^2 \dots \dots$ pythagoras $= 13^2 - 12^2$ $= 169 - 144$ $= 25$ $\therefore OT = 5$ $\therefore TR = OR - OT$ $= 13\text{cm} - 5\text{cm}$ $= 8\text{cm}$ In ΔPTR, $PR^2 = TR^2 + PT^2$ $= 8^2 + 12^2$ $= 64 + 144$ $= 208 \text{ cm}^2$ $\therefore PR = \sqrt{208} \text{ cm or } 4\sqrt{13} \text{ cm or } 14,42 \text{ cm}$	A✓ OT = 5 CA✓ TR = 8cm CA✓ $PR^2 = 208$ CA✓ PR = $4\sqrt{13}$ or 14,42 (4) [6]

QUESTION 21

21.1	Interior opposite angle	A✓ S (1)														
21.2	 Construction : Draw diameter LOQ and join QP or Join OL and OP <table><tr><th>STATEMENT</th><th>REASON</th></tr><tr><td>Let $\hat{P}LM = \hat{L}_1 = x$</td><td></td></tr><tr><td>$\hat{P}_1 + \hat{P}_2 = 90^\circ$</td><td>angle subtended by the diameter</td></tr><tr><td>$\hat{L}_2 = 90^\circ - x$</td><td>LM $\perp$ OL, tan – radius</td></tr><tr><td>$\therefore \hat{Q} = x$</td><td>Sum of the angles of a triangle</td></tr><tr><td>$\hat{N} = x$</td><td>Subtended by the same chord LP</td></tr><tr><td>$\hat{P}LM = \hat{N}$</td><td></td></tr></table>	STATEMENT	REASON	Let $\hat{P}LM = \hat{L}_1 = x$		$\hat{P}_1 + \hat{P}_2 = 90^\circ$	angle subtended by the diameter	$\hat{L}_2 = 90^\circ - x$	LM $\perp$ OL, tan – radius	$\therefore \hat{Q} = x$	Sum of the angles of a triangle	$\hat{N} = x$	Subtended by the same chord LP	$\hat{P}LM = \hat{N}$		A✓ construction A✓ S/R A✓ S/R A✓ S A✓ S/R (5)
STATEMENT	REASON															
Let $\hat{P}LM = \hat{L}_1 = x$																
$\hat{P}_1 + \hat{P}_2 = 90^\circ$	angle subtended by the diameter															
$\hat{L}_2 = 90^\circ - x$	LM $\perp$ OL, tan – radius															
$\therefore \hat{Q} = x$	Sum of the angles of a triangle															
$\hat{N} = x$	Subtended by the same chord LP															
$\hat{P}LM = \hat{N}$																

21.3.1 $\hat{A} = 180^\circ - \hat{AED} \dots$ co interior $\angle$'s, $AB \parallel ED$ $= 180^\circ - 70^\circ$ $= 110^\circ$	A✓ S/R A✓ 110° (2)
21.3.2 $\hat{B}_1 = 70^\circ \dots$ ext $\angle$ cyclic quad ABDE	A✓ R A✓ 70° (2)
21.3.3 $\hat{D}_2 = \hat{B}_1 = 70^\circ \dots$ (alt $\angle$ s ; $DE \parallel CA$)	CA✓ 70° A✓ S/R (2)
21.3.4 $\hat{B}_2 = \hat{D}_2 = 70^\circ \dots$ ($\angle$ s opp = sides)	CA✓ 70° A✓ S/R (2)
21.3.5 $\hat{E}_1 = 180^\circ - (\hat{B}_2 + \hat{D}_2) \dots$ ($\angle$ sum of Δ) $= 180^\circ - 140^\circ$ $= 40^\circ$ $\therefore \hat{D}_1 = \hat{E}_1 = 40^\circ \dots$ tan chord theorem	CA✓ $\hat{E}_1 = 40^\circ$ CA✓ $\hat{D}_1 = 40^\circ$ A✓ R (3) [17]

QUESTION 22

22.1 $\hat{P}_1 = \hat{B}_2 = x \dots$ alt $\angle$ s; $SP \parallel BC$ $\hat{P}_2 = \hat{P}_1 = x \dots$ given $Q_1 = P_1 = x \dots$ tan chord theorem	A✓ S A✓ R A✓ S/R A✓ S (4)
22.2 $PC = BC \dots$ $\hat{P}_2 = \hat{B}_2 = x$ proved above (Δ PCB)	A✓ $\hat{P}_2 = \hat{B}_2 = C = x$ A✓ reason (2)

22.3 $\hat{Q}_1 = \hat{B}_2 = x \dots$ proved $\therefore$ RCQB is a cyclic quad $\dots$ converse $\angle$'s in the same segment	A✓ S A✓ R (2)
22.4 $\hat{S} = \hat{B}_3 \dots$ corresp $\angle$'s $SP \parallel BC$ $= \hat{R}_3 \dots \angle$'s in the same segment, cyclic quad RCQB In Δ PBS and Δ QCR $\hat{P}_1 = \hat{Q}_1 = x \dots$ proved $\hat{S} = \hat{R}_3 \dots$ proved Remaining $\angle$ s equal $\therefore \Delta$ PBS $\parallel \Delta$ QCR	A✓ S/R A✓ S/R A✓ S/R A✓ R (5)
22.5 In Δ PBQ and Δ PCR $\hat{P}_2$ is common $P\hat{Q}B = \hat{R}_2 \dots$ ext $\angle$ of cyclic quad RCQB Δ PBQ $\parallel \Delta$ PCR $\dots$ (3 rd $\angle$ Δ) $\therefore \frac{PB}{CP} = \frac{QB}{CR}$ ($\parallel \Delta$ s) $\therefore PB \cdot CR = QB \cdot CP$	A✓ S A✓ S/R A✓ S/R A✓ (4) [17]

QUESTION 23

In Δ KLM $\frac{LD}{9} = \frac{8}{6} \dots$ (LM//DE; proportionality theorem) $\therefore LD = 12$	A✓ S/R A✓ LD = 12
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$\widehat{DML} = \widehat{MDE} = x \dots \text{alt } \angle s, LM \parallel DE$ $\therefore LM = LD = 12 \dots \text{ (sides opp } \angle s \text{)}$	$A \checkmark S$ $A \checkmark \text{ answer}$ $A \checkmark R$
	(5)
	[5]

QUESTION 24

24.1.1	$\widehat{P}_1 + \widehat{P}_2 = 90^\circ$ ($\angle$ in semi $\odot$) $\widehat{S} = 60^\circ$ ($\angle s$ of Δ)	$\checkmark S \checkmark R$ $\checkmark S$
24.1.2	$\widehat{T}_4 = 85^\circ$ (vertically opposite $\angle s$) $\widehat{P}_1 = 35^\circ$ ($\angle s$ of Δ) $\widehat{R}_3 = 35^\circ$ ($\angle s$ in same segment) OR $\widehat{T}_4 = 85^\circ$ (vertically opposite $\angle s$) $\widehat{P}_1 = 35^\circ$ ($\angle s$ of Δ) $\widehat{P}_2 = 55^\circ$ $N\widehat{O}R = 110^\circ$ ($\angle$ at centre; $\angle$ at circumf) $\widehat{R}_3 = \frac{180^\circ - 110^\circ}{2} = 35^\circ$ ($\angle s$ of Δ)	$\checkmark S$ $\checkmark S$ $\checkmark S \checkmark R$ $\checkmark S$ $\checkmark S \checkmark R$ $\checkmark S$
24.1.3	$\widehat{O}_1 = 70^\circ$ ($\angle$ at centre ...) $\widehat{N}_1 = 25^\circ$ ($\angle s$ of Δ) OR	$\checkmark S \checkmark R$ $\checkmark S \checkmark R$

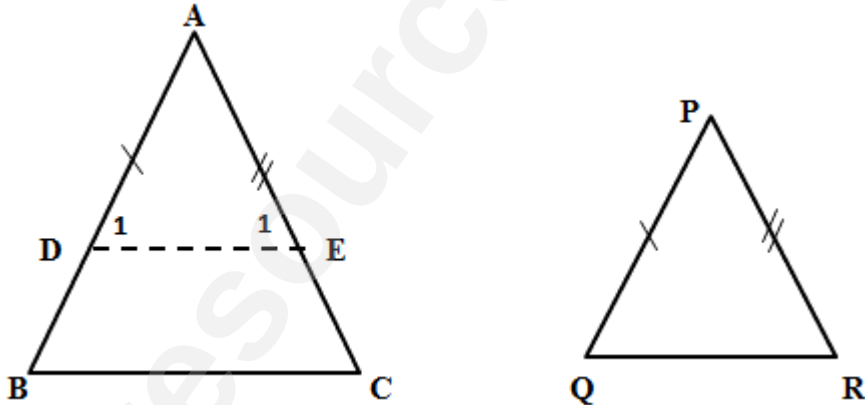
	$\hat{P}_2 = 90^\circ - 35^\circ = 55^\circ$ $\hat{N}_2 = 35^\circ$ (radii equal) $\hat{N}_1 = 180^\circ - (35^\circ + 35^\circ + 30^\circ + 55^\circ) = 25^\circ$ ($\angle s$ of Δ)	$\checkmark S$ $\checkmark S$ $\checkmark S$ $\checkmark R$	(4)
24.1.4	$\hat{P}_2 = 55^\circ$ ($\angle s$ of Δ) $\hat{R}_4 = \hat{P}_2 = 55^\circ$ (tan-chord theorem)	$\checkmark S$ $\checkmark S \checkmark R$	(3)
24.2	$\hat{N}_1 \neq \hat{R}_3$ $\therefore NT$ is not a tangent to that circle	$\checkmark S$ ($25^\circ \neq 35^\circ$) $\checkmark$ Justification	(2)
			[16]

QUESTION 25

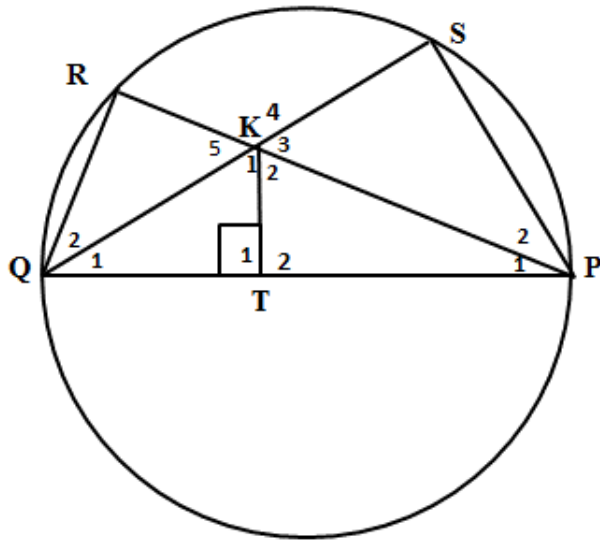
25.1	$\frac{EF}{ED} = \frac{5}{11}$	(Prop theorem – $FB \parallel DC$)	$\checkmark S \checkmark R$ (2)
25.2	$\frac{8}{ED} = \frac{5}{11}$ $ED = \frac{88}{5} = 17,6$	$\checkmark S$ $\checkmark S$	(2)
25.3	In ΔEFB and ΔEDC : $\hat{E}$ is common $\hat{F}_1 = \hat{D}$ (corres $\angle s$; $AB \parallel DC$); $AB \parallel DC$ $\hat{B}_1 = \hat{C}_1$ ($\angle s$ of Δ) $\Delta EFB \parallel \Delta EDC$ ($\angle \angle \angle$) $\frac{DC}{FB} = \frac{ED}{EF}$		$\checkmark$ $\checkmark S R$ $\checkmark \Delta EFB \parallel \Delta EDC \checkmark R$ $\checkmark S$

	$\frac{DC}{6} = \frac{11}{5}$ $DC = 13,2$	$\checkmark$ answer (6)
25.4	In $\triangle AGF$ and $\triangle CGD$: $\hat{G}_1 = \hat{G}_3$ (vert opp $\angle$ s) $\hat{A} = \hat{C}_1$ (alt $\angle$ s $AB \parallel DC$) $\hat{F}_3 = \hat{D}$ ($\angle$ s of Δ) $\triangle AGF \parallel \triangle CGD$ ($\angle\angle\angle$) $\frac{AG}{GC} = \frac{AF}{DC}$ $\frac{AG}{GC} = \frac{14}{13,2} = \frac{35}{33}$	$\checkmark$ $\checkmark$ S R $\checkmark \triangle AGF \parallel \triangle CGD \checkmark$ R $\checkmark$ S $\checkmark$ S (6)
25.5	$GC = \frac{33}{68} \times 18 = 8,74$	$\checkmark \frac{33}{68}$ $\checkmark$ answer (2)
		[18]

QUESTION 26

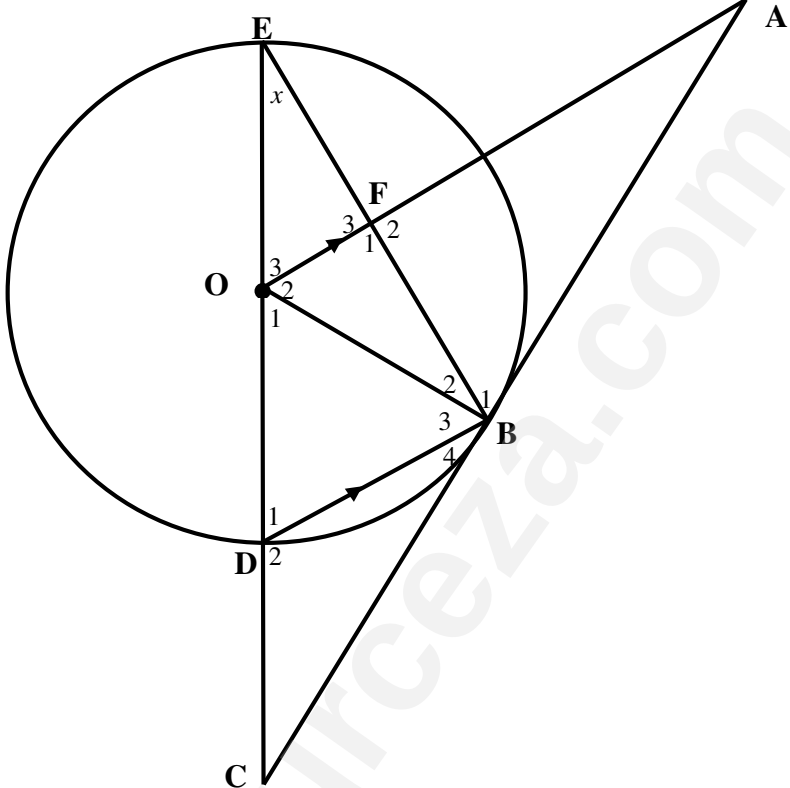
		
26.1.1	In $\triangle ADE$ and $\triangle PQR$: $AD = PQ$ $AE = PR$ $\hat{A} = \hat{A}$ $\therefore \triangle ADE \equiv \triangle PQR$ ($S\angle S$)	$\checkmark$ all 3 statements $\checkmark$ R (2)
26.1.2	$\hat{D}_1 = \hat{Q}$ ($\equiv$) $\hat{B} = \hat{Q}$ (given) $\hat{D}_1 = \hat{B}$ $\therefore DE \parallel BC$ (corresponding $\angle$ s =)	$\checkmark \hat{D}_1 = \hat{Q}$ $\checkmark \hat{D}_1 = \hat{B}$ $\checkmark$ R (3)
26.1.3	$\frac{AB}{AD} = \frac{AC}{AE}$ (line $\parallel$ to one side of Δ) But/ maar $AD = PQ$ and $AE = PR$ $\therefore \frac{AB}{PQ} = \frac{AC}{PR}$	$\checkmark$ S/R $\checkmark$ S (2)

26.2



26.2.1	In ΔQSP and ΔQTK: $\hat{Q}_1$ is common $\hat{S} = 90^\circ$ ($\angle$ in semi $\odot$) $\hat{S} = \hat{T}_1$ $\hat{P}_1 + \hat{P}_2 = \hat{K}_1$ ($\angle s$ of Δ) $\Delta QSP \parallel \Delta QTK$ ($\angle \angle \angle$)	$\check{Q}_1$ is common $\check{S} = 90^\circ$ $\check{R}$ $\check{S} = \hat{T}_1$ $\check{3}^{rd}$ angle or $\angle \angle \angle$ (5)
26.2.2	$PS^2 = PQ^2 - SQ^2$ (theorem of Pythagoras) But $\frac{PQ}{QK} = \frac{SP}{TK}$ ($\parallel \Delta's$) $PQ = \frac{SP \cdot QK}{TK}$ $PS^2 = \frac{SP^2 \cdot QK^2}{TK^2} - SQ^2$	$\check{S}$ $\check{S} \check{R}$ $\check{PQ} = \frac{SP \cdot QK}{TK}$ (4)
		[16]

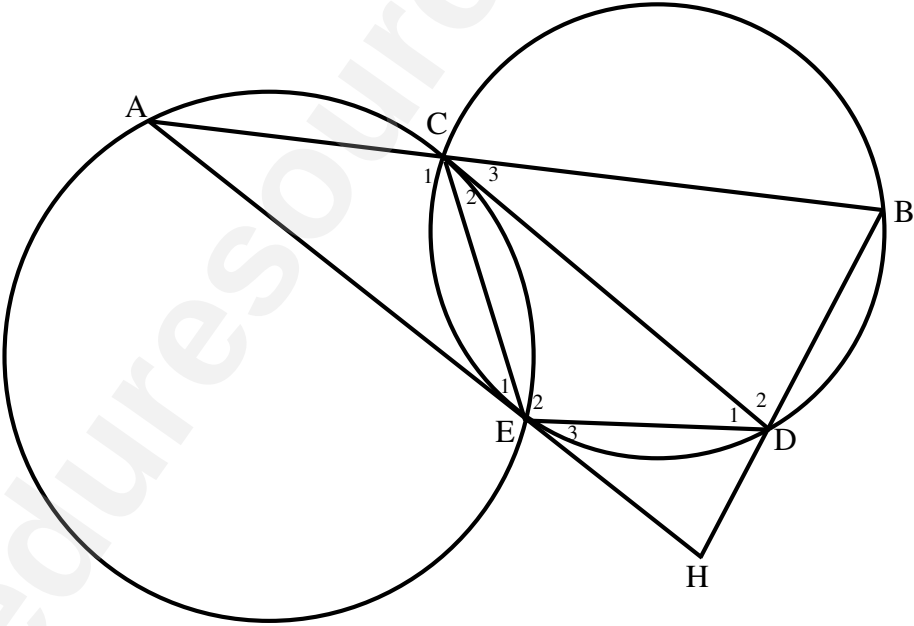
QUESTION 27

27.1.1	90°	✓ ans	(1)
27.1.2	Angle in the alternate segment	✓ ans	(1)
27.2			
27.2.1	$\hat{B}_4 = \hat{E} = x$ (tan chord theorem) $\hat{B}_4 = \hat{A} = x$ (corresponding angles) $\hat{B}_2 = \hat{E} = x$ (radii $OE = OB$)	✓S ✓R ✓S ✓R ✓S ✓R	(6)
27.2.2	$\hat{B}_2 + \hat{B}_3 = 90^\circ$ (subtended by a diameter) $\hat{CBE} = 90^\circ + x$	✓S ✓R ✓ ans	(3)
27.2.3	In $\triangle DBE$, $\frac{EO}{OD} = \frac{EF}{FB}$ (line $\parallel$ to one side of a $\triangle$) But/maar $\frac{EO}{OD} = 1$ (radii) $\frac{EF}{FB} = 1$ $EF = FB$ F is the midpoint of EB	✓S ✓R ✓ S ✓ $EF = FB$	(4)
OR			

	In $\triangle EOF$ and $\triangle BOF$ $\hat{E} = \hat{B}_2$ (Proven above) $EO = OB$ (radii) $\hat{D}_1 = \hat{B}_3$ ($\angle$ s opp = sides) $\hat{D}_1 = \hat{O}_3$ (corresp $\angle$ s) $\therefore \hat{B}_3 = \hat{O}_3$ $\therefore \hat{B}_3 = \hat{O}_2$ (alt $\angle$ s) $\therefore \hat{O}_3 = \hat{O}_2$ $\triangle EOF \equiv \triangle BOF$ (AAS) $EF = FB$	$\checkmark \hat{E} = \hat{B}_2$ $\checkmark \hat{D}_1 = \hat{B}_3$ $\checkmark \hat{D}_1 = \hat{O}_3$ $\checkmark \triangle EOF \equiv \triangle BOF$ (AAS)
27.2.4	$OF \perp EB$ (line from centre to a midpoint) $EF = 4$ (F is the midpoint) $OE^2 = OF^2 + EF^2$ $= 3^2 + 4^2$ $= 25$ $OE = 5$ $ED = 10 \text{ cm}$ OR $\hat{F}_3 = 90^\circ$ (corresponding angles) $EF = 4$ (F is the mid pint) $OE^2 = OF^2 + EF^2$ $= 3^2 + 4^2$ $= 25$ $OE = 5$ $ED = 10 \text{ cm}$	$\checkmark$ S/R $\checkmark EF = 4$ $\checkmark OE = 5$ $\checkmark$ ans OR $\checkmark$ S/R $\checkmark EF = 4$ $\checkmark OE = 5$ $\checkmark$ ans (4)

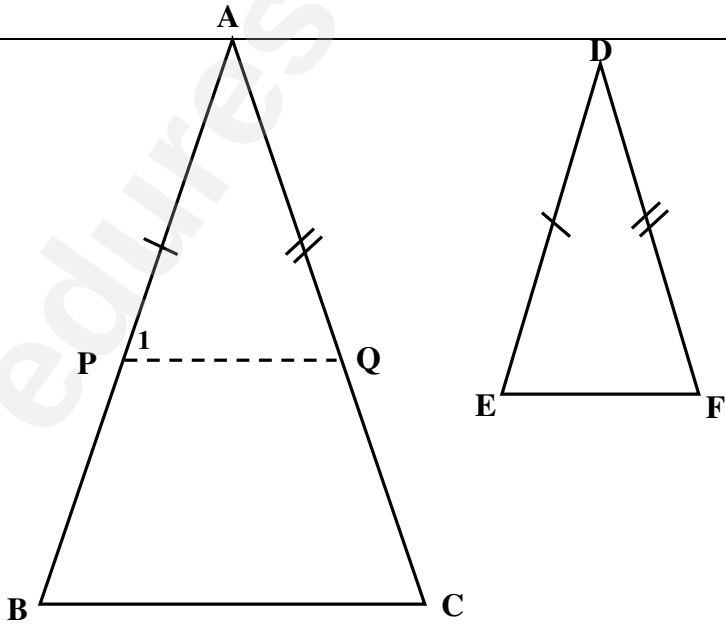
	OR $OF = \frac{1}{2}DB \quad (\text{midpoint theorem})$ $DB = 6 \text{ cm}$ In $\triangle EDB$, $ED^2 = 6^2 + 8^2 \quad (\text{Pythagoras thm})$ $= 100$ $ED = 10$	OR $\checkmark OF = \frac{1}{2}DB$ $\checkmark DB = 6$ $\checkmark \text{Application of Pythagoras thm}$ $\checkmark \text{ans} \quad (4)$ [19]
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QUESTION 28

		
28.1	$\hat{A} = \hat{C}_2 \quad (\text{tan CD and chord C})$ $= \hat{E}_3 \quad (\text{tan AEH and chord ED})$ But they are corresponding angles $AB \parallel ED$	$\checkmark \hat{A} = \hat{C}_2$ $\checkmark \text{reason}$ $\checkmark \hat{C}_2 = \hat{E}_3$ $\checkmark \text{reason}$ $\checkmark \text{corresponding angles}$

	OR $\hat{A} + \hat{C}_1 + \hat{E}_1 = 180^\circ \quad (\text{sum of angles in a } \Delta)$ $\hat{C}_2 + \hat{E}_2 + \hat{D}_1 = 180^\circ \quad (\text{Sum of angles in a } \Delta)$ But $\hat{A} = \hat{C}_2$ (tan CD and chord CE) $\hat{E}_1 = \hat{D}_1 \quad (\text{tan AEH and chord CE})$ $\therefore \hat{C}_1 = \hat{E}_2$ but they are alt.angles) $AB \parallel ED$	OR $\checkmark \hat{A} + \hat{C}_1 + \hat{E}_1 = 180^\circ \quad \text{and}$ $\hat{C}_2 + \hat{E}_2 + \hat{D}_1 = 180^\circ$ $\checkmark \hat{A} = \hat{C}_2$ $\checkmark \text{reason}$ $\checkmark \hat{E}_1 = \hat{D}_1$ $\checkmark \text{corresponding angles (5)}$
28.2	ACDE is a parallogram because one pair of opposite sides (AC and ED) are equal and parallel	$\checkmark \text{answer}$ $\checkmark \text{reason} \quad (2)$
28.3	In ΔABH, $\frac{AC}{CB} = \frac{HD}{DB} \quad (\text{proportionality thm or } AH \parallel CD)$ $\frac{HE}{EA} = \frac{HD}{DB} \quad (\text{proportionality thm or } AB \parallel ED)$ $\frac{AC}{CB} = \frac{HE}{EA}$	$\checkmark \frac{AC}{CB} = \frac{HD}{DB}$ $\checkmark \text{reason}$ $\checkmark \frac{HE}{EA} = \frac{HD}{DB}$ $\checkmark \text{reason} \quad (4)$ [11]

QUESTION 29

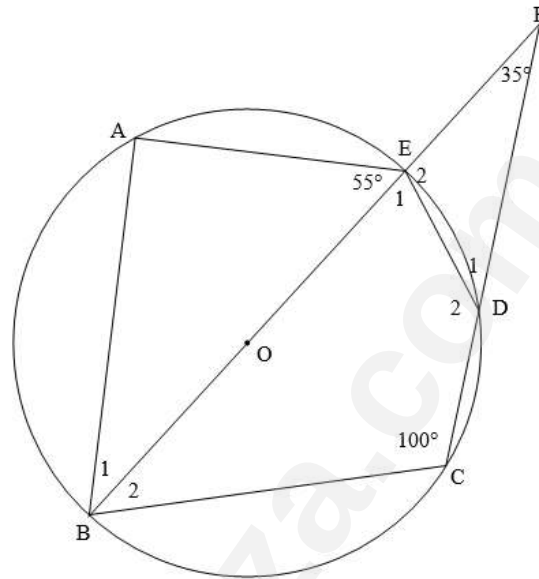
		
29.1	Const: On AB ,mark off AP = DE and on AC, mark off AQ = DF.	$\checkmark$ Construction

The diagram shows two triangles, PQR and EST , positioned such that their bases Q, R, S, E lie on a single straight line. The vertices P, S, T are also collinear. A circle is drawn passing through points $Q, R, S,$ and P . Angles at vertex Q ($\angle PQR$) and vertex E ($\angle SET$) are labeled with '1' and '2'. Angles at vertex R ($\angle PRS$) and vertex S ($\angle EST$) are labeled with '2' and '3'. An angle at vertex S ($\angle PSR$) is labeled '1'. Arrows point from the labels '1' at Q to '1' at E , and from '2' at R to '2' at S , indicating that these pairs of angles are equal.

	$QR = RS$ (side opp. of equal angles)	$\checkmark R$ (4)
29.2.2	In ΔRST and ΔPQT $\hat{T} = \hat{T}$ (common) $\hat{R}_2 + \hat{R}_3 = \hat{P}$ (ext. angle of a c.q PQRS) $\hat{S}_3 = \hat{Q}_1 + \hat{Q}_3$ (ext. angle of c.q or 3rd angle in Δ) $\Delta RST \parallel \Delta PQT$ (AAA)	$\checkmark \hat{T} = \hat{T}$ $\checkmark \hat{R}_2 + \hat{R}_3 = \hat{P} \quad \checkmark R$ $\checkmark$ 3rd angle or Reason (4)
29.2.3	$\frac{RS}{PQ} = \frac{ST}{QT} = \frac{RT}{PT}$ ($\Delta RST \parallel \Delta PQT$) $\frac{RS}{PQ} = \frac{RT}{PT}$(1) In ΔQST, $QS \parallel RE$ $\therefore \frac{SE}{ET} = \frac{QR}{RT}$ (line drawn parallel to one side of a Δ) $\therefore \frac{SE}{ET} = \frac{RS}{RT}$ (QR = RS proved above) $\therefore \frac{SE}{ET} = \frac{RS}{RT}$ $= \frac{PQ}{PT}$ (from equation (1))	$\checkmark R$ ($\Delta RST \parallel \Delta PQT$) $\checkmark \frac{RS}{PQ} = \frac{RT}{PT}$ $\checkmark \therefore \frac{SE}{ET} = \frac{QR}{RT}$ $\checkmark$ Reason $\checkmark \therefore \frac{SE}{ET} = \frac{RS}{RT}$ (5) [20]

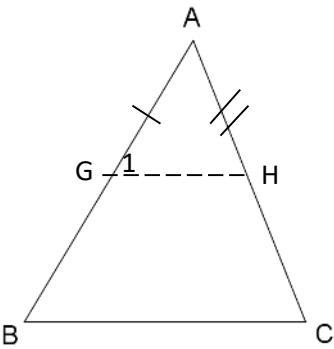
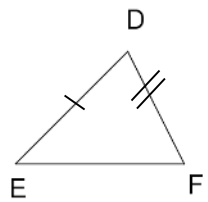
QUESTION 30

30.1

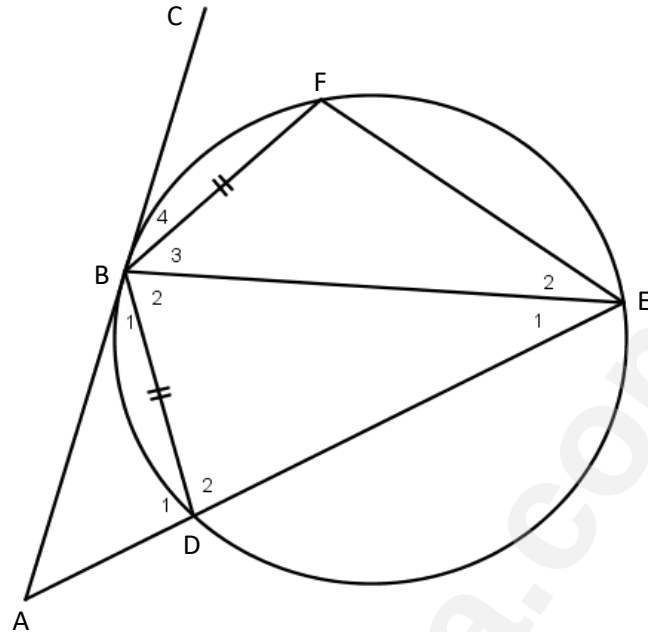


Q30	SUGGESTED ANSWER	DESCRIPTORS	MARKS
30.1.1	$\hat{BAE} = 90^\circ$ $\angle$ in semi-circle	✓ S ✓ R	(2)
30.1.2	$\hat{E}_1 = 80^\circ$ opp angles of cyclic quad	✓ S ✓ R	(2)
30.1.3	$D_1 = 45^\circ$ ext $\angle$ of Δ FED	✓ S ✓ R	(2)
30.2	$\hat{B}_1 = 35^\circ$ Interior $\angle$ of Δ $\hat{F} = 35^\circ$ given $\therefore AB \parallel CF$ Alternate angles =	✓ S ✓ R ✓ S ✓ R	(4)
			[10]

QUESTION 31

Q31	SUGGESTED ANSWER	DESCRIPTORS	MARK
31.1	  Constr.: Measure $AG = DE$ on AB and $AH = DF$ on AC. Draw GH Proof: $\hat{A} = \hat{D} \dots$ given $AG = DE \dots$ Constr. $AH = DF \dots$ Constr $\therefore \triangle GAH \equiv \triangle EDF \quad (s; \angle; S)$ $\therefore \hat{G}_1 = \hat{E}$ But $\hat{B} = \hat{E} \dots$ given $\therefore \hat{G}_1 = \hat{B}$ $\therefore GH \parallel BC \dots$ corresp $\angle s =$ $\therefore \frac{AG}{AB} = \frac{AH}{AC}$ $\therefore \frac{DE}{AB} = \frac{DF}{AC} \dots \quad AG = DE ; AH = DF$	Consider other proofs as well ✓ constr. ✓ S ✓ R ✓ $\hat{G}_1 = \hat{B}$ ✓ S & R ✓ S ✓ S & R	(7)

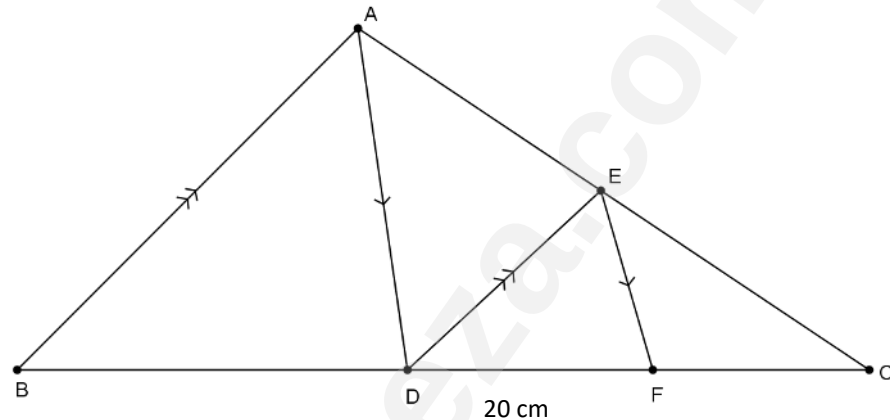
31.2



31.2.1	1) $\widehat{B_1} = \widehat{E_1}$...tan-chord thm $\widehat{E_2} = \widehat{E_1}$...equal chords subtend equal $\angle$'s $\therefore \widehat{E_2} = \widehat{B_1}$	✓S&R ✓S	(3)
31.2.2	In $\triangle BDA$ and $\triangle EFB$: $\widehat{BDA} = \widehat{F}$...ext$\angle$ of cyclic quad $\therefore \widehat{E_2} = \widehat{B_1}$ Proven $\therefore \triangle BDA \parallel \triangle EFB$ ($\angle$; $\angle$; $\angle$)	✓✓S&R ✓S ✓S&R	(4)
OR			
	In $\triangle BDA$ and $\triangle EFB$: 1) $\widehat{BDA} = \widehat{F}$... ext$\angle$ of cyclic quad 2) $\widehat{B_1} = \widehat{E_1}$... tan-chord thm $\widehat{E_2} = \widehat{E_1}$... equal chords opposite equal $\angle$'s $\therefore \widehat{E_2} = \widehat{B_1}$ $\widehat{A} = \widehat{B_3}$... sum of $\angle$'s in $\triangle$ $\therefore \triangle BDA \parallel \triangle EFB$ ($\angle$; $\angle$; $\angle$)	✓S&R ✓S&R ✓S &R ✓S &R	
31.2.2	$\frac{BD}{EF} = \frac{DA}{FB}$ $\therefore BD \cdot FB = EF \cdot DA$ $\therefore BD^2 = DA \cdot EF$... $BD = FB$	✓S ✓S&R	(2)

	$BG^2 = \frac{BP^2 \cdot BF}{BS}$ $\therefore \frac{BG^2}{BP^2} = \frac{BF}{BS}$		
			[10]

QUESTION 33



Q33	SUGGESTED ANSWER	DESCRIPTORS	Marks
33.1.1	$\frac{FC}{20} = \frac{4}{5}$... EF AD, Prop. Thm $\therefore FC=16$	✓✓ S&R ✓ answer	(3)
33.1.2	$\frac{36}{DB} = \frac{4}{5}$... DE AB, Prop. Thm $\therefore DB= 45$	✓ DC = 36 ✓✓ S&R ✓ answer	(4)
33.2	$\frac{\text{Area } \Delta ECF}{\text{Area } \Delta ABC} = \frac{\frac{1}{2} \cdot 4k \cdot 16 \cdot \sin C}{\frac{1}{2} \cdot 9k \cdot 81 \cdot \sin C}$ $\frac{\text{Area } \Delta ECF}{\text{Area } \Delta ABC} = \frac{64}{729}$	✓ $\frac{1}{2} \cdot 4k \cdot 16 \cdot \sin C$ ✓ $\frac{1}{2} \cdot 9k \cdot 81 \cdot \sin C$ ✓✓ answer	(4)
			[11]