



**GAUTENG PROVINCE**  
EDUCATION  
REPUBLIC OF SOUTH AFRICA

# **PREPARATORY EXAMINATION VOORBEREIDENDE EKSAMEN**

**2020**

## **MARKING GUIDELINES / NASIENRIGLYNE**

**MATHEMATICS (PAPER 2) (10612)  
WISKUNDE (VRAESTEL 2) (10612)**

**21 pages / bladsye**

**NOTE:**

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

**LET WEL:**

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aannames van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

<b>GEOMETRY / MEETKUNDE</b>	
<b>S</b>	A mark for a correct statement (A statement mark is independent of a reason.)
	<i>'n Punt vir 'n korrekte bewering (n Punt vir 'n bewering is onafhanklik van die rede.)</i>
<b>R</b>	A mark for a correct reason (A reason mark may only be awarded if the statement is correct.)
	<i>'n Punt vir 'n korrekte rede (n Punt word slegs vir die rede toegeken as die bewering korrek is.)</i>
<b>S / R</b>	Award a mark if the statement AND reason are both correct.
	<i>(Ken 'n punt toe as beide die bewering EN rede korrek is.)</i>

## QUESTION / VRAAG 1

1.1	$\bar{x} = \frac{1\ 581}{31}$ $= 51$ <b>OR / OF</b> $\bar{x} = 51 \text{ (calculator method / sakrekenaar metode)}$	$\checkmark \frac{1\ 581}{31}$ $\checkmark 51$ <b>OR / OF</b> $\checkmark \checkmark 51$	(2)
1.2	$\therefore$ skewed to the right (positively skewed) $\therefore$ skeef na regs (positief skeef)	$\checkmark$ answer / antwoord	(1)
1.3	Physical Sciences performed better. $Q_1$ is 40% in Physical Sciences and 28% in Mathematics which indicates the lower 25% of the class performed much better in Physical Sciences than in Mathematics. <i>Fisiese Wetenskappe presteer beter.</i> $Q_1$ is 40% in Fisiese Wetenskappe en 28% in Wiskunde wat aandui dat die onderste 25% van die klas heelwat beter presteer in Fisiese Wetenskappe as in Wiskunde.	$\checkmark$ answer / antwoord  $\checkmark$ reason / rede	(2)
1.4	Accept any mark between 40 – 50. Aanvaar enige punt tussen 40 – 50 .	$\checkmark \checkmark$ answer / antwoord	(2)
1.5	The greatest difference is $87\% - 71\% = 16\%$ $\therefore$ the Physical Sciences mark is 71%. Die grootste verskil is $87\% - 71\% = 16\%$ $\therefore$ die Fisiese Wetenskappe punt is 71%.	$\checkmark 87\% - 71\% = 16\%$ $\checkmark$ answer / antwoord <b>answer only full marks /  antwoord alleenlik volpunte</b>	(2)
			<b>[9]</b>

## QUESTION / VRAAG 2

2.1	$a = 12,41$ $b = 0,49$ $\hat{y} = 12,41 + 0,49x$	$\checkmark a = 12,41$ $\checkmark b = 0,49$ $\checkmark \hat{y} = 12,41 + 0,49x$	(3)
2.2	$\hat{y} = 12,41 + 0,49x$ $= 12,41 + 0,49(150)$ $= 85,91 \approx 86\%$  <b>OR/OF</b> $\hat{y} = 85,17$	$\checkmark$ substitution / vervanging $\checkmark$ answer / antwoord  <b>OR/OF</b> $\checkmark \checkmark \hat{y} = 85,17$	(2)
2.3	$\hat{y} = 12,41 + 0,49x$ The y-intercept is 12,41 which means that a learner who did not begin the exam achieved 12,41%. This is clearly impossible. Die y-afsnit is 12,41 wat beteken dat 'n leerling wat die eksamen nie begin het nie, alreeds 12,41% behaal het. Dit is onmoontlik.	$\checkmark$ conclusion / gevolgtrekking	(1)

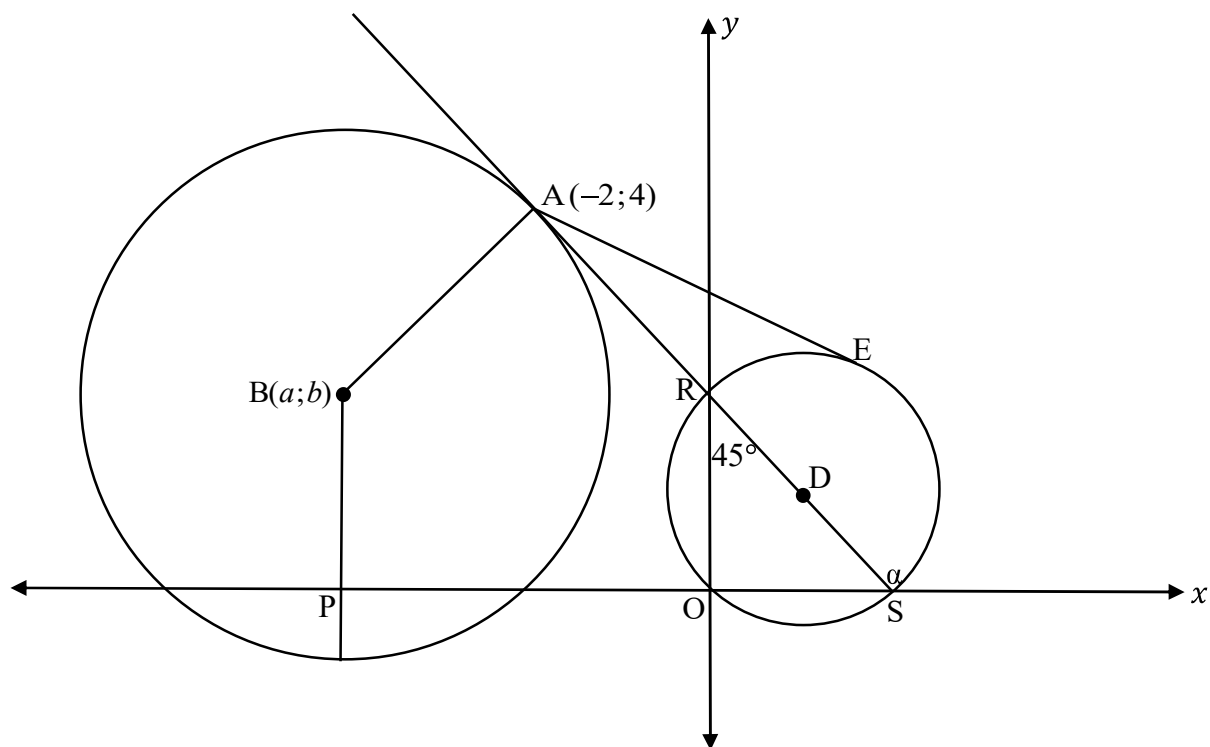
2.4	10,28	✓✓ 10,28 (2)
2.5	$63,9 - \sigma = p$ $63,9 + \sigma = 103,59$ $127,92 = p + 103,59$ $p = 24,33$  <b>OR / OF</b> $\sigma = 103,59 - 63,96$ $= 39,63$ $p = 63,96 - 39,63$ $= 24,33$	$\checkmark 63,9 - \sigma = p$ $\checkmark 63,9 + \sigma = 103,59$  $\checkmark p = 24,33$  <b>OR / OF</b> $\checkmark \sigma = 39,63$ $\checkmark 63,96 - 39,63$ $\checkmark p = 24,33$  (3)
		[11]

## QUESTION / VRAAG 3

3.1	$E\left(\frac{12}{2}; \frac{6}{2}\right)$ $E(6; 3)$	$\checkmark 6$ $\checkmark 3$  (2)
3.2	$m_{BA} = \frac{6-0}{7-5}$ $= 3$  $y = mx + c$ $y = 3x + c$ $6 = 3(7) + c$ <b>OR / OF</b> $c = -15$ $y = 3x - 15$  <b>OR / OF</b>	$\checkmark m_{BA} = 3$  $\checkmark$ substitution of m and $(7; 6) / (5; 0)$ <i>Vervanging van m en</i> $(7; 6) / (5; 0)$  $\checkmark y = 3x - 15$

	$y = mx + c$ $y = 3x + c$ $0 = 3(5) + c$ $c = -15$ $y = 3x - 15$	<b>OR / OF</b> $y - y_1 = m(x - x_1)$ $y - 0 = 3(x - 5)$ $y = 3x - 15$	(3)
3.3	$rx - 3y + 5 = 0$ $-3y = -rx - 5$ $y = \frac{r}{3}x + \frac{5}{3}$  $3 = \frac{r}{3}$ $r = 9$		✓ standard form / <i>standaardvorm</i>  ✓ $3 = \frac{r}{3}$ ✓ $r = 9$
3.4	Area $\triangle AOP = 10$ $\frac{1}{2} \times AO \times \perp h = 10$ $\frac{1}{2} \times 5 \times \perp h = 10$ $\perp h = 4$ but / maar $y < 0$ $\therefore y = -4$  $AP = BP$ $AP^2 = BP^2$ $(x-5)^2 + (-4-0)^2 = (x-7)^2 + (-4-6)^2$ $x^2 - 10x + 25 + 16 = x^2 - 14x + 49 + 100$ $4x = 108$ $x = 27$  P (27 ; -4)		✓ $\frac{1}{2} \times 5 \times \perp h = 10$  ✓ $\perp h = 4$  ✓ $y = -4$ ✓ $(x-5)^2 + (-4-0)^2$ and / en $(x-7)^2 + (-4-6)^2$ ✓ equate the two lengths / <i>gelykstel van die twee</i> <i>lengtes</i> ✓ $4x = 108$ ✓ $x = 27$
			(7)
			[15]

## QUESTION / VRAAG 4



4.1	$\alpha = 135^\circ$ ext $\angle$ of $\Delta$ / buite $\angle$ van $\Delta$ $\tan(135^\circ) = m$ $m = -1$ $y = mx + c$ $y = -1x + c$ $4 = -1(-2) + c$ <b>OR / OF</b> $y - y_1 = m(x - x_1)$ $c = 2$ $y - 4 = -1(x + 2)$ $y = -x + 2$ $y = -1x - 2 + 4$ $y = -x + 2$	$\checkmark \tan(135^\circ) = m$ $\checkmark m = -1$ $\checkmark$ substitute $m$ and $(-2; 4)$ / $\checkmark$ vervang $m$ en $(-2; 4)$ $\checkmark$ equation / vergelyking (4)
4.2	$P(-4; 0)$ $a = -4$ $m_{BA} \cdot m_{AS} = -1$ $m_{BA} = 1$ $m_{BA} = \frac{4 - b}{-2 + 4}$ $1 = \frac{4 - b}{2}$ $2 = 4 - b$ $b = 2$	$\checkmark a = -4$ $\checkmark m_{BA} = 1$ $\checkmark$ substitute / vervang $\checkmark b = 2$ (4)

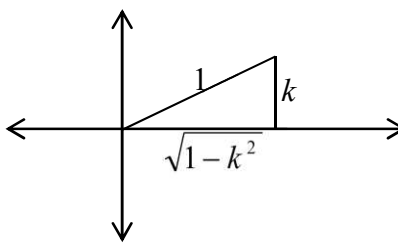
4.3	$(x-a)^2 + (y-b)^2 = r^2$ $(x+4)^2 + (y-2)^2 = r^2$ $(-2+4)^2 + (4-2)^2 = r^2$ $4+4=r^2$ $(x+4)^2 + (y-2)^2 = 8$	✓ substitute midpoint in correct formula / <i>vervang middelpunt in korrekte formule</i> ✓ substitute / <i>vervang</i> (-2;4) ✓ $(x+4)^2 + (y-2)^2 = 8$ (3)
4.4	$x^2 - 2x + y^2 - 2y = 0$ $(x^2 - 2x + 1) + (y^2 - 2y + 1) = 1 + 1$ $(x-1)^2 + (y-1)^2 = 2$	✓ $(x-1)^2$ ✓ $(y-1)^2$ ✓ 2 (3)
4.5	D (1 ; 1)	✓ answer / <i>antwoord</i> (1)
4.6	$DE = \sqrt{2}$ $DA = \sqrt{(-2-1)^2 + (4-1)^2}$ $= \sqrt{9+9}$ $= \sqrt{18}$ <b>OR/OF</b> $= 3\sqrt{2}$  $\hat{D}EA = 90^\circ$ radius $\perp$ tangent / <i>radius <math>\perp</math> raaklyn</i> $AD^2 = DE^2 + AE^2$ pythagoras $(\sqrt{18})^2 = (\sqrt{2})^2 + AE^2$ $18 - 2 = AE^2$ $AE = 4$	✓ $DE = \sqrt{2}$ ✓ correct substitution in correct formula / <i>korrekte vervanging in korrekte formule</i> ✓ $DA = \sqrt{18}$ <b>OR/OF</b> $3\sqrt{2}$ ✓ $\hat{D}EA = 90^\circ$  ✓ $(\sqrt{18})^2 = (\sqrt{2})^2 + AE^2$ ✓ $AE = 4$ (6)
		[21]

## QUESTION / VRAAG 5

5.1	$1 - 4\sin^2 15^\circ$ $= 1 - 4\sin^2(45^\circ - 30^\circ)$ $= 1 - 4[\sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ]^2$ $= 1 - 4\left[\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2}\right]^2$ $= 1 - 4\left[\frac{\sqrt{6} - \sqrt{2}}{4}\right]^2$ $= 1 - 4\left[\frac{6 - 4\sqrt{3} + 2}{16}\right]$ $= 1 - 4\left[\frac{8 - 4\sqrt{3}}{16}\right]$ $= 1 - \left[\frac{8 - 4\sqrt{3}}{4}\right]$ $= \sqrt{3} - 1$ <p><b>OR/OF</b></p> $1 - 4\sin^2 15^\circ$ $= 1 - 4\sin^2(60^\circ - 45^\circ)$ $= 1 - 4[\sin 60^\circ \cos 45^\circ - \cos 60^\circ \sin 45^\circ]^2$ $= 1 - 4\left[\frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} - \frac{1}{2} \cdot \frac{\sqrt{2}}{2}\right]^2$ $= 1 - 4\left[\frac{\sqrt{6} - \sqrt{2}}{4}\right]^2$ $= 1 - 4\left[\frac{6 - 4\sqrt{3} + 2}{16}\right]$ $= 1 - 4\left[\frac{8 - 4\sqrt{3}}{16}\right]$ $= 1 - \left[\frac{8 - 4\sqrt{3}}{4}\right]$ $= \sqrt{3} - 1$	$\checkmark 1 - 4\sin^2(45^\circ - 30^\circ)$ $\checkmark \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$ $\checkmark \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2}$ $\checkmark 1 - 4\left[\frac{6 - 4\sqrt{3} + 2}{16}\right]$ $\checkmark \sqrt{3} - 1$ <p><b>OR/OF</b></p> $\checkmark 1 - 4\sin^2(60^\circ - 45^\circ)$ $\checkmark \sin 60^\circ \cos 45^\circ - \cos 60^\circ \sin 45^\circ$ $\checkmark \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} - \frac{1}{2} \cdot \frac{\sqrt{2}}{2}$ $\checkmark 1 - 4\left[\frac{6 - 4\sqrt{3} + 2}{16}\right]$ $\checkmark \sqrt{3} - 1$ <p style="text-align: right;">(5)</p>
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5.2	$\frac{\sqrt{3} \sin x \cdot \sin^2 72^\circ + \sin^2 198^\circ \cdot \sqrt{3} \cos(x-90^\circ)}{\tan 120^\circ \cdot \sin x}$ $= \frac{\sqrt{3} \sin x \cdot \sin^2 (90^\circ - 18^\circ) + \sin^2 (180^\circ + 18^\circ) \cdot \sqrt{3} \sin x}{\tan(180^\circ - 60^\circ) \cdot \sin x}$ $= \frac{\sqrt{3} \sin x \cdot \cos^2 18^\circ + \sin^2 18^\circ \cdot \sqrt{3} \sin x}{-\tan 60^\circ \cdot \sin x}$ $= \frac{\sqrt{3} \sin x (\cos^2 18^\circ + \sin^2 18^\circ)}{-\sqrt{3} \cdot \sin x}$ $= -1$ <p><b>OR/OF</b></p> $\frac{\sqrt{3} \sin x \cdot \sin^2 72^\circ + \sin^2 18^\circ \cdot \sqrt{3} \sin x}{-\tan 60^\circ \cdot \sin x}$ $= \frac{\sqrt{3} \sin x (\sin^2 72^\circ + \cos^2 72^\circ)}{-\sqrt{3} \cdot \sin x}$ $= \frac{\sqrt{3} \sin x (1)}{-\sqrt{3} \cdot \sin x}$ $= -1$	<p>✓ <math>\sin x</math></p> <p>✓ <math>\cos^2 18^\circ</math></p> <p>✓ <math>\sin^2 18^\circ</math></p> <p>✓ <math>-\tan 60^\circ</math></p> <p>✓ factorise / <i>faktoriseer</i></p> <p>✓ <math>-1</math></p> <p><b>OR/OF</b></p> <p>✓ <math>\sin^2 18^\circ</math></p> <p>✓ <math>\sin x</math></p> <p>✓ <math>-\tan 60^\circ</math></p> <p>✓ factorise / <i>faktoriseer</i></p> <p>✓ <math>\cos^2 72^\circ</math></p> <p>✓ <math>-1</math></p> <p style="text-align: right;">(6)</p>
5.3	$6 \sin x \cdot \cos x + 3 \cos x - 4 \sin^2 x - 2 \sin x = 0$ $3 \cos x(2 \sin x + 1) - 2 \sin x(2 \sin x + 1) = 0$ $(2 \sin x + 1)(3 \cos x - 2 \sin x) = 0$ $\sin x = -\frac{1}{2} \quad \text{OR/OF} \quad 3 \cos x = 2 \sin x$ $\tan x = \frac{3}{2}$ $\text{RA} = 30^\circ \qquad \text{RA} = 56,31^\circ$ $x = 210^\circ + k \cdot 360^\circ \qquad x = 56,31^\circ + k \cdot 180^\circ$ $x = 330^\circ + k \cdot 360^\circ \qquad x = 236,31^\circ + k \cdot 180^\circ; k \in Z$ <p><b>OR/OF</b></p>	<p>✓ grouping / <i>groepeer</i></p> <p>✓ factorise / <i>faktoriseer</i></p> <p>✓ <math>\sin x = -\frac{1}{2}</math></p> <p>✓ <math>\tan x = \frac{3}{2}</math></p> <p>✓ <math>210^\circ + k \cdot 360^\circ</math></p> <p>✓ <math>330^\circ + k \cdot 360^\circ</math> ,</p> <p>✓ <math>56,31^\circ + k \cdot 180^\circ, k \in Z</math></p> <p><b>OR/OF</b></p>

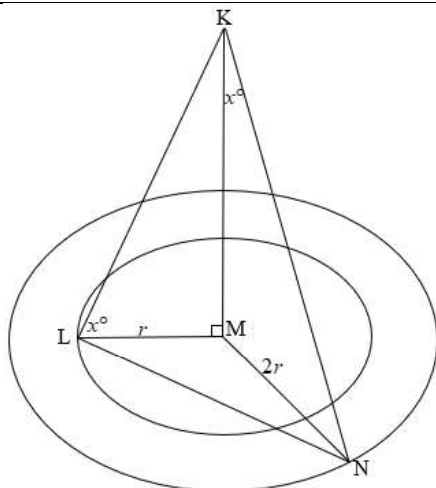
	$6 \sin x \cdot \cos x + 3 \cos x - 4 \sin^2 x - 2 \sin x = 0$ $(6 \sin x \cdot \cos x + 3 \cos x) - (4 \sin^2 x + 2 \sin x) = 0$ $3 \cos x(2 \sin x + 1) - 2 \sin x(2 \sin x + 1) = 0$ $(2 \sin x + 1)(3 \cos x - 2 \sin x) = 0$ $\sin x = -\frac{1}{2} \quad \text{OR/OF} \quad 3 \cos x = 2 \sin x$ $\tan x = \frac{3}{2}$ $x = -30^\circ + k \cdot 360^\circ \quad x = 56,31^\circ + k \cdot 180^\circ \quad ; k \in Z$ $x = 210^\circ + k \cdot 360^\circ$	<p>✓ grouping / <i>groepeer</i></p> <p>✓ factorise / <i>faktoriseer</i></p> <p>✓ <math>\sin x = -\frac{1}{2}</math></p> <p>✓ <math>\tan x = \frac{3}{2}</math></p> <p>✓ <math>-30^\circ + k \cdot 360^\circ</math></p> <p>✓ <math>210^\circ + k \cdot 360^\circ</math></p> <p>✓ <math>56,31^\circ + k \cdot 180^\circ ; k \in Z</math></p> <p>(7)</p>
5.4	$(1 - \tan A) \left( \frac{\cos A}{\cos 2A} \right) = \frac{1}{\cos A + \sin A}$ $\text{LHS/LK} = (1 - \tan A) \left( \frac{\cos A}{\cos 2A} \right)$ $= \left( 1 - \frac{\sin A}{\cos A} \right) \left( \frac{\cos A}{\cos^2 A - \sin^2 A} \right)$ $= \left( \frac{\cos A - \sin A}{\cos A} \right) \left( \frac{\cos A}{(\cos A - \sin A)(\cos A + \sin A)} \right)$ $= \frac{1}{\cos A + \sin A}$ <p>LHS / LK = RHS / RK</p>	<p>✓ <math>\frac{\sin A}{\cos A}</math></p> <p>✓ <math>\cos^2 A - \sin^2 A</math></p> <p>✓ <math>\frac{\cos A - \sin A}{\cos A}</math></p> <p>✓ <math>(\cos A - \sin A)(\cos A + \sin A)</math></p> <p>(4)</p>
5.5.1	$\cos 2\theta = \sqrt{1 - k^2}$ <div style="text-align: center;">  </div> <p><b>OR/OF</b></p> $\cos^2 2\theta = 1 - \sin^2 2\theta$ $= 1 - k^2$ $\cos 2\theta = \sqrt{1 - k^2}$	<p>✓ ✓ <math>\sqrt{1 - k^2}</math></p> <p><b>OR/OF</b></p> <p>✓ <math>\cos^2 2\theta = 1 - \sin^2 2\theta</math></p> <p>✓ <math>\sqrt{1 - k^2}</math></p> <p>(2)</p>

5.5.2	$\frac{\sin 2\theta}{\tan \theta}$ $= \frac{2 \sin \theta \cdot \cos \theta}{\frac{\sin \theta}{\cos \theta}}$ $= 2 \sin \theta \cdot \cos \theta \cdot \frac{\cos \theta}{\sin \theta}$ $= 2 \cos^2 \theta$ <p>But/maar <math>\cos 2\theta = \sqrt{1-k^2}</math></p> $2 \cos^2 \theta - 1 = \sqrt{1-k^2}$ $2 \cos^2 \theta = \sqrt{1-k^2} + 1$ $\frac{\sin 2\theta}{\tan \theta} = \sqrt{1-k^2} + 1$	$\checkmark 2 \sin \theta \cdot \cos \theta$ $\checkmark \frac{\sin \theta}{\cos \theta}$ $\checkmark 2 \cos^2 \theta$ $\checkmark 2 \cos^2 \theta - 1$ $\checkmark \sqrt{1-k^2} + 1$ <p style="text-align: right;">(5)</p>
		<b>[29]</b>

## QUESTION / VRAAG 6

6.1	$a = -1$ $d = 2$	✓ $a = -1$ ✓ $d = 2$  (2)
6.2	$D\left(-150^\circ; \frac{1}{2}\right)$	✓ $\left(-150^\circ; \frac{1}{2}\right)$  (1)
6.3.1	$-90^\circ < x < 90^\circ$ <b>OR / OF</b> $x \in (-90^\circ; 90^\circ)$	✓ $-90^\circ$ and / en $90^\circ$ ✓ correct inequality / <i>korrekte ongelykheid</i>  (2)
6.3.2	$-135^\circ < x < -45^\circ$ <b>OR / OF</b> $x \in (-135^\circ; -45^\circ)$	✓ $-135^\circ$ and / en $-45^\circ$ ✓ correct inequality / <i>korrekte ongelykheid</i>  (2)
		If learner gives all three answers, then maximum 1/2 / <i>Indien 'n leerling al drie die antwoorde gee, dan maksimum 1/2</i> $x \in (-135^\circ; -45^\circ)$ or/of $(0^\circ; 45^\circ)$ or/of $(135^\circ; 180^\circ)$
		[7]

## QUESTION / VRAAG 7



7.1	<p>In <math>\triangle KLM</math></p> $\frac{KM}{LM} = \tan x$ $\frac{KM}{r} = \tan x$ $KM = r \tan x$ <p>In <math>\triangle KMN</math></p> $\frac{MN}{KM} = \tan x$ $\frac{2r}{KM} = \tan x$ $\frac{2r}{r \tan x} = \tan x$ $2 = \tan^2 x$ $\sqrt{2} = \tan x$ $x = 54,74^\circ$ <p style="text-align: center;"><b>OR/OF</b></p> $KM = \frac{2r}{\tan x}$ $r \tan x = \frac{2r}{\tan x}$	<p>✓ correct trig ratio / <i>korrekte trig verhouding</i></p> <p>✓ <math>KM = r \tan x</math> (simplification / <i>vereenvoudiging</i>)</p> <p>✓ <math>\frac{2r}{KM} = \tan x</math></p> <p>✓ <math>\frac{2r}{r \tan x}</math></p> <p>✓ <math>\sqrt{2} = \tan x</math></p> <p>✓ <math>x = 54,74^\circ</math></p> <p style="text-align: right;">(6)</p>
7.2	$LN^2 = LM^2 + MN^2 - 2LM \cdot MN \cos M$ $LN^2 = (5)^2 + (10)^2 - 2(5) \cdot (10) \cos 110^\circ$ $LN^2 = 159,20$ $LN = \sqrt{159,20}$ $LN = 12,62 \text{ m}$	<p>✓ correct substitution in cos-rule / <i>korrekte vervanging in cos-reël</i></p> <p>✓ 12,62m</p> <p style="text-align: right;">(2)</p>
		[8]

## QUESTION / VRAAG 8

8.1.1	$\hat{A}DC = 67^\circ$ <i>OR / OF</i> $\hat{B}_2 + \hat{B}_3 = 113^\circ$ $\hat{A}DC = 67^\circ$	ext. $\angle$ of cyclic quad / <i>buite <math>\angle</math> van kvh</i>  $\angle^s$ straight line / $\angle^e$ op reguit lyn opp $\angle^s$ of cyclic quad / <i>oorst <math>\angle^e</math> van kvh</i>	$\checkmark$ S $\checkmark$ R   $\checkmark$ S $\checkmark$ R (2)
8.1.2	$\hat{C} = 180^\circ - 67^\circ$ $= 113^\circ$	co-int $\angle^s$ $BC \parallel AD$ / <i>ko-binne <math>\angle^e</math> <math>BC \parallel AD</math></i>	$\checkmark$ S/R (1)
8.1.3	$\hat{A} = 67^\circ$	opp $\angle^s$ of cyclic quad / alt $\angle^s$ $BC \parallel AD$ / alt $\angle^s$ $EC \parallel AD$ <i>oorst <math>\angle^e</math> van kvh / verwisselende <math>\angle^e</math> <math>BC \parallel AD</math> / verwis <math>\angle^e</math> <math>EC \parallel AD</math></i>	$\checkmark$ S/R (1)
8.1.4	$\hat{B}_2 = 67^\circ$ $\hat{D}_2 = 180^\circ - 67^\circ - 67^\circ$ $= 46^\circ$	$\angle^s$ opposite = sides / $\angle^e$ teenoor = sye sum of $\angle^s$ in $\Delta$ / <i>som vd <math>\angle^e</math> v <math>\Delta</math></i>	$\checkmark$ S $\checkmark$ R  $\checkmark$ S (3)
8.1.5	$\hat{B}DG = 113^\circ$ <i>OR / OF</i> $\hat{D}_1 = 67^\circ$ $\hat{B}DG = 113^\circ$	tan chord theorem / <i>raaklyn koordstelling</i>  tan chord theorem / <i>raaklyn koordstelling</i>	$\checkmark$ S $\checkmark$ R  <i>OR / OF</i> $\checkmark$ R $\checkmark$ S (2)

<p>8.2</p>	<p><math>\hat{B}_3 = \hat{D}_2 = 46^\circ</math>  <math>AB = CD</math></p> <p><b>OR/OF</b></p> <p><math>\hat{ADC} = \hat{A}</math>  <math>AB = CD</math></p>	<p>alt <math>\angle^s BC \parallel AD</math> / <i>verwisselende</i> <math>\angle^e BC \parallel AD</math>  <math>\angle^s</math> subtend = chords / <math>\angle^e</math> onderspan = koorde</p> <p>both = <math>67^\circ</math>  sides opp equal angles in trapezium ABCD / <i>sye teenoor gelyke hoeke in trapesium ABCD</i></p>	<p><math>\checkmark</math>S  <math>\checkmark</math>R</p> <p><b>OR/OF</b></p> <p><math>\checkmark</math>S  <math>\checkmark</math>R</p> <p>(2)</p>
<b>[11]</b>			

**QUESTION / VRAAG 9**

<p>9.1</p>		
<p>9.1.1(a)</p>	<p><math>\hat{O}_1 = 2x</math></p> <p><math>\angle</math> centre = <math>2 \times \angle</math> circumference /  <i>middelpunts <math>\angle = 2 \times</math> omtreks <math>\angle</math></i></p>	<p><math>\checkmark</math>S/R</p> <p>(1)</p>

9.1.1(b)	$\hat{A}_1 = \hat{CDB} = x$ $\hat{M}_2 = 90^\circ$ $\therefore \hat{ABO} = 90^\circ - x$  <b>OR/OF</b> $\hat{O}_1 = 2x$ $\hat{M}_1 = 90^\circ$  $\hat{C} = 90^\circ - 2x$ $\hat{B}_1 = 90^\circ - 2x$ $\hat{ABO} = 90^\circ - x$	$\angle^s$ in the same segment / $\angle^e$ in dies. segment line from centre to midpoint of chord / <i>lyn van middelpunt van sirkel na middelpunt van koord</i>  sum of $\angle^s$ in $\Delta$ / ext $\angle$ of a $\Delta$ / <i>som vd <math>\angle^e</math> v <math>\Delta</math> / buite <math>\angle</math> v <math>\Delta</math></i>  proved/ <i>reeds bewys</i> line from centre to midpoint of chord / <i>lyn van middelpunt van sirkel na middelpunt van koord</i>  sum of $\angle^s$ in $\Delta$ / <i>som vd <math>\angle^e</math> v <math>\Delta</math></i>  $\angle^s$ in the same segment / $\angle^e$ in dies. segment	$\checkmark$ S/R  $\checkmark$ S $\checkmark$ R  $\checkmark$ S  <b>OR/OF</b> $\checkmark$ S $\checkmark$ R  $\checkmark$ S $\checkmark$ S/R  (4)
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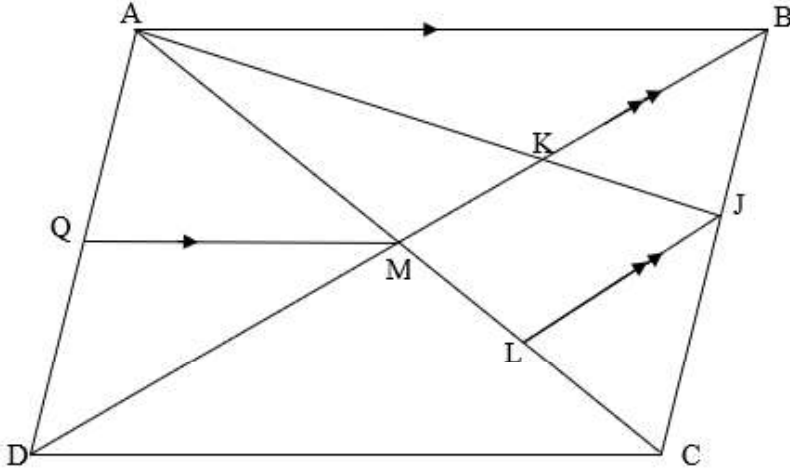
9.1.2	<p>AD  OB  <math>\hat{O}_1 = \hat{ADC} = 2x</math></p> <p><math>\therefore \hat{D}_1 = x</math>  <math>\hat{A}_1 = x</math>  <math>\therefore \hat{D}_1 = \hat{A}_1</math></p> <p>AB is a tangent / <i>is 'n raaklyn</i></p> <p><b>OR / OF</b></p> <p><math>\hat{A}_2 = 90^\circ</math>  <math>\therefore AD  OB</math>  <math>C\hat{D}A = \hat{O}_1 = 2x</math>  <math>\therefore \hat{D}_1 = x</math>  <math>\hat{D}_1 = \hat{A}_1</math></p> <p>AB is a tangent / <i>is 'n raaklyn</i></p>	<p>midpoint theorem / <i>middelpunt stelling</i>          corresponding <math>\angle^s AD    OB</math> /  <i>ooreenkom <math>\angle^e AD    OB</math></i></p> <p>proved / <i>reeds bewys</i></p> <p>converse tan chord theorem /  <i>omgekeerde raaklyn koordstelling</i></p> <p><math>\angle</math> in a semi-circle / <math>\angle</math> in <i>halwe sirkel</i>          corr <math>\angle^s</math> are equal / <i>ooreenk <math>\angle^e</math> gelyk</i>          corr <math>\angle^s DA    OB</math> / <i>ooreenk <math>\angle^e DA    OB</math></i></p> <p>converse tan chord theorem /  <i>omgekeerde raaklyn koord</i></p>	<p>✓S ✓R          ✓S          ✓S          ✓S          ✓R  <b>OR / OF</b>          ✓S ✓R          ✓R          ✓S          ✓S          ✓R          ✓R</p> <p>(6)</p>
9.1.3	<p><math>DC^2 = AD^2 + AC^2</math>          but / <i>maar</i> <math>AC = 2AM</math> ;          and / <i>en</i> <math>DC = 2DO</math>  <math>(2DO)^2 = AD^2 + (2AM)^2</math>  <math>4DO^2 = AD^2 + 4AM^2</math></p> <p>but / <i>maar</i> In <math>\triangle ABM</math>  <math>AM^2 = AB^2 - MB^2</math>  <math>\therefore 4DO^2 = AD^2 + 4(AB^2 - MB^2)</math>  <math>AD^2 = 4DO^2 - 4AB^2 + 4MB^2</math></p>	<p>Pythagoras</p> <p>Pythagoras</p>	<p>✓S          ✓S          ✓S          ✓substitution /  <i>vervanging</i></p> <p>(4)</p>

<p>9.2</p>			
<p>9.2.1</p>	$\hat{M}_2 = \hat{Q}$ $\hat{M}_4 = \hat{Q} = \hat{M}_2$ $\hat{W}_1 = \hat{Q} = \hat{M}_2$  <b>OR/OF</b> $\hat{W}_1 = \hat{M}_4 = \hat{M}_2$	<p>alternate <math>\angle^s</math> <math>NQ \parallel MP</math> /  <i>verwissel</i> <math>\angle^e</math> <math>NQ \parallel MP</math>                  tan chord theorem / <i>raaklyn koordstelling</i>  <math>\angle^s</math> in the same segment / tan chord                  theorem / <math>\angle^e</math> <i>dieselfde sirkel segment /</i>  <i>raaklyn koord stelling</i>                   tan chord theorem / <i>raaklyn</i>  <i>koordstelling</i></p>	<p>✓S                   ✓S/R                  ✓S/R                    (3)</p>
<p>9.2.2</p>	<p>In <math>\triangle WMV</math> and/en <math>\triangle QMN</math></p> $\hat{W}_1 = \hat{Q}$ $\hat{M}_1 = \hat{M}_3$  $\hat{V}_1 = \hat{N}_1 + \hat{N}_2$ $\therefore \triangle WMV \parallel \triangle QMN$  <b>OR / OF</b>  In $\triangle WMV$ and/en $\triangle QMN$ $\hat{W}_1 = \hat{Q}$ $\hat{M}_1 = \hat{M}_3$  $\therefore \triangle WMV \parallel \triangle QMN$	<p>proved / <i>reeds bewys</i>                   equal chords subtend equal <math>\angle^s</math> / <i>gelyke</i>  <i>koorde onderspan gelyke</i> <math>\angle^e</math>                  sum of <math>\angle^s</math> in <math>\Delta</math> / <i>som vd</i> <math>\angle^e</math> v <math>\Delta</math>  <math>\angle\angle\angle</math></p>	<p>✓S                  ✓S/R                  ✓S   <b>OR / OF</b>                   ✓S                  ✓S/R                  ✓R                   (3)</p>

9.2.3	$\frac{MV}{MN} = \frac{WV}{QN}$ $\frac{MV}{WV} = \frac{MN}{QN}$ $MV \times QN = MN \times WV$ <p>but / maar <math>QN = PW</math></p> $MV \times PW = MN \times WV$ $\frac{MV}{WV} = \frac{MN}{PW}$	$\Delta WMV \parallel \Delta QMN \parallel \Delta^s$  given / gegee	✓S ✓R  ✓S	(3)
				[24]

## QUESTION / VRAAG 10

10.1	<p>Construction: Join DC and BE and altitudes <math>k</math> and <math>h</math></p> <p>Konstruksie: Verbind DC en BE asook die hoogtelyne <math>k</math> en <math>h</math></p> $\frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEB} = \frac{\frac{1}{2} \times AD \times k}{\frac{1}{2} \times DB \times k} = \frac{AD}{DB}$ $\frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEC} = \frac{\frac{1}{2} \times AE \times h}{\frac{1}{2} \times EC \times h} = \frac{AE}{EC}$ <p>but / maar <math>\text{Area } \Delta DEB = \text{Area } \Delta DEC</math>    same base, same height / gelyke hoogte, dieselfde basis</p> $\therefore \frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEB} = \frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEC}$ $\therefore \frac{AD}{DB} = \frac{AE}{EC}$	✓construction / konstruksie  ✓S  ✓S  ✓S ✓R  ✓S	(6)

10.2			
10.2.1 (a)	$\frac{ML}{LC} = \frac{BJ}{JC} = \frac{2}{3}$	line $\parallel$ one side $\triangle BCM$ <b>OR</b> prop theorem $MB \parallel JL$ / lyn $\parallel$ aan een sy van $\triangle BCM$ <b>OF</b> <i>eweredigheidsstelling <math>MB \parallel JL</math></i>	$\checkmark$ S $\checkmark$ R (2)
10.2.1 (b)	$\frac{MC}{ML} = \frac{BC}{BJ} = \frac{5}{2}$ <p><math>AM = MC</math></p> $\frac{AM}{ML} = \frac{5}{2}$ $\frac{AK}{KJ} = \frac{AM}{ML} = \frac{5}{2}$	line $\parallel$ one side $\triangle BMC$ <b>OR</b> prop theorem $MB \parallel JL$ / lyn $\parallel$ aan een sy van $\triangle BMC$ <b>OF</b> eweredigheidsstelling $MB \parallel JL$	$\checkmark$ S $\checkmark$ S/R $\checkmark$ S (3)
10.2.2	$AB \parallel CD$ $AB \parallel QM$ In $\triangle ADC$ $\therefore QM \parallel CD$ $AM = MC$ $\therefore AQ = QD$ <p><i>but</i> <math>AD = BC</math>  <math>AQ = \frac{1}{2} AD</math>  <math>= \frac{1}{2} \left( \frac{2\sqrt{10}}{3} \right)</math>  <math>\therefore AQ = QD = \frac{2}{3} \sqrt{10} \div 2</math>  <math>= \frac{\sqrt{10}}{3}</math> units</p>	opposite sides of parm / oorst sye van parm  proved / reeds bewys line passing through the midpoint of 1 side $\parallel$ to second side / lyn sny die middelpunt van 1 sy $\parallel$ aan tweede sy  opposite sides of parm / oorst sye van parm	$\checkmark$ S $\checkmark$ S / R $\checkmark$ S $\checkmark$ S

	<b>OR / OF</b>	<b>OR / OF</b>	
	<p>In <math>\triangle ABD</math>  <math>BM = MD</math>  <math>QM \parallel AB</math>  <math>\therefore AQ = QD</math>  <math>\therefore QM = \frac{1}{2} AB</math>  <math>AQ = QD</math>  <math>AQ = \frac{1}{2} \left( \frac{2}{3} \sqrt{10} \right)</math>  <math>= \frac{\sqrt{10}}{3}</math> units/eenhede</p>	<p>diag of a parm / <i>hoeklyne van parm</i>  given / <i>gegee</i>  Line passing through the midpoint of  1 side <math>\parallel</math> 2<sup>nd</sup> side / <i>lyn deur middelpunt aan</i>  <i>een sy <math>\parallel</math> tweede sy</i> <b>OR/OF</b>  midpoint theorem / <i>middelpunt stelling</i></p>	<p>✓S  ✓S/R  ✓S/R  ✓S</p>
	<p><b>OR / OF</b>  Let/stel <math>BC = 2k</math> en/and  <math>AB = 3k</math>  <math>3k = \sqrt{10}</math>  <math>k = \frac{\sqrt{10}}{3}</math>  <math>BC = \frac{2\sqrt{10}}{3}</math>  <math>\frac{AQ}{AD} = \frac{AM}{AC} = \frac{5}{10}</math>  <math>AQ = \frac{1}{2} AD</math>  <math>AD = BC = \frac{2\sqrt{10}}{3}</math>  <math>AQ = \frac{\sqrt{10}}{3}</math></p>	<p>line <math>\parallel</math> one side <math>\triangle ADC</math> <b>OR</b> prop  theorem <math>QM \parallel DC</math> / <i>lyn <math>\parallel</math> aan een sy van</i>  <math>\triangle ADC</math> <b>OF</b> eweredigheidsstelling  <math>QM \parallel DC</math>  opposite sides of parm / <i>oorst sye van</i>  <i>parm</i></p>	<p><b>OR / OF</b>  ✓S  ✓S/R  ✓R  ✓S  (4)</p>
		[15]	

**TOTAL / TOTAAL: [150]**