



NATIONAL SENIOR CERTIFICATE

GRADE/IBANGA 12

SEPTEMBER 2024

MATHEMATICS P2/IMATHEMATIKA P2 MARKING GUIDELINE/ISIKHOKELO SOKUMAKISHA

MARKS/AMANQ 150
AKU:

This marking guideline consists of 17 pages.
Esi sikhokelo sokumakisha sinamaphepha
ayi 17.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone a question, mark the crossed out version.
- Consistency accuracy applies in ALL aspects of the Marking Guideline. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

GEOMETRY	
S	A mark for a correct statement (A statement mark is independent of a reason)
R	A mark for the correct reason. (A reason mark may only be awarded only if the statement is correct)
S/R	Award a mark if a statement AND a reason are both correct

QAPHELA:

- *Xa umviwa ephendule umbuzo KABINI makisha kuphela ilinge LOKUQALA.*
- *Xa umviwa elihlabile ilinge lombuzo akawuphinda umbuzo, makisha okuhlathiweyo.*
- *Inconsistency accuracy yenzeka kuzo ZONKE iinkalo zesikhokelo sokumakisha. Yeka ukumakisha kwimpazamo yesibini yekhalithuleyishini.*
- *Ukucingela iimpendulo/iiveliyu ukusombulula ingxaki AKWAMKELEKANGA.*

IJIYOMETRI	
S	<i>Inqaku ngesithethithimenti esichanekileyo (Inqaku lesithethithimenti lahlukile kwelesizathu)</i>
R	<i>Inqaku lesizathu esichanekileyo (Inqaku lesizathu linikwa kuphela xa isithethithimenti sichanekile)</i>
S/R	<i>Nika inqaku ukuba isithethithimenti NESizathu ziyafana</i>

QUESTION 1/UMBUZO 1

1.1	<div>82 64 55 50 41</div> <div>71 78 88 98 96</div> <div>63 66 80 84 88</div>		
1.1.1	88	✓ answer / <i>impendulo</i>	(1)
1.1.2	Range / <i>Omvang</i> = $98 - 41 = 57$	✓ answer / <i>impendulo</i>	(1)
1.1.3	$\bar{x} = \frac{1104}{15}$ $= 73,60$	✓ 1104 ✓ answer / <i>impendulo</i>	(2)
1.1.4	$\sigma = 16,30$	✓ answer / <i>impendulo</i>	(1)
1.1.5	$\bar{x} - \sigma = 73,60 - 16,30$ $= 57,30$ \therefore There were 3 truck drivers. <i>Daar was 3 trokbestuurders</i>	✓ $73,60 - 16,30$ ✓ 57,30 ✓ answer / <i>impendulo</i>	(3)
1.2	let total mass of 8 people be x : <i>laat die totale massa van 8 mense x wees :</i> number of people to be added be k : <i>aantal mense wat by moet kom k wees :</i> $\frac{x}{8} = 75$ $x = 600$ $75k + 600 = 1000$ $\therefore k = \frac{1000 - 600}{75}$ $k = 5,333$ It will be approximately equal to 5 people <i>Iqikeleleka ukulingana nabantu abayi5</i>	 ✓ $\frac{x}{8} = 75$ ✓ mass of 8 people (600) <i>Ubunzima babantu abayi8 (600)</i> ✓ equation / <i>i-ikhweyizhini</i> $(75k + 600 = 1000)$ ✓ answer / <i>impendulo</i>	(4)
			[12]

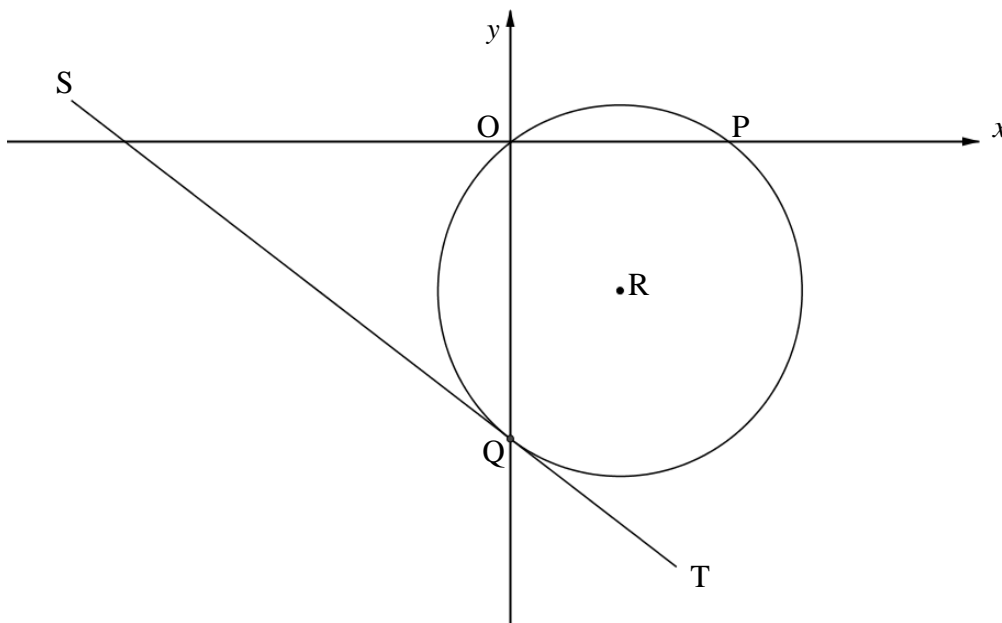
QUESTION 2/UMBUZO 2

TEST A / UVAVANYO A	39	33	35	44	37	40	24	31	30	5
TEST B / UVAVANYO B	41	45	48	40	47	42	37	44	43	24

2.1	(44 ; 40)	✓ 44 in TEST A / kuVAVANYO A	(1)
2.2	$a = 25,48$ $b = 0,49$ $y = 25,48 + 0,49x$	✓ $a = 25,48$ ✓ $b = 0,49$ ✓ $y = 25,48 + 0,49x$	(3)
2.3	$y = 25,48 + 0,49(14)$ $= 32$	✓ correct substitution / <i>Isaphusitityhushini echanekileyo</i> ✓ answer / <i>impendulo</i>	(2)
2.4	$r = 0,79$ Strong positive correlation <i>Correlation esitrongo ephozithivu</i>	✓ $r = 0,79$ ✓ comment / <i>ukuphawula (phawula)</i>	(2)
			[8]

3.5	Kite / iKhayithi	✓ answer / impendulo	(1)
3.6	$\frac{HC}{AH} = \frac{FC}{BF}$ [line/lyn to one side of a Δ / aan een sy van Δ] $\frac{2}{1} = \frac{FC}{2\sqrt{5}}$ $FC = 4\sqrt{5}$ $BC = 4\sqrt{5} + 2\sqrt{2} = 6\sqrt{5}$ $AC = 6\sqrt{5}$ [adj. sides of a kite / aangr. sye van vlieër]	✓ correct ratio / Iratio echanekileyo ✓ correct substitution Isaphusitityhushini echanekileyo ✓ FC ✓ AC = BC	(4)
3.7	$\hat{B} = \hat{A} = 71,57^\circ$ [\angle s opp = sides / \angle e teenoor = sye] $\therefore \hat{C} = 36,87^\circ$ Area of/van AOFC = Area of/van ΔABC – Area of/van ΔOBF $= \frac{1}{2} \times 6\sqrt{5} \times 6\sqrt{5} \times \sin 36,87^\circ - 12$ $= 41,99$	✓ $\hat{C} = 36,87^\circ$ ✓ Area of/ka ΔABC ✓ answer / impendulo	(3)
			[19]

QUESTION 4/UMBUZO 4

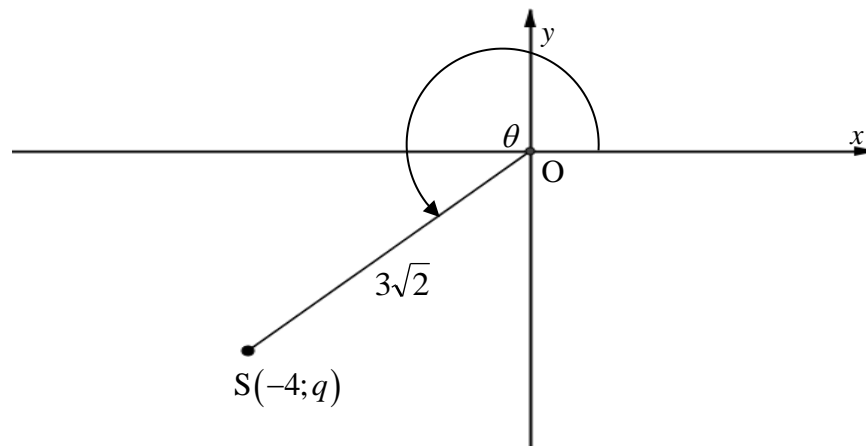


4.1.1	$y = -\frac{3}{4}(0) - 8$ $= -8$ $Q(0; -8)$	✓ $x = 0$ ✓ y- coordinate / y kho-odineyithi	(2)
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4.1.2	$m_{QR} = \frac{4}{3}$ [tan \perp rad / raakl \perp rad] $y + 8 = \frac{4}{3}(x - 0)$ $y = \frac{4}{3}x - 8$	$\checkmark m_{QR}$ \checkmark substituting m_{QR} and $Q(0; -8)$ ukusaphusitityhutha m_{QR} kunye no $Q(0; -8)$ \checkmark equation / i-ikhweyizhini	(3)
4.1.3	$\frac{4}{3}x - 8 = 0$ $x = 6$ $P(6; 0)$	$\checkmark y = 0$ $\checkmark x = 6$	(2)
4.1.4	$x_R = \frac{0+6}{2}; y_R = \frac{-8+0}{2}$ $x_R = 3; y_R = -4$	\checkmark correct substitution <i>Ukusaphusitityhutha okuchanekileyo</i> $\checkmark x_R = 3 \quad \checkmark y_R = -4$	(3)
4.1.5	$r^2 = (0-3)^2 + (-8+4)^2$ $= 25$ $(x-3)^2 + (y+4)^2 = 25$	\checkmark correct substitution <i>Ukusaphusitityhutha okuchanekileyo</i> $\checkmark r^2 = 25$ \checkmark equation / i-ikhweyizhini	(3)
4.1.6	$k = -4 + 5$ or / of $k = -4 - 5$ $k = 1$ or / of $k = -9$	\checkmark method / imethodi $\checkmark k = 1 \quad \checkmark k = -9$	(3)
4.2	$(x - \sin \theta)^2 + (y + 2 \sin \theta)^2 = -2 + \sin^2 \theta + 4 \sin^2 \theta$ $r^2 = -2 + 5 \sin^2 \theta$ For any value of θ maximum of $\sin^2 \theta = 1$ <i>Vir enige waarde van θ is maksimum van $\sin^2 \theta = 1$</i> $\therefore r = \sqrt{-2 + 5(1)}$ $= \sqrt{3}$	$\checkmark (x - \sin \theta)^2 + (y + 2 \sin \theta)^2$ $\checkmark r^2 = -2 + 5 \sin^2 \theta$ \checkmark maximum of $\sin^2 \theta = 1$ <i>imaximum ka $\sin^2 \theta = 1$</i> $\checkmark r = \sqrt{-2 + 5(1)}$ \checkmark answer / impendulo	(5)
			[21]

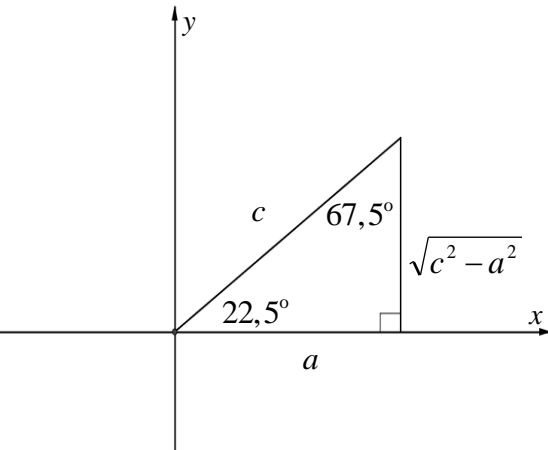
QUESTION 5/UMBUZO 5

5.1

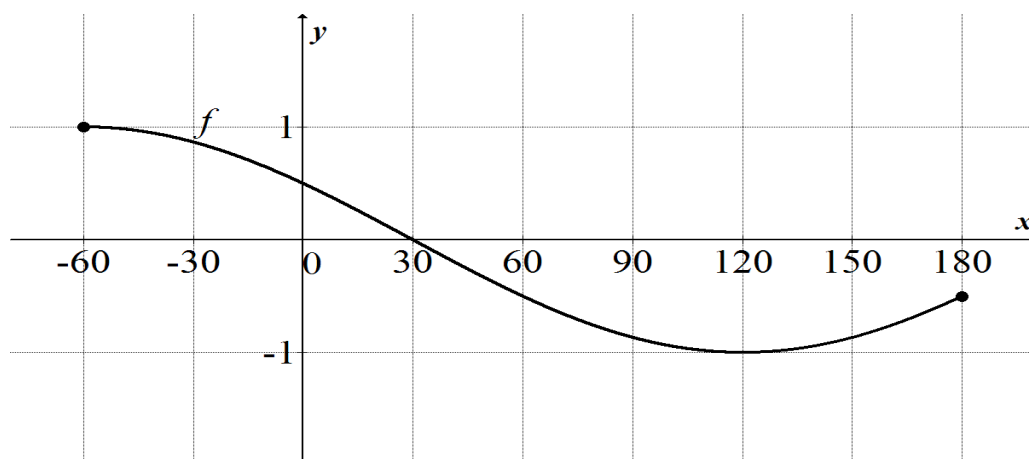


5.1.1	$q = -\sqrt{(3\sqrt{2})^2 - (-4)^2}$ $= -\sqrt{2}$ <p style="text-align: center;"><i>Pyth</i></p>	✓ correct substitution <i>Ukusaphusitityhutha</i> <i>okuchanekileyo</i> ✓ answer / <i>impendulo</i>	(2)
5.1.2	$\sin(\theta + 45^\circ) = \sin \theta \cdot \cos 45^\circ + \cos \theta \sin 45^\circ$ $= \frac{-\sqrt{2}}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{2} + \left(\frac{-4}{3\sqrt{2}}\right) \cdot \frac{\sqrt{2}}{2}$ $= \frac{-1 - 2\sqrt{2}}{3\sqrt{2}}$	✓ expansion / <i>ukuexpanda</i> ✓ ratios of / <i>iiratio zika</i> <i>\sin \theta</i> & <i>\cos \theta</i> ✓ special angles / <i>iispecial engile</i> ✓ answer / <i>impendulo</i>	(4)
5.1.3	$\cos(2\theta - 360^\circ) = \cos 2\theta$ $= 2\cos^2 \theta - 1$ $= 2\left(\frac{-4}{3\sqrt{2}}\right)^2 - 1$ $= \frac{7}{9}$	✓ $\cos 2\theta$ ✓ identity / <i>iayidentithi</i> ✓ ratio of / <i>verhouding van \cos \theta</i> ✓ answer / <i>impendulo</i>	(4)
5.2	$\frac{\sin(90^\circ - \theta) \cdot \cos 480^\circ + \cos(180^\circ - \theta) \cdot \tan 45^\circ}{\cos \theta \cdot \sin 390^\circ - \tan 180^\circ}$ $= \frac{\cos \theta \cdot (-\cos 60^\circ) + (-\cos \theta)(\tan 45^\circ)}{\cos \theta (\sin 30^\circ) - \tan 180^\circ}$ $= \frac{-\frac{1}{2} \cos \theta - \cos \theta(1)}{\cos \theta \left(\frac{1}{2}\right) - 0}$ $= \frac{-\frac{3}{2} \cos \theta}{\frac{1}{2} \cos \theta}$ $= -3$	✓ $\cos \theta$ ✓ $-\cos 60^\circ$ ✓ $\sin 30^\circ$ ✓ special angles / <i>iispecial engile</i> ✓ answer / <i>impendulo</i>	(5)

5.3	$\begin{aligned} \text{LHS} / \text{LK} &= \frac{\cos x}{\sin 2x} - \frac{\cos 2x}{2 \sin x} \\ &= \frac{2 \sin x \cos x - \cos 2x \sin 2x}{2 \sin 2x \sin x} \\ &= \frac{\sin 2x - \cos 2x \sin 2x}{2 \sin 2x \sin x} \\ &= \frac{\sin 2x(1 - \cos 2x)}{2 \sin 2x \sin x} \\ &= \frac{1 - (1 - 2 \sin^2 x)}{2 \sin x} \\ &= \frac{2 \sin^2 x}{2 \sin x} \\ &= \sin x \end{aligned}$	<p>✓ simplification / <i>ukusimplifaya</i></p> <p>✓ $\sin 2x$</p> <p>✓ common factor / <i>Ikhomoni fekhitha</i></p> <p>✓ identity / <i>iyidentithi</i> $1 - 2 \sin^2 x$</p> <p>✓ $\frac{2 \sin^2 x}{\sin x}$</p>	(5)
5.4.1	$\begin{aligned} \frac{\cos 60^\circ}{\sin x} - \frac{\sin 60^\circ}{\cos x} &= 2 \\ \frac{\cos 60^\circ \cos x - \sin 60^\circ \sin x}{\sin x \cos x} &= 2 \\ \cos(x + 60^\circ) &= 2 \sin x \cos x \\ \cos(x + 60^\circ) &= \sin 2x \\ \cos(x + 60^\circ) &= \cos(90^\circ - x) \end{aligned}$	<p>✓ simplification / <i>ukusimplifaya</i></p> <p>✓ $\cos(x + 60^\circ)$</p> <p>✓ $\sin 2x$</p>	(3)
5.4.2	$\begin{aligned} \cos(x + 60^\circ) &= \cos(90^\circ - 2x) \\ x + 60^\circ &= \pm(90^\circ - 2x) + 360^\circ.k \\ x + 60^\circ &= 90^\circ - 2x + 360^\circ.k \quad \text{or / of} \quad x + 60^\circ = -90^\circ + 2x + 360^\circ.k \\ 3x &= 30^\circ + 360^\circ.k \quad \text{or / of} \quad -x = -120^\circ + 360^\circ.k \\ x &= 10^\circ + 120^\circ.k \quad \text{or / of} \quad x = 120^\circ - 360^\circ.k, k \in \mathbb{Z} \\ \text{OR / OF} \\ x + 60^\circ &= 90^\circ - 2x + 360^\circ.k \quad \text{or / of} \quad x + 60^\circ = 360^\circ - 90^\circ + 2x + 360^\circ.k \\ 3x &= 30^\circ + 360^\circ.k \quad \text{or / of} \quad -x = 240^\circ + 360^\circ.k \\ x &= 10^\circ + 120^\circ.k \quad \text{or / of} \quad x = -240^\circ - 360^\circ.k, k \in \mathbb{Z} \end{aligned}$	<p>✓ $x + 60^\circ = 90^\circ - 2x$</p> <p>✓ $\left[\begin{array}{l} 3x = 30^\circ + 360^\circ.k \\ \text{or / of} \\ -x = -120^\circ + 360^\circ.k \end{array} \right]$</p> <p>✓ $\left[\begin{array}{l} x = 10^\circ + 120^\circ.k \\ \text{or / of} \\ x = 120^\circ - 360^\circ.k \end{array} \right]$</p> <p>✓ $360^\circ.k, k \in \mathbb{Z}$</p>	(4)

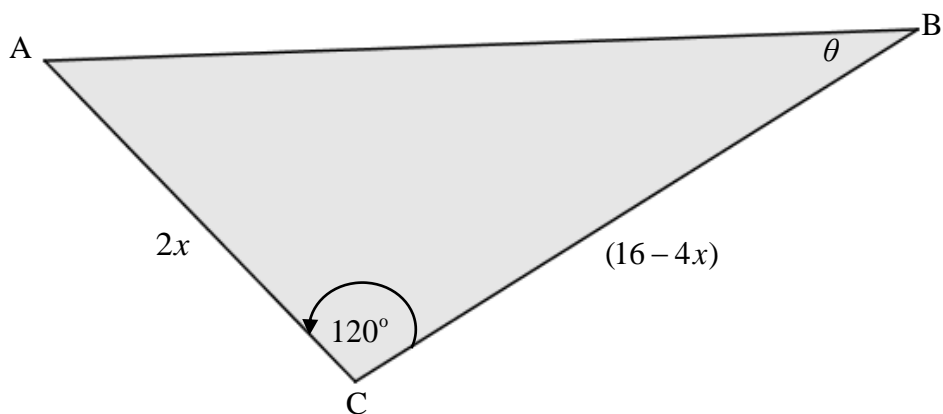
5.5	<p>$y = \sqrt{c^2 - a^2}$ Pyth Theorem / Stelling</p>  $\frac{\sqrt{2}}{2} = \sin 45^\circ$ $= 2 \sin 22,5^\circ \cos 22,5^\circ$ $= 2 \cdot \frac{\sqrt{c^2 - a^2}}{c} \cdot \frac{a}{c}$ $= 2 \cdot \frac{\sqrt{a^2 + b^2 - a^2}}{c} \cdot \frac{a}{c}$ $= \frac{2ab}{c^2}$	<p>✓ $y = \sqrt{c^2 - a^2}$ Pyth Theorem / Stelling</p> <p>OR/OKANYE correct diagram <i>Idayagram echanekileyo</i></p> <p>✓ $\sin 45^\circ$</p> <p>✓ $2 \sin 22,5^\circ \cdot \cos 22,5^\circ$</p> <p>✓ substitution / <i>isaphusitityhushini</i></p> <p>✓ c^2 i.t.o./ i.t.v a^2 & b^2</p>	(5) [32]
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QUESTION 6/UMBUZO 6



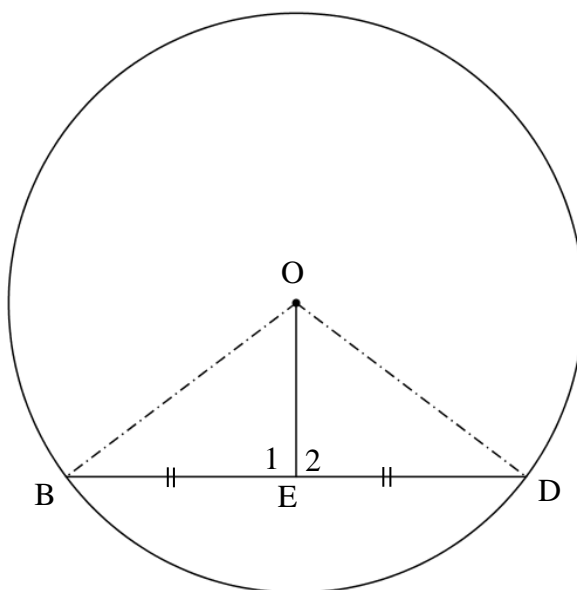
6.1	Period / iPhiriyodi ngu 360°	✓ answer / impendulo	(1)
6.2	Min value / Min veliyu = -1	✓ answer / impendulo	(1)
6.3	$-1 \leq y \leq 1$ $-1+1 \leq y \leq 1+1$ $0 \leq y \leq 2$	✓ correct critical values/ <i>Iikhrithikhali veliyu ezichanekileyo</i> ✓ correct notation / inoteyishini echanekileyo	(2)
6.4	$120^\circ < x < 180^\circ$	✓ correct critical values <i>Iikhrithikhali veliyu ezichanekileyo</i> ✓ correct notation / inoteyishini echanekileyo	(2)
6.5	$g(x) = -\sin(x - 30^\circ - 60^\circ)$ $= -\sin(x - 90^\circ)$ $= -\cos x$	✓ $(-\sin x - 30^\circ - 60^\circ)$ ✓ $\sin(x - 90^\circ)$ ✓ $-\cos x$	(3)
6.6		✓ intercepts with the axes/ <i>ii-intasephuthi nee-axes</i> ✓ turning points / iitheningi poyinti ✓ shape / isheyiphu	(3)
			[12]

QUESTION 7 / UMBUZO 7



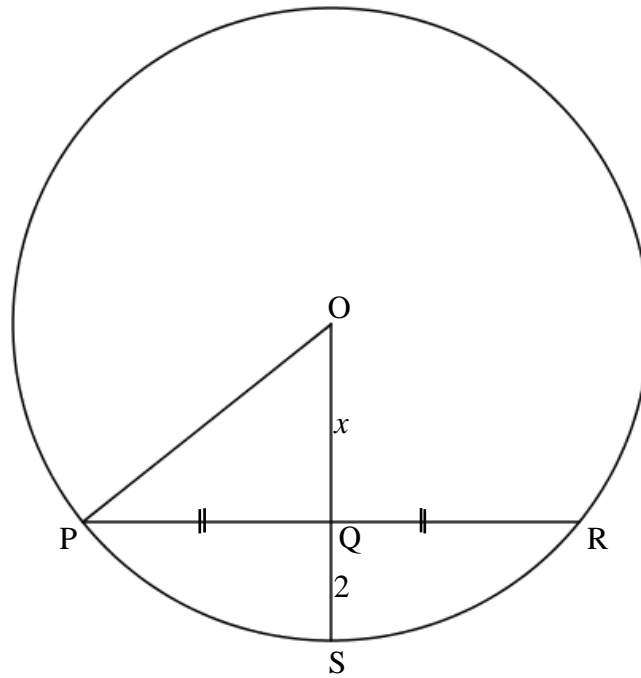
7.1	$A \text{ of } \triangle ABC = \frac{1}{2} \times 2x \times (16 - 4x) \times \sin 120^\circ$ $= (16x - 4x^2) \times \sin 60^\circ$ $= 8\sqrt{3}x - 2\sqrt{3}x^2$	✓ correct substitution / <i>Ukusaphusitityhutha okuchanekileyo</i> ✓ $\sin 60^\circ$ ✓ answer / <i>impendulo</i>	(3)
7.2	$A' = 0$ $8\sqrt{3} - 4\sqrt{3}x = 0$ $x = 2$	✓ derivative / <i>iderivative</i> = 0 ✓ $8\sqrt{3} - 4\sqrt{3}x$ ✓ answer / <i>impendulo</i>	(3)
			[6]

QUESTION 8/UMBUZO 8



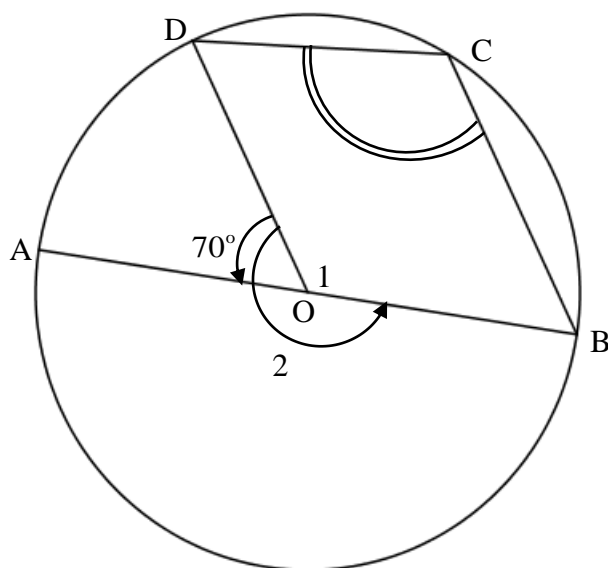
8.1	<p>Construction: Draw DO and OB</p> <p>Proof: In $\triangle ODE$ and $\triangle OEB$</p> <p>$DE = EB$ [given]</p> <p>$OD = OB$ [radii]</p> <p>$OE = OE$ [common]</p> <p>$\therefore \triangle ODE \equiv \triangle OEB$ [SSS]</p> <p>$\hat{E}_1 + \hat{E}_2 = 180^\circ$ [\angles on str line]</p> <p>$\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$ [$\triangle ODE \equiv \triangle OEB$]</p> <p><i>Ikhonsitrakhishini: Zoba uDO noOB</i></p> <p><i>iPrufu: ku$\triangle ODE$ naku$\triangle OEB$</i></p> <p>$DE = EB$ [gegee]</p> <p>$OD = OB$ [radiusse]</p> <p>$OE = OE$ [gemeen]</p> <p>$\therefore \triangle ODE \equiv \triangle OEB$ [SSS]</p> <p>$\hat{E}_1 + \hat{E}_2 = 180^\circ$ [\angle op reguitlyn]</p> <p>$\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$ [$\triangle ODE \equiv \triangle OEB$]</p>	<p>✓ construction</p> <p>✓ first statement (radii)</p> <p>✓ other 2 statements</p> <p>✓ reason for congruency</p> <p>✓ R</p> <p>✓ <i>ikhonsitrakhishini</i></p> <p>✓ <i>isiteyithimenti sokuqala (iirediyasi)</i></p> <p>✓ <i>ezinye iziteyithimenti eziyi2</i></p> <p>✓ <i>izizathu zecongruency</i></p> <p>✓ R</p>	(5)
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8.2



8.2.1	$\angle OQP = 90^\circ$ [line from centre to the midpoint] <i>[ilayini ukusuka embindini ukuya kwimidipoyinti]</i>	\checkmark S \checkmark R	(2)
8.2.2	$PQ = 4$ $OP^2 = PQ^2 + OQ^2$ [Pyth] $(x+2)^2 = 4^2 + x^2$ $x^2 + 4x + 4 = 16 + x^2$ $4x = 12$ $x = 3$ $OP = OS = 5$ [radii / radiusse]	\checkmark PQ \checkmark substitution into Pythagoras/ <i>Ukusaphusitityhutha kwiPythagoras</i> \checkmark simplification / <i>ukusimplifaya</i> \checkmark x-value / <i>x-veliyu</i> \checkmark PO	(5)
			[12]

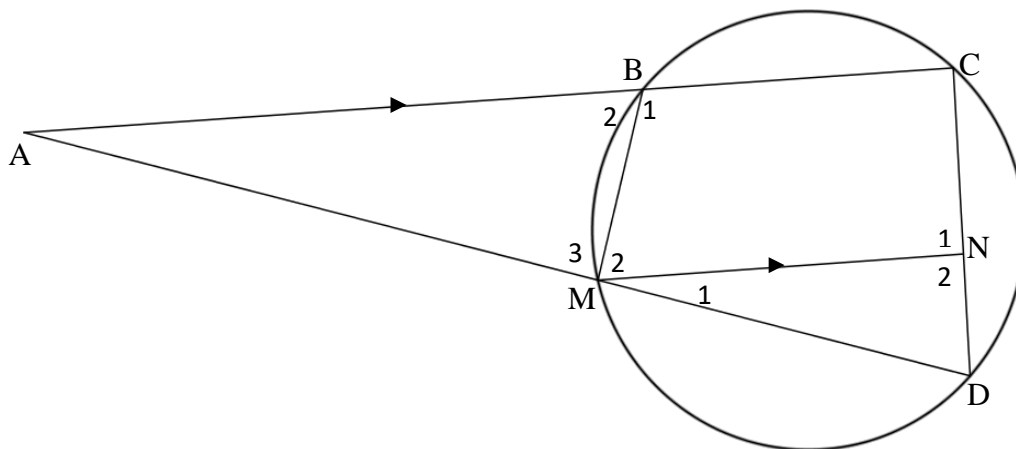
QUESTION 9/UMBULO 9



9.1	$\hat{O}_1 = 110^\circ$ [Angles on a straight line / <i>Le op reguitlyn</i>] $\hat{O}_2 = 350^\circ$ [Angles around a point / <i>Le om 'n punt</i>] $\therefore \hat{C} = 175^\circ$ [Angle at centre = $2 \times$ Angle at circumference] [Middel-punts $\angle = 2 \times$ Omtreks \angle]	✓ S/R ✓ S ✓ R $\hat{O}_1 = 110^\circ$ $\hat{O}_2 = 250^\circ$ $\therefore \hat{C} = 125^\circ$ ✓ S ✓ R	(5)
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QUESTION 10 / UMBUZO 10

AC = 36 units/yunithi, AD = 48 units/yunithi and/aze BM = 24 units/yunithi



10.1	$\hat{A} = \hat{A}$ [common / gemeen] $\hat{B}_2 = \hat{D}$ [ext \angle of a cyclic quad / buite \angle van koordev.] $\hat{M}_3 = \hat{C}$ [ext \angle of a cyclic quad / buite \angle van koordev.] or / of [3 ^{rd/de} \angle] $\triangle ABM \parallel \triangle ADC$ [$\angle \angle \angle$]	\checkmark S \checkmark S \checkmark R \checkmark R 3 rd angle/3 rd engile OR/OKANYE \checkmark R $\angle \angle \angle$	(4)
10.2	$\frac{BM}{DC} = \frac{AM}{AC}$ [$\parallel \Delta$ s] but/maar $AM = DC$ [given / gegee] $\frac{BM}{DC} = \frac{DC}{AC}$ $CD^2 = BM \times AC$	\checkmark S \checkmark R \checkmark $AM = DC$	(3)
10.3	$CD^2 = 24 \times 36 = 864$ $\frac{CN}{CD} = \frac{AM}{AD}$ [line \parallel to one side of a Δ] [lyn \square aan een sy van 'n Δ] $AM = CD$ $CN = \frac{CD^2}{AD}$ $= \frac{864}{48}$ $= 18$	\checkmark length of CD^2 / ubude buka CD^2 \checkmark S \checkmark R \checkmark CN in terms of CD^2 / CN ngokwethem zika CD^2 \checkmark correct substitution Ukusaphusitityhutha okuchanekileyo \checkmark length of CN Ubude buka CN	(6)
			[13]
		TOTAL/EWONKE:	150