



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE
*NASIONALE
SENIOR SERTIFIKAAT***

GRADE/GRAAD 12

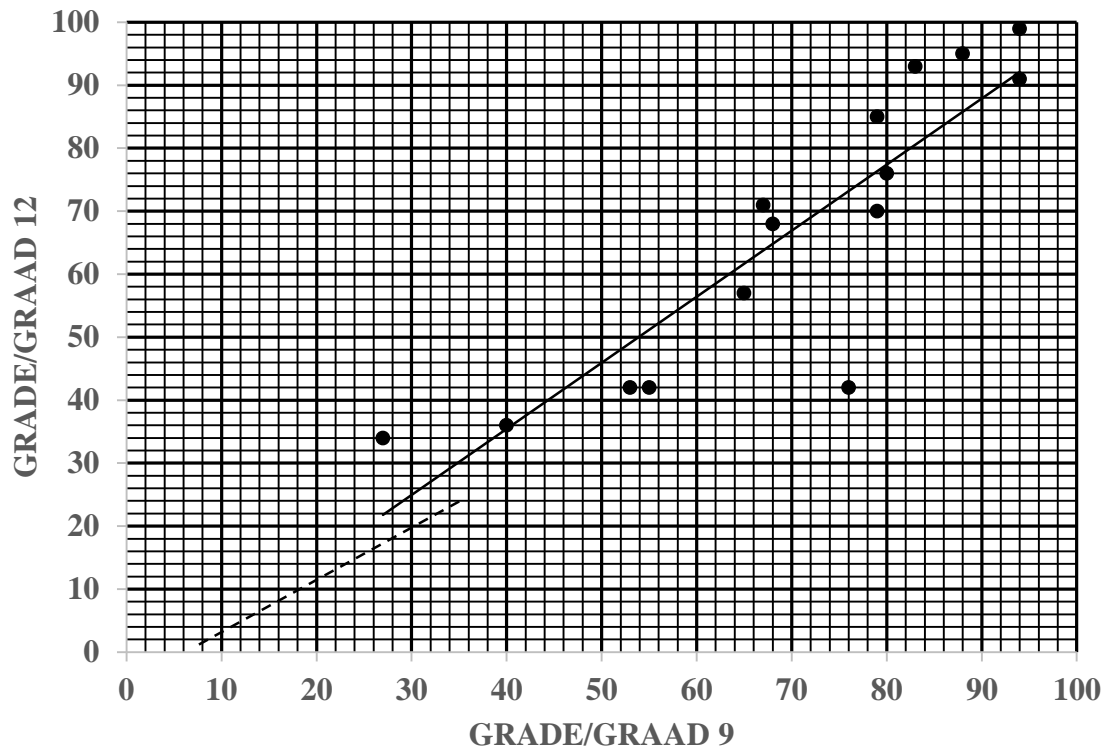
SEPTEMBER 2018

**MATHEMATICS P2/WISKUNDE V2
MARKING GUIDELINE/NASIENRIGLYN**

MARKS/PUNTE: 150

This marking guideline consists of 15 pages.
Hierdie nasien riglyn bestaan uit 15 bladsye.

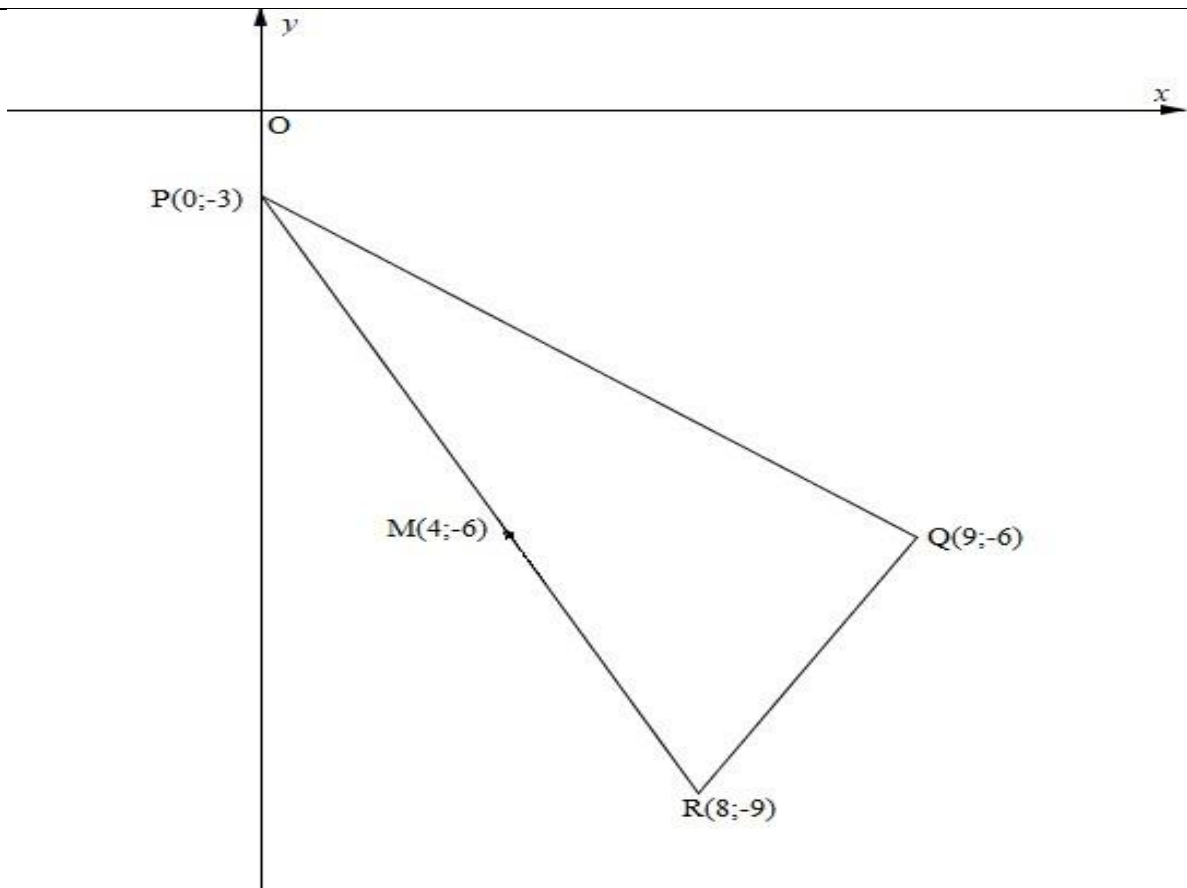
QUESTION 1/VRAAG 1



1.1	$a = -6,54$ $b = 1,05$ $\hat{y} = 1,05x - 6,54$	✓ value of a / waarde van a ✓ value of b / waarde van b ✓ equation / vergelyking	(3)
1.2	$y = -6,54 + 1,05(41)$ $= 36,51 \approx 37$	✓ substitution / vervanging ✓ answer / antwoord	(2)
1.3	On the scatter plot / <i>Op spreidiagram</i>	✓✓ x -intercept / x -afsnit $6 < x < 8$ and / en (45;41) both correct / beide korrek OR/OF ✓✓ (69,87;66,73) and/en (45;41) both correct / beide korrek	(2)
1.4	$r = 0,88$	✓✓ answer / antwoord	(2)
1.5	Yes. The strong positive correlation <i>Ja. Die sterk positiewe korrelasie</i>	✓ Yes / Ja ✓ strong positive / sterk positief	(2)
			[11]

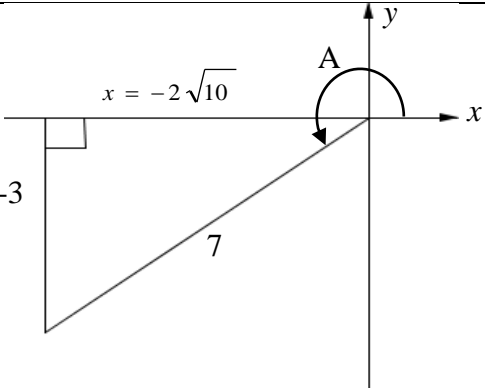
3.2	$m_{AB} = -3$ $\frac{3+3}{p+3} = -3$ $-3p - 9 = 6$ $p = -5$	✓ m_{AB} ✓ m_{AB} in terms of p / in terme van p ✓ equating / gelykstelling ✓ value of p / waarde van p	(4)
3.3	$-3x - 12 = 0$ $x = -4$ $E(-4; 0)$	✓ $y = 0$ ✓ $x = 4$	(2)
3.4	$M = \left(\frac{-5+2}{2}; \frac{3+5}{2} \right)$ $= \left(-\frac{3}{2}; 4 \right)$	✓ x -coordinate/koördinaat ✓ y -coordinate/koördinaat	(2)
3.5	$m_{EM} = \frac{0-4}{-4+\frac{3}{2}}$ $= \frac{8}{5}$ $m_{BC} = \frac{5+3}{2+3}$ $= \frac{8}{5}$ $\therefore EM \parallel BC$ [= gradients/gradiente]	✓ correct substitution / korrekte vervanging ✓ m_{EM} ✓ m_{BC} ✓ = gradients / = gradiente	(4)
3.6	$\tan \theta = -3$ $\theta = 108,4349488^\circ$ $\tan \beta = \frac{8}{5}$ $\beta = 57,99461679^\circ$ $\therefore \hat{A}\hat{B}\hat{C} = 50,44^\circ$	✓ size of θ / grootte van θ ✓ size of α / grootte van β ✓ size of $\hat{A}\hat{B}\hat{C}$ / grootte van $\hat{A}\hat{B}\hat{C}$	(4)
			[21]

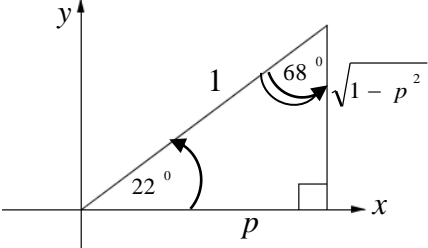
QUESTION 4 / VRAAG 4



4.1	$PR = \sqrt{(0 - 8)^2 + (-3 + 9)^2}$ $= 10$	✓ correct substitution / <i>korrekte vervanging</i> ✓ answer / <i>antwoord</i> (2)
4.2	$M = \left(\frac{0 + 8}{2}; \frac{-3 - 9}{2} \right)$ $= (4; -6)$	✓ x-coordinate/ <i>koördinaat</i> ✓ y-coordinate/ <i>koördinaat</i> (2)
4.3	$m_{PQ} = \frac{-3 + 6}{0 - 9}$ $= -\frac{1}{3}$ $m_{QR} = \frac{-6 + 9}{9 - 8}$ $= 3$ $\therefore \hat{PQR} = 90^\circ \quad [m_{PQ} \times m_{QR} = -\frac{1}{3} \times 3 = -1]$	✓ correct substitution <i>korrekte vervanging</i> ✓ m_{PQ} ✓ m_{QR} ✓ $m_{PQ} \times m_{QR} = -\frac{1}{3} \times 3 = -1$ (4)
4.4	$(x - 4)^2 + (y + 6)^2 = 25$	✓ $r^2 = 25$ ✓ equation / <i>vergelyking</i> (2)

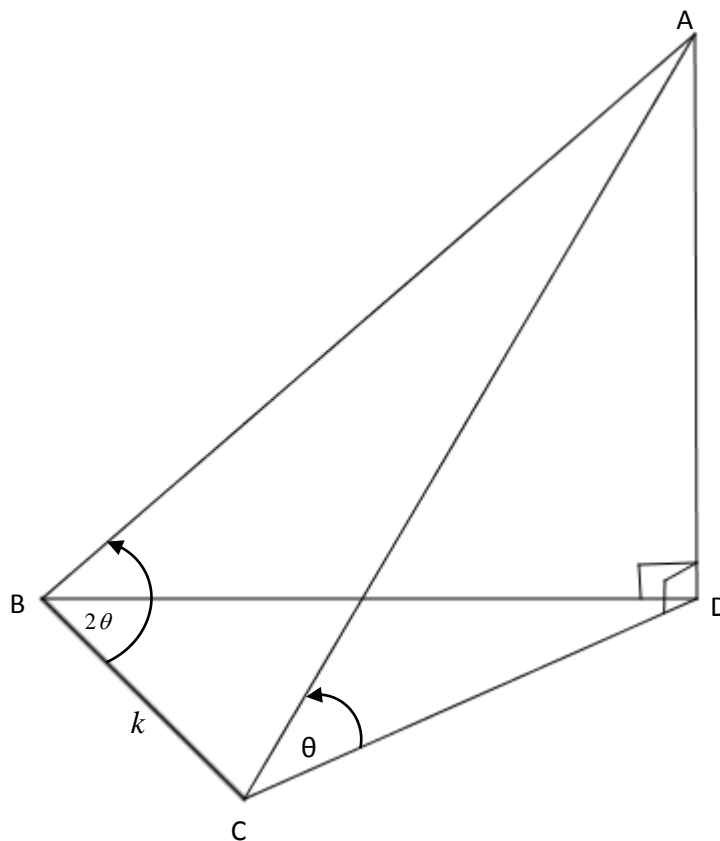
4.5	$m_{rad} = \frac{-6 + 3}{4 - 0}$ $= -\frac{3}{4}$ $m_{tan} = \frac{4}{3}$ $y = \frac{4}{3}x - 3$	<ul style="list-style-type: none"> ✓ correct subst. / <i>korrekte verv.</i> ✓ $m_{rad} = -\frac{3}{4}$ ✓ $m_{tan} = \frac{4}{3}$ ✓ Subst / Verv. (0 ; -3) & m ✓ equation / <i>vergelyking</i> <p style="text-align: right;">(5)</p>
4.6	$(\sqrt{146})^2 = (\cos \theta - 8)^2 + (\sin \theta + 9)^2$ $146 = \cos^2 \theta - 16 \cos \theta + 64 + \sin^2 \theta + 18 \sin \theta + 81$ $0 = -16 \cos \theta + 18 \sin \theta$ $0 = -16 \cos \theta + 18 \sin \theta$ $\frac{\sin \theta}{\cos \theta} = \frac{16}{18}$ $\tan \theta = \frac{8}{9}$	<ul style="list-style-type: none"> ✓ correct substitution <i>korrekte vervanging</i> ✓ simplification/<i>vereenvoudiging</i> ✓ $\sin^2 \theta + \cos^2 \theta = 1$ ✓ equation/<i>vergelyking</i> <ul style="list-style-type: none"> ✓ $\tan \theta = \frac{8}{9}$ <p style="text-align: right;">(5)</p>
		[20]

QUESTION 5/VRAAG 5		
<p>5.1</p>	 <p> $x = -2\sqrt{10}$ -3 7 </p> $\sin(A + 30^\circ) = \sin A \cos 30^\circ + \cos A \sin 30^\circ$ $= \left(-\frac{3}{7}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{-2\sqrt{10}}{7}\right)\left(\frac{1}{2}\right)$ $= -\frac{3\sqrt{3} - 2\sqrt{10}}{14}$	<p>✓ $x = -2\sqrt{10}$</p> <p>✓ Expansion/<i>Uitbreiding</i></p> <p>✓ Both/<i>Beide</i> $\frac{\sqrt{3}}{2}$ & $\frac{1}{2}$</p> <p>✓ $-\frac{2\sqrt{10}}{7}$</p> <p>(4)</p>
<p>5.2</p>	$-\sin^2(90^\circ - x) - \tan \cos(-x) \cdot \sin(-x - 360^\circ)$ $= -(\cos x)^2 - \frac{\sin x}{\cos x}(\cos x)(-\sin x)$ $= -\cos^2 x + \sin^2 x$ $= -(\cos^2 x - \sin^2 x)$ $= -\cos 2x$	<p>✓ $(\cos x)^2$</p> <p>✓ $\frac{\sin x}{\cos x}$</p> <p>✓ $\cos x$</p> <p>✓ $(-\sin x)$</p> <p>✓ $-(\cos^2 x - \sin^2 x)$</p> <p>✓ $-\cos 2x$</p> <p>(6)</p>
<p>5.3</p>	$x^2 - 2x \sin A = \cos^2 A$ $\cos^2 A + 2x \sin A - x^2 = 0$ $\Delta = (2 \sin A)^2 - 4(-1)(\cos^2 A)$ $= 4(\sin^2 A + \cos^2 A)$ $= 4$	<p>✓ standard form/<i>standaardvorm</i></p> <p>✓ correct substitution/<i>korrekte vervanging</i></p> <p>✓ $\Delta = 4$</p> <p>(3)</p>

5.4	$\begin{aligned} \text{LHS/LK} &= \frac{\cos 3x}{\sin x} + \frac{\sin 3x}{\cos x} \\ &= \frac{\cos 3x \cos x + \sin 3x \sin x}{\sin x \cos x} \\ &= \frac{\cos(3x - x)}{\sin x \cos x} \\ &= \frac{\cos 2x}{\frac{1}{2} \sin 2x} \\ &= \frac{2}{\tan 2x} \end{aligned}$	<p>✓ Simplification <i>Vereenvoudiging</i></p> <p>✓ $\cos 2x$</p> <p>✓ $\frac{1}{2} \sin 2x$</p> <p>(3)</p>
5.5.1	$\begin{aligned} \sin 68^\circ &= \cos 22^\circ \\ &= p \end{aligned}$ <p>OR/OF</p>  $\sin 68^\circ = p$	<p>✓ $\cos 22^\circ$</p> <p>✓ p</p> <p>OR/OF</p> <p>✓ $y = \sqrt{1 - p^2}$</p> <p>✓ $\sin 68^\circ = p$</p> <p>(2)</p>
5.5.2	$\begin{aligned} \cos 16^\circ &= \cos(38^\circ - 22^\circ) \\ &= \cos 38^\circ \cdot \cos 22^\circ + \sin 38^\circ \cdot \sin 22^\circ \\ &= \sqrt{1 - q^2} \cdot p + q \cdot \sqrt{1 - p^2} \\ &= p \sqrt{1 - q^2} + q \sqrt{1 - p^2} \end{aligned}$	<p>✓ $\cos(38^\circ - 22^\circ)$</p> <p>✓ Expansion / <i>Uitbreiding</i></p> <p>✓ $\cos 38^\circ$ i.t.o / i.t.v q</p> <p>✓ $\sin 22^\circ$ i.t.o / i.t.v p</p> <p>(4)</p>
		[22]

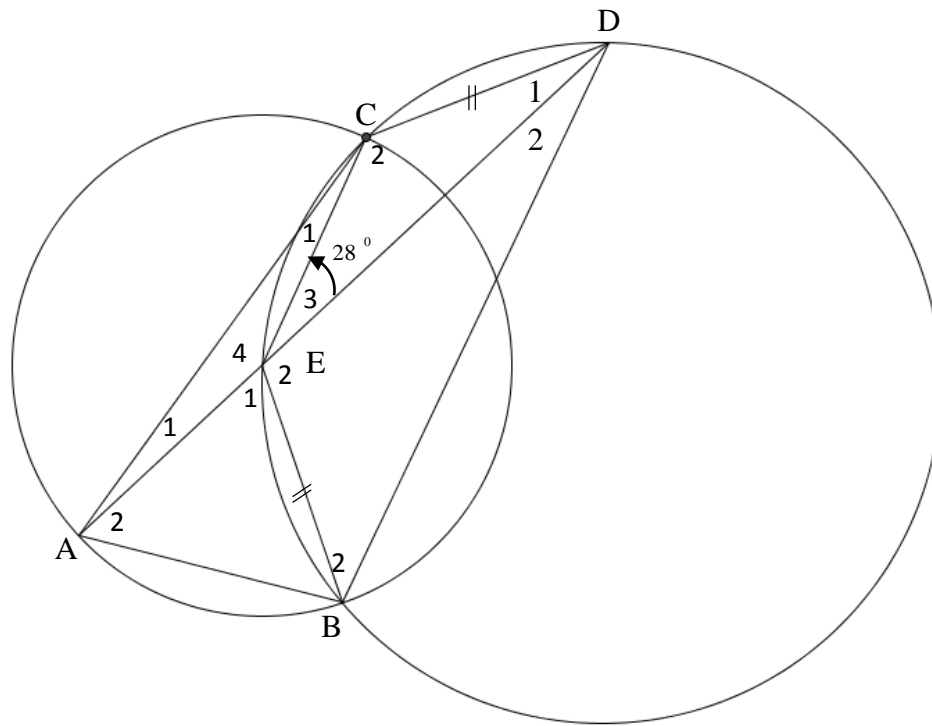
QUESTION 6 / VRAAG 6			
6.1	$a = -2$ $p = 30^\circ$	✓ $a = -2$ ✓ $p = 30^\circ$	(2)
6.2			
6.2.1	$x = 60^\circ$	✓	(1)
6.2.2	$\cos(x - 60) = \sin 3x$ $\cos(x - 60) = \cos(90^\circ - 3x)$ $x - 60 = \pm(90^\circ - 3x) + 360^\circ \cdot k \quad k \in \mathbb{Z}$ $\therefore 4x = 150^\circ + 360^\circ \cdot k$ OR $-2x = -30^\circ + 360^\circ \cdot k \quad k \in \mathbb{Z}$ $\therefore x = 37,50^\circ + 90^\circ \cdot k \quad \text{or} \quad x = 15^\circ - 180^\circ \cdot k$ $\therefore x = -52,50^\circ \text{ and } x = 15^\circ$	✓ co-function <i>ko-funksie</i> ✓ ref \angle ✓ $4x = 150^\circ + 360^\circ \cdot k$ ✓ & $-2x = -30^\circ + 360^\circ \cdot k$ ✓ $x = 15^\circ$ ✓ $x = -52,50^\circ$	(6)
6.2.3	$-52,50^\circ < x < 15^\circ$	✓ both critical values <i>beide kritiese waardes</i> ✓ notation / <i>notasie</i>	(2)
			[11]

QUESTION 7 / VRAAG 7



7.1	$AB = k$ $AC = \sqrt{(2k)^2 + k^2 - 2 \cdot 2k \cdot k \cdot \cos 2\theta}$ $= \sqrt{5k^2 - 4k^2 \cdot \cos 2\theta}$ $= \sqrt{k^2(5 - 4(1 - 2\sin^2 \theta))}$ $= \sqrt{k^2(5 - 4 + 8\sin^2 \theta)}$ $= k\sqrt{1 + 8\sin^2 \theta}$	<ul style="list-style-type: none"> ✓ AB i.t.o / i.t.v k ✓ cosine rule formula in ΔABC <i>kosinusreël formule in ΔABC</i> ✓ correct subst. / <i>korrekte vervanging</i> ✓ $\cos 2\theta = 1 - 2\sin^2 \theta$ ✓ simplification / <i>vereenvoudiging</i> 	(5)
7.2	$AC = 139,5\sqrt{1 + 8\sin^2(42^\circ)}$ $\approx 299 \text{ m}$	<ul style="list-style-type: none"> ✓ correct substitution/<i>korrekte vervanging</i> ✓ answer/<i>antwoord</i> 	(2)
			[7]

QUESTION 8 / VRAAG 8

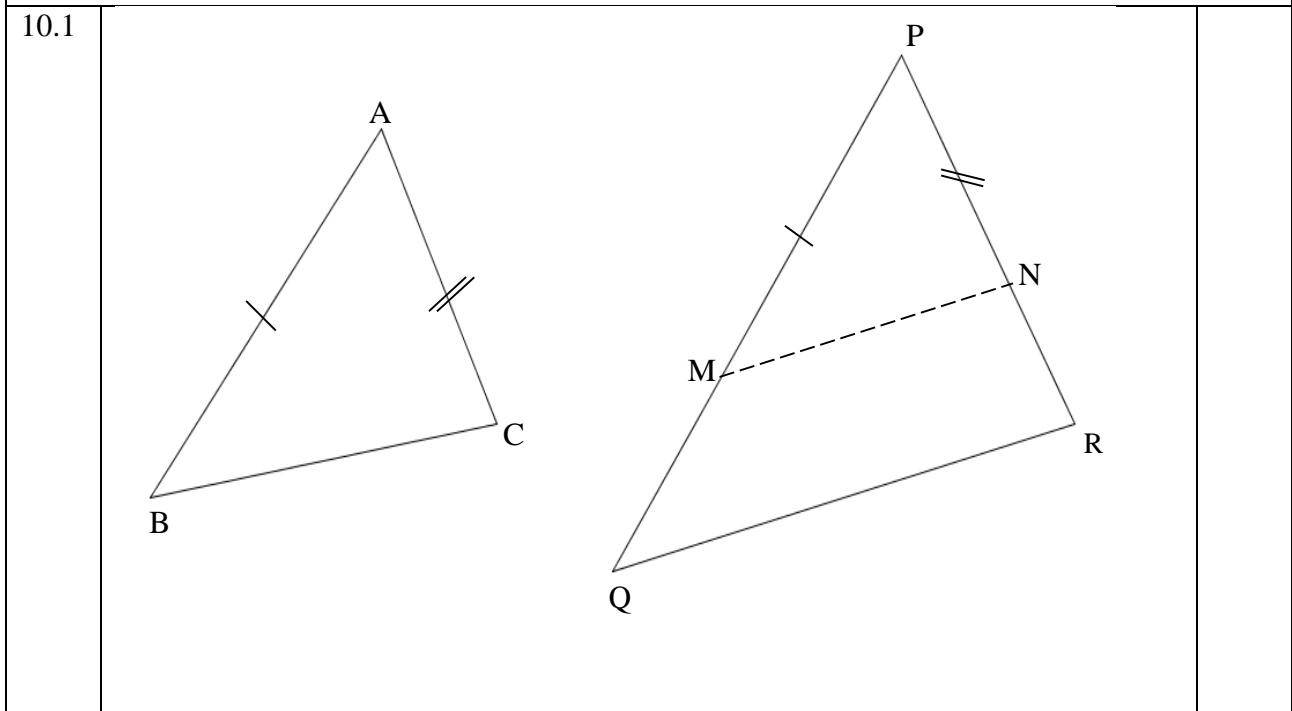


8.1	$\hat{D}_2 = 28^\circ$ [\angle s subt by = chords] / [\angle e onderspan deur = koorde]	✓ S ✓ R	(2)
8.2	Alternate \angle s = / <i>Verwisselende</i> \angle e	✓ R	(1)
8.3	EB = EC [radii / radiusse] but/maar EB = CD [given / gegee] \therefore EC = CD	✓ S ✓ R	(2)
8.3.1	$\hat{D}_1 = 28^\circ$ [\angle s opp = sides] / [\angle e teenoor = sye] $\hat{C}_2 = 124^\circ$ [\angle s of a Δ] / [\angle evan'n Δ] $\therefore \hat{B}_2 = 56^\circ$ [opp. \angle s of a cyclic quad] / [teenoorst. \angle e van koordevierhoek]	✓ S/R ✓ S ✓ S ✓ R	(4)
8.3.2	$\hat{E}_2 = 96^\circ$ [\angle s of a Δ] / [\angle evan'n Δ] $\therefore \hat{BAC} = \frac{1}{2}(96^\circ + 28^\circ)$ [\angle at centre = $2 \times \angle$ at circumf] = 62° [Middelpunts \angle = $2 \times$ Omtrekshoek]	✓ S ✓ S ✓ R	(3)
			[12]

QUESTION 9 / VRAAG 9			
9.1	$\frac{YU}{UZ} = \frac{XV}{VZ}$ <p>[prop theo, $UV \parallel YX$ or line \parallel to one side of a Δ] [Eweredigh. Stelling, $UV \parallel YX$ of lyn \parallel aan een sy van 'n Δ]</p> $= \frac{YV}{VW}$ <p>[prop theo, $UV \parallel ZW$ or line \parallel to one side of a Δ] [Eweredigh. Stelling, $UV \parallel ZW$ of lyn \parallel aan een sy van 'n Δ]</p> $\therefore \frac{XV}{VZ} = \frac{YV}{VW}$	<p>✓ S ✓ R</p> <p>✓ S</p>	(3)
9.2	$\frac{\text{Area of/van } \Delta X V Y}{\text{Area of/van } \Delta W V Z} = \frac{\frac{1}{2} \times 3r \times 3s \times \sin \hat{V}_2}{\frac{1}{2} \times 4r \times 4s \times \sin \hat{V}_5}$ <p>but/maar \hat{V}_2 [vert. opp. \angles] / [regoorst. \anglee]</p> $= \frac{9}{16}$	<p>✓ substitution / vervanging</p> <p>✓ substitution / vervanging</p> <p>✓ S/R</p> <p>✓ answer / antwoord</p>	(4)
9.3	$\hat{X}_1 = \hat{V}_4$ [alt. \angle s, $XY \parallel WX$] / [verw. \angle e, $XY \parallel WX$] $\hat{V}_3 = \hat{V}_4$ [given] / [gegee] $\hat{V}_3 = \hat{W}_2$ [corresp \angle s, $WZ \parallel UV$] / [ooreenk. \angle e, $WZ \parallel UV$] $\therefore \hat{X}_1 = \hat{W}_2$ WXYZ is a cyclic quad [converse \angle s same segment or line subt = \angle s] WXYZ is 'n koordevierhoek [omgekeerde \angle e in dieselfde segment of lyn onderspan = \angle e]	<p>✓ S/R</p> <p>✓ S/R</p> <p>✓ R</p>	(3)

9.4	$\hat{V}_3 = \hat{V}_4 = \hat{X}_1$ $\therefore UV$ is a tangent to circle XYV [converse of tan chord theo.] <i>UV is 'n raaklyn aan die sirkel XYZ</i> [omgekeerde van raaklyn – koord stelling]	✓ S ✓ R	(2)
			[12]

QUESTION 10 / VRAAG 10



Constr: Mark M on PQ and N on PR such that $PM = AB$ and $PN = AC$
Konstr: Merk M op PQ en N op PR sodat $PM = AB$ en $PN = AC$

Proof/Bewys: In $\triangle ABC$ and/en $\triangle PMN$

- $AB = PM$ [constr / konstr.]
- $\hat{A} = \hat{P}$ [given / gegee]
- $AC = PN$ [constr / konstr.]

$\therefore \triangle ABC \cong \triangle PMN$ [S \angle S]

$\therefore \hat{B} = \hat{PMN}$
 $= \hat{Q}$ [given / gegee]

$\therefore MN \parallel QR$ [corresp $\angle s = /ooreenk. \angle e =$]

$\frac{PM}{PQ} = \frac{PN}{PR}$ [prop theo/eweredigh. stelling, $MN \parallel QR$]

but/maar $AB = PM$ and/en $AC = PN$ [constr / konstr.]

$\therefore \frac{AB}{PQ} = \frac{AC}{PR}$

- ✓ constr konstr.
- ✓ SSS
- ✓ R
- ✓ S/R
- ✓ S/R
- ✓ S

(6)

<p>10.2</p>			
<p>10.2.1</p>	<p>$\hat{N}_1 = 90^\circ$ [\angle subt by diameter / \angle in semi - circle] [\angle <i>onderspan deur middellyn</i> / \angle in semi - sirkel] $\therefore LN = NP$ [line from centre \perp to chord] / [<i>lyn vanaf die middelpunt \perp op koord</i>]</p>	<p>\checkmark S \checkmark R \checkmark R</p>	<p>(3)</p>
<p>10.2.2</p>	<p>$\hat{P}_4 = \hat{L}$ [tangent chord theorem] / [<i>raaklyn - koord stelling</i>] $L\hat{P}R = 90^\circ$ [\angle subt by diameter] / [\angle <i>onderspan deur middellyn</i>] $\therefore \hat{R}_2 = 90^\circ - \hat{P}_4$ [\angle s/e of / <i>van Δ LPR</i>] $\hat{R}_1 = 90^\circ - \hat{P}_4$ [\angle s/e of / <i>van Δ RPQ</i>]</p>	<p>\checkmark S \checkmark R \checkmark S/R \checkmark S</p>	<p>(4)</p>
<p>10.2.3</p>	<p>$\hat{N}_1 = \hat{Q}$ [both = 90° / <i>beide = 90°</i>] $\hat{P}_2 = \hat{L}$ [\angle s opp. = sides] / [\angle <i>teenoor = sye</i>] $= \hat{P}_4$ $\hat{M}_2 = \hat{R}_1$ [$3^{rd/de}$ \angle] $\therefore \Delta PNM \parallel \Delta PQR$ [$\angle \angle \angle$]</p>	<p>\checkmark S \checkmark S \checkmark R \checkmark R</p>	<p>(4)</p>

<p>10.2.4</p>	<p>In $\triangle P L R$ and/en $\triangle Q P R$ $\hat{L} \hat{P} R = \hat{Q}$ [both/beide = 90^0] $\hat{R}_2 = \hat{R}_1$ [proved/alreeds bewys] $\hat{L} = \hat{P}_4$ [$3^{rd/de} \angle$] $\triangle P L R \parallel \triangle Q P R$ [$\angle \angle \angle$] $\therefore \frac{L R}{P R} = \frac{P R}{Q R}$ $L R = \frac{30^2}{15}$ $= 60$</p>	<p>✓ SSS ✓ R ✓ ratios / <i>verhoudings</i> ✓ substitution / <i>vervang</i> ✓ LR</p>	<p>(5)</p>
<p>10.2.5</p>	<p>$N M \parallel P R$ [co - int \angles supp OR corresp \angles =] [ko - binne \anglee suppl. OF ooreenk. \anglee =] $\therefore N M = \frac{1}{2} P R$ [midpoint theorem / middelpunt stelling] $\sin x = \frac{30\sqrt{3}}{15}$ $x = 60^0$</p>	<p>✓ R ✓ R ✓ ratio/<i>verhouding</i> ✓ value of x / waarde van x</p>	<p>(4)</p>
			<p>[26]</p>