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**GRADE/GRAAD 12**

**SEPTEMBER 2019**

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

**MARKS/PUNTE: 150**

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This marking guideline consists of 16 pages./  
*Hierdie nasienriglyn bestaan uit 16 bladsye.*

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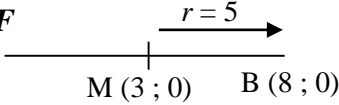
QUESTION 1/VRAAG 1		
1.1	$x = \frac{420,8}{80}$ $= 5,26$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 100px;">           Answer only: Full marks  <i>Slegs antwoord: Volpunte</i> </div>	$\checkmark \frac{420,8}{80}$ $\checkmark \text{ answer / antwoord}$
1.2	total of heights / <i>totaal van hoogtes</i> $= 4,86 \times 7 = 34,02$ Error/ <i>fout</i> = $4,98 - 4,89 = 0,09$ new total of heights / <i>nuwe totaal van hoogtes</i> $= 33,93$ new mean / <i>nuwe gemiddelde</i> = $\frac{33,93}{7} = 4,85 \text{ m}$	$\checkmark \text{ error / fout} = 0,09$ $\checkmark \text{ new total / nuwe totaal}$ $\checkmark \text{ answer / antwoord}$
1.3	Standard deviation of individual heights of the 80 giraffes would be bigger than that of 7 males. There is a bigger spread of heights among population of juveniles and adults and babies.  <i>Standaardafwyking van individuele hoogtes van 80 kameelperde sal groter wees as die van die 7 manlike kameelperde.</i> <i>Daar is 'n groter verspreiding van hoogtes onder die jeugdige en volwasse en baba bevolking.</i>	$\checkmark \text{ bigger/larger standard deviation}$ $\checkmark \text{ groter standaardafwyking}$ $\checkmark \text{ bigger spread of heights}$ $\checkmark \text{ groter verspreiding van hoogtes}$
		(2)
		(3)
		(2)
		<b>[7]</b>

QUESTION 2/VRAAG 2			
2.1	<p style="text-align: center;"><b>Price of chocolate vs % of cocoa solids</b> <i>Prys van sjokolade vs % van kakaomassas</i></p> <p style="text-align: center;">✓✓ all points plotted correctly <i>alle punte korrek afgesteek</i></p>		(2)
2.2	$\hat{y} = a + bx$ $a = 4,64 \quad b = 0,27$ $\hat{y} = 4,64 + 0,27x$	<ul style="list-style-type: none"> <li>✓ value of/waarde van <math>a</math></li> <li>✓ value of/waarde van <math>b</math></li> <li>✓ equation / vergelyking</li> </ul>	(3)
2.3	See line in 2.1 / <i>Sien lyn in 2.1</i>	<ul style="list-style-type: none"> <li>✓ correct gradient / <i>korrekte gradiënt</i></li> <li>✓ correct line / <i>korrekte lyn</i></li> </ul>	(2)
2.4	$r = 0,78$	✓ $r = 0,78$	(1)
2.5	fairly strong positive correlation in the % of cocoa and the price. <i>redelike sterk positiewe korrelasie tussen die % van kakao en die prys.</i>	✓ correct description of $r$ <i>korrek beskrywing van <math>r</math></i>	(1)
2.6.1	Brand D / <i>Handelsmerk D</i> <b>OR / OF</b> (35 ; 24)	✓ answer / <i>antwoord</i>	(1)
2.6.2	$\hat{y} = 4,64 + 0,27(35)$ $= R14,09$  Overpriced by/ <i>Te duur</i> : $R24,00 - R14,09 = R9,91$	<ul style="list-style-type: none"> <li>✓ substitution of 35 <i>vervanging van 35</i></li> <li>✓ R14,09</li> <li>✓ R9,91</li> </ul>	(3)
			<b>[13]</b>

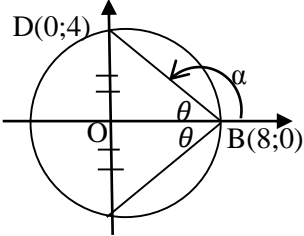
QUESTION 3 / VRAAG 3			
3.1	D (4 ; 0)	✓ answer / <i>antwoord</i>	(1)
3.2	$m_{DE} = \frac{-\frac{4}{3} - 0}{0 - 4}$ $= -\frac{4}{3} \times \left(-\frac{1}{4}\right)$ $= \frac{1}{3}$	✓ substitution / <i>vervanging</i>  ✓ answer / <i>antwoord</i>	(2)
3.3	Angle of inclination of DE / <i>Inklinasiehoek van DE</i> $= \tan^{-1} \frac{1}{3}$ $= 18,43^\circ$ $\hat{ODE} = 18,43^\circ \quad (\text{vert. opp. } \angle s) / (\text{regoorst. } \angle e)$ $\hat{OED} = 71,57^\circ \quad (\text{complementary } \angle s)$ $\quad (\text{komplementêre } \angle e)$ $\therefore \hat{PRB} = 71,57^\circ \quad (\text{corr. } \angle s : DE \parallel BC)$ $\quad (\text{ooreenk. } \angle e : DE \parallel BC)$	✓ $\tan^{-1} \frac{1}{3}$  ✓ $18,43^\circ$  ✓ answer / <i>antwoord</i>  ✓ reason / <i>rede</i>	(4)
3.4	$DE = \sqrt{(4-0)^2 + \left(0 + \frac{4}{3}\right)^2}$ $= \frac{4\sqrt{10}}{3}$	✓ substitution / <i>vervanging</i>  ✓ answer / <i>antwoord</i>	(2)
3.5	$\frac{AD}{AB} = \frac{3}{9} = \frac{1}{3}$	✓ ratios / <i>verhoudings</i> ✓ simplified answer / <i>vereenvoudigde antwoord</i>	(2)

<p>3.6</p>	<p><math>\triangle ABC \parallel \triangle ADE</math></p> $\therefore \frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{3}$ $BC = 3 DE$ $= 3 \left( \frac{4\sqrt{10}}{3} \right)$ $\therefore BC = 4\sqrt{10}$ <p style="text-align: center;"><b>OR/OF</b></p> <p>equation of BC / <i>vergelyking van BC</i></p> $y - 6 = \frac{1}{3}(x - 4)$ $\therefore y = \frac{1}{3}x + \frac{14}{3}$ $m_{AC} = \frac{\frac{5}{-4}}{-\frac{5}{12}} = -\frac{5}{12}$ <p>equation of AC / <i>vergelyking van AC</i></p> $y = -\frac{5}{12}x - \frac{4}{3}$ $\therefore \frac{1}{3}x + \frac{14}{3} = -\frac{5}{12}x - \frac{4}{3}$ $4x + 56 = -5x - 16$ $9x = -72$ $\therefore x = -8$ $y = \frac{1}{3}(-8) + \frac{14}{3}$ $\therefore y = 2$ <p>C (-8; 2) and/en B (4; 6)</p> $\therefore BC = \sqrt{(-8 - 4)^2 + (2 - 6)^2} = 4\sqrt{10}$	<p>✓ ratio of corresponding sides <i>verhouding van ooreenstemmende sye</i></p> <p>✓ isolating / isoleer BC</p> <p>✓ substitution / <i>vervang</i></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ equation of BC / <i>vergelyking van BC</i></p> <p>✓ equation of AC / <i>vergelyking van AC</i></p> <p>✓ answer / <i>antwoord</i></p>	<p style="text-align: right;">(3)</p>
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3.7.1	Midpoint of DE / <i>Middelpunt van DE</i> $\left( \frac{4+0}{2}; \frac{0-\frac{4}{3}}{2} \right)$ $\left( 2; -\frac{2}{3} \right)$	✓✓ coordinates / <i>koördinate</i>	(2)
3.7.2	$m_{\text{bisector}}/m_{\text{halveerlyn}} = -3$ Equation of bisector / <i>Vergelyking van halveerlyn</i> $y + \frac{2}{3} = -3(x - 2)$ $\therefore y = -3x + \frac{16}{3}$	✓ gradient of bisector / <i>gradiënt van halveerlyn</i>  ✓ substitution / <i>vervanging</i>  ✓ equation / <i>vergelyking</i>	(3)
3.8	$LHS/LK = -3$ $RHS/RK = -3(4) + \frac{16}{3}$ $= -\frac{20}{3} = -6\frac{2}{3} \approx -6,66$ $LHS/LK \neq RHS/RK$ No, bisector does not pass through A. / <i>Nee, die halveerlyn gaan nie deur A nie</i>	✓ substitution / <i>vervanging</i>  ✓ conclusion / <i>gevolgtrekking</i>	(2)
			<b>[21]</b>

QUESTION 4/VRAAG 4		
<p>4.1</p>	$x^2 - 6x + y^2 = 16$ $(x - 3)^2 + (y - 0)^2 = 16 + 9$ $(x - 3)^2 + (y - 0)^2 = 25$ <p>Hence centre / <i>Gevolglik middelpunt</i> (3 ; 0)                      Radius/<i>Radius</i> = <math>\sqrt{25} = 5</math></p>	<p>✓ completing the square <i>voltooing van vierkant</i>                      ✓ final form / <i>finale vorm</i></p> <p>✓ taking square root / <i>vierkantswortel</i></p>
<p>4.2.1</p>	<p><math>y = 0</math> : hence/<i>gevolglik</i> <math>(x - 3)^2 = 25</math>  <math>x - 3 = \pm 5</math>  <math>x = 3 \pm 5</math></p> <p>B (8 ; 0)</p> <p><b>OR / OF</b></p>  <p>M (3 ; 0)      B (8 ; 0)</p>	<p>✓ equating / <i>stel y = 0</i>                      ✓ solving for x / <i>Los op vir x</i></p> <p>✓ coordinates of B <i>koördinate van B</i></p> <p><b>OR / OF</b>                      ✓✓✓ use of horizontal distance / <i>gebruik van horisontale afstand</i></p>
<p>4.2.2</p>	<p><math>x = 0</math> : then/<i>dan</i> <math>(-3)^2 + y^2 = 25</math>  <math>9 + y^2 = 25</math>  <math>y^2 = 16</math>  <math>y = \pm 4</math></p> <p>C(0 ; - 4)</p> <p><b>OR/OF</b>                      using Pythagoras / <i>gebruik van Pythagoras</i>                      : <math>MD^2 = OM^2 + OD^2</math>  <math>5^2 = 3^2 + OD^2</math>  <math>4 = OD = OC</math>                      C(0 ; - 4)</p>	<p>✓ equating x to 0 <i>stel x gelyk aan 0</i></p> <p>✓ coordinates of C <i>koördinate van C</i></p> <p><b>OR/OF</b>                      ✓ use of Pythagoras <i>gebruik van Pythagoras</i>                      ✓ coordinates of C <i>koördinate van C</i></p>
<p>4.3</p>	<p><math>\widehat{MCP} = 90^\circ</math>  <math>PM^2 = MC^2 + PC^2</math>  <math>(8\frac{1}{3})^2 = 5^2 + PC^2</math>  <math>PC = \sqrt{\frac{400}{9}} = \frac{20}{3} = 6,67</math></p> <p><b>OR / OF</b></p> <p><math>\widehat{POC} = 90^\circ</math>  <math>PC^2 = PO^2 + OC^2</math>  <math>PO = 8\frac{1}{3} - 5 + 2 = \frac{16}{3}</math> and/en <math>OC = 4</math>  <math>PC^2 = (\frac{16}{3})^2 + 4^2</math>  <math>PC = \sqrt{\frac{400}{9}} = \frac{20}{3} = 6,67</math></p>	<p>✓ radius <math>\perp</math> tangent <i>radius <math>\perp</math> raaklyn</i>                      ✓ substitution into Pythag. Thm <i>vervanging in Stelling van Pyth</i></p> <p>✓ answer / <i>antwoord</i></p> <p><b>OR/OF</b></p> <p>✓ calculation of PO <i>berekening van PO</i></p> <p>✓ substitution into Pythag. Thm <i>vervanging in Stelling van Pyth</i></p> <p>✓ answer / <i>antwoord</i></p>



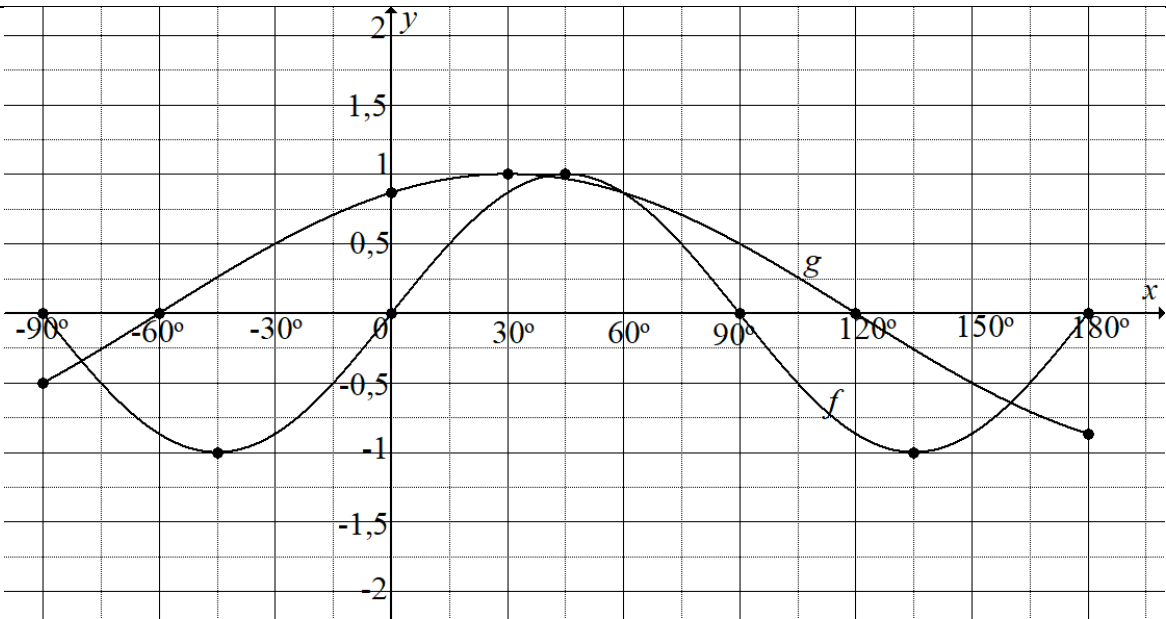
<p>4.4</p>  <p> <math>m_{BD} = -\frac{1}{2}</math>  <math>\tan^{-1}\left(-\frac{1}{2}\right) = -26,57^\circ</math>  <math>\therefore \alpha = 180 - 26,57^\circ</math>  <math>\therefore \theta = 180^\circ - 153,43^\circ = 26,57^\circ</math>  <math>\widehat{D\hat{B}C} = 2 \times 26,57^\circ</math>  <math>= 53,14^\circ</math> </p> <p style="text-align: center;"><b>OR / OF</b></p> <p> <math>\sin \theta = \frac{4}{\sqrt{(8)^2 + (-4)^2}}</math> </p> <p> <math>\sin^{-1}(0,4472\dots) = 26,57^\circ</math>  <math>\widehat{D\hat{B}C} = 2 \times 26,57^\circ = 53,14^\circ</math> </p> <p style="text-align: center;"><b>OR / OF</b></p> <p> <math>\tan \widehat{D\hat{B}O} = \frac{4}{8} = \frac{1}{2}</math> </p> <p> <math>\widehat{D\hat{B}O} = 26,57^\circ</math>  <math>\widehat{D\hat{B}C} = 2 \times 26,57^\circ</math>  <math>= 53,14^\circ</math> </p>	<p>           ✓ gradient of BD / <i>gradiënt van BD</i>            ✓ calculation of <math>\alpha</math> / <i>berekening van <math>\alpha</math></i>            ✓ angle <math>\theta</math> / <i>hoek <math>\theta</math></i>            ✓ doubling the angle / <i>verdubbeling van hoek</i> </p> <p style="text-align: center;"><b>OR / OF</b></p> <p>           ✓ sin definition / <i>sin-definisie</i>            ✓ use of arcsin / <i>gebruik van <math>\sin^{-1}</math></i>            ✓ angle <math>\theta</math> / <i>hoek <math>\theta</math></i>            ✓ doubling the angle / <i>verdubbeling van hoek</i> </p> <p style="text-align: center;"><b>OR / OF</b></p> <p>           ✓ tan ratio / <i>tan verhouding</i>            ✓ use of arctan to find angle / <i>gebruik van <math>\tan^{-1}</math> om hoek te bepaal</i>            ✓ angle / <i>hoek</i>            ✓ doubling the angle / <i>verdubbeling van hoek</i> </p>	(4)
<p>4.5</p> <p>New circle centre/<i>Nuwe sirkel middelpunt</i> - <math>M'(5; 1)</math></p> <p><math>C'(2; -3)</math></p> <p><math>m_{M'C'} = \frac{4}{3}</math></p> <p><math>m_{tan} = -\frac{3}{4}</math></p> <p><math>-3 = -\frac{3}{4}(2) + c</math></p> <p><math>\therefore c = -\frac{3}{2}</math></p> <p><math>\therefore y = -\frac{3}{4}x - \frac{3}{2}</math></p>	<p>           ✓ coordinates of <math>M'</math> and <math>C'</math> / <i>koördinate van <math>M'</math> en <math>C'</math></i>            ✓ gradient of MC / <i>gradiënt van MC</i>            ✓ gradient of tangent / <i>gradiënt van raaklyn</i> </p> <p style="text-align: center;"><b>OR / OF</b></p> <p>           ✓ equation / <i>vergelyking</i> </p>	

	<b>OR / OF</b>	<b>OR / OF</b>	
	Gradient of MC / <i>Gradiënt van MC</i> = $\frac{4}{3}$ Hence gradient of M'C' / <i>Gevolglik gradiënt van M'C'</i> = $\frac{4}{3}$ (MC $\parallel$ M'C') Gradient of tangent at C' / <i>Gradiënt van raaklyn by C'</i> = $-\frac{3}{4}$ (M'C' $\perp$ tang at C') (M'C' $\perp$ raaklyn by C') C' = (2 ; - 3) $\therefore y + 3 = -\frac{3}{4}(x - 2)$ $\therefore y = -\frac{3}{4}x - \frac{3}{2}$	✓ gradient of MC / <i>gradiënt van MC</i> ✓ gradient of M'C' / <i>gradiënt van M'C'</i> ✓ coordinates of C' / <i>koördinate van C'</i> ✓ equation / <i>vergelyking</i>	(4)
			<b>[19]</b>
<b>QUESTION 5/VRAAG 5</b>			
5.1.1	1	✓ answer / <i>antwoord</i>	(1)
5.1.2	cos 2A	✓ answer / <i>antwoord</i>	(1)
5.2.1	$3^2 = 2^2 + k^2$ $k = -\sqrt{5}$	✓ distance formula / <i>afstand formule</i> Pythagoras Thm / <i>Stelling</i> ✓ answer with correct sign <i>antwoord met korrekte teken</i>	(2)
5.2.2(a)	$\tan(\theta - 180^\circ) = \tan \theta$ $= -\frac{\sqrt{5}}{2}$	✓ reduction / <i>reduksie</i> ✓ answer / <i>antwoord</i>	(2)
5.2.2(b)	$\frac{1 - \sin^2 2\theta}{1 - 2\sin^2 \theta} = \frac{\cos^2 2\theta}{\cos 2\theta}$ $= \cos 2\theta$ $= 1 - 2\sin^2 \theta$ $= 1 - 2\left(-\frac{\sqrt{5}}{3}\right)^2$ $= 1 - \frac{10}{9}$ $= -\frac{1}{9}$ <p style="text-align: center;"><b>OR / OF</b></p> $\frac{1 - \sin^2 2\theta}{1 - 2\sin^2 \theta} = \frac{\cos^2 2\theta}{\cos 2\theta}$ $= \cos 2\theta$ $= 2\cos^2 \theta - 1$ $= 2\left(\frac{2}{3}\right)^2 - 1$ $= \frac{8}{9} - 1$ $= -\frac{1}{9}$	✓ $1 - \sin^2 2\theta = \cos^2 2\theta$ ✓ $1 - 2\sin^2 \theta = \cos 2\theta$ ✓ substitution for sin <i>vervanging vir sin</i> ✓ answer / <i>antwoord</i> <p style="text-align: center;"><b>OR / OF</b></p> ✓ $1 - \sin^2 2\theta = \cos^2 2\theta$ ✓ $1 - 2\sin^2 \theta = \cos 2\theta$ ✓ substitution for cos <i>vervanging vir cos</i> ✓ answer / <i>antwoord</i>	

	OR / OF	OR / OF	
	$\frac{1 - \sin^2 2\theta}{1 - 2\sin^2 \theta} = \frac{1 - (2\sin\theta\cos\theta)^2}{1 - 2\sin^2 \theta}$ $= \frac{1 - \left[2\left(-\frac{\sqrt{5}}{3}\right)\left(\frac{2}{3}\right)\right]^2}{1 - 2\left(-\frac{\sqrt{5}}{3}\right)^2}$ $= -\frac{1}{9}$	<ul style="list-style-type: none"> <li>✓ <math>\sin^2 2\theta = (2\sin\theta\cos\theta)^2</math></li> <li>✓ substitution for <math>\sin \theta</math> <i>vervanging vir <math>\sin \theta</math></i></li> <li>✓ substitution for <math>\cos \theta</math> <i>vervanging vir <math>\cos \theta</math></i></li> <li>✓ answer / <i>antwoord</i></li> </ul>	(4)
5.3	$\sin(-200^\circ)\cos 310^\circ + \tan(-135^\circ)\cos 380^\circ \sin 230^\circ$ $= \sin(20^\circ)(\cos 50^\circ) + (\tan 45^\circ)(\cos 20^\circ)(-\sin 50^\circ)$ $= \sin 20^\circ \cos 50^\circ - (1)\cos 20^\circ \sin 50^\circ$ $= \sin(20^\circ - 50^\circ)$ $= \sin(-30^\circ)$ $= -\frac{1}{2}$	<ul style="list-style-type: none"> <li>✓ ✓ ✓ ✓ reductions to acute angles / <i>reduksie tot skerphoeke</i></li> <li>✓ sin expansion / <i>sin uitbreiding</i></li> <li>✓ answer / <i>antwoord</i></li> </ul>	(6)
5.4	$\text{LHS/LK} = \sin 2\theta + \cos(2\theta - 90^\circ)$ $= \sin 2\theta + \sin 2\theta$ $= 2 \sin 2\theta$ $= 2(2\sin \theta \cos \theta)$ $= 4 \sin \theta \cos \theta$ $= \text{RHS/RK}$	<ul style="list-style-type: none"> <li>✓ <math>\cos(2\theta - 90^\circ) = \sin 2\theta</math></li> <li>✓ simplification <i>vereenvoudiging</i></li> <li>✓ expansion / <i>uitbreiding</i></li> </ul>	(3)
5.5	$10^{\sin x} + 10^{\sin x} \cdot 10^1 = 110$ $10^{\sin x}(1 + 10) = 110$ $10^{\sin x} = 10^1$ $\therefore \sin x = 1$ $\therefore x = -270^\circ \text{ or/of } x = 90^\circ$	<ul style="list-style-type: none"> <li>✓ split into product of 2 bases <i>skei in product van 2 basisse</i></li> <li>✓ simplification / factorisation <i>vereenvoudiging/faktorisering</i></li> <li>✓ division by 11 / <i>deel deur 11</i></li> <li>✓ equating the exponents <i>gelykstel van eksponente</i></li> <li>✓ both solutions / <i>beide oplossings</i></li> </ul>	(5)
			[24]

**QUESTION 6/VRAAG 6**

6.1



✓ completing / voltooiing van  $f(x) = \sin 2x$  graph/grafiek

(1)

6.2

See graph in 6.1 / Sien grafiek in 6.1

$g(x) = \cos(x - 30^\circ)$   
 ✓ y intercept / y-afsnit  
 ✓ end points / eindpunte  
 ✓ turning point / draaipunte  
 ✓ x intercepts / x-afsnitte

(4)

6.3

$\sin 2x = \sin(90^\circ - (x - 30^\circ))$   
 $\sin 2x = \sin(120^\circ - x)$   
 $2x = 120^\circ - x + k \cdot 360^\circ$  or/of  $2x = 180^\circ - (120^\circ - x) + k \cdot 360^\circ$   
 $3x = 120^\circ + k \cdot 360^\circ$  or/of  $x = 60^\circ + k \cdot 360^\circ$   
 $\therefore x = 40^\circ + k \cdot 120^\circ$  or/of  $x = 60^\circ + k \cdot 360^\circ ; k \in \mathbb{Z}$   
 $k = 0 : \theta = 40^\circ ; 60^\circ$   
 $k = -1 : \theta = -80^\circ$

✓ co-ratio on RHS  
 ko-verhouding RK  
 ✓ simplification  
 vereenvoudiging  
 ✓  $x = 40^\circ + k \cdot 120^\circ$   
 ✓  $x = 60^\circ + k \cdot 360^\circ$   
 ✓✓ solutions  
 oplossings

(6)

[11]

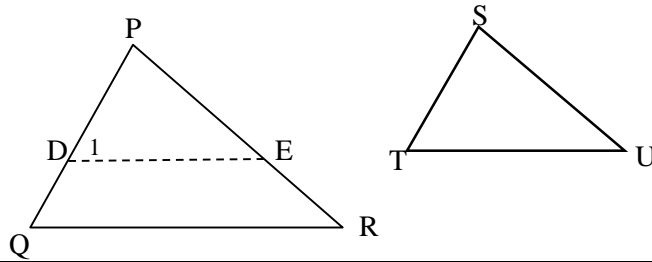
QUESTION 7/VRAAG 7		
7.1	$\tan y = \frac{PB}{k}$ $\therefore PB = k \cdot \tan y$ $\tan x = \frac{PB}{BC}$ $\therefore BC = \frac{PB}{\tan x}$ Hence/ <i>Gevolglik</i> $BC = \frac{k \cdot \tan y}{\tan x}$	✓ use of tan ratio <i>gebruik van tan verhouding</i> ✓ $PB = k \cdot \tan y$  ✓ $BC = \frac{PB}{\tan x}$
7.2	$(AC)^2 = (4,73)^2 + (3)^2 - 2(4,73)(3)(\cos 100^\circ)$  $AC = 6,03 \text{ m}$	✓ use of cosine rule <i>gebruik van cosinusreël</i> ✓ correct substitution in cosine rule <i>korrekte vervanging in cosinusreël</i> ✓ answer / <i>antwoord</i>
		<b>[6]</b>

QUESTION 8 / VRAAG8			
8.1.1	$\widehat{BAE} = 90^\circ$ ( $\angle$ in a semi-circle / $\angle$ in halwe sirkel)	✓ statement/stelling (S) ✓ reason / rede (R)	(2)
8.1.2	$\widehat{E}_1 = 40^\circ$ (sum of $\angle$ s of $\Delta$ / som van $\angle$ e van $\Delta$ )	✓ statement / S ✓ reason / R	(2)
8.1.3	$\widehat{C}_1 = 40^\circ$ ( $\angle$ s subtended by AB OR $\angle$ s in the same segment) ( $\angle$ e onderspan deur AB OF $\angle$ e in dieselfde segment)	✓ statement / S ✓ reason / R	(2)
8.1.4	$\widehat{C}_2 = 62^\circ$ (ext. $\angle$ of cyclic quad. / buite $\angle$ van koordev.)	✓ statement / S ✓ reason / R	(2)
8.1.5	$\widehat{ABD} = 62^\circ$ ( $\angle$ s subtended by AD OR $\angle$ s in the same segment OR ext. $\angle$ of cyclic quad.) ( $\angle$ e onderspan deur AD OF $\angle$ e in dieselfde segment OF buite $\angle$ van koordevierhoek)	✓ statement / S ✓ reason / R	(2)
8.2	equal to the angle in the alternate segment/ gelyk aan die hoek in die oorsaande segment	✓ answer / antwoord	(1)
8.3	R.T.P / Te Bewys: STUR cyclic / koordevierhoek Proof : $\widehat{U}_2 = x$ (tan chord thm)/(raaklyn koord stelling) $\widehat{R}_3 = y$ (tan chord thm)/(raaklyn koord stelling) $\widehat{R}_2 = 180^\circ - (x + y)$ ( $\angle$ s on str line)/( $\angle$ e op reguitlyn) <b>OR/OF</b> $\widehat{R}_2 = 180^\circ - (x + y)$ (3 $\angle$ s $\Delta$ )/(3 $\angle$ e $\Delta$ ) $T + \widehat{R}_2 = 180^\circ$  STUR cyclic (opposite angles are suppl.) STUR is 'n koordevierhoek (oorstaande hoeke is suppl.)	✓ statement / S ✓ reason / R ✓ S & R ✓ S & R  ✓ opp. $\angle$ s of quad. supplementary teenoorst. $\angle$ e van vierhoek supplementêr	(5)
8.4	$PN = NQ = 8$ units/eenhede (line from the centre $\perp$ chord) (lynstuk vanaf middelpunt $\perp$ koord)  $MP^2 = 6^2 + 8^2$ (Pyth. Theorem)/(Pyth. Stelling) $\therefore MP = 10$ units/eenhede $MP = RM = MT = 10$ (radii)/(radiusse) $\therefore RT = 20$ units/eenhede	✓ S & R ✓ S & R  ✓ S & R ✓ answer / antwoord	(4)
			<b>[20]</b>

QUESTION 9/VRAAG9			
9.1.1	$\frac{AD}{DE} = \frac{AC}{CF} \quad (\text{prop. theorem; } DC \parallel EF)$ $\frac{12}{3} = \frac{AC}{5}$ $20 = AC$ <p>(<i>Eweredigh. stelling ; DC    EF</i>)</p>	✓ S & R ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i>	(3)
9.1.2	$AO = 10$ (diagonals of a parallelogram bisect) ( <i>hoeklyne van 'n parallelogram halveer</i> )	✓ answer / <i>antwoord</i>	(1)
9.1.3	$\triangle ADC \parallel \triangle AEF \quad (\angle, \angle, \angle)$ $\frac{AD}{AE} = \frac{DC}{EF} \quad (\parallel \Delta s: \text{sides in prop.})$ $\frac{12}{15} = \frac{14}{EF}$ $EF = \frac{14 \times 15}{12}$ $EF = 17,5$ <p>(<i>   Δe : sye is eweredig</i>)</p>	✓ S & R ✓ statement / S ✓ answer / <i>antwoord</i>	(3)
9.2	$\frac{\text{Area } \triangle ADC}{\text{Area } \triangle AEF} = \left(\frac{12}{15}\right)^2$ $= \left(\frac{4}{5}\right)^2 = \frac{16}{25}$ $\frac{\text{Area } \triangle ADO}{\text{Area } \triangle ADC} = \frac{1}{2}$ $\frac{\text{Area } \triangle ADC}{\text{Area } \triangle AEF} \times \frac{\text{Area } \triangle ADO}{\text{Area } \triangle ADC} = \frac{\text{Area } \triangle ADO}{\text{Area } \triangle AEF}$ <p>But/Maar: <math display="block">\frac{\text{Area } \triangle ADC}{\text{Area } \triangle AEF} \times \frac{\text{Area } \triangle ADO}{\text{Area } \triangle ADC} = \frac{16}{25} \times \frac{1}{2}</math></p> $= \frac{8}{25}$ $\therefore \frac{\text{Area } \triangle ADO}{\text{Area } \triangle AEF} = \frac{8}{25}$ <p style="text-align: center;"><b>OR/OF</b></p> $\frac{\text{Area } \triangle ADO}{\text{Area } \triangle AEF} = \frac{\frac{1}{2} AD \cdot AO \sin \hat{D}AO}{\frac{1}{2} AE \cdot AF \sin \hat{D}AO}$ $= \frac{12 \times 10}{15 \times 25}$ $= \frac{8}{25}$	<p><b>(Area =&gt; Oppervlakte)</b></p> ✓ $\frac{\text{Area } \triangle ADC}{\text{Area } \triangle AEF} = \frac{16}{25}$ ✓ $\frac{\text{Area } \triangle ADO}{\text{Area } \triangle ADC} = \frac{1}{2}$ ✓ simplification / <i>vereenvoudiging</i> <p style="text-align: center;"><b>OR/OF</b></p> ✓ use of area rule <i>gebruik van oppervlakte reël</i> ✓ area of $\triangle ADO$ ✓ area of $\triangle AEF$	(3)
			<b>[10]</b>

**QUESTION 10/VRAAG 10**

10.1



Construction: Mark D on PQ and E on PR such that PD = ST and PE = SU. Join DE.

Konstruksie: Merk D op PQ en E op PR sodat PD = ST en PE = SU. Verbind DE.

Proof/Bewys: In  $\triangle PDE$  and/en  $\triangle STU$

$\hat{P} = \hat{S}$  (given) / (gegee)

PD = ST (construction) / (konstruksie)

PE = SU (construction) / (konstruksie)

$\triangle PDE \equiv \triangle STU$  (SAS)

$\therefore \hat{D}_1 = \hat{T}$  ( $\equiv \Delta$ 's)

But/Maar:  $\hat{Q} = \hat{T}$  (given) / (gegee)

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

$\therefore DE \parallel QR$  (corr.  $\angle$  s =) / (ooreenk.  $\angle$  e =)

$\therefore \frac{PD}{PQ} = \frac{PE}{PR}$  (prop. theorem;  $DE \parallel QR$ )

$\therefore \frac{ST}{PQ} = \frac{SU}{PR}$

✓ construction / konstruksie

✓ S & R

✓  $\hat{D}_1 = \hat{T}$

✓  $\hat{D}_1 = \hat{Q}$

✓ reason for lines

||

rede vir // lyne

✓ prop. theorem;

DE || QR

eweredigh. stelling;

DE||QR

(6)

10.2.1

$\hat{A} = x$  (tan chord thm)/(raakl koord stelling)

$\hat{C}_3 = x$  (angles opp. = sides)/(hoeke teenoor = sye)

✓ statement(S) ✓

reason(R)

✓ S & R

(3)

10.2.2

R.T.P/Te Bewys:  $\triangle TOC \parallel \triangle BPC$

$\hat{A}CB = 90^\circ$  ( $\angle$  in the semi-circle)/( $\angle$  in halwe sirkel)

Proof/Bewys :  $\hat{C}_3 = \hat{C}_1 = x$  (proved)/(reeds bewys)

$\hat{T}_2 = 90^\circ + x$  (ext.  $\angle$  of  $\Delta$ ) / (buite  $\angle$  van  $\Delta$ )

$\hat{B}_1 = 90^\circ + x$  (ext.  $\angle$  of  $\Delta$ ) / (buite  $\angle$  van  $\Delta$ )

$\therefore \hat{T}_2 = \hat{B}_1$

$\therefore \hat{O}_2 = \hat{P}$  (sum of  $\angle$  s in  $\Delta$ ) / (som van  $\angle$  e in  $\Delta$ )

$\therefore \triangle TOC \parallel \triangle BPC$  ( $\angle, \angle, \angle$ )

**OR/OF**

$\hat{A}CB = 90^\circ$  ( $\angle$  in the semi-circle) / (hoek in halwe sirkel)

$\hat{B}_2 = 90^\circ - x$  (sum of  $\angle$  s in  $\Delta$ ) / (som van  $\angle$  e in  $\Delta$ )

$\therefore \hat{P} = 90^\circ - 2x$  (ext.  $\angle$  of  $\Delta$ ) / (buite  $\angle$  van  $\Delta$ )

$\hat{O}_1 = 2x$  ( $\angle$  at centre =  $2 \times \angle$  at circum.) / (Middelpunts  $\angle = 2 \times$  Omtrekshoek)

$\therefore \hat{O}_2 = 90^\circ - 2x$  (SO  $\perp$  AB)

$\therefore \hat{O}_2 = \hat{P}$

$\hat{C}_3 = \hat{C}_1 = x$  (proved above) / (alreeds bo bewys)

$\therefore \triangle TOC \parallel \triangle BPC$  ( $\angle, \angle, \angle$ )

✓ S & R

✓ S

✓ S & R

✓ S

✓ R

**OR/OF**

✓ S & R

✓ S

✓ S & R

✓ S

✓ R

(5)



10.2.3	<p>R.T.P/<i>Te Bewys</i>: <math>TO \cdot PC = OB \cdot BP</math></p> <p>Proof/<i>Bewys</i> : <math>\frac{TO}{BP} = \frac{OC}{PC}</math></p> <p>But/<i>Maar</i> <math>OC = OB</math> (radii)/(radiusse)</p> <p><math>\therefore \frac{TO}{BP} = \frac{OB}{PC}</math></p> <p><math>\therefore TO \cdot PC = OB \cdot BP</math></p>	<p>✓ sides in prop. <i>sy is eweredig</i></p> <p>✓ S</p>	(2)
10.2.4	<p>In <math>\triangle OPC</math>:</p> <p><math>OP^2 = OC^2 + PC^2</math> (Pyth. theorem/<i>stelling</i>)</p> <p>But/<i>Maar</i>: <math>OB = OC = BP</math> (radii)/(radiusse)</p> <p><math>\therefore (2OC)^2 = OC^2 + PC^2</math></p> <p><math>4OC^2 = OC^2 + PC^2</math></p> <p><math>\therefore PC^2 = 3OC^2</math></p>	<p>✓ S &amp; R</p> <p>✓ <math>OB = OC = BP</math></p> <p>✓ <math>(2OC)^2 = OC^2 + PC^2</math></p>	(3)
			<b>[19]</b>
<b>TOTAL/TOTAAL:</b>			<b>150</b>