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**GRADE/GRAAD 12**

**SEPTEMBER 2018**

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

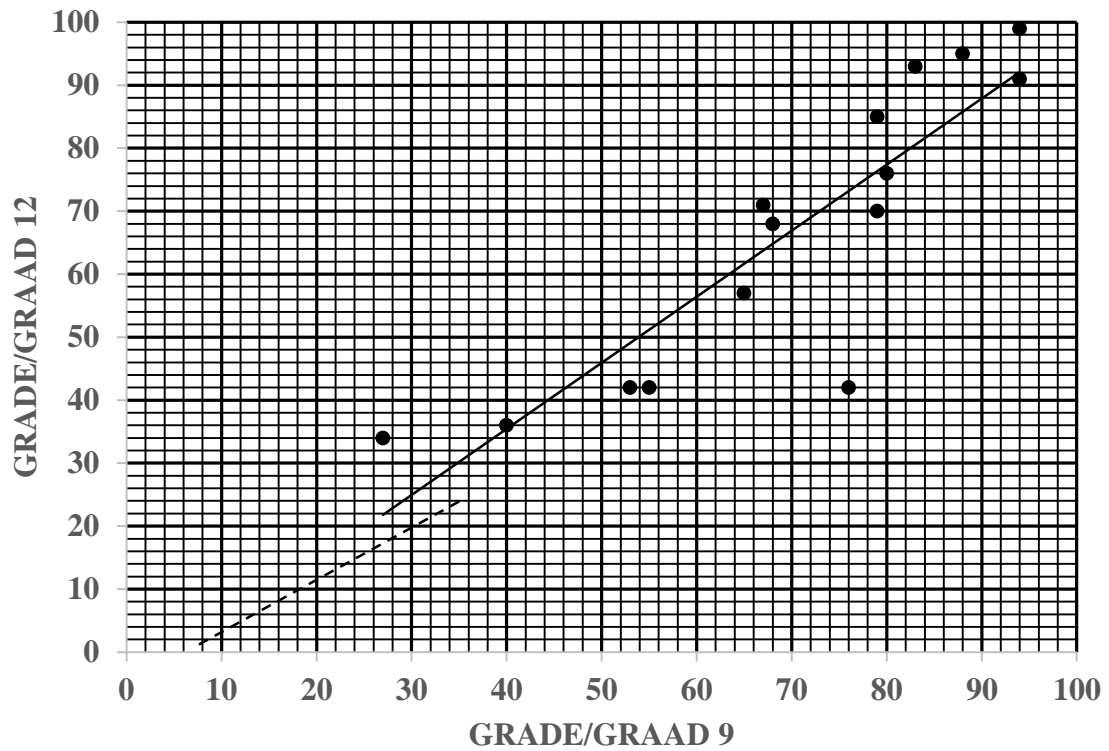
**MARKS/PUNTE: 150**

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

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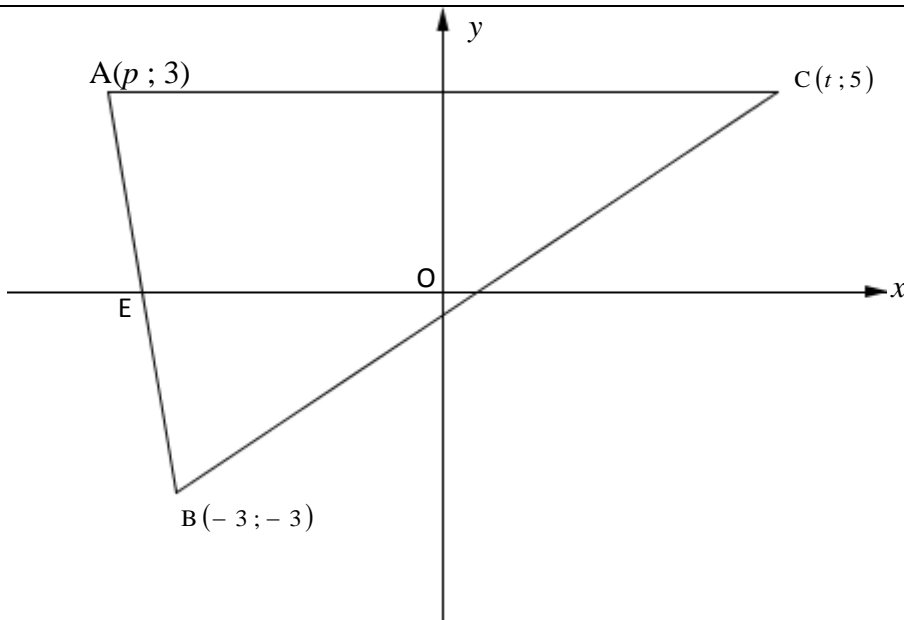
QUESTION 1/VRAAG 1



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 <b>OR/OF</b> ✓✓ (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)
			<b>[11]</b>

QUESTION 2/VRAAG 2			
2.1	$\text{Range/Omvang} = 29 - 10$ $= 19$	✓ answer / antwoord	(1)
2.2	$\bar{x} = \frac{15 + 23 + 17 + 24 + 26 + 18 + 28 + 13 + 10 + 28 + 29}{11}$ $= \frac{231}{11}$ $= 21$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;">                     Answer ONLY full marks                      Slegs antwoord - volpunte                 </div>	✓✓ answer / antwoord	(2)
2.3	$\sigma = 6,37$	✓ min    ✓ max/maks ✓ answer / antwoord	(3)
2.4	$(21 - 6,37 ; 21 + 6,37) = (14,63 ; 27,37)$ 5 weeks/weke	✓ 231  ✓ answer / antwoord	(2)
			<b>[8]</b>

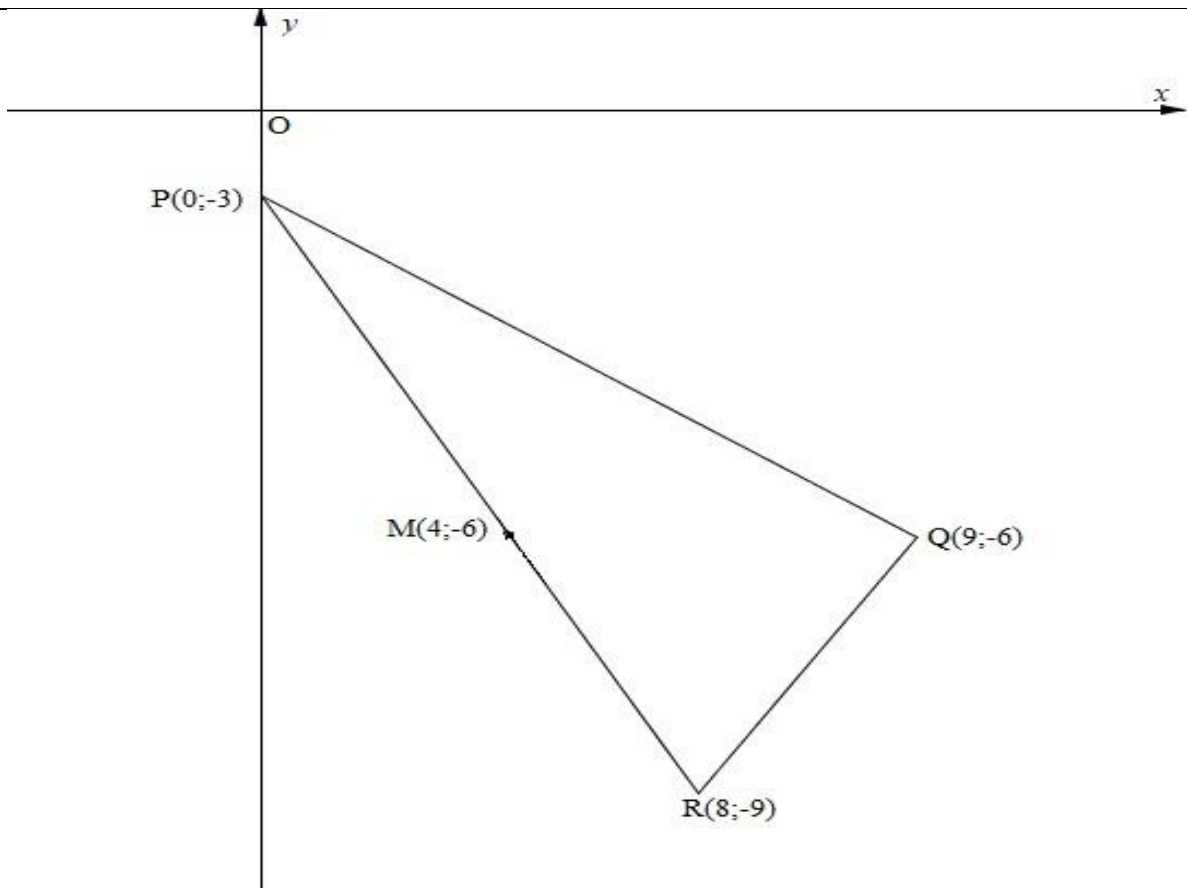
**QUESTION 3 / VRAAG 3**



3.1	$(\sqrt{89})^2 = (-3 - t)^2 + (-3 - 5)^2$ $89 = 9 + 6t + t^2 + 64$ $t^2 + 6t - 16 = 0$ $(t - 2)(t + 8) = 0$ $\therefore t = 2 \text{ or / of } t \neq -8$	✓ substitution / vervanging  ✓ simplification / vereenvoudiging  ✓ standard form / standaardvorm  ✓ factors / faktore  ✓ value of t / waarde van t	(5)
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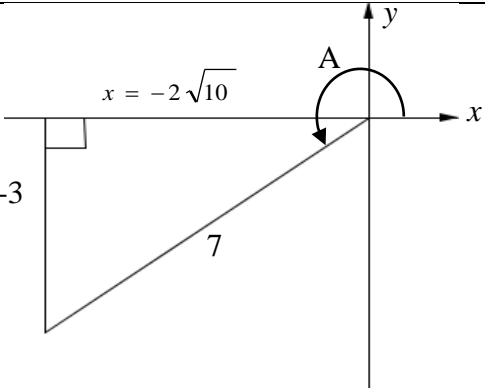
3.2	$m_{AB} = -3$ $\frac{3+3}{p+3} = -3$ $-3p - 9 = 6$ $p = -5$	✓ $m_{AB}$ ✓ $m_{AB}$ in terms of $p$ / in terme van $p$ ✓ equating / gelykstelling ✓ value of $p$ / waarde van $p$	(4)
3.3	$-3x - 12 = 0$ $x = -4$ $E(-4; 0)$	✓ $y = 0$ ✓ $x = 4$	(2)
3.4	$M = \left( \frac{-5+2}{2}; \frac{3+5}{2} \right)$ $= \left( -\frac{3}{2}; 4 \right)$	✓ $x$ -coordinate/koördinaat ✓ $y$ -coordinate/koördinaat	(2)
3.5	$m_{EM} = \frac{0-4}{-4+\frac{3}{2}}$ $= \frac{8}{5}$ $m_{BC} = \frac{5+3}{2+3}$ $= \frac{8}{5}$ $\therefore EM \parallel BC \text{ [ = gradients/gradiente ]}$	✓ 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 $\theta$ / grootte van $\theta$  ✓ size of $\alpha$ / grootte van $\beta$ ✓ size of $\hat{A}\hat{B}\hat{C}$ / grootte van $\hat{A}\hat{B}\hat{C}$	(4)
			<b>[21]</b>

**QUESTION 4 / VRAAG 4**

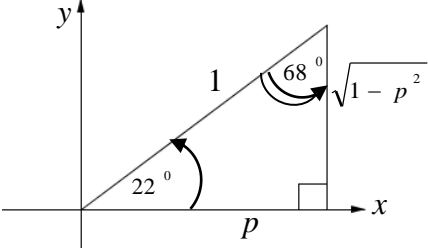


4.1	$PR = \sqrt{(0 - 8)^2 + (-3 + 9)^2}$ $= 10$	✓ correct substitution / <i>korrekte vervanging</i> ✓ answer / <i>antwoord</i> (2)
4.2	$M = \left( \frac{0 + 8}{2}; \frac{-3 - 9}{2} \right)$ $= (4; -6)$	✓ x-coordinate/ <i>koördinaat</i> ✓ y-coordinate/ <i>koördinaat</i> (2)
4.3	$m_{PQ} = \frac{-3 + 6}{0 - 9}$ $= -\frac{1}{3}$ $m_{QR} = \frac{-6 + 9}{9 - 8}$ $= 3$ $\therefore \hat{PQR} = 90^\circ \quad [m_{PQ} \times m_{QR} = -\frac{1}{3} \times 3 = -1]$	✓ 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"> <li>✓ correct subst. / <i>korrekte verv.</i></li> <li>✓ <math>m_{rad} = -\frac{3}{4}</math></li> <li>✓ <math>m_{tan} = \frac{4}{3}</math></li> <li>✓ Subst / Verv. (0 ; -3) &amp; m</li> <li>✓ equation / <i>vergelyking</i></li> </ul> <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"> <li>✓ correct substitution <i>korrekte vervanging</i></li> <li>✓ simplification/<i>vereenvoudiging</i></li> <li>✓ <math>\sin^2 \theta + \cos^2 \theta = 1</math></li> <li>✓ equation/<i>vergelyking</i></li> </ul> <ul style="list-style-type: none"> <li>✓ <math>\tan \theta = \frac{8}{9}</math></li> </ul> <p style="text-align: right;">(5)</p>
		<b>[20]</b>

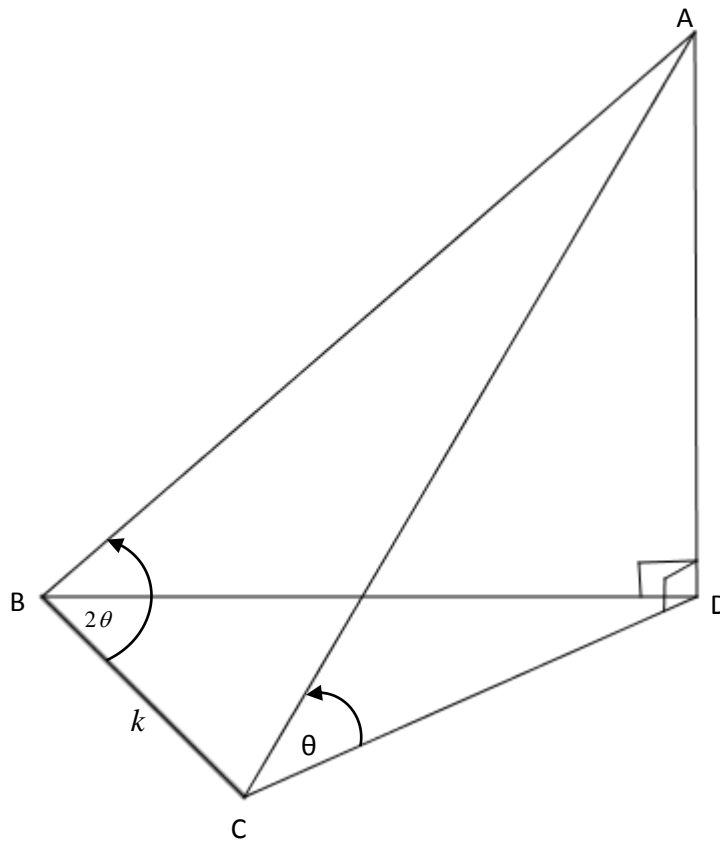
QUESTION 5/VRAAG 5		
<p>5.1</p>	 $\sin(A + 30^\circ) = \sin A \cos 30^\circ + \cos A \sin 30^\circ$ $= \left(-\frac{3}{7}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{-2\sqrt{10}}{7}\right)\left(\frac{1}{2}\right)$ $= -\frac{3\sqrt{3} - 2\sqrt{10}}{14}$	<p>✓ <math>x = -2\sqrt{10}</math></p> <p>✓ Expansion/<i>Uitbreiding</i></p> <p>✓ Both/<i>Beide</i> <math>\frac{\sqrt{3}}{2}</math> &amp; <math>\frac{1}{2}</math></p> <p>✓ <math>-\frac{2\sqrt{10}}{7}</math></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>✓ <math>(\cos x)^2</math></p> <p>✓ <math>\frac{\sin x}{\cos x}</math></p> <p>✓ <math>\cos x</math></p> <p>✓ <math>(-\sin x)</math></p> <p>✓ <math>-(\cos^2 x - \sin^2 x)</math></p> <p>✓ <math>-\cos 2x</math></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>✓ <math>\Delta = 4</math></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>✓ <math>\cos 2x</math></p> <p>✓ <math>\frac{1}{2} \sin 2x</math></p> <p>(3)</p>
5.5.1	$\begin{aligned} \sin 68^\circ &= \cos 22^\circ \\ &= p \end{aligned}$ <p><b>OR/OF</b></p>  $\sin 68^\circ = p$	<p>✓ <math>\cos 22^\circ</math></p> <p>✓ <math>p</math></p> <p><b>OR/OF</b></p> <p>✓ <math>y = \sqrt{1 - p^2}</math></p> <p>✓ <math>\sin 68^\circ = p</math></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>✓ <math>\cos(38^\circ - 22^\circ)</math></p> <p>✓ Expansion / <i>Uitbreiding</i></p> <p>✓ <math>\cos 38^\circ</math> i.t.o / i.t.v <math>q</math></p> <p>✓ <math>\sin 22^\circ</math> i.t.o / i.t.v <math>p</math></p> <p>(4)</p>
		<b>[22]</b>

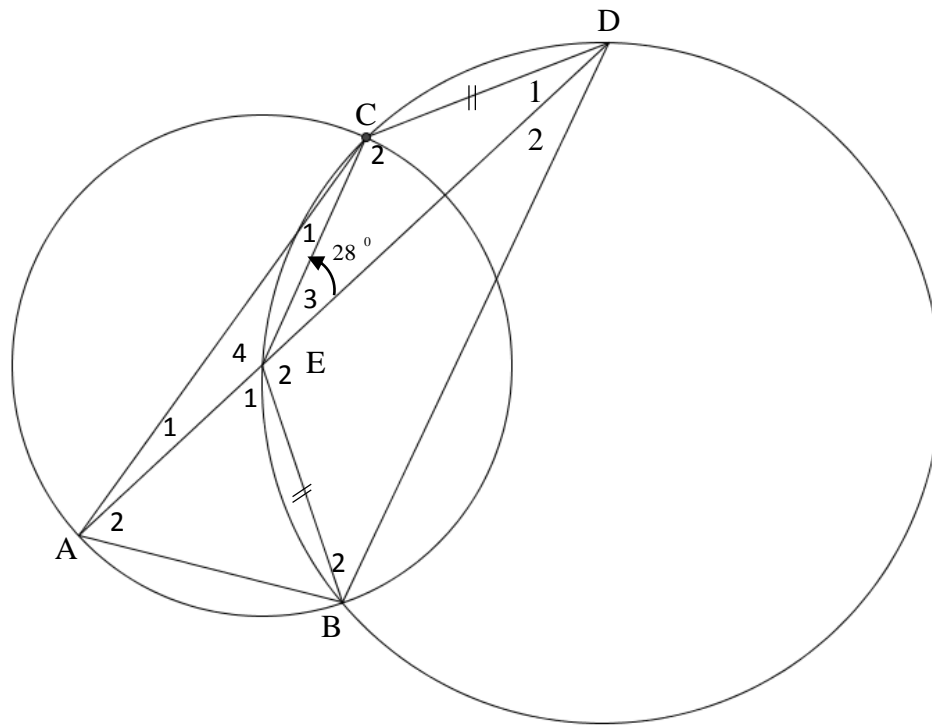
QUESTION 6 / VRAAG 6			
6.1	$a = -2$ $p = 30^\circ$	✓ $a = -2$ ✓ $p = 30^\circ$	(2)
6.2			
6.2.1	$x = 60^\circ$	✓	(1)
6.2.2	$\cos(x - 60) = \sin 3x$ $\cos(x - 60) = \cos(90^\circ - 3x)$ $x - 60 = \pm(90^\circ - 3x) + 360^\circ \cdot k \quad k \in \mathbb{Z}$ $\therefore 4x = 150^\circ + 360^\circ \cdot k$ 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)
			<b>[11]</b>

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

**QUESTION 8 / VRAAG 8**

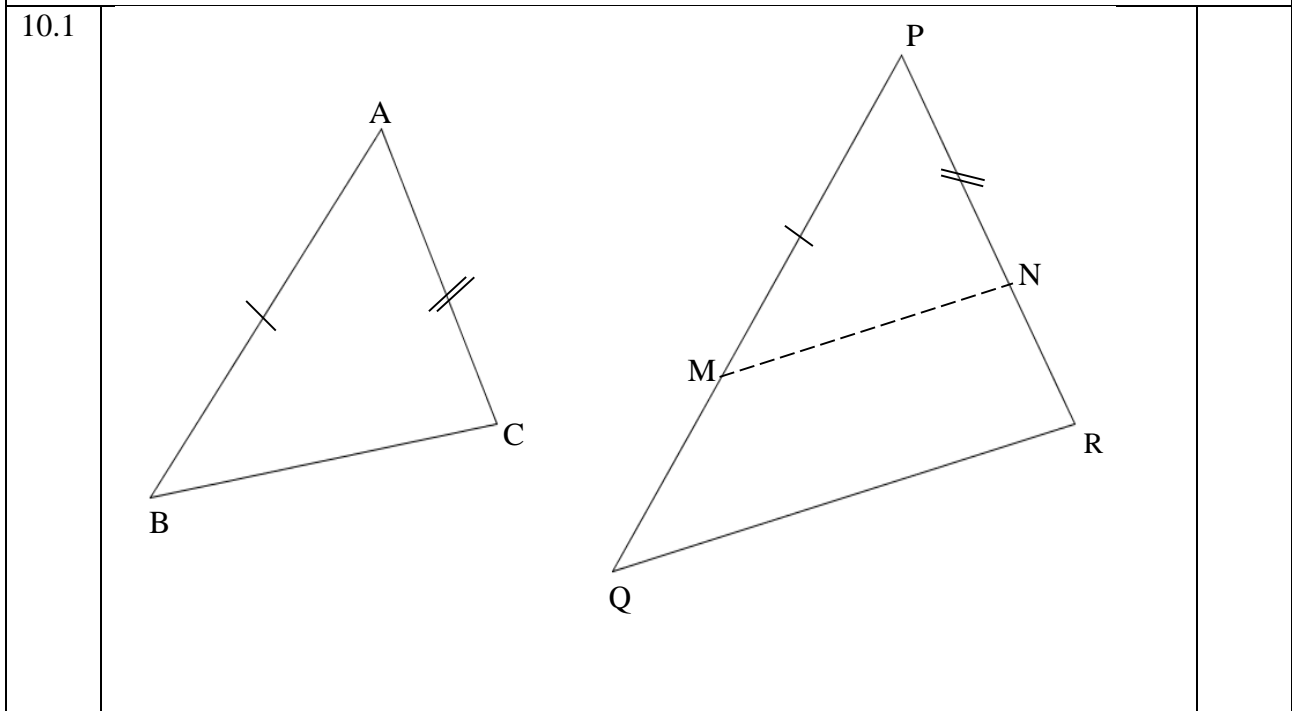


8.1	$\hat{D}_2 = 28^\circ$ [ $\angle$ s subt by = chords] / [ $\angle$ e onderspan deur = koorde]	$\checkmark$ S $\checkmark$ R (2)
8.2	Alternate $\angle$ s = / <i>Verwisselende</i> $\angle$ e	$\checkmark$ R (1)
8.3	$EB = EC$ [radii / <i>radiusse</i> ] <i>but/maar</i> $EB = CD$ [given / <i>gegee</i>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

QUESTION 9 / VRAAG 9			
9.1	$\frac{YU}{UZ} = \frac{XV}{VZ}$ <p>[prop theo, <math>UV \parallel YX</math> or line <math>\parallel</math> to one side of a <math>\Delta</math>]                  [Eweredigh. Stelling, <math>UV \parallel YX</math> of lyn <math>\parallel</math> aan een sy van 'n <math>\Delta</math>]</p> $= \frac{YV}{VW}$ <p>[prop theo, <math>UV \parallel ZW</math> or line <math>\parallel</math> to one side of a <math>\Delta</math>]                  [Eweredigh. Stelling, <math>UV \parallel ZW</math> of lyn <math>\parallel</math> aan een sy van 'n <math>\Delta</math>]</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 <math>\hat{V}_2</math> [vert. opp. <math>\angle</math>s] / [regoorst. <math>\angle</math>e]</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><math>\hat{N}_1 = 90^\circ</math> [<math>\angle</math> subt by diameter / <math>\angle</math> in semi - circle]                  [<math>\angle</math> <i>onderspan deur middellyn</i> / <math>\angle</math> in semi - sirkel]  <math>\therefore LN = NP</math> [line from centre <math>\perp</math> to chord] /                  [<i>lyn vanaf die middelpunt <math>\perp</math> op koord</i>]</p>	<p>✓ S ✓ R                  ✓ R</p>	<p>(3)</p>
<p>10.2.2</p>	<p><math>\hat{P}_4 = \hat{L}</math> [tangent chord theorem] / [<i>raaklyn - koord stelling</i>]  <math>L\hat{P}R = 90^\circ</math> [<math>\angle</math> subt by diameter] / [<math>\angle</math> <i>onderspan deur middellyn</i>]  <math>\therefore \hat{R}_2 = 90^\circ - \hat{P}_4</math> [<math>\angle</math> s/e of/van <math>\Delta LPR</math>]  <math>\hat{R}_1 = 90^\circ - \hat{P}_4</math> [<math>\angle</math> s/e of/van <math>\Delta RPQ</math>]</p>	<p>✓ S ✓ R                  ✓ S/R                  ✓ S</p>	<p>(4)</p>
<p>10.2.3</p>	<p><math>\hat{N}_1 = \hat{Q}</math> [both = <math>90^\circ</math> / <i>beide = <math>90^\circ</math></i>]  <math>\hat{P}_2 = \hat{L}</math> [<math>\angle</math> s opp. = sides] / [<math>\angle</math> <i>teenoor = sye</i>]  <math>= \hat{P}_4</math>  <math>\hat{M}_2 = \hat{R}_1</math> [<math>3^{rd/de}</math> <math>\angle</math>]  <math>\therefore \Delta PNM \parallel \Delta PQR</math> [<math>\angle \angle \angle</math>]</p>	<p>✓ S                  ✓ S ✓ R                  ✓ R</p>	<p>(4)</p>

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