



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE EXAMINATIONS/  
*SENIORSERTIFIKAAT-EKSAMEN***

**MATHEMATICS P2/*WISKUNDE V2***

**JUNE 2016**

**MEMORANDUM**

**MARKS/*PUNTE*: 150**

**This memorandum consists of 21 pages./  
*Hierdie memorandum bestaan uit 21 bladsye.***

**NOTE:**

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

**LET WEL:**

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n poging om 'n vraag te beantwoord, doodgetrek en nie oorgedoen het nie, sien die doodgetrekte poging na.
- Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing. Staak nasien by die tweede berekeningsfout.
- Om antwoorde/waardes om 'n probleem op te los, te veronderstel, word NIE toegelaat NIE.

**QUESTION/VRAAG 1**

8	8	10	12	16	19	20	21	24	25	26
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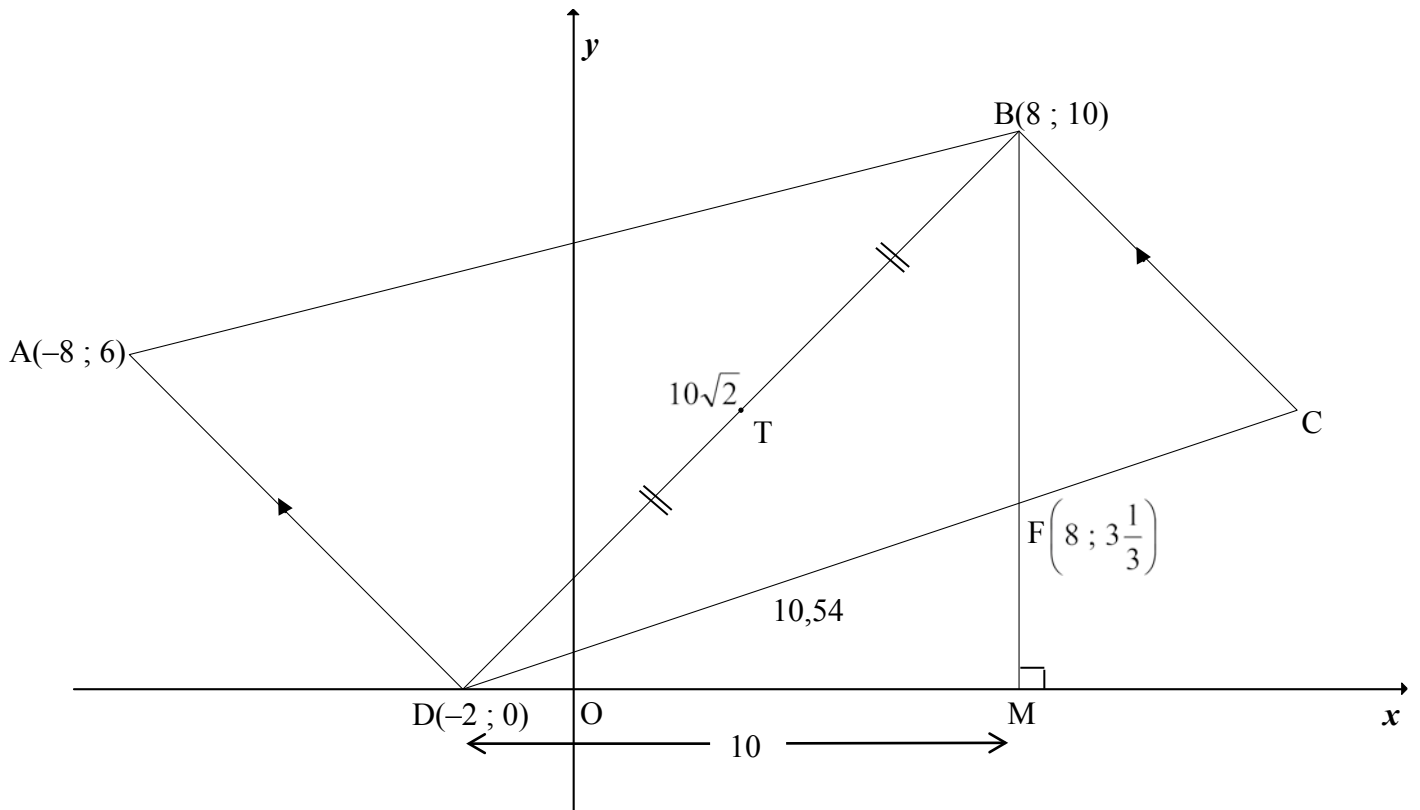
1.1	$\text{Mean/Gemiddelde} = \frac{189}{11}$ $= 17,18$	Answer only: Full marks <i>Slegs antwoord: Volpunte</i>	✓ 189 ✓ answer (2)
1.2	Min = 8, max = 26 Median/Mediaan = 19 Q <sub>1</sub> = 10, Q <sub>3</sub> = 24 ∴ (8 ; 10 ; 19 ; 24 ; 26)		✓ min, max ✓ median ✓ Q <sub>1</sub> & Q <sub>3</sub> (3)
1.3			✓ box/boks/mond ✓ whiskers/snor (2)
1.4	The data is skewed to the left/ <i>Die data is skeef na links.</i> <b>OR/OF</b> Negatively skewed/ <i>Negatief skeef</i>		✓ answer (1) ✓ answer (1)
1.5	SD/SA = 6,46		✓✓ answer (2)
1.6	17,18 + 6,46 = 23,64 ∴ 3 destinations/ <i>bestemmings</i>		✓ interval ✓ answer (2) <b>[12]</b>

## QUESTION/VRAAG 2

Temperature at midday (in °C) <i>Middaguur-temperatuur (in °C)</i>	18	21	19	26	32	35	36	40	38	30	25
Number of bottles of water (500 ml) <i>Getal bottels water (500 ml)</i>	12	15	13	31	46	51	57	70	63	53	23

2.1	(30 ; 53)	✓ answer (1)
2.2	$a = -38,51$ $b = 2,68$ $\therefore \hat{y} = 2,68x - 38,51$	✓ value $a$ ✓ value $b$ ✓ equation (3)
2.3	$\therefore \hat{y} \approx 36,53$ bottles  <b>OR/OF</b> $\hat{y} \approx 2,68(28) - 38,51$ $\approx 36,53$ bottles	✓✓ answer (2)  ✓ substitution ✓ answer (2)
2.4	Strong/ <i>Sterk</i> The majority of the points lie <b>close to</b> the regression line./ <i>Die meerderheid punte lê naby die regressielyn.</i>  <b>OR/OF</b> Strong/ <i>Sterk</i> $r = 0,98$	✓ strong/ <i>sterk</i> ✓ reason/ <i>rede</i> (2)  ✓ strong/ <i>sterk</i> ✓ reason/ <i>rede</i> (2)
2.5	Temperature cannot rise beyond a certain point as this would be life threatening <b>OR</b> there is only so much water one can consume before it becomes a risk to your health (hyponatremia)./ <i>Temperatuur kan nie hoër as 'n sekere punt styg nie, anders raak dit lewensgevaarlik. OF 'n persoon kan net 'n sekere hoeveelheid water inneem, anders raak dit 'n gesondheidsrisiko</i>	✓ reason/ <i>rede</i> (1)
		<b>[9]</b>

**QUESTION/VRAAG 3**



3.1	$m_{AD} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{0 - 6}{-2 + 8}$ $= \frac{-6}{6} = -1$	✓ substitution  ✓ -1  (2)
3.2	$m_{BC} = -1 \quad [BC \parallel AD]$ $y = -x + c$ $10 = -8 + c$ $c = 18$ $y = -x + 18$ <p><b>OR/OF</b></p> $m_{BC} = -1 \quad [BC \parallel AD]$ $y - y_1 = m(x - x_1)$ $y - 10 = -(x - 8)$ $y = -x + 18$	✓ gradient  ✓ substitute $m$ and (8 ; 10)  ✓ equation  (3)
		✓ gradient  ✓ substitute $m$ and (8 ; 10) ✓ equation  (3)

<p>3.3</p>	$m_{BD} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{10 - 0}{8 + 2} = 1$ $m_{BD} \times m_{AD} = 1 \times -1 = -1$ $\therefore DB \perp AD$ <p><b>OR</b></p> $AD^2 = 72 \text{ or } AD = \sqrt{72} \text{ or } 6\sqrt{2}$ $AB^2 = 272 \text{ or } AB = \sqrt{272} \text{ or } 4\sqrt{17}$ $BD^2 = 200 \text{ or } BD = \sqrt{200} \text{ or } 10\sqrt{2}$ $\therefore AB^2 = AD^2 + BD^2$ $\therefore \hat{A}DB = 90^\circ \quad [\text{converse Pyth th/ omgekeerde Pyth st}]$	<p>✓ substitution ✓ answer ✓ <math>m_{BD} \times m_{AD} = -1</math> (3)</p> <p>✓✓ calculating all 3 sides</p> <p>✓ <math>AB^2 = AD^2 + BD^2</math> (3)</p>
<p>3.4</p>	$\tan \hat{B}DM = m_{BD} = 1$ $\therefore \hat{B}DM = 45^\circ$ <p><b>OR</b></p> $\sin \hat{B}DM = \frac{BM}{BD} = \frac{10}{10\sqrt{2}} = \frac{1}{\sqrt{2}}$ $\therefore \hat{B}DM = 45^\circ$	<p>✓ <math>\tan \hat{B}DM = m_{BD}</math> ✓ answer (2)</p> <p>✓ <math>\sin \hat{B}DM = \frac{1}{\sqrt{2}}</math> ✓ answer (2)</p>
<p>3.5</p>	$T(x; y) = \left( \frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2} \right)$ $= \left( \frac{-2 + 8}{2}; \frac{0 + 10}{2} \right)$ $= (3; 5)$ <p>T symmetrical about BM/T is simmetries om BM  <math>\therefore</math> distance of T to BM = 5 units = distance from BM to C  <math>\therefore</math> C(13; 5)</p> <p><b>OR/OF</b></p>	<p>✓ T(3; 5)</p> <p>✓ value of x ✓ value of y (3)</p>

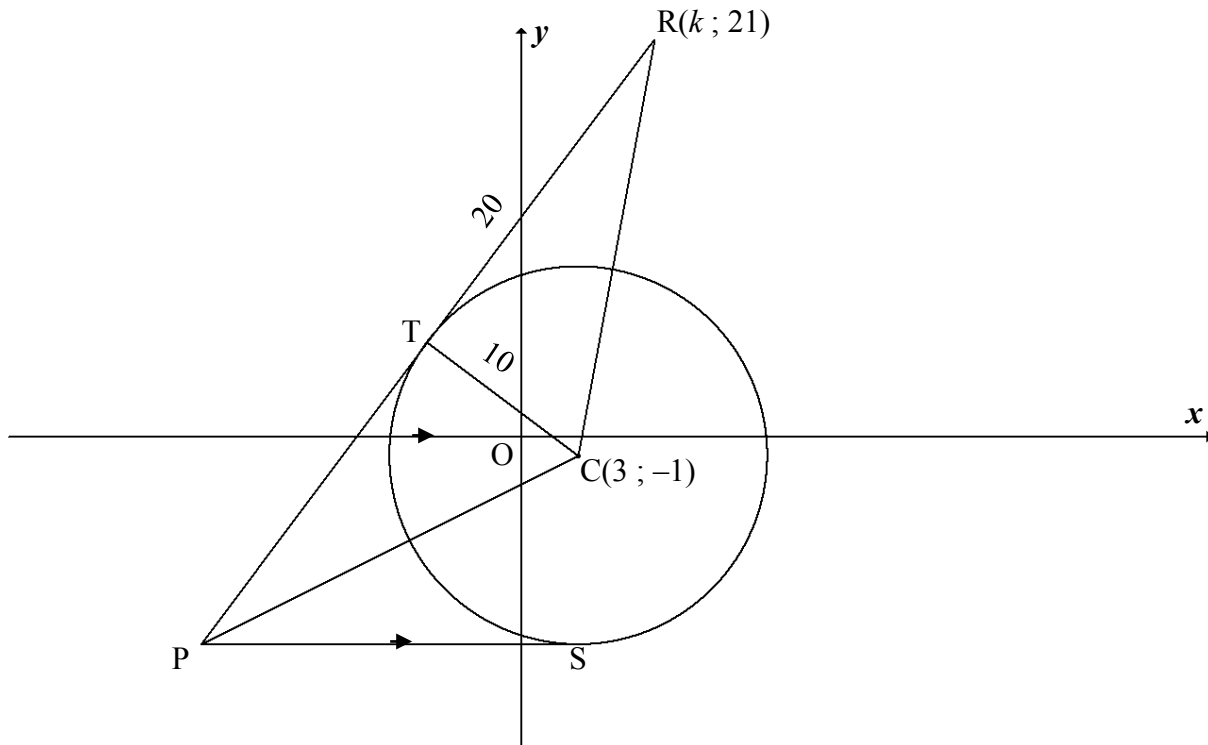
	$m_{DF} = \frac{3\frac{1}{3} - 0}{8 - (-2)} = \frac{1}{3}$ <p><u>Equation of DF:</u>  <math>y - y_1 = m(x - x_1)</math>  <math>y - 0 = \frac{1}{3}(x + 2)</math>  <math>y = \frac{1}{3}x + \frac{2}{3}</math></p> <p><u>Equation of BC:</u> <math>y = -x + 18</math>  <math>\frac{1}{3}x + \frac{2}{3} = -x + 18</math>  <math>4x = 52</math>  <math>x = 13</math>  <math>\therefore y = -13 + 18 = 5</math>  <math>\therefore C(13 ; 5)</math></p>	<p>✓ eq of DF</p> <p>✓ value of x                  ✓ value of y</p> <p>(3)</p>
<p>3.6</p>	<p>area/opp <math>\triangle BDF = \text{area/opp } \triangle BDM - \text{area/opp } \triangle DFM</math>  <math display="block">= \frac{1}{2}(10)(10) - \frac{1}{2}(10)\left(\frac{10}{3}\right)</math>  <math display="block">= \frac{100}{3} \text{ or } 33\frac{1}{3} \text{ or } 33,3 \text{ square units/vk eenh}</math></p> <p><b>OR/OF</b></p> <p>area/opp <math>\triangle BDF = \frac{1}{2} \cdot BF \cdot DM</math>  <math display="block">= \frac{1}{2}\left(\frac{20}{3}\right)(10)</math>  <math display="block">= \frac{100}{3} \text{ or } 33\frac{1}{3} \text{ or } 33,3 \text{ square units/vk eenh}</math></p> <p><b>OR/OF</b></p>	<p>✓ formula/method                  ✓ 10 (DM)                  ✓ 10 (BM)                  ✓ <math>\frac{10}{3}</math> or <math>3\frac{1}{3}</math> (<math>\perp</math>h)                  ✓ answer</p> <p>(5)</p> <p>✓ formula/method                  ✓ BF                  ✓✓ DM                  ✓ answer</p> <p>(5)</p>

	$\tan \hat{FDM} = m_{DC} = \frac{5-0}{13+2} = \frac{1}{3} \quad \text{or} \quad \tan \hat{FDM} = \frac{FM}{DM} = \frac{\frac{10}{3}}{10} = \frac{1}{3}$ $\hat{FDM} = 18,43^\circ$ $\therefore \hat{BFD} = 108,43^\circ \quad [\text{ext } \angle \Delta]$ $BF = \frac{20}{3} \text{ or } 6\frac{2}{3}$ $DF^2 = (10)^2 + \left(3\frac{1}{3}\right)^2 \quad [\text{Pyth } \triangle DFM]$ $DF = 10,54 \text{ or } \frac{\sqrt{1000}}{3} \text{ or } \frac{10\sqrt{10}}{3}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <math display="block">BD = \sqrt{(10-0)^2 + (8+2)^2}</math> <math display="block">= \sqrt{200} \text{ or } 10\sqrt{2}</math> </div> $\therefore \text{area/opp } \triangle BDF = \frac{1}{2} \cdot BF \cdot FD \cdot \sin \hat{BFD}$ $= \frac{1}{2} \left(\frac{20}{3}\right) \left(\frac{10\sqrt{10}}{3}\right) (\sin 108,43)$ $= \frac{100}{3} \text{ or } 33\frac{1}{3} \text{ or } 33,33 \text{ square units/vk eenh}$ <p><b>OR/OF</b></p> $BF = \frac{20}{3} \text{ or } 6\frac{2}{3}$ $BD = \sqrt{(10-0)^2 + (8+2)^2}$ $= \sqrt{200} \text{ or } 10\sqrt{2}$ $\text{area/opp } \triangle BDF = \frac{1}{2} \cdot BF \cdot BD \cdot \sin \hat{DBF}$ $= \frac{1}{2} \left(\frac{20}{3}\right) \left(\sqrt{200}\right) (\sin 45^\circ)$ $= \frac{100}{3} \text{ or } 33\frac{1}{3} \text{ or } 33,33 \text{ square units/vk eenh}$ <p><b>OR/OF</b></p> $\text{area/opp } \triangle BDF$ $= \text{area/opp } \triangle BCD - \text{area/opp } \triangle BCF$ $= \frac{1}{2} (10\sqrt{2})(5\sqrt{2}) - \frac{1}{2} \left(\frac{20}{3}\right)(5)$ $= \frac{100}{3} \text{ or } 33\frac{1}{3} \text{ or } 33,33 \text{ square units/vk eenh}$ <p><b>OR/OF</b></p>	<p>✓ gradient/ratio</p> <p>✓ <math>\hat{BFD}</math></p> <p>✓ DF</p> <p>✓ correct substitution into area rule</p> <p>✓ answer (5)</p> <p>✓ BF</p> <p>✓ BD</p> <p>✓ formula/method</p> <p>✓ correct substitution into area rule</p> <p>✓ answer (5)</p> <p>✓ formula/method</p> <p>✓ <math>BD = 10\sqrt{2}</math></p> <p>✓ <math>BC = 5\sqrt{2}</math></p> <p>✓ <math>BF = \frac{20}{3}</math></p> <p>✓ answer (5)</p>
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	$\tan \hat{FDM} = m_{DC} = \frac{5-0}{13+2} = \frac{1}{3} \quad \text{or} \quad \tan \hat{FDM} = \frac{FM}{DM} = \frac{\frac{10}{3}}{10} = \frac{1}{3}$ $\hat{FDM} = 18,43^\circ$ $\hat{BDF} = 26,56^\circ$ <p>area / opp <math>\triangle BDF</math></p> $= \frac{1}{2} \cdot BD \cdot DF \cdot \sin \hat{BDF}$ $= \frac{1}{2} \cdot (10\sqrt{2}) \cdot \left(\frac{10\sqrt{10}}{3}\right) \cdot \sin 26,56^\circ$ $= \frac{100}{3} \text{ or } 33\frac{1}{3} \text{ or } 33,33 \text{ square units/vk eenh}$	<p>✓ gradient/ratio</p> <p>✓ <math>\hat{BDF}</math></p> <p>✓ DF <b>OR/OF</b> BD</p> <p>✓ correct substitution into area rule</p> <p>✓ answer</p> <p>(5) <b>[18]</b></p>
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**QUESTION/VRAAG 4**



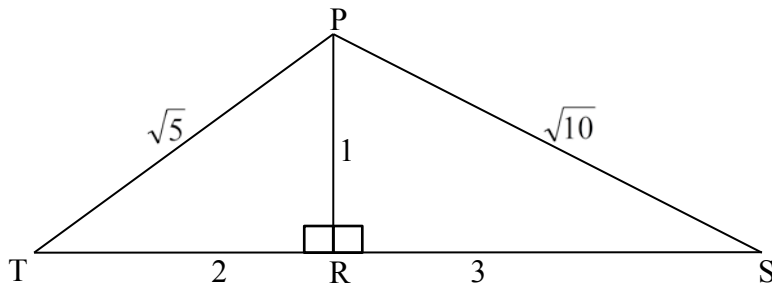
4.1	radius $\perp$ tangent /raaklyn	✓ R (1)
4.2	$CR^2 = TR^2 + CT^2$ (Pyth) $CR^2 = 20^2 + 10^2 = 500$ $CR = \sqrt{500}$ or $10\sqrt{5}$	✓ substitution ✓ answer (2)
4.3	$CR^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $500 = (k - 3)^2 + (21 + 1)^2$ $k^2 - 6k + 9 + 484 = 500$ $k^2 - 6k - 7 = 0$ $(k - 7)(k + 1) = 0$ $k = 7$ or $k \neq -1$  <b>OR/OF</b>  $CR^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $500 = (k - 3)^2 + (21 + 1)^2$ $(k - 3)^2 = 16$ $k - 3 = 4$ or $k - 3 = -4$ $k = 7$ or $k \neq -1$	✓ substitution  ✓ standard form  ✓ factors ✓ $k = 7$ (4)  ✓ substitution  ✓ square form ✓ square root ✓ $k = 7$ (4)

4.4	$(x - 3)^2 + (y + 1)^2 = 100$	✓✓ answer (2)
4.5	CS = 10 and CS $\perp$ PS $\therefore S(3; -11)$ $\therefore y = -11$	✓ S(3; -11) ✓ answer (2)
4.6.1	S(3; -11) $\therefore 3(-11) - 4x = 35$ $x = -17$ $\therefore P(-17; -11)$  <b>OR/OF</b> $\frac{4}{3}x + \frac{35}{3} = -11$ $\frac{4}{3}x = \frac{-68}{3}$ $x = -17$ P(-17; -11)	✓ substituting  ✓ answer (2)  ✓ equating  ✓ answer (2)
4.6.2	PT = PS [tangents from common point/rklyne vanaf dies pt] $= 17 + 3 = 20$ units  <b>OR</b> $PC = \sqrt{(-17 - 3)^2 + (-11 + 1)^2}$ $= \sqrt{500}$ or $10\sqrt{5}$ $PT^2 = PC^2 - TC^2$ [Pyth th] $= 500 - 100$ $= 400$ $\therefore PT = 20$  <b>OR</b> $PC = \sqrt{(-17 - 3)^2 + (-11 + 1)^2}$ $= \sqrt{500}$ or $10\sqrt{5}$ $\Delta PTC \equiv \Delta RTC$ [90°HS] $\therefore PT = TR$ $\therefore PT = 20$	✓ S ✓R ✓ answer (3)  ✓ value of PC ✓ using Pyth ✓ answer (3)  ✓ value of PC ✓ S/R or proved ✓ answer (3)
4.7.1	M(3; -16)	✓ answer (1)

4.7.2	Radius = 4	✓ answer (1)
4.7.3	$r_1 + r_2 = 10 + 4 = 14$ $\text{distance CM} = \sqrt{(3 - 3)^2 + (-1 + 16)^2}$ $= \sqrt{225}$ $= 15$ <p> <math>\text{CM} &gt; r_1 + r_2</math>            Therefore the two circles do not intersect or touch./<i>Daarom sny of raak die twee sirkels nie.</i> </p>	✓ $r_1 + r_2$  ✓ 15  ✓ explanation  (3) <b>[21]</b>

**QUESTION/VRAAG 5**

5.1



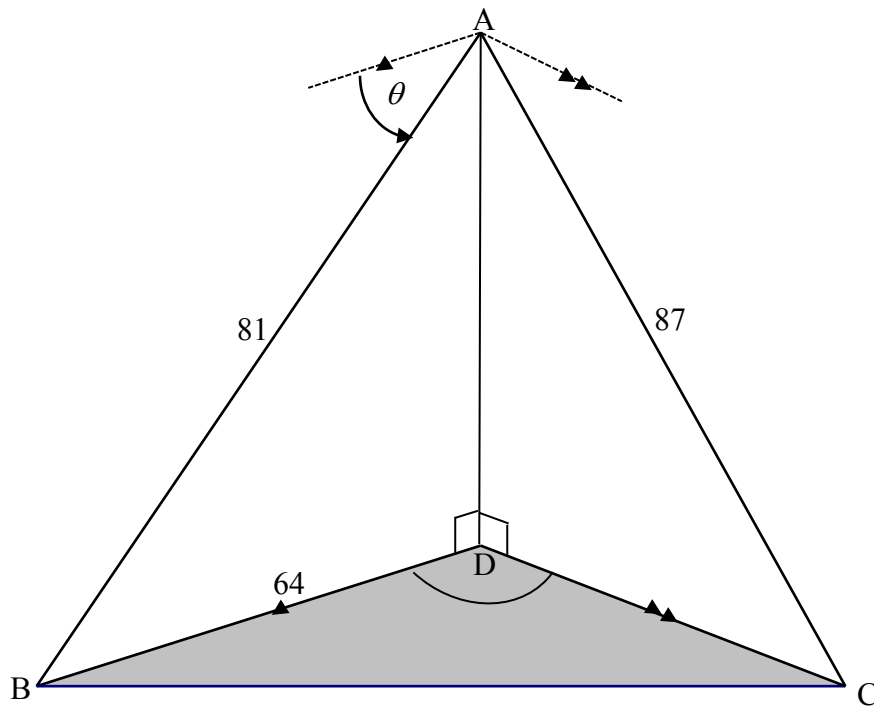
5.1.1(a)	$\sin T = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5} = 0,45$	✓ value (1)
5.1.1(b)	$\cos S = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10} = 0,95$	✓ value (1)
5.1.2	$\begin{aligned} \cos(T + S) &= \cos T \cos S - \sin T \sin S \\ &= \left(\frac{2}{\sqrt{5}}\right)\left(\frac{3}{\sqrt{10}}\right) - \left(\frac{1}{\sqrt{5}}\right)\left(\frac{1}{\sqrt{10}}\right) \\ &= \frac{6}{\sqrt{50}} - \frac{1}{\sqrt{50}} \\ &= \frac{5}{\sqrt{50}} \text{ or } \frac{1}{\sqrt{2}} \text{ or } \frac{\sqrt{2}}{2} \end{aligned}$	✓ expansion ✓ $\frac{2}{\sqrt{5}}$ ✓ $\frac{1}{\sqrt{10}}$ ✓ simplification ✓ answer (5)
5.2	$\begin{aligned} &\frac{1}{\cos(360^\circ - \theta) \sin(90^\circ - \theta)} - \tan^2(180^\circ + \theta) \\ &= \frac{1}{(\cos \theta)(\cos \theta)} - \tan^2 \theta \\ &= \frac{1}{\cos^2 \theta} - \left(\frac{\sin^2 \theta}{\cos^2 \theta}\right) \\ &= \frac{1 - \sin^2 \theta}{\cos^2 \theta} \\ &= \frac{\cos^2 \theta}{\cos^2 \theta} \text{ OR } \frac{1 - \sin^2 \theta}{1 - \sin^2 \theta} \\ &= 1 \end{aligned}$	✓ $\cos \theta$ ✓ $\cos \theta$ ✓ $\tan^2 \theta$ ✓ $\frac{\sin^2 \theta}{\cos^2 \theta}$ ✓ identity ✓ answer (6)

5.3	$(\sin x - \cos x)^2 = \left(\frac{3}{4}\right)^2$ $\sin^2 x - 2 \sin x \cos x + \cos^2 x = \frac{9}{16}$ $1 - 2 \sin x \cos x = \frac{9}{16}$ $2 \sin x \cos x = \frac{7}{16}$ $\therefore \sin 2x = \frac{7}{16}$	✓ squaring both sides ✓ expanding LHS ✓ using identity ✓ simplifying ✓ answer <p style="text-align: right;">(5) <b>[18]</b></p>
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**QUESTION/VRAAG 6**

<p>6.1</p>	$4 \sin x + 2 \cos 2x = 2$ $2 \sin x + \cos 2x - 1 = 0$ $2 \sin x + (1 - 2 \sin^2 x) - 1 = 0$ $2 \sin^2 x - 2 \sin x = 0$ $2 \sin x(\sin x - 1) = 0$ $2 \sin x = 0 \quad \text{or} \quad \sin x - 1 = 0$ $\sin x = 0 \quad \quad \quad \sin x = 1$ $x = k.180^\circ \quad \text{or} \quad x = 90^\circ + k.360, k \in Z$	<p>✓ using identity ✓ standard form</p> <p>✓ factors</p> <p>✓ <math>\sin x = 0</math> or <math>\sin x = 1</math></p> <p>✓ <math>k.180^\circ</math> ✓ <math>90^\circ + k.360, k \in Z</math></p> <p>(6)</p>
<p>6.2.1</p>		<p>✓ turning point <math>(-90^\circ; -3)</math> ✓ turning point <math>(90^\circ; 1)</math> ✓ <math>(-180^\circ; -1)</math> &amp; <math>(0^\circ; -1)</math></p> <p>(3)</p>
<p>6.2.2</p>	<p><math>(-90^\circ; 0^\circ)</math></p> <p><b>OR/OF</b></p> <p><math>-90^\circ &lt; x &lt; 0^\circ</math></p>	<p>✓ ✓ answer (2)</p> <p>✓ ✓ answer (2)</p>
<p>6.2.3</p>	<p><math>f(x) = g(x)</math> <math>\therefore -180^\circ; 0^\circ; 90^\circ; 180^\circ</math> <math>f(x + 30^\circ) = g(x + 30^\circ)</math> <math>\therefore x = -30^\circ; 60^\circ; 150^\circ</math></p>	<p>✓ any ONE correct ✓ other 2 correct</p> <p>(2)</p> <p><b>[13]</b></p>

**QUESTION/VRAAG 7**



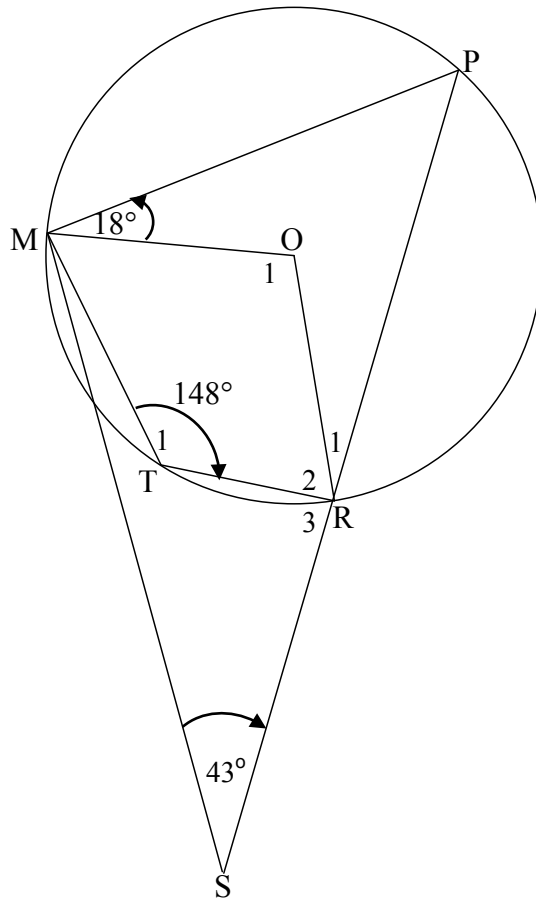
<p>7.1</p>	<p><math>\hat{A}BD = \theta</math> [alternate <math>\angle</math> s;    lines]</p> $\cos \theta = \frac{BD}{AB} = \frac{64}{81}$ $\theta = 38^\circ$ <p><b>OR/OF</b></p> $\sin \hat{B}AD = \frac{64}{81}$ $\hat{B}AD = 52,18^\circ$ $\theta = 38^\circ$	<p>✓ correct trig ratio ✓ substitution into correct ratio ✓ answer (to the nearest degree) (3)</p> <p>✓ correct trig ratio ✓ substitution into correct ratio ✓ answer (to the nearest degree) (3)</p>
<p>7.2</p>	$BC^2 = AB^2 + AC^2 - 2(AB)(AC) \cos \hat{B}AC$ $= 81^2 + 87^2 - 2(81)(87) \cos 82,6^\circ$ $= 12314,754\dots$ $BC = 110,97 \text{ m}$	<p>✓ use cosine rule ✓ correct substitution into cosine rule</p> <p>✓ answer (3)</p>

7.3	$\frac{\sin \hat{D}CB}{BD} = \frac{\sin \hat{B}DC}{BC}$ $\sin \hat{D}CB = \frac{BD \cdot \sin \hat{B}DC}{BC}$ $\sin \hat{D}CB = \frac{64 \cdot \sin 110^\circ}{110,97}$ $\therefore \hat{D}CB = 32,82^\circ$	✓ use sine rule  ✓ substitution  ✓ answer  (3) <b>[9]</b>
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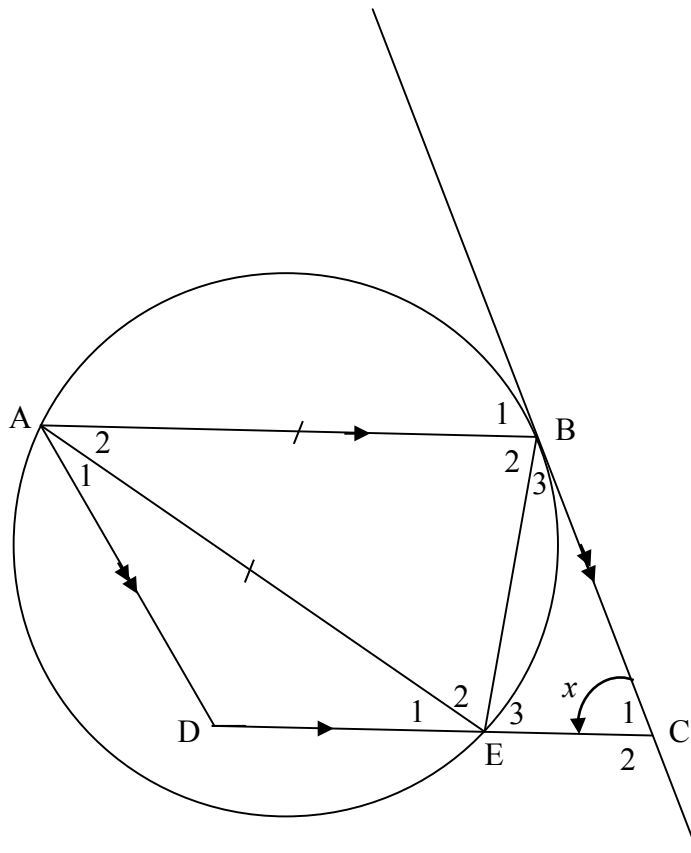
**QUESTION/VRAAG 8**

8.1



8.1.1	$\hat{P} = 32^\circ$ [opp $\angle$ s of cyclic quad/teenoorst $\angle$ e v koordevh]	✓ S ✓ R (2)
8.1.2	$\hat{O}_1 = 2(32^\circ) = 64^\circ$ [ $\angle$ centre = 2 $\angle$ at circum/midpts $\angle$ = 2 omtreks $\angle$ ] <b>OR/OF</b> reflex $\hat{O} = 296^\circ$ [ $\angle$ centre = 2 $\angle$ at circum/midpts $\angle$ = 2 omtreks $\angle$ ] $\hat{O}_1 = 64^\circ$ [ $\angle$ s around a point/ $\angle$ e om 'n punt]	✓ S ✓ R (2) ✓ S and R ✓ S (2)
8.1.3	$\hat{O}MS = 180^\circ - (32^\circ + 18^\circ + 43^\circ)$ [sum $\angle$ s $\Delta$ / som $\angle$ e $\Delta$ ] $= 87^\circ$	✓ S ✓ S (2)
8.1.4	$\hat{R}_3 = \hat{T}MP$ [ext $\angle$ cyclic quad/buite $\angle$ koordevh] $= 87^\circ + 18^\circ - 6^\circ$ $= 99^\circ$	✓ R ✓ S (2)

8.2

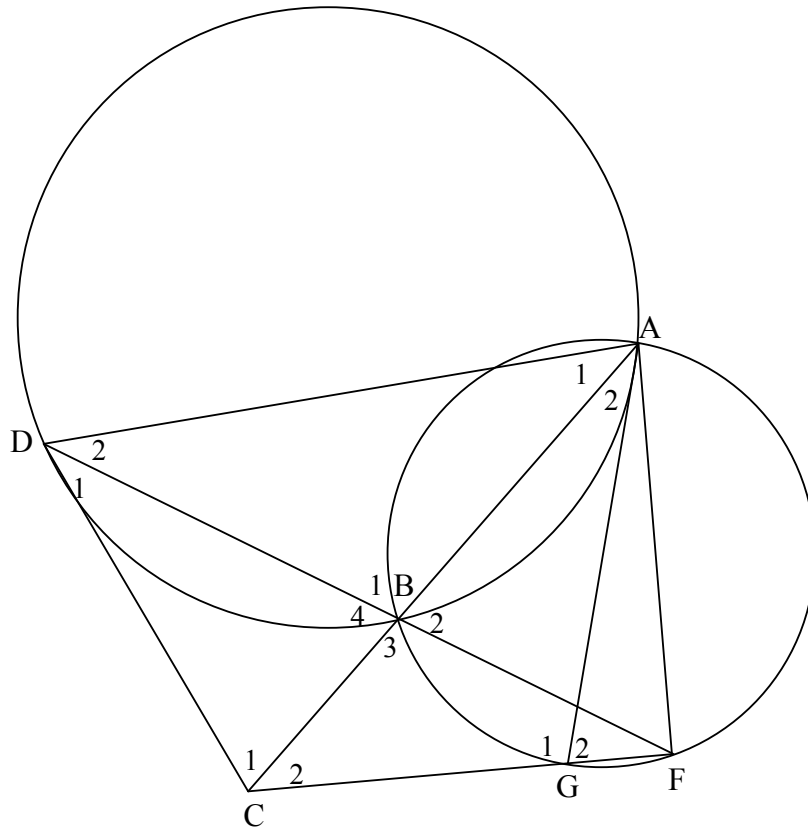


8.2.1	corres $\angle$ s/ooreenk $\angle e$ ; $AB \parallel DC$	$\checkmark$ R (1)
8.2.2	$\hat{E}_2 = x$ [tan - chord theorem/raakl – koordst] $\hat{B}_2 = x$ [ $\angle$ s opp = sides/ $\angle e$ teenoor = sye] $\hat{E}_3 = x$ [alt $\angle$ s/verwiss $\angle e$ ; $AB \parallel DC$ ] $\hat{D}\hat{A}\hat{B} = x$ [opp $\angle$ s $\parallel^m$ /teenoor $\angle e \parallel^m$ <b>OR/OF</b> alternate/verwiss $\angle$ s/ $e$ ; $BC \parallel AD$ ]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Any 3 <math>\angle</math>s correct</div> $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R (6)
8.2.3	$\hat{D} = 180^\circ - x$ [co - int $\angle$ s suppl/ko – binne $\angle e$ suppl; $AD \parallel BC$ ] $\therefore \hat{B}_2 + \hat{D} = 180^\circ$ $\therefore$ ABED a cyc quad/ <i>kdvh</i> [converse opp $\angle$ s of cyclic quad/ <i>omgek teenoorst <math>\angle e</math> koordevh</i> ]  <b>OR/OF</b> $\hat{D}\hat{A}\hat{B} = x$ [opp $\angle$ s/teenoor $\angle e \parallel^m$ ] <b>OR/OF</b> [alt $\angle$ s/verwiss $\angle e$ ; $BC \parallel AD$ ] $\hat{E}_3 = \hat{D}\hat{A}\hat{B} = x$ $\therefore$ ABED a cyc quad/ <i>kdvh</i> [converse ext $\angle$ of cyc quad/ <i>omgek buite<math>\angle</math> v koordevh</i> ]	$\checkmark$ S $\checkmark$ R  $\checkmark$ R (3)  $\checkmark$ S $\checkmark$ R  $\checkmark$ R (3) <b>[18]</b>

**QUESTION/VRAAG 9**

9.1	... in the alternate segment/...in die(teen)oorstaande segment	✓ answer	(1)
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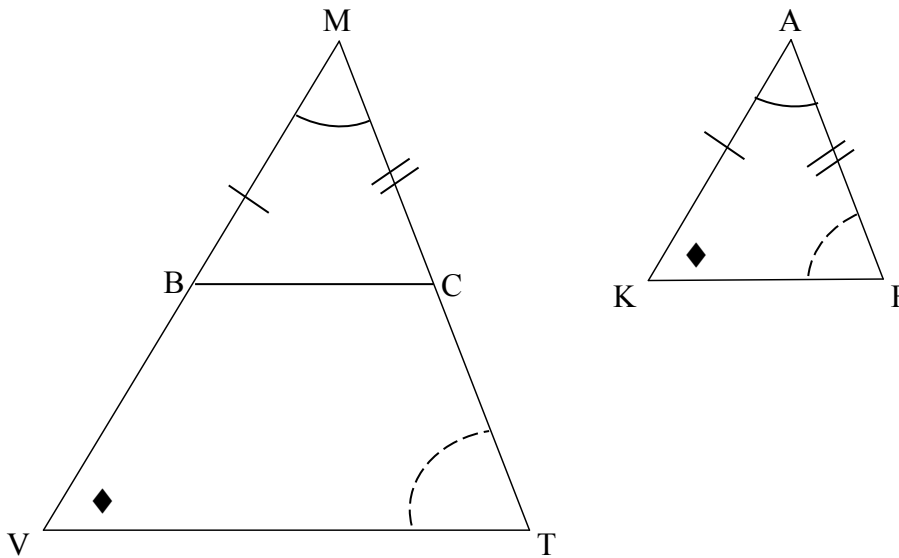
9.2



9.2.1	$\hat{A}_1 = \hat{D}_1$ [tan chord theorem/raakl – koordst] $\hat{B}_4 = \hat{A}_1 + \hat{D}_2$ [ext $\angle \Delta$ /buite $\angle \Delta$ ] $= \hat{D}_1 + \hat{D}_2$	✓ S ✓ R ✓ S ✓ R	(4)
9.2.2	$\hat{B}_4 = \hat{B}_2$ [vert opp $\angle$ s/regoorst $\angle e$ ] $\hat{D}_1 + \hat{D}_2 = \hat{B}_2$ [proven/bewys] $= \hat{G}_2$ [ $\angle$ s in same segment/ $\angle e$ in dies segment] $\therefore$ AGCD is cyc quad/kvh [converse ext $\angle$ cyc quad/omgek buite $\angle$ kvh]	✓ S ✓ S ✓ R ✓ R	(4)
9.2.3	$\hat{D}_1 = \hat{A}_2$ [ $\angle$ s in same segment/ $\angle e$ in dies segment] $\hat{A}_2 = \hat{F}$ [ $\angle$ s in same segment/ $\angle e$ in dies segment] $\therefore \hat{D}_1 = \hat{F}$ $\therefore DC = CF$ [sides opp = $\angle$ s/sye teenoor = $\angle e$ ]	✓ S ✓ R ✓ S ✓ R	(4)

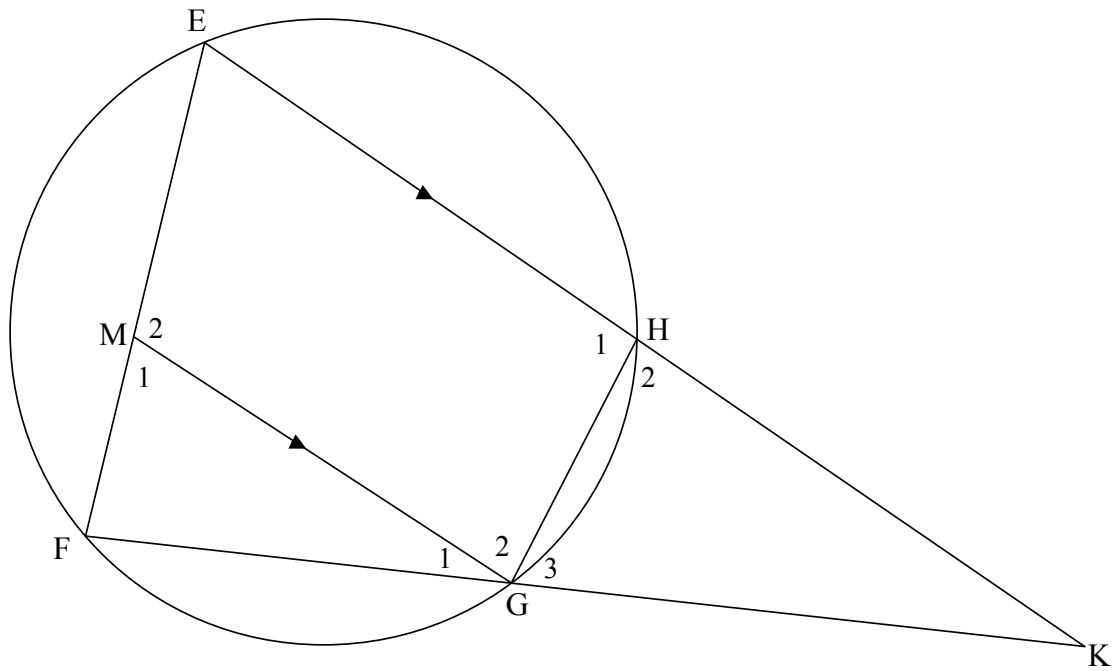
[13]

**QUESTION/VRAAG 10**



10.1	<p><b>Constr/Konstr :</b>                  Draw line BC such that <math>MB = AK</math> and <math>MC = AF</math>  <i>Trek lyn BC sodat <math>MB = AK</math> en <math>MC = AF</math></i></p> <p><b>Proof/Bewys :</b>                  In <math>\triangle BMC</math> and/en <math>\triangle KAF</math>  <math>MB = AK</math> [constr/konstr]  <math>\hat{M} = \hat{A}</math> [given/gegee]  <math>MC = AF</math> [constr/konstr]  <math>\triangle BMC \cong \triangle KAF</math> [s <math>\angle</math> s]  <math>\therefore \hat{MBC} = \hat{AKF}</math> or <math>\hat{MCB} = \hat{AFK}</math> [<math>\cong \Delta</math>]                  but /maar <math>\hat{V} = \hat{K}</math> or <math>\hat{T} = \hat{F}</math> [given/gegee]  <math>\therefore \hat{MBC} = \hat{V}</math> or <math>\hat{MCB} = \hat{T}</math>                  But these are corresponding <math>\angle</math>s/maar hulle is ooreenk <math>\angle</math>e  <math>\therefore BC \parallel VT</math> [corr <math>\angle</math>s = /ooreenk <math>\angle</math>e =]  <math>\therefore \frac{MV}{MB} = \frac{MT}{MC}</math> [prop theorem/eweredighst; <math>BC \parallel VT</math>]                  but /maar <math>MB = AK</math> and <math>MC = AF</math> [constr/konstr]  <math>\therefore \frac{MV}{AK} = \frac{MT}{AF}</math></p>	<p>✓ constr/konstr</p> <p>✓ S / R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S / R</p> <p>✓ S ✓ R</p> <p style="text-align: right;">(7)</p>
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10.2



10.2.1(a)	In $\Delta KGH$ and $\Delta KEF$ $\hat{K}$ is common/ <i>gemeen</i> $\hat{H}_2 = \hat{F}$ [ext $\angle$ cyclic quad/ <i>buite <math>\angle</math> koordevh</i> ] $\hat{G}_3 = \hat{E}$ [sum $\angle$ s $\Delta$ OR ext $\angle$ cyclic quad/ <i>som <math>\angle</math>e <math>\Delta</math> OR <i>buite <math>\angle</math> koordevh</i>]  <math>\therefore \Delta KGH \parallel \Delta KEF</math> [<math>\angle\angle\angle</math>]             </i>	✓ S ✓ S ✓ R ✓ naming third angle OR $\angle\angle\angle$ (4)
10.2.1(b)	$\frac{EF}{GH} = \frac{KE}{KG}$ [ $\parallel \Delta$ s] $\therefore \frac{EF}{GH} = \frac{KE}{EF}$ [ $KG = EF$ ] $\therefore EF^2 = KE \cdot GH$	✓ S ✓ S (2)
10.2.1(c)	$\frac{KG}{KF} = \frac{EM}{EF}$ [prop theorem/ <i>eweredighst</i> ; $MG \parallel EK$ ] but $EF = KG$ [given/ <i>gegee</i> ] $\frac{KG}{KF} = \frac{EM}{KG}$ $KG^2 = EM \cdot KF$	✓ S ✓ R ✓ S (3)
10.2.2	$KE \cdot GH = EM \cdot KF$ $EM = \frac{20 \times 4}{16}$ $= 5$ units	✓ $KE \cdot GH = EM \cdot KF$ ✓ substitution ✓ answer (3) <b>[19]</b>

TOTAL/TOTAAL: 150