



Province of the  
**EASTERN CAPE**  
EDUCATION

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

**GRADE/*GRAAD* 12**

**SEPTEMBER 2018**

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

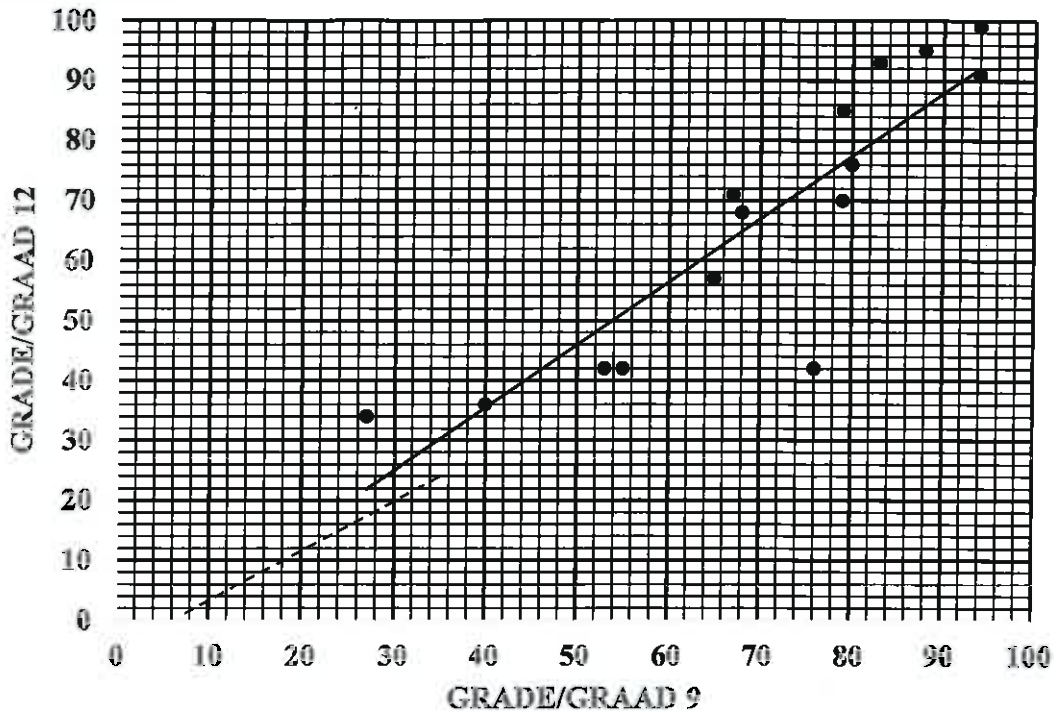
**MARKS/*PUNTE*: 150**

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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

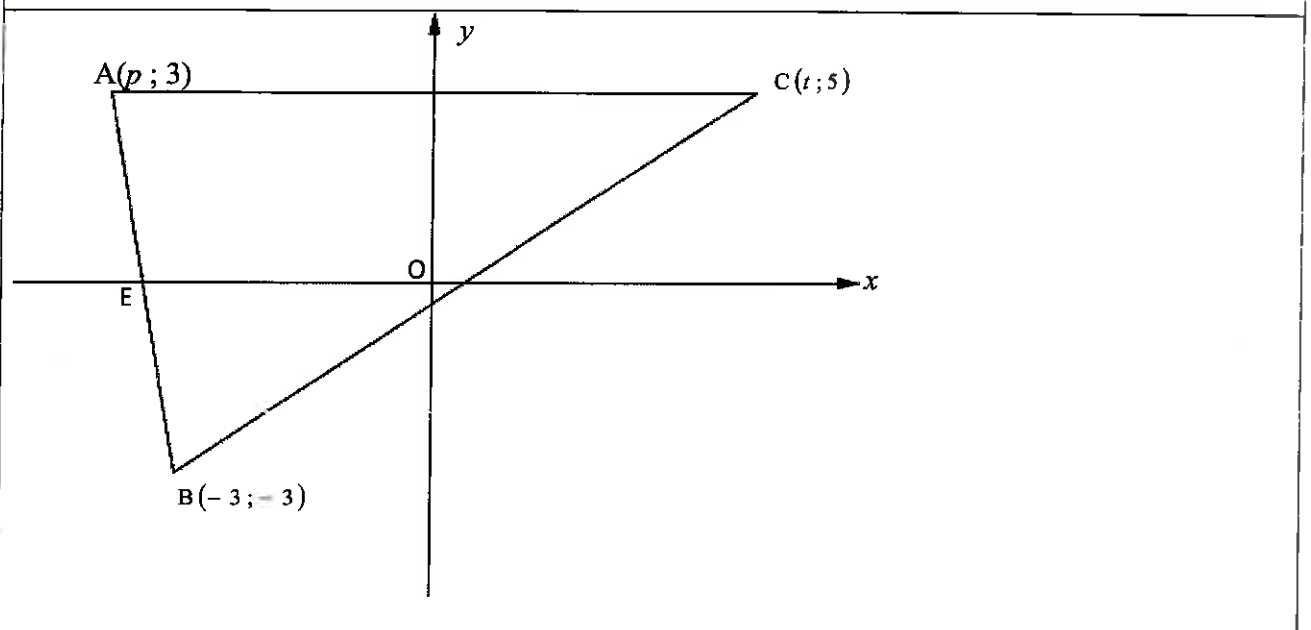


1.1	$a = -6,54$ ✓ $b = 1,05$ ✓ $\hat{y} = 1,05x - 6,54$ ✓	✓ value of $a$ / waarde van $a$ ✓ value of $b$ / waarde van $b$ ✓ equation / vergelyking	3	(3)
1.2	$y = -6,54 + 1,05(41)$ ✓ $= 36,51 \approx 37$ ✓ nearest 2	✓ substitution / vervanging ✓ answer / antwoord	2	(2)
1.3	On the scatter plot / Op spreidiagram $(\bar{x}; \bar{y}) = (69,87; 66,73)$ ✓ low pt = $(20; 14,46)$ ✓	✓✓ $x$ -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	(2)
1.4	$r = 0,88$ ✓✓	✓ ✓ answer / antwoord	2	(2)
1.5	Yes. The strong positive correlation ✓ Ja. Die sterk positiewe korrelasie ✓	✓ Yes / Ja ✓ strong positive / sterk positief	2	(2)
<b>[11]</b>				

**QUESTION 2/VRAAG 2**

2.1	$\text{Range/Omvang} = 29 - 10$ $= 19$	✓ answer / antwoord	(1)
2.2	$\bar{x} = \frac{15 + 23 + 17 + 24 + 26 + 18 + 28 + 13 + 10 + 28 + 29}{11}$ $= \frac{231}{11}$ $= 21$	✓✓ answer / antwoord  Answer ONLY full marks Slegs antwoord - volpunte	(2)
2.3	$\sigma = 6,37$	<del>✓ min</del> ✓ <del>max</del> / maks ✓ answer / antwoord	(3)
2.4	$(21 - 6,37; 21 + 6,37) = (14,63; 27,37)$ 5 weeks/weke	<del>✓ 231</del> $\bar{x} \pm \sigma$ both ✓ ✓ answer / antwoord	(2)
			<b>[8]</b>

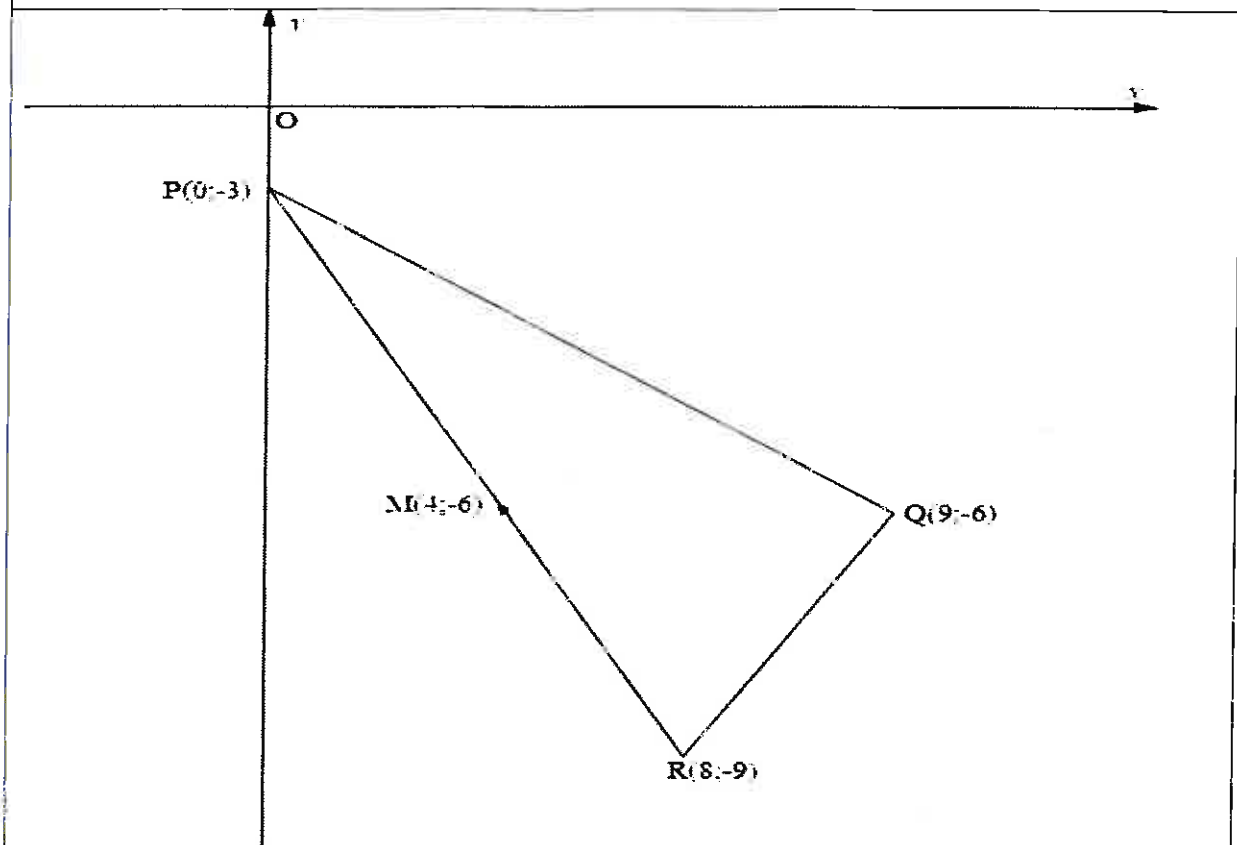
**QUESTION 3 / VRAAG 3**



3.1	$(\sqrt{89})^2 = (-3 - t)^2 + (-3 - 5)^2$ ✓ $89 = 9 + 6t + t^2 + 64$ ✓ $t^2 + 6t - 16 = 0$ ✓ $(t - 2)(t + 8) = 0$ ✓ $\therefore t = 2$ or / of $t = -8$ reject	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ standard form / standaardvorm ✓ factors / faktore ✓ value of t / waarde van t	(5)
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3.2	$m_{AB} = -3$ ✓ $\frac{3+3}{p+3} = -3$ ✓ ✓ ✓ $-3p - 9 = 6$ $p = -5$ ✓ ✓	4	✓ $m_{AB}$ ✓ $m_{AB}$ in terms of $p$ / in terme van $p$ ✓ equating / gelykstelling ✓ value of $p$ / waarde van $p$	(4)
3.3	$-3x - 12 = 0$ $x = -4$ $E(-4; 0)$ ✓ ✓ ✓	2	✓ $y = 0$ ✓ $x = 4$	(2)
3.4	$M = \left( \frac{-5+2}{2}; \frac{3+5}{2} \right)$ $= \left( -\frac{3}{2}; 4 \right)$ ✓ ✓ ✓	2	✓ $x$ -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/gradiënte ] ✓ ✓	4	✓ correct substitution / korrekte vervanging ✓ $m_{EM}$ ✓ $m_{BC}$ ✓ = gradients / = gradiënte	(4)
3.6	$\tan \theta = -3$ ✓ ✓ ✓ $\theta = 108,4349488^\circ$ ✓ ✓ ✓ $\tan \beta = \frac{8}{5}$ $\beta = 57,99461679^\circ$ ✓ ✓ ✓ $\therefore \hat{A}\hat{B}\hat{C} = 50,44^\circ$ ✓ ✓ ✓	4	✓ $\tan \theta = m$ ✓ 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)
				[21]

QUESTION 4 / VRAAG 4

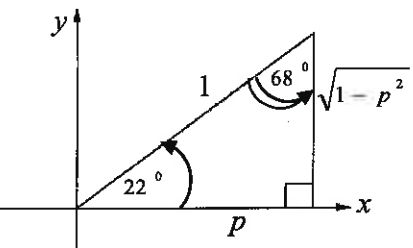


4.1	$PR = \sqrt{(0-8)^2 + (-3+9)^2}$ $= 10$	✓ correct substitution / <i>korrekte vervanging</i> ✓ answer / <i>antwoord</i> (2)
4.2	$M = \left( \frac{0+8}{2}; \frac{-3-9}{2} \right)$ $= (4; -6)$	✓ x-coordinate/ <i>koördinaat</i> ✓ y-coordinate/ <i>koördinaat</i> (2)
4.3	$m_{PQ} = \frac{-3+6}{0-9}$ $=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

4.5	$m_{rad} = \frac{-6 + 3}{4 - 0} \quad \checkmark$ $= -\frac{3}{4} \quad \checkmark$ $m_{tan} = \frac{4}{3} \quad \checkmark$ $y = \frac{4}{3}x - 3 \quad \checkmark \quad \checkmark \text{ eqn}$ <p style="text-align: right; color: red; font-size: 2em;">5</p>	<ul style="list-style-type: none"> <li>✓ correct subst. / korrekte verv.</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 / vergelyking</li> </ul> <p style="text-align: right;">(5)</p>
4.6	$(\sqrt{146})^2 = (\cos \theta - 8)^2 + (\sin \theta + 9)^2 \quad \checkmark$ $146 = \cos^2 \theta - 16 \cos \theta + 64 + \sin^2 \theta + 18 \sin \theta + 81$ <del><math display="block">0 = -16 \cos \theta + 18 \sin \theta</math></del> $0 = -16 \cos \theta + 18 \sin \theta \quad \checkmark$ <p style="text-align: center; color: red; font-size: 1.5em;"><math>s^2 + c^2 = 1 \quad \checkmark</math></p> $\frac{\sin \theta}{\cos \theta} = \frac{16}{18}$ $\tan \theta = \frac{8}{9} \quad \checkmark$ <p style="text-align: right; color: red; font-size: 2em;">5</p>	<ul style="list-style-type: none"> <li>✓ correct substitution korrekte vervanging</li> <li>✓ simplification/vereenvoudiging</li> <li>✓ <math>\sin^2 \theta + \cos^2 \theta = 1</math></li> <li>✓ equation/vergelijking</li> </ul> $\tan \theta = \frac{8}{9}$ <p style="text-align: right;">(5)</p>
		<b>[20]</b>

**QUESTION 5/VRAAG 5**

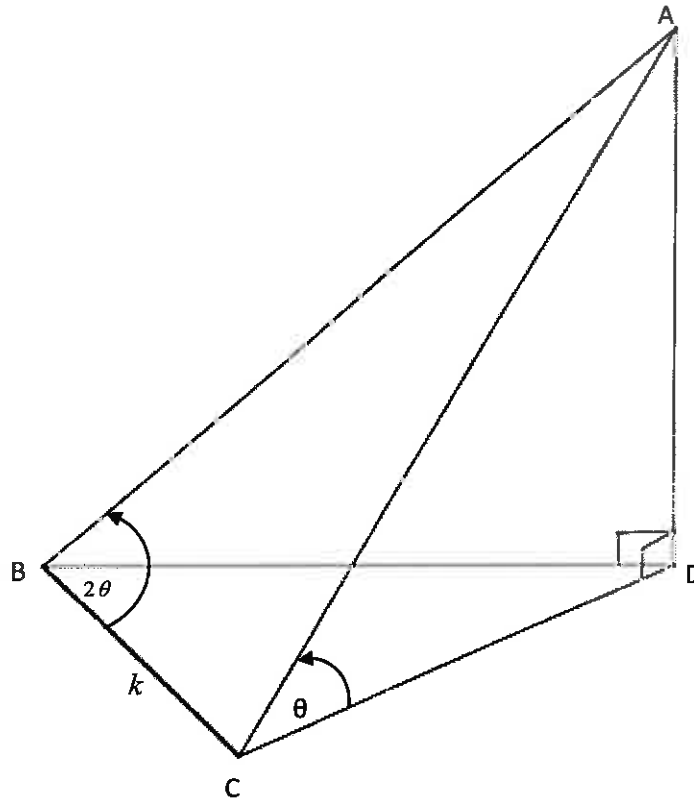
<p>5.1</p>	<p> <math>x = -2\sqrt{10}</math>  <math>\sin(A + 30^\circ) = \sin A \cos 30^\circ + \cos A \sin 30^\circ</math>  <math>= \left(-\frac{3}{7}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{-2\sqrt{10}}{7}\right)\left(\frac{1}{2}\right)</math>  <math>= \frac{3\sqrt{3} - 2\sqrt{10}}{14}</math> </p>	<p> <math>\checkmark x = -2\sqrt{10}</math> or <math>-\sqrt{40}</math>  <math>\checkmark</math> Expansion/Uitbreiding  <math>\checkmark</math> Both/Beide <math>\frac{\sqrt{3}}{2}</math> &amp; <math>\frac{1}{2}</math>  <math>\checkmark -\frac{2\sqrt{10}}{7}</math> </p> <p>(4)</p>
<p>5.2</p>	<p> <math>-\sin^2(90^\circ - x) - \tan \cos(-x) \cdot \sin(-x - 360^\circ)</math>  <math>= -(\cos x)^2 - \frac{\sin x}{\cos x} (\cos x)(-\sin x)</math>  <math>= -\cos^2 x + \sin^2 x</math>  <math>= -(\cos^2 x - \sin^2 x)</math>  <math>= -\cos 2x</math> </p> <p>Handwritten red notes include a large '6' and a small 'p'.</p>	<p> <math>\checkmark (\cos x)^2</math>  <math>\checkmark \frac{\sin x}{\cos x}</math>  <math>\checkmark \cos x</math>  <math>\checkmark (-\sin x)</math>  <math>\checkmark -(\cos^2 x - \sin^2 x)</math>  <math>\checkmark -\cos 2x</math> </p> <p>(6)</p>
<p>5.3</p>	<p> <math>x^2 - 2x \sin A = \cos^2 A</math>  <math>\cos^2 A + 2x \sin A - x^2 = 0</math>  <math>\Delta = (2 \sin A)^2 - 4(-1)(\cos^2 A)</math>  <math>= 4(\sin^2 A + \cos^2 A)</math>  <math>= 4</math> </p> <p>Handwritten red notes include a large '3'.</p>	<p> <math>\checkmark</math> standard form/standaardvorm  <math>\checkmark</math> correct substitution/korrekte vervanging  <math>\checkmark \Delta = 4</math> </p> <p>(3)</p>

5.4	$\text{LHS/LK} = \frac{\cos 3x}{\sin x} + \frac{\sin 3x}{\cos x}$ $= \frac{\cos 3x \cos x + \sin 3x \sin x}{\sin x \cos x}$ $= \frac{\cos(3x - x)}{\sin x \cos x}$ $= \frac{\cos 2x}{\frac{1}{2} \sin 2x}$ $= \frac{2}{\sin 2x}$	<p>✓ Simplification Vereenvoudiging</p> <p>✓ <math>\cos 2x</math></p> <p>✓ <math>\frac{1}{2} \sin 2x</math></p> <p>(3)</p>
5.5.1	$\sin 68^\circ = \cos 22^\circ$ $= p$ <p>OR/OF</p>  <p><math>\sin 68^\circ = p</math></p>	<p>✓ <math>\cos 22^\circ</math></p> <p>✓ <math>p</math></p> <p>OR/OF</p> <p>✓ <math>y = \sqrt{1 - p^2}</math></p> <p>✓ <math>\sin 68^\circ = p</math></p> <p>(2)</p>
5.5.2	$\cos 16^\circ = \cos(38^\circ - 22^\circ)$ $= \cos 38^\circ \cos 22^\circ + \sin 38^\circ \sin 22^\circ$ $= \sqrt{1 - q^2} \cdot p + q \cdot \sqrt{1 - p^2}$ $= p \sqrt{1 - q^2} + q \sqrt{1 - p^2}$	<p>✓ <math>\cos(38^\circ - 22^\circ)</math></p> <p>✓ Expansion / Uitbreiding</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>

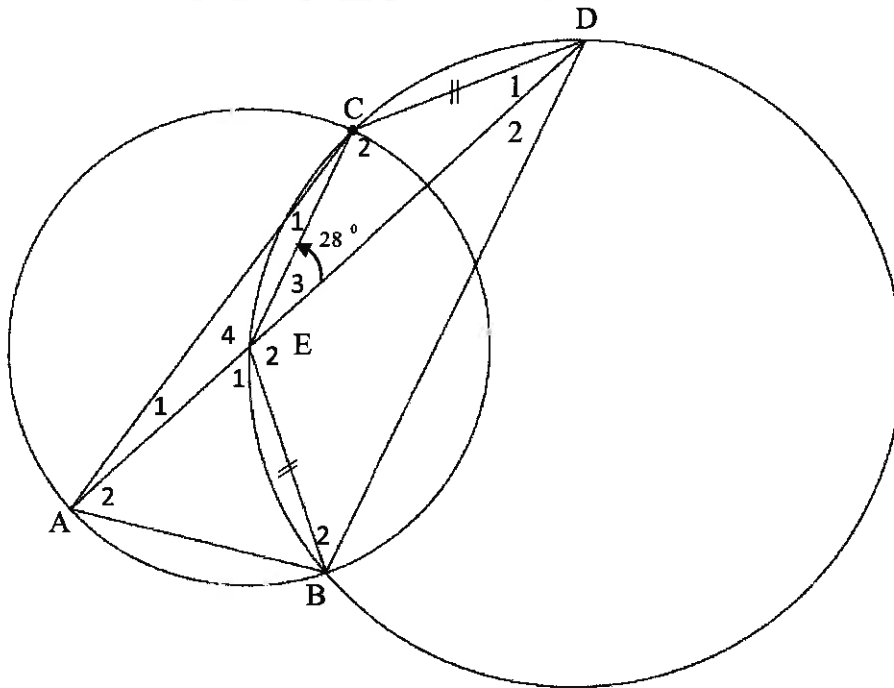
## QUESTION 7 / VRAAG 7



7.1	$AB = 2k$ ✓ $AC = \sqrt{(2k)^2 + k^2 - 2 \cdot 2k \cdot k \cdot \cos 2\theta}$ ✓ $= \sqrt{5k^2 - 4k^2 \cdot \cos 2\theta}$ $= \sqrt{k^2 (5 - 4(1 - 2\sin^2 \theta))}$ $= \sqrt{k^2 (5 - 4 + 8\sin^2 \theta)}$ ✓ $= k\sqrt{1 + 8\sin^2 \theta}$ ✓ 5	✓ AB i.t.o / i.t.v $k$ ✓ cosine rule formula in $\Delta ABC$ <i>kosinusreël formule in <math>\Delta ABC</math></i> ✓ correct subst. / <i>korrekte vervanging</i> ✓ $\cos 2\theta = 1 - 2\sin^2 \theta$ ✓ simplification / <i>vereenvoudiging</i>	(5)
7.2	$AC = 139,5\sqrt{1 + 8\sin^2(42^\circ)}$ ✓ $\approx 299$ m ✓ <i>nearest m</i>	✓ correct substitution/ <i>korrekte vervanging</i> ✓ answer/ <i>antwoord</i>	(2)
			<b>[7]</b>

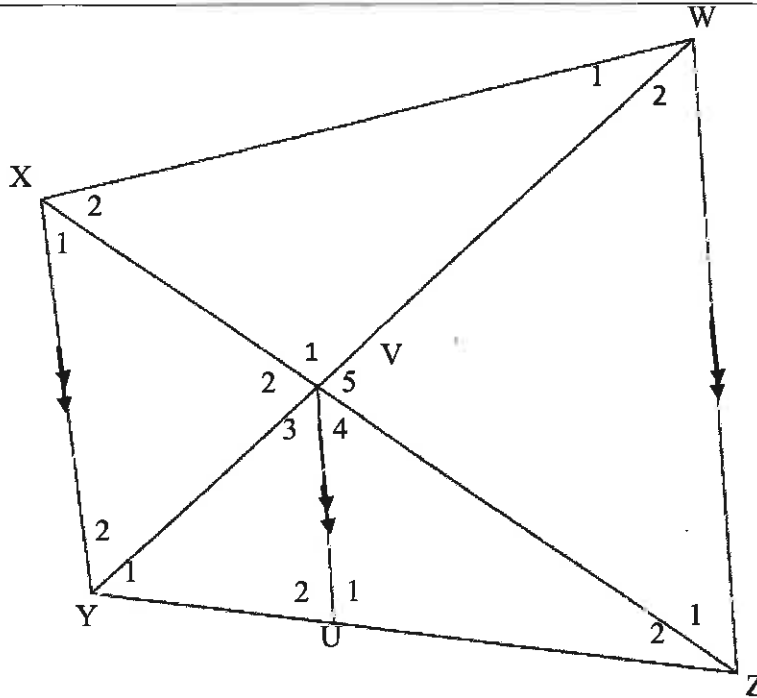
cos rule ✓

QUESTION 8 / VRAAG 8



8.1	$\hat{D}_2 = 28^\circ$ ✓ S [∠ subt by = chords] / [∠ onderspan deur = koorde] ✓ R	✓ S ✓ R (2)	2
8.2	Alternate ✓ S ∠s = / Verwisselende ∠e	✓ R (1)	1
8.3	EB = EC ✓ S but/maar EB = CD ✓ R [radii / radiusse] ∴ EC = CD [given / gegee]	✓ S ✓ R (2)	2
8.3.1	$\hat{D}_1 = 28^\circ$ ✓ S $\hat{C}_2 = 124^\circ$ ✓ S $\therefore \hat{B}_2 = 56^\circ$ ✓ S ✓ R [opp. ∠s of a cyclic quad] / [teenoorst. ∠e van koordevierhoek]	✓ S/R ✓ S ✓ S ✓ R (4)	4
8.3.2	$\hat{E}_2 = 96^\circ$ ✓ S $\therefore \hat{BAC} = \frac{1}{2}(96^\circ + 28^\circ)$ ✓ S $= 62^\circ$ ✓ S [∠ at centre = 2 × ∠ at circum f] [Middelpunts ∠ = 2 × Om trekshoek]	✓ S ✓ S ✓ R (3)	
		[12]	

QUESTION 9 / VRAAG 9



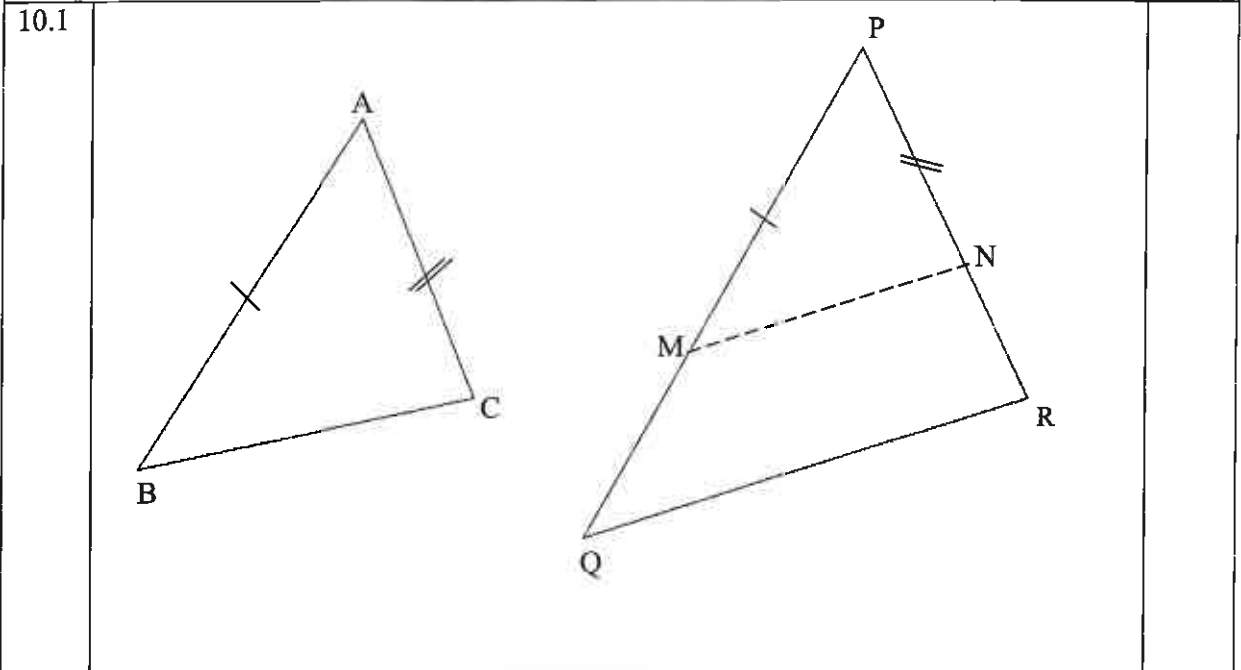
9.1	$\frac{YU}{UZ} = \frac{XV}{VZ}$ <p>[prop theo, <math>UV \parallel YX</math> or line <math>\parallel</math> to one side of a <math>\Delta</math>]                  [Eweredigh. Stelling, <math>UV \parallel YX</math> of lyn <math>\parallel</math> aan een sy van 'n <math>\Delta</math>]</p> $= \frac{YV}{VW}$ <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> $\therefore \frac{XV}{VZ} = \frac{YV}{VW}$	✓ S ✓ R  ✓ S	(3)
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9.2	$\frac{\text{Area of van } \Delta XYV}{\text{Area of van } \Delta WVZ} = \frac{\frac{1}{2} \times 3r \times 3s \times \sin \hat{V}_2}{\frac{1}{2} \times 4r \times 4s \times \sin \hat{V}_4}$ <p>but/maar <math>\hat{V}_2</math> [vert. opp. <math>\angle</math>s] / [regoorst. <math>\angle</math>e]</p> $= \frac{9}{16}$	✓ substitution / vervanging ✓ substitution / vervanging ✓ S/R ✓ answer / antwoord	(4)
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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]	✓ S/R  ✓ S/R ✓ R	(3)
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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 <math>XYZ</math></i> [omgekeerde van raaklyn – koord stelling]	✓ S ✓ R	(2)
			<b>[12]</b>

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

<p>10.2.4</p>	<p>In <math>\triangle PQR</math> and <math>\triangle QPR</math>  <math>\hat{L}PR = \hat{Q}</math> [both/beide = <math>90^\circ</math>]  <math>\hat{R}_2 = \hat{R}_1</math> [proved/alreeds bewys]  <math>\hat{L} = \hat{P}_2</math> [<math>3^{rd}^{rd}</math> <math>\angle</math>]  <math>\triangle PQR \parallel \triangle QPR</math> [<math>\angle \angle \angle</math>]  <math>\therefore \frac{LR}{PR} = \frac{PR}{QR}</math>  <math>LR = \frac{30^2}{15}</math>  <math>= 60</math></p>	<p>✓ SSS                   ✓ R                   ✓ ratios / verhoudings                   ✓ substitution / vervanging                   ✓ LR</p>	<p>(5)</p>
<p>10.2.5</p>	<p><math>NM \parallel PR</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 NM = \frac{1}{2}PR</math> [midpoint theorem / middelpunt stelling]  <math>\sin x = \frac{30\sqrt{3}}{15}</math>  <math>x = 60^\circ</math></p>	<p>✓ R                   ✓ R                   ✓ ratio/verhouding                  ✓ value of <math>x</math> /                  waarde van <math>x</math></p>	<p>(4)</p>
			<p>[26]</p>



Province of the  
**EASTERN CAPE**  
EDUCATION

LEARNER'S NAME: LEERDERNAAM:	SOLNS
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GRADE 12 GRAAD 12	
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**NATIONAL/NASIONALE  
SENIOR  
CERTIFICATE/SERTIFIKAAT**

**GRADE 12/GRAAD 12**

**SEPTEMBER 2018**

**MATHEMATICS P2/WISKUNDE V2  
SPECIAL ANSWER BOOK/SPEZIALE ANTWOORDEBOEK**

Marker/Merker			Moderator's Initials / Moderator se paraaf								NM
Question Vraag	Mark Punt	Initial Parafeer	Marks Punte	S M	Marks Punte	D M	Marks Punte	P M	Marks Punte		
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
<b>TOTAL TOTAAL</b>											

This special answer book consists of 21 pages.  
Hierdie spesiale antwoordeboek bestaan uit 21 bladsye.





QUESTION 1/VRAAG 1

Grade/Graad 9	27	40	53	55	65	67	68	76	79	79	80	83	88	94	94	x
Grade/Graad 12	34	36	42	42	57	71	68	42	70	85	76	93	95	99	91	y

1.1

$A = -6,54$  ✓  $B = 1,05$  ✓

$\therefore y = -6,54 + 1,05x$  ✓

(3)

3

1.2

$y = -6,54 + 1,05(41) = 36,51$

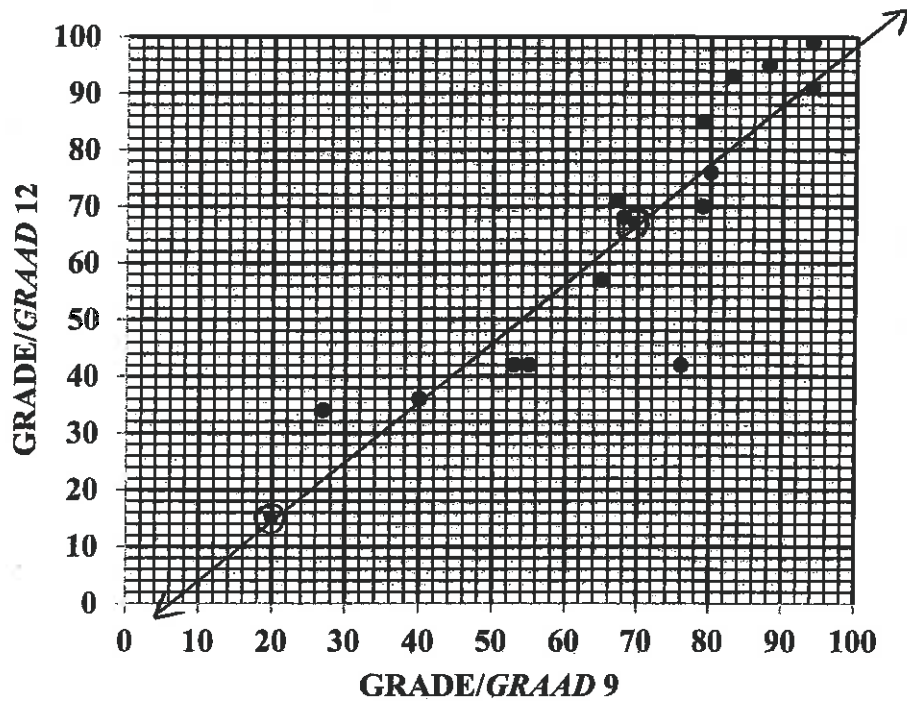
$\therefore 37\%$  ✓  $\rightarrow$  nearest  $x$

(2)

2

1.3

GRADE 12 MARKS VERSUS GRADE 9  
GRAAD 12 PUNTE VS GRAAD 9



(2)

2

$(\bar{x}, \bar{y})$   
 $= (69,87; 66,73)$  ✓  
 $x = 20$   
 $y = -6,54 + 1,05(20)$   
 $= 14,46$   
 $(20; 14,46)$  ✓

1.4

$r = 0,88$  ✓✓

(2)

2

1.5

Yes ✓,  $r = 0,88$  so there is a strong positive linear correlation between the Gr 9/12 marks.

(2)

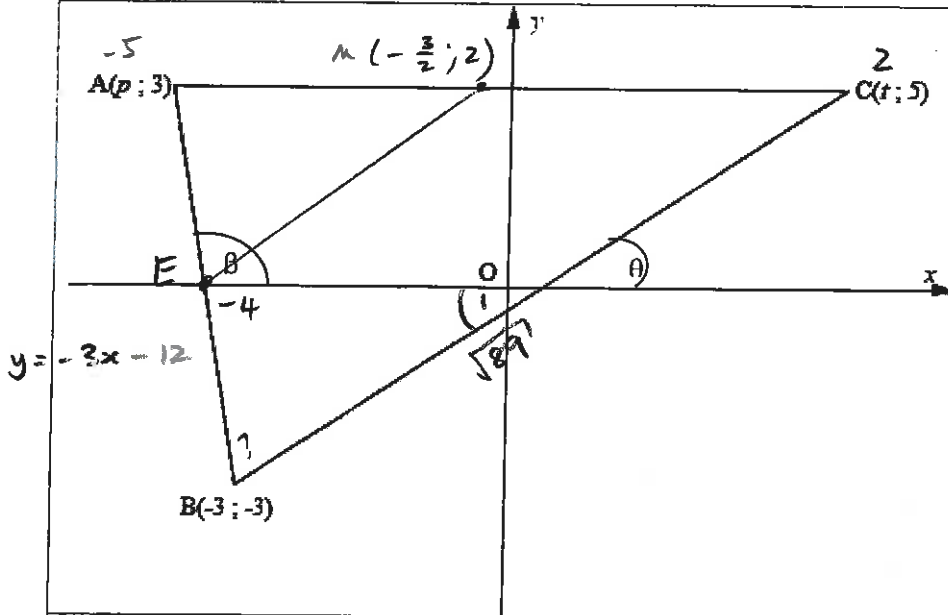
2

[11]

QUESTION 2/VRAAG 2		
10 13   15 17 18 23 24 26   28 28 29 14,63 27,37		
2.1	$R = 29 - 10$ $= 19$ ✓ →	(1)
2.2	$\bar{x} = 21$ ✓✓ →	(2)
2.3	$\sigma = 6,37$ ✓✓✓ →	(3)
2.4	$21 - 6,37 = 14,63$ $21 + 6,37 = 27,37$ ∴ 5 weeks ✓ →      ✓ both	(2)
		[8]

1  
2  
3  
2

## QUESTION 3/VRAAG 3



3.1

$$BC = \sqrt{89}$$

$$B(-3; -3) \quad C(t; 5)$$

$$\sqrt{(t - (-3))^2 + (5 - (-3))^2} = \sqrt{89}$$

$$()^2 \text{ bs: } (t+3)^2 + 64 = 89$$

$$(t+3)^2 = 25$$

$$\therefore t = -8 \text{ or } 2$$

$$t+3 = \pm 5$$

reject  $\rightarrow$ 

$$t = -3 \pm 5$$

(5)

3.2

$$y = -3x - 12$$

$$\text{Sub } A(p; 3)$$

$$3p = -15$$

$$\checkmark 3 = -3p - 12$$

$$p = -5$$

 $\rightarrow$ 

(4)

3.3

$$\text{xint: } 0 = -3x - 12$$

$$y = -3x - 12$$

$$3x = -12$$

$$x = -4$$

$$\therefore E(-4; 0)$$

(2)

5

4

2

3.4	$x_m = \frac{-5+2}{2} \quad y_m = \frac{3+5}{2} \quad A(-5;3) \quad M \quad C(2;5)$		
	$= -\frac{3}{2} \quad = 4$		
	$\therefore M(-\frac{3}{2}; 4)$		
	$\longrightarrow$		(2)
3.5	$E(-4;0) \quad M(-\frac{3}{2}; 4)$	$B(-3; -3) \quad C(2; 5)$	
	$m_{EM} = \frac{4-0}{-\frac{3}{2}-(-4)} \checkmark$	$m_{BC} = \frac{5-(-3)}{2-(-3)}$	
	$= \frac{8}{5} \checkmark$	$= \frac{8}{5} \checkmark$	
	$\therefore m_{EM} = m_{BC} \quad \text{both} = \frac{8}{5}$		
	$\therefore EM \parallel BC \quad \checkmark \text{ equal grads}$		
	$\longrightarrow$		(4)
3.6	$\tan \beta = -3 \checkmark \quad m_{AB}$	$\tan \theta = \frac{8}{5} \quad m_{BC}$	
	$\hat{\alpha} = 71,56...^\circ$	$\hat{\alpha} = 57,99...^\circ$	
	$\tan - \text{in}$	$\tan + \text{in}$	
	$\text{II} : \beta = 108,43...^\circ \checkmark$	$\text{I} : \theta = 57,99...^\circ \checkmark$	
	$\hat{\alpha} = 57,99...^\circ \quad \text{vert opp} \hat{\alpha}'s =$		
	$108,43...^\circ = 57,99...^\circ + \hat{A}BC \quad \text{ext} \hat{\alpha} \Delta$		
	$50,44^\circ = \hat{A}BC \checkmark$		
	$\longrightarrow$		(4)

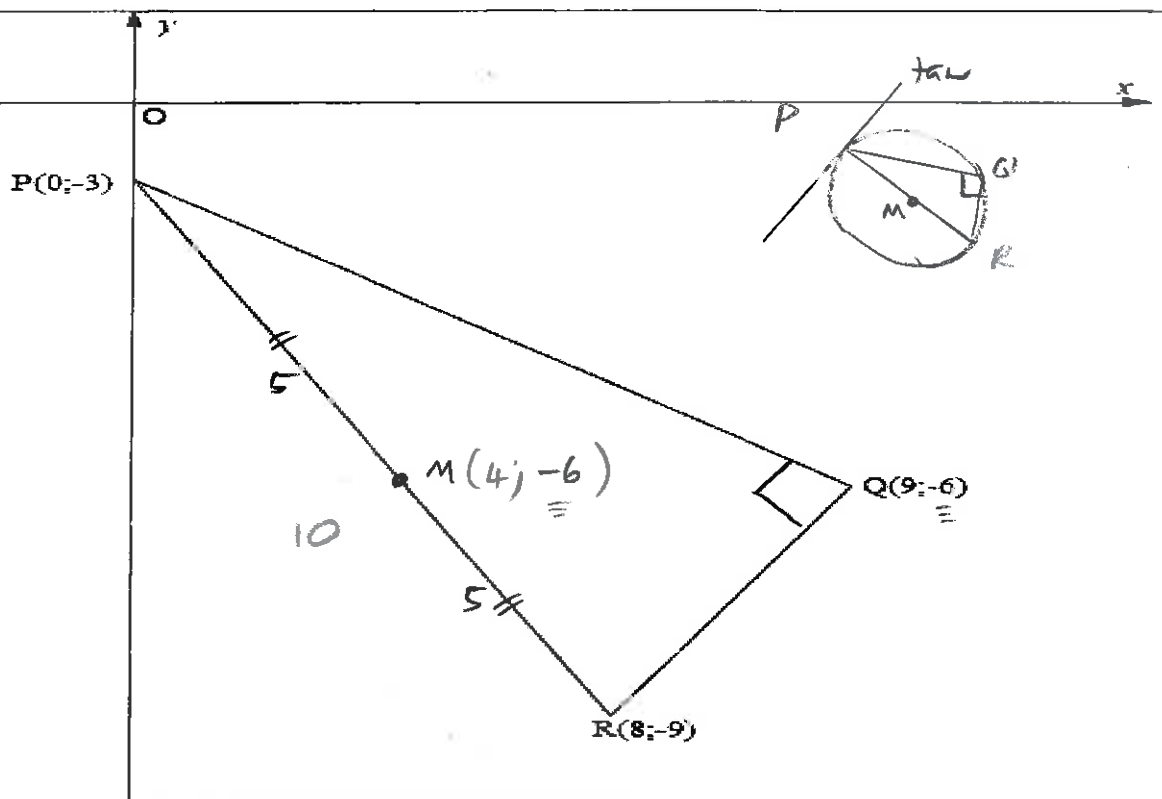
2

4

4

[21]

## QUESTION 4/VRAAG 4



4.1

$$PR = \sqrt{(9-0)^2 + (-9-(-3))^2} \quad \checkmark \quad P(0; -3) \quad R(8; -9)$$

$$= \sqrt{100}$$

$$= 10 \quad \checkmark$$

(2)

4.2

$$x_M = \frac{0+8}{2} \quad y_M = \frac{-3+(-9)}{2} \quad P(0; -3) \quad M \quad R(8; -9)$$

$$= 4 \quad \checkmark \quad \checkmark \quad = -6$$

$$\therefore M(4; -6) \quad \checkmark \quad \checkmark$$

(2)

4.3	$P(0; -3) \quad Q(9; -6)$	$Q(9; -6) \quad R(8; -9)$	
	$m_{PQ} = \frac{-6 - (-3)}{9 - 0}$	$m_{QR} = \frac{-9 - (-6)}{8 - 9}$	
	$= -\frac{1}{3}$	$= 3$	
	$\therefore \text{prod grad's} = -1$		
	$\therefore m_{PQ} \times m_{QR} = (-\frac{1}{3}) \times (3) = -1$		
	$\therefore PQ \perp QR$		
	$\therefore \hat{PQR} = 90^\circ$		
	$\rightarrow$		(4)
4.4	$PR$ is diameter	$\text{conv } \wedge$ in semi $\theta = 90^\circ$	(4)
	$\therefore M(4; -6)$ is centre	midpt of $PR$	
	$\therefore r = 5$	$PR = 10$ radius	
	$\therefore (x - 4)^2 + (y - (-6))^2 = (5)^2$		
	$\therefore (x - 4)^2 + (y + 6)^2 = 25$		
	$\xrightarrow{\text{LHS}} \quad \xrightarrow{\sqrt{25}}$		(2)
4.5	$m_{PR} = \frac{-9 - (-3)}{8 - 0}$	$P(0; -3) \quad R(8; -9)$	(5)
	$= -\frac{3}{4}$		
	$\therefore m_{\text{tan}} = \frac{4}{3}$	$\text{tan} \perp \text{rad}$	
	$\therefore y = \frac{4}{3}x + c$		
	$c = -3$	$P(0; -3)$	
	$\therefore y = \frac{4}{3}x - 3$		
	$\rightarrow$		(5)
4.6	$TR = \sqrt{146}$	$T(\cos\theta, \sin\theta) \quad R(8; -9)$	(5)
	$(\ )^2 \text{ b s} \quad TR^2 = 146$		
	$(\sin\theta - (-9))^2 + (\cos\theta - 8)^2 = 146$		
	$(\sin\theta + 9)^2 + (\cos\theta - 8)^2 = 146$		
	$\sin^2\theta + 18\sin\theta + 81 + \cos^2\theta - 16\cos\theta + 64 = 146$		
	$18\sin\theta - 16\cos\theta = 146 - 64 - 81 - 1, s^2 + c^2 = 1$		
	$18\sin\theta - 16\cos\theta = 0$		
	$18\tan\theta - 16 = 0 \quad \div \cos\theta (\cos\theta \neq 0)$		
	$\tan\theta = \frac{8}{9}$		
	$\rightarrow$		(5)
			[20]

4

2

5

5

## QUESTION 5/VRAAG 5

5.1

$$\sin A = -\frac{3}{7} = \frac{-3}{7} \frac{y}{r}$$

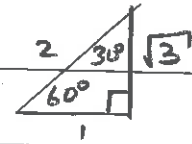
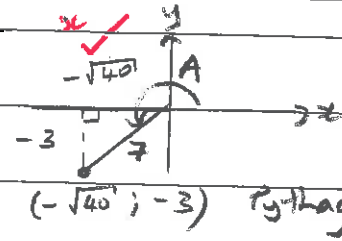
$$\sin(A + 30^\circ)$$

$$= \sin A \cos 30^\circ + \cos A \sin 30^\circ \quad (-\sqrt{40}; -3) \text{ Pythag}$$

$$= \left(-\frac{3}{7}\right) \left(\frac{\sqrt{3}}{2}\right) + \left(\frac{-\sqrt{40}}{7}\right) \left(\frac{1}{2}\right)$$

$$= \frac{-3\sqrt{3}}{14} - \frac{2\sqrt{10}}{7 \cdot 2} \quad \sqrt{40} = \sqrt{4 \cdot 10} = \sqrt{4} \cdot \sqrt{10} = 2\sqrt{10}$$

$$= -\frac{3}{14}\sqrt{3} - \frac{1}{7}\sqrt{10} = -2\sqrt{10}$$



(4)

5.2

$$\cdot \sin(90^\circ - x) = \cos x \quad \cdot \sin(-x - 360^\circ) = \sin(-x)$$

$$\cdot \cos(-x) = \cos x \quad = -\sin x$$

$$\therefore -(\cos x)^2 - \frac{\sin x}{\cos x} \cdot (\cos x) \cdot (-\sin x)$$

$$= -\cos^2 x + \sin^2 x$$

$$= -\cos^2 x + (1 - \cos^2 x)$$

$$= -\cos^2 x + 1 - \cos^2 x$$

$$= 1 - 2\cos^2 x$$

$$= -(2\cos^2 x - 1)$$

$$= -\cos 2x$$

(6)

5.3

$$x^2 - 2x \sin A = \cos^2 A$$

$$x^2 - 2 \sin A \cdot x - \cos^2 A = 0 \quad \checkmark \text{ sid } \frac{1}{2} \sin$$

$$\Delta = (-2 \sin A)^2 - 4(1)(-\cos^2 A) \quad \checkmark$$

$$= 4 \sin^2 A + 4 \cos^2 A$$

$$= 4(\sin^2 A + \cos^2 A)$$

$$= 4 \quad \checkmark$$

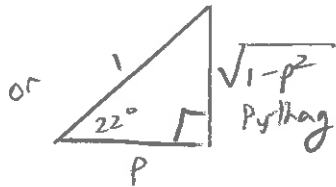
$$= 2^2 \quad \therefore \Delta > 0 \text{ and } \Delta = \text{perfect square}$$

$\therefore$  roots are real and rational

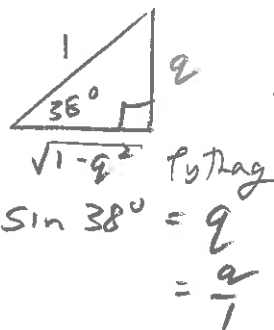
(3)

5.4	$\text{LHS} = \frac{\cos 3x}{\sin x} + \frac{\sin 3x}{\cos x}$ $= \frac{\cos 3x \cos x + \sin 3x \sin x}{\sin x \cos x}$ $= \frac{\cos(3x-x)}{\sin x \cos x}$ $= \frac{\cos 2x}{\sin x \cos x}$	$\text{RHS} = \frac{2}{\tan 2x}$ $= 2 \div \frac{\sin 2x}{\cos 2x}$ $= \frac{2}{1} \times \frac{\cos 2x}{\sin 2x}$ $= \frac{2 \cos 2x}{2 \sin x \cos x}$ $= \frac{\cos 2x}{\sin x \cos x}$	3
$\therefore \text{LHS} = \text{RHS} \rightarrow$			
(3)			
5.5	5.5.1	$\sin 68^\circ = \sin(90^\circ - 22^\circ)$ $= \cos 22^\circ$ $= p$	2
(2)			
	5.5.2	$\cos 16^\circ = \cos(38^\circ - 22^\circ)$ $= \cos 38^\circ \cos 22^\circ + \sin 38^\circ \sin 22^\circ$ $= \left(\frac{\sqrt{1-q^2}}{1}\right) p + q \left(\frac{\sqrt{1-p^2}}{1}\right)$ $= p \sqrt{1-q^2} + q \sqrt{1-p^2}$	4
(4)			
[22]			

$\sin^2 22^\circ + \cos^2 22^\circ = 1$   
 $\sin^2 22^\circ + p^2 = 1$   
 $\sin 22^\circ = \sqrt{1-p^2}$



$\cos 22^\circ = p$   
 $= \frac{p}{1}$



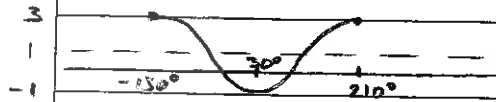
$\sin^2 38^\circ + \cos^2 38^\circ = 1$   
 $q^2 + \cos^2 38^\circ = 1$   
 $\cos 38^\circ = \sqrt{1-q^2}$



QUESTION 6/VRAAG 6

$y = a \cos(x - p)$

6.1



$\checkmark a \checkmark p$

$y = 2 \cos(x - 210^\circ) + 1$

$a = 2 \quad p = 210^\circ \text{ or } -150^\circ$

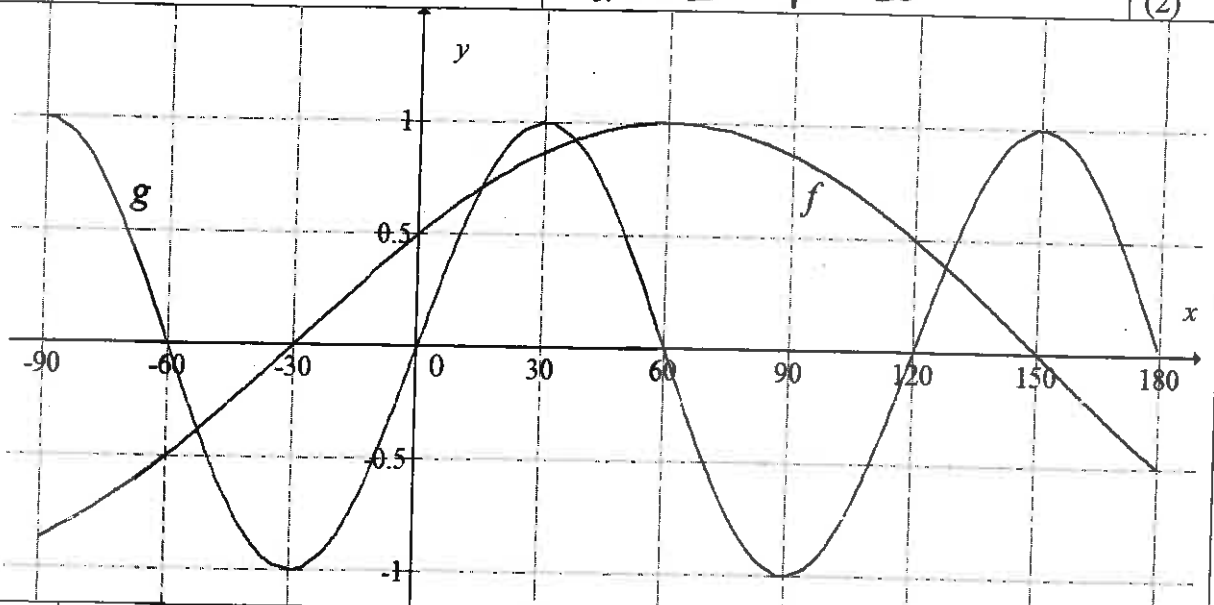
(OR)

$y = -2 \cos(x - 30^\circ) + 1$

$a = -2 \quad p = 30^\circ$

2

6.2



6.2.1

$f'(x) = 0$

$f' = 0$

$x = 60^\circ$

cos



1

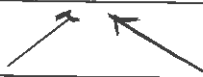
6.2.2

$f(x) = g(x)$

$\cos(x - 60^\circ) = \sin 3x$

$A = x - 60^\circ \quad B = 3x$

$\cos A = \sin B$



(KEZ)

$\cos(90^\circ - B) \quad \cos(270^\circ + B)$

$\cos A = \cos(90^\circ - B) \quad \text{or} \quad \cos A = \cos(270^\circ + B)$

$A = 90^\circ - B \quad k 360^\circ$

$A = 270^\circ + B + k 360^\circ$

(6)

PTO

6.2.3	$f(x) > g(x)$	$x \in [-90^\circ; 30^\circ]$	val ✓ not ✓ (2)
	$y_f > y_g$		
	$x \in (-52,5^\circ; 15^\circ)$		
$\xrightarrow{\hspace{10em}}$			[11]
Additional space/Addisionele ruimte			
6.2.2. cont :			
	$x - 60^\circ = 90^\circ - 3x + k360^\circ$	$x - 60^\circ = 270^\circ + 3x + k360^\circ$	
	$4x = 150^\circ + k360^\circ$	$-2x = 330^\circ + k360^\circ$	
	$x = 37,5^\circ + k90^\circ$	$x = -165^\circ - k180^\circ$	

so  $x \in [-90^\circ; 30^\circ]$

$-52,5^\circ; 37,5^\circ; x$

$-165^\circ; 15^\circ$

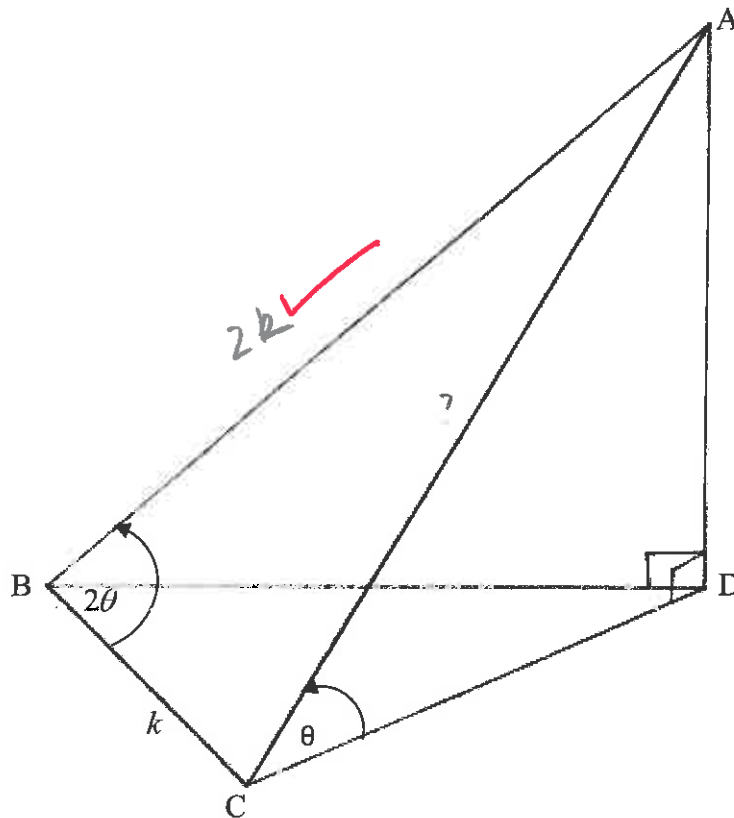
$\therefore x = -52,5^\circ$  or  $15^\circ$

$\xrightarrow{\hspace{10em}}$

2

6

## QUESTION 7/VRAAG 7



7.1

$$AC^2 = (2k)^2 + (k)^2 - 2(2k)(k)\cos 2\theta \quad \checkmark$$

$$= 4k^2 + k^2 - 4k^2(1 - 2\sin^2\theta) \quad \checkmark$$

$$= 5k^2 - 4k^2 + 8k^2\sin^2\theta$$

$$= k^2 + 8k^2\sin^2\theta \quad \checkmark$$

$$= k^2(1 + 8\sin^2\theta) \quad \checkmark$$

$$AC = \sqrt{k^2(1 + 8\sin^2\theta)}$$

$$= \sqrt{k^2} \sqrt{1 + 8\sin^2\theta} = k \sqrt{1 + 8\sin^2\theta} \quad \checkmark$$

5

(5)

7.2

$$AC = 139,5 \sqrt{1 + 8(\sin 42^\circ)^2} \quad \checkmark$$

$$= 298,60 \dots$$

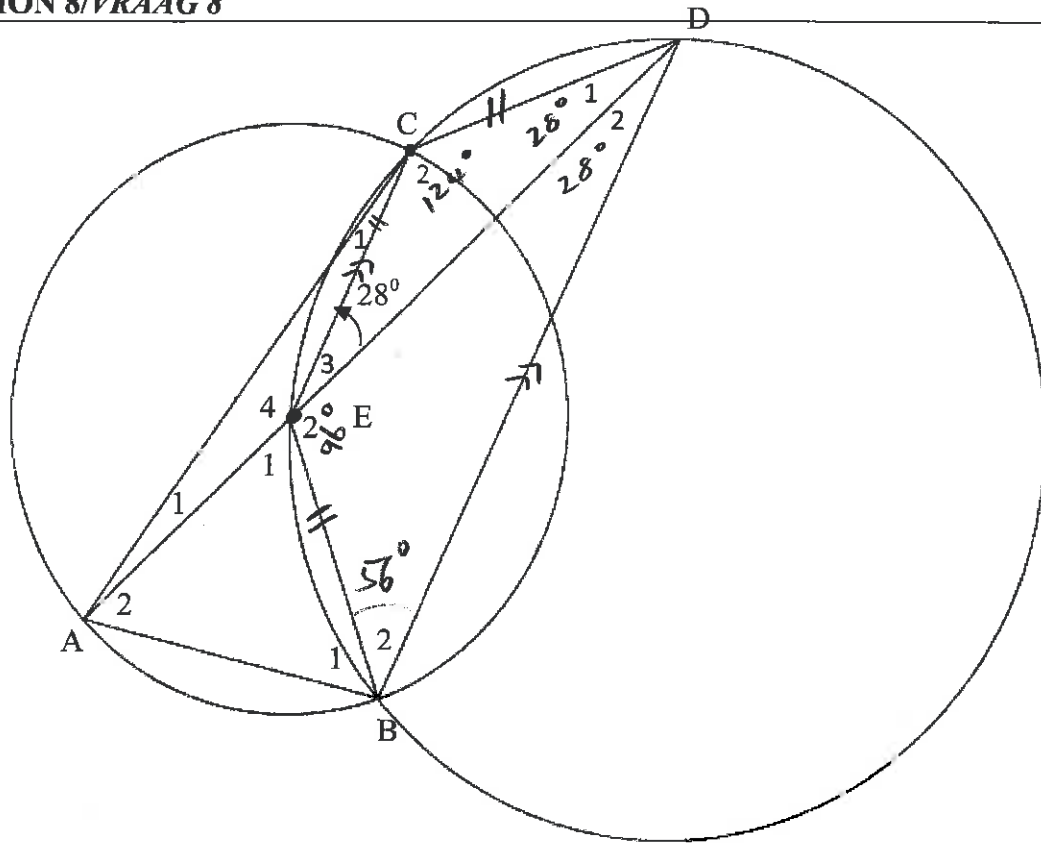
$$= 299 \text{ m} \quad \checkmark \text{ nearest m}$$

2

(2)

[7]

QUESTION 8/VRAAG 8



8.1	$\hat{D}_2 = 28^\circ$ ✓ <sup>S</sup> ✓ <sup>R</sup> = chords = $\hat{C}$ 's @ circum $\longrightarrow$	(2)
8.2	$CE \parallel BD$ $\longrightarrow$	(1)
8.3	$CD = BE$ given $CE = BE$ ✓ <sup>S</sup> ✓ <sup>R</sup> radii $\therefore CD = CE$ $\longrightarrow$	(2)

2

1

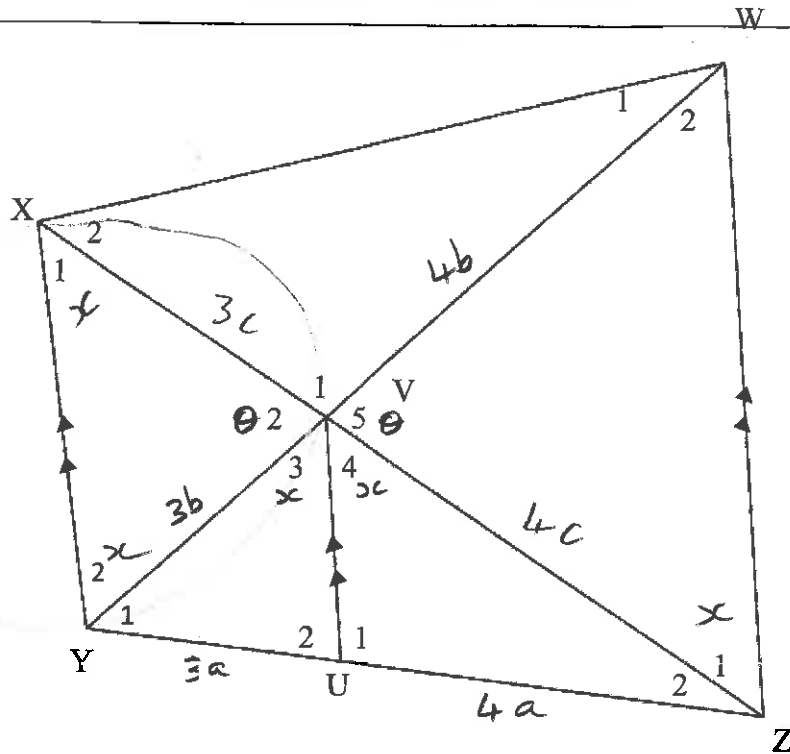
2

8.4	8.4.1	$\hat{D}_1 = 28^\circ$ ✓ <i>SR</i>	∠'s opp = sides	(4)
		$\hat{C}_2 = 124^\circ$ ✓ <i>S</i>	sum ∠'s in $\Delta = 180^\circ$	
		$\therefore \hat{B}_2 = 56^\circ$ ✓ <i>S</i> ✓ <i>R</i>	opp ∠'s cyclic quad = $180^\circ$	
		$\xrightarrow{\quad}$		
	8.4.2	$\hat{E}_2 = 96^\circ$ ✓ <i>S</i>	sum ∠'s in $\Delta = 180^\circ$	(3)
		$\therefore \hat{BEC} = 124^\circ$		
		$\therefore \hat{BAC} = 62^\circ$ ✓ <i>S</i>	∠ centre = 2 ∠ @ arcum ✓ <i>R</i>	
		$\xrightarrow{\quad}$		
				[12]

4

3

QUESTION 9/VRAAG 9



9.1

$$\frac{uZ}{YZ} = \frac{4}{7} \quad uZ = 4a \quad uY = 3a$$

$$\frac{YU}{uZ} = \frac{YV}{VW} \quad \checkmark \text{S} \quad \checkmark \text{A} \quad \text{line} \parallel \text{side of } \Delta$$

fill in 3b 4b

$$\frac{YU}{uZ} = \frac{XV}{VZ} \quad \checkmark \text{S} \quad \text{line} \parallel \text{side of } \Delta$$

fill in 3c 4c

$$\therefore \frac{YV}{VW} = \frac{XV}{VZ} \quad \text{both} = \frac{3}{4}$$

(3)

3

9.2

Let  $\angle 2 = \angle 5 = \theta$   $\checkmark \text{SP}$  vert opp  $\angle$ s =

$$\frac{\text{area } \Delta XYU}{\text{area } \Delta WVZ} = \frac{\frac{1}{2}(3b)(3c) \sin \theta}{\frac{1}{2}(4b)(4c) \sin \theta} \quad \checkmark$$

$$= \frac{9}{16} \quad \checkmark$$

(4)

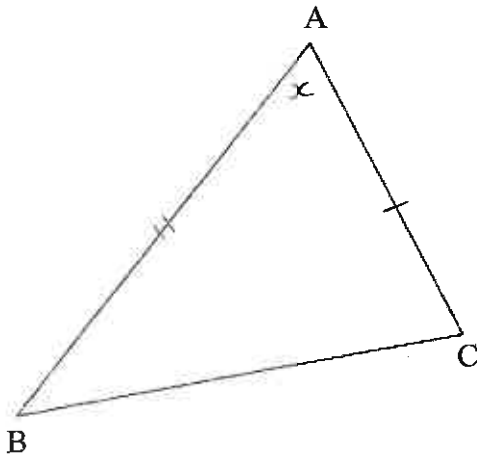
4

9.3	let $\hat{V}_3 = \hat{V}_4 = x$	given	(3)
	$\hat{Y}_2 = x$ ✓SR	alt $\hat{1}s = , XY \parallel VU$	
	$\hat{Z}_1 = x$ ✓SR	alt $\hat{1}s = , VU \parallel WZ$	
	$\therefore \hat{Y}_2 = \hat{Z}_1$	both $L = x$	
	$\therefore WXYZ$ is a $\checkmark^R$ cyclic quad	conv $\hat{1}s$ in same $\odot$	
		segm =	
9.4	$\hat{X}_1 = x$ ✓SR	conv $\hat{1}s = , XY \parallel VU$	(2)
	$\therefore \hat{V}_3 = \hat{X}_1$	both = $x$	
	$\therefore UV$ is tangent to $\odot X V Y$	conv $\hat{1}$ tan chord	
			[12]

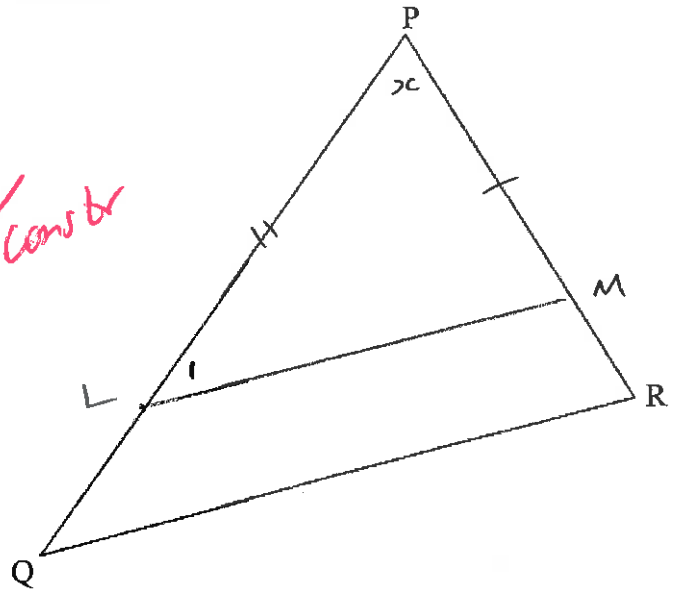
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2

QUESTION 10/VRAAG 10



✓ Constr



10.1

Constr : as shown

In  $\Delta$ 's ABC, PLM

1.  $AB = PL$

Constr

2.  $AC = PM$

Constr

3.  $\hat{A} = \hat{P}$

given

} ✓ SF

$\therefore \Delta ABC \equiv \Delta PLM$  ✓ SF SAS

$\therefore \hat{B} = \hat{L}_1$

$\Delta ABC \equiv \Delta PLM$

but  $\hat{B} = \hat{Q}$

given

$\therefore \hat{L}_1 = \hat{Q}$

both =  $\hat{B}$

$\therefore LM \parallel QR$  ✓ SF

Corollary =

$\therefore \frac{PL}{PQ} = \frac{PM}{PR}$  ✓ SF

line  $\parallel$  1 side of  $\Delta$

but  $PL = AB$   $PM = AC$  ✓ Constr

✓ conclusion method

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

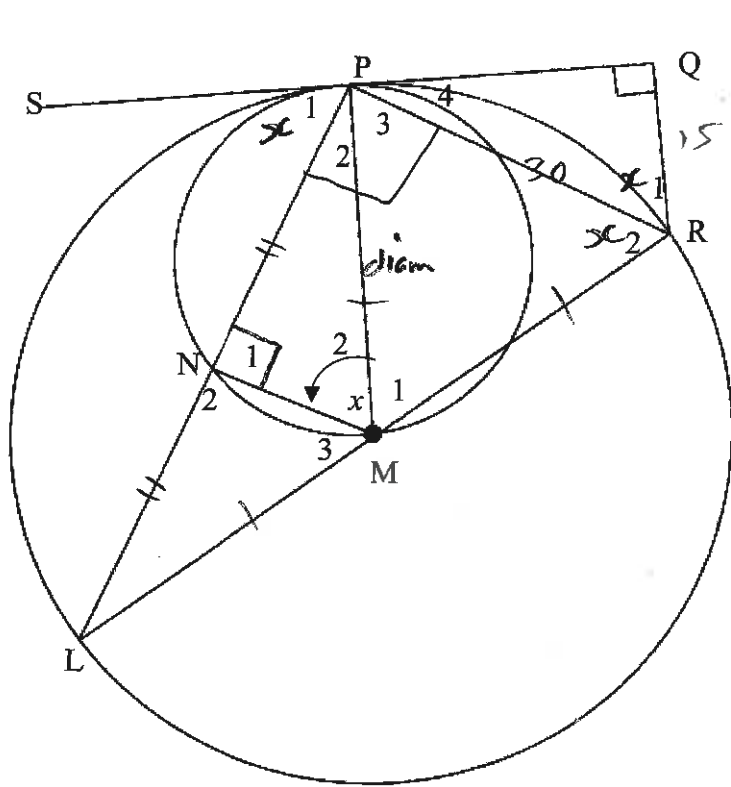


6

(6)



10.2



10.2.1

$\hat{N}_1 = 90^\circ$  ✓s ✓R

^ in semi  $\theta = 90^\circ$

$\therefore LN = NP$  ✓R

line from centre O  
⊥ to chord

(3)

10.2.2

$\hat{P}_1 = x$  ✓SR

^ tan chord

$\therefore \hat{R}_2 = x$  ✓SR

^ tan chord

$\hat{P}_2 + \hat{P}_3 = 90^\circ$  ✓SR

^ in semi  $\theta = 90^\circ$

$\therefore \hat{R}_1 = x$  ✓SR

ext ^  $\Delta$

$\therefore \hat{R}_1 = \hat{R}_2$

both = x

$\therefore PR$  bisects  $\hat{QPL}$

(4)

3

4

	10.2.3	<p>In <math>\Delta</math>'s <math>P_2N_1M_2, P_1O R_1</math></p> <p>1. <math>\hat{N}_1 = \hat{Q}</math> ✓✓S</p> <p>2. <math>\hat{M}_2 = \hat{R}_1</math> ✓✓R</p> <p><math>\therefore \Delta PNM \parallel \Delta PQR</math> AAA ✓✓R</p>	<p>both = <math>90^\circ</math> 10.2.1.</p> <p>both = <math>\sphericalangle</math> 10.2.2.</p>	(4)	4
10.3	10.3.1	<p><math>\frac{PM}{PR} = \frac{NM}{QR}</math> ✓✓S ✓✓R</p> <p><math>\frac{r}{30} = \frac{NM}{15}</math></p> <p>but <math>LM = MR</math></p> <p>and <math>LN = NP</math></p> <p><math>\therefore NM = 15</math> ✓✓SR</p> <p><math>\therefore \frac{r}{30} = \frac{15}{15}</math></p> <p><math>r = 30</math> ✓</p> <p><math>\therefore LR = 60</math> ✓✓SR</p>	<p><math>\Delta PNM \parallel \Delta PQR</math></p> <p><math>PM = \text{radius} = r</math></p> <p>radii</p> <p>10.2.1.</p> <p>Midpt Thm</p> <p>radii</p>	(5)	5
	10.3.2	<p><math>\cos x = \frac{1}{2}</math> ✓✓</p> <p><math>\text{ref}^\circ = 60^\circ</math></p> <p><math>\cos + \text{in}^\circ</math></p> <p>I: <math>x = 60^\circ</math> ✓✓</p>	<p><math>\frac{\text{adj}}{\text{hyp}} = \frac{QR}{PR} = \frac{15}{30}</math></p>	(4)	4
				(4)	[26]