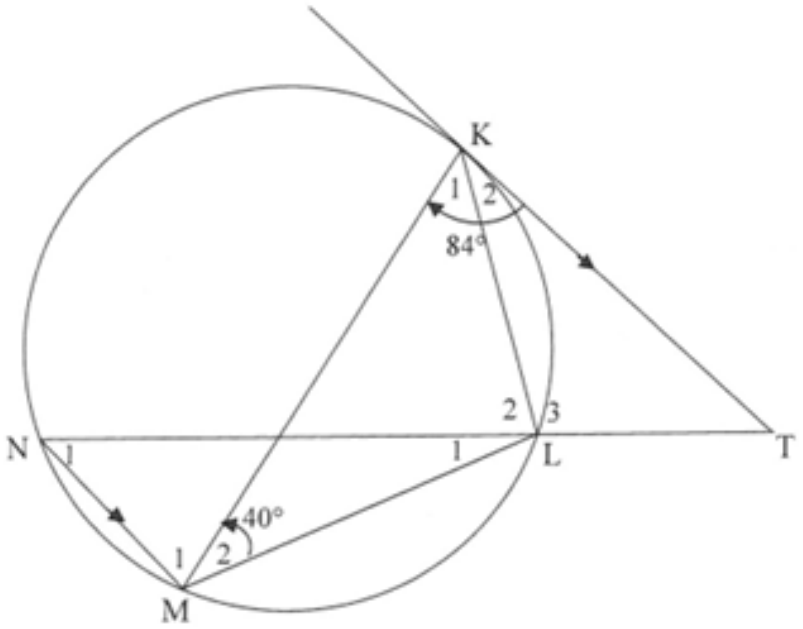
Grade 11 EUCLIDEAN GEOMETRY

FEB/MARCH 2016

QUESTION 8

8.1 In the diagram below, tangent KT to the circle at K is parallel to the chord NM. NT cuts the circle at L. ΔKML is drawn. $\hat{M}_2 = 40°$ and $M\hat{K}T = 84°$.



Determine, giving reasons, the size of:

8.1.1 $\hat{K}_2$ (2)

8.1.2 $\hat{N}_1$ (3)

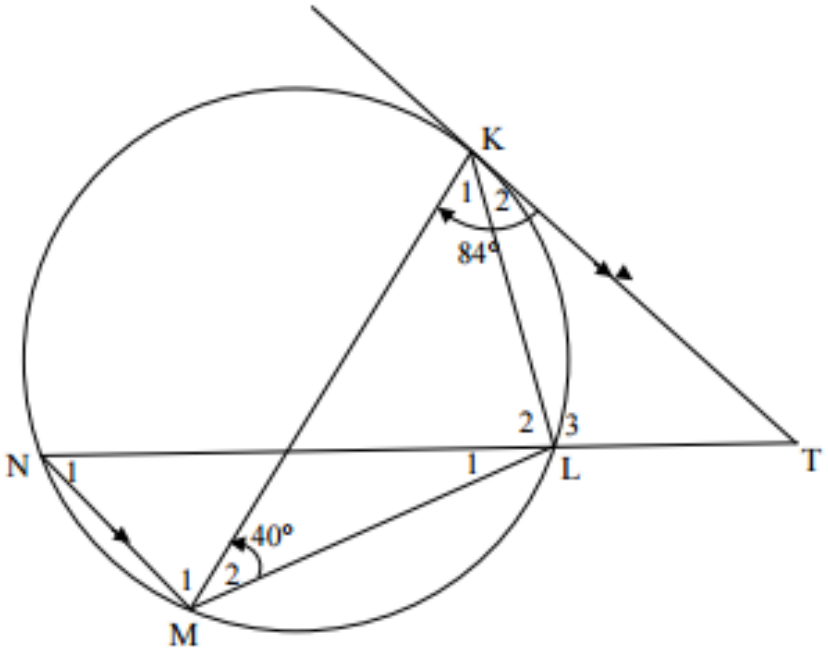
8.1.3 $\hat{T}$ (2)

8.1.4 $\hat{L}_2$ (2)

8.1.5 $\hat{L}_1$ (1)

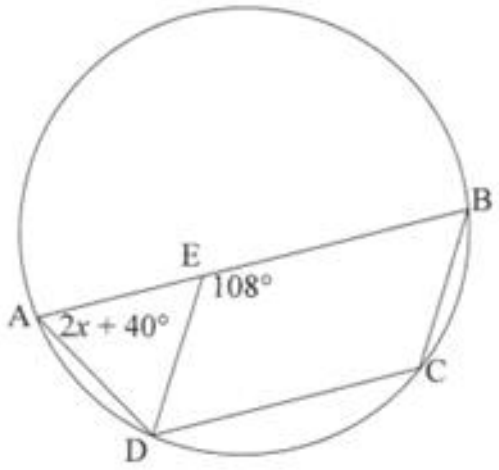
QUESTION/*VRAAG* 8

8.1



8.1.1	$\hat{K}_2 = \hat{M}_2 = 40°$ [tan chord theorem/*raakl-kdst*]	✓S ✓R (2)
8.1.2	$\hat{N}_1 = \hat{K}_1$ [∠s in the same seg/*∠e in dies segm*] $\hat{K}_1 = 84° - 40° = 44°$ $\therefore\ \hat{N}_1 = 44°$	✓S ✓R ✓S (3)
8.1.3	$\hat{T} = \hat{N}_1 = 44°$ [alt/*verw ∠s/e*; KT || NM]	✓S ✓R (2)
8.1.4	$\hat{L}_2 = \hat{K}_2 + \hat{T}$ [ext ∠ of Δ/*buite ∠ v Δ*] $= 40° + 44°$ $= 84°$	✓R ✓S (2)
8.1.5	In ΔKLM: $44° + 84° + 40° + \hat{L}_1 = 180°$ [∠s sum in Δ/*∠e som in Δ*] $\therefore \hat{L}_1 = 12°$	✓S (1)

8.2 In the diagram below, AB and DC are chords of a circle. E is a point on AB such that BCDE is a parallelogram. $D\hat{E}B = 108°$ and $D\hat{A}E = 2x + 40°$.



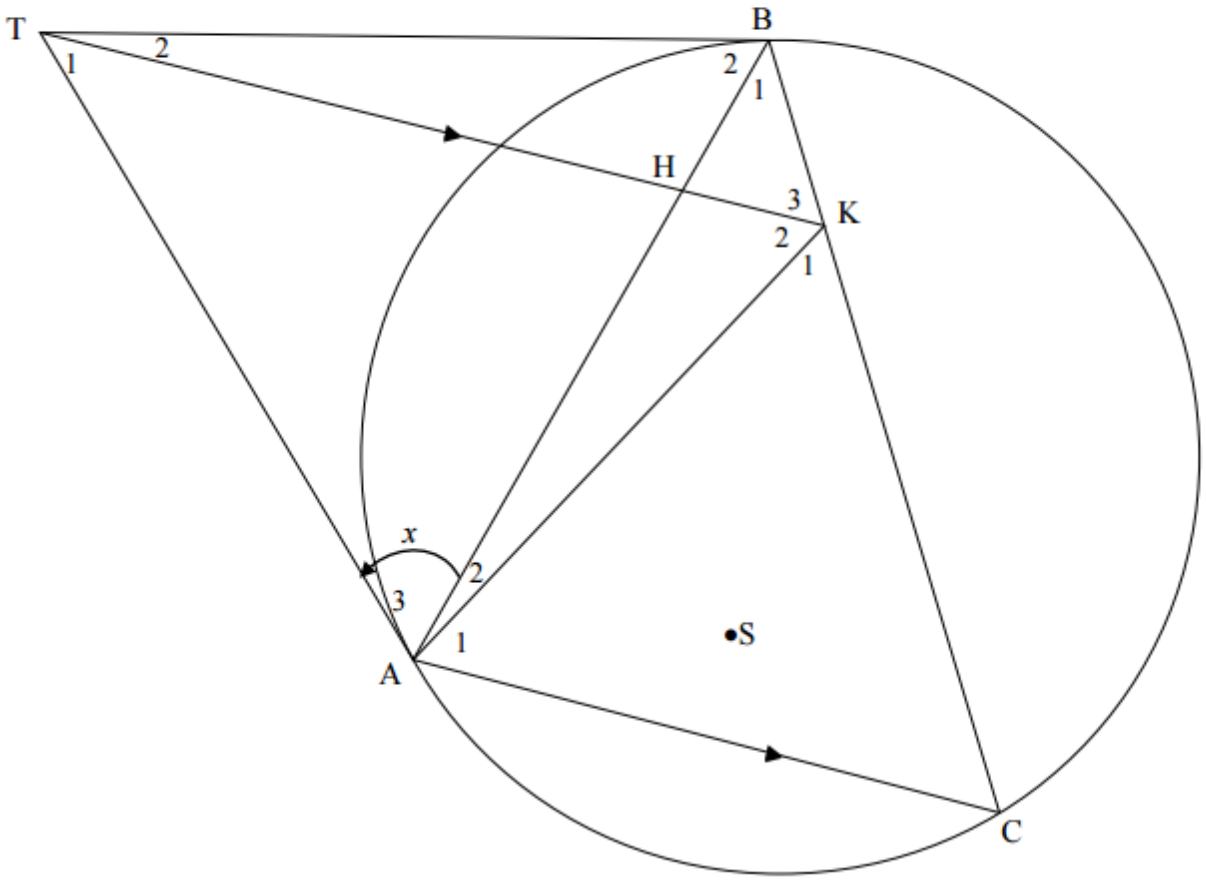
Calculate, giving reasons, the value of x. (5)
[15]

8.2	$\hat{C} = 108°$ $2x + 40° + 108° = 180°$ $2x = 32°$ $x = 16°$	[opp∠s of ‖m/*tos ∠e v ‖m*] [opp∠s of cyc quad/*tos∠e v kdvh*]	✓S ✓R ✓S ✓R ✓answ/*antw* (5)
		OR/*OF*	
	$\hat{C} = 180° - (2x + 40°)$ $180° - (2x + 40°) = 108°$ $2x = 32°$ $x = 16°$	[opp∠s of cyc quad/*tos∠e v kdvh*] [opp∠s of ‖m/*tos ∠e v ‖m*]	✓S ✓R ✓S ✓R ✓answ/*antw* (5) **[15]**

NOVEMBER 2015

QUESTION 9

In the diagram below, ΔABC is drawn in the circle. TA and TB are tangents to the circle. The straight line THK is parallel to AC with H on BA and K on BC. AK is drawn. Let $\hat{A}_3 = x$.



9.1 Prove that $\hat{K}_3 = x$. (4)

9.2 Prove that AKBT is a cyclic quadrilateral. (2)

9.3 Prove that TK bisects $A\hat{K}B$. (4)

9.4 Prove that TA is a tangent to the circle passing through the points A, K and H. (2)

9.5 S is a point in the circle such that the points A, S, K and B are concyclic. Explain why A, S, B and T are also concyclic. (2)

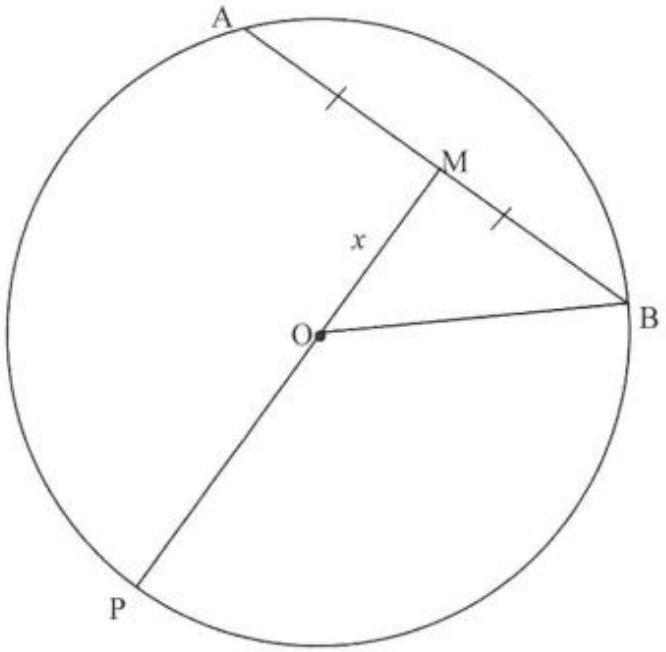
[14]

9.1	$\hat{K}_3 = \hat{C}$ $\hat{C} = x$ $\hat{K}_3 = x$	[corresp ∠s/*ooreenk ∠e* ; CA||KT] [tan-chord th/*raakl-koordst*]	✓ S ✓ R ✓ S ✓ R (4)
9.2	$\hat{K}_3 = x = \hat{A}_3$ ∴ AKBT is cyc quad	[proved/*bewys* in 9.1] [line (BT) subtends equal ∠s/ *lyn (BT) onderspan gelyke ∠e*]	✓ S ✓ R (2)
9.3	$\hat{B}_2 = \hat{C} = x$ $\hat{B}_2 = \hat{K}_2 = x$ $\therefore \hat{K}_3 = \hat{K}_2 = x$ ∴ TK bisects/*halveer* $A\hat{K}B$ **OR/*OF*** $\hat{B}_2 = \hat{A}_3 = x$ $\hat{B}_2 = \hat{K}_2 = x$ $\therefore \hat{K}_3 = \hat{K}_2 = x$ ∴ TK bisects/*halveer* $A\hat{K}B$	[tan-chord th/*raakl-koordst*] [∠s in the same segm/*∠e in dies segm*] [tans for same pt; ∠s opp equal sides/ *rkle v dies pt; ∠e to gelyke sye*] [∠s in the same seg/*∠e in dies segm*]	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ S ✓ R (4)
9.4	$\hat{A}_3 = \hat{K}_2 = x$ ∴ TA tangent	[proven/*bewys*] [converse tan chord theorem/ *omgekeerde raakl-kdst*]	✓ S ✓ R (2)
9.5	The circle passing through points A, K and B contains the point S on the circumference (A, S, K and B concyclic)./*Die sirkel deur punt A, K en B bevat die punt S op die omtrek (A, S, K en B konsiklies).* The circle passing through A, K and B contains the point T on the circumference (proven in 9.2)./*Die sirkel deur punt A, K en B bevat die punt T op die omtrek (bewys in 9.2).* ∴ points A, S, B and T are also concyclic/*punte A, S, B en T is konsiklies*		✓ S ✓ S (2)

FEB/MARCH 2015

QUESTION 7

In the diagram, AB is a chord of the circle with centre O. M is the midpoint of AB. MO is produced to P, where P is a point on the circle. OM = x units, AB = 20 units and $\frac{PM}{OM} = \frac{5}{2}$.



7.1 Write down the length of MB. (1)

7.2 Give a reason why OM $\perp$ AB. (1)

7.3 Show that OP = $\frac{3x}{2}$ units. (2)

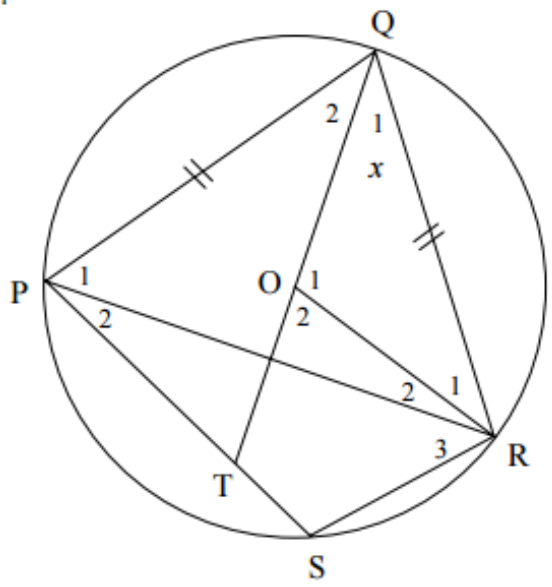
7.4 Calculate the value of x. (3)

[7]

7.1	MB = 10 cm	✓ answer/*antw* (1)
7.2	line from centre to midpoint of chord is perpendicular to chord/*lyn vanaf midpt na midpt van koord is loodreg op koord* **OR/*OF*** line from centre bisects chord/*lyn vanaf midpt halveer koord*	✓ answer/*antw* (1) ✓ answer/*antw* (1)
7.3	$\frac{MP}{OM}=\frac{5}{2}$ $\frac{x+OP}{x}=\frac{5}{2}$ $2x+2OP=5x$ $OP=\frac{3x}{2}$ **OR/*OF*** $\frac{OP}{OM}=\frac{3}{2}$ $OP=\frac{3x}{2}$	✓ $\frac{x+OP}{x}=\frac{5}{2}$ ✓ $OP=\frac{3x}{2}$ (2) ✓ $\frac{OP}{OM}=\frac{3}{2}$ ✓ $OP=\frac{3x}{2}$ (2)

NOVEMBER 2009

8.2 In the diagram below, O is the centre of the circle. P, Q, R and S are points on the circumference of the circle. TOQ is a straight line such that T lies on PS.
PQ = QR and $\hat{Q}_1 = x$.



8.2.1 Calculate, with reasons, $\hat{P}_1$ in terms of x. (3)

8.2.2 Show that TQ bisects $P\hat{Q}R$. (3)

8.2.3 Show that STOR is a cyclic quadrilateral. (3)

S

8.2.1	$\hat{R}_1 = x$ (∠'s opp = radii) $\hat{O}_1 = 180° - 2x$ (∠ sum in ΔQRT) $\hat{P}_1 = 90° - x$ (∠ circle centre = twice ∠ at circumference)	✓ S/R ✓ $\hat{O}_1 = 180° - 2x$ ✓ S/R $\hat{P}_1 = 90° - x$ (3)
8.2.2	PQ = QR (given) $Q\hat{R}P = 90° - x$ (∠ opp = sides in Δ) $P\hat{Q}R = 2x$ (∠ sum in ΔPQR) $x + \hat{Q}_2 = 2x$ $\hat{Q}_2 = x$ TQ bisects $P\hat{Q}R$	✓S/R ✓ Statement ✓ $\hat{Q}_2 = x$ (3)
8.2.3	$P\hat{Q}R = 2x$ $\hat{S} = 180° - 2x$ (opp ∠'s of cyclic quad are supplementary) $\hat{O}_1 = 180° - 2x$ $\hat{O}_1 = \hat{S}$ STOR is a cyclic quadrilateral ... (converse – ext ∠ of cyclic quad = int opp. ∠) (ext ∠ quad = int opp ∠)	✓S/R ✓Statement ✓Reason (3) **[15]**