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# SA EXAM PAPERS

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DEPARTMENT OF EDUCATION  
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**PROVINSIALE EKSAMEN  
PROVINCIAL EXAMINATION**

**GRAAD 12/GRADE 12**

**WISKUNDE/MATHEMATICS  
VRAESTEL 2/PAPER 2  
JUNIE/JUNE 2025  
NASIENRIGLYNE/MARKING GUIDELINES**

**PUNTE/MARKS: 150**

**TYD/TIME: 3 uur/hours**

**Hierdie nasienriglyne bestaan uit 17 bladsye./  
These marking guidelines consist of 17 pages**



**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.

**SA EXAM PAPERS**

**QUESTION/VRAAG 1**

|     |                                                                      |                                     |
|-----|----------------------------------------------------------------------|-------------------------------------|
| 1.1 | $\tilde{x} = 48,45$                                                  | ✓✓ Answer (2)                       |
| 1.2 | $\sigma = 25,97$                                                     | ✓ Answer (1)                        |
| 1.3 | $[48,45 - 25,97 ; 48,45 + 25,97]$<br>$[22,48 ; 74,42]$<br>8 learners | ✓22.48<br>✓74.42<br>✓8 learners (3) |
| 1.4 | $IQR = 55 - 31$<br>$= 24$                                            | ✓55 ✓31<br>✓ Answer (3)             |
| 1.5 | 112<br>$Q_3 + 1.5 \cdot IQR = 55 + 1.5(24) = 91$<br>$112 > 91$       | ✓ Answer (1)                        |
|     |                                                                      | <b>[10]</b>                         |



## QUESTION/VRAAG 2

|     |                                                                                                                                                               |                                 |     |  |                                                                      |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----|--|----------------------------------------------------------------------|
| 2.1 | $43 + 69 + 110 + 49 + 20 + 9 = 300$ cars                                                                                                                      |                                 |     |  | ✓300 (1)                                                             |
| 2.2 | Speed/ <i>spoed</i><br>km/h                                                                                                                                   | Frequency/<br><i>Frekwensie</i> | F   |  | ✓43,112,<br>222<br><br>✓271,291,<br>300<br>(2)                       |
|     | $60 \leq x < 70$                                                                                                                                              | 43                              | 43  |  |                                                                      |
|     | $70 \leq x < 80$                                                                                                                                              | 69                              | 112 |  |                                                                      |
|     | $80 \leq x < 90$                                                                                                                                              | 110                             | 222 |  |                                                                      |
|     | $90 \leq x < 100$                                                                                                                                             | 49                              | 271 |  |                                                                      |
|     | $100 \leq x < 110$                                                                                                                                            | 20                              | 291 |  |                                                                      |
|     | $110 \leq x < 120$                                                                                                                                            | 9                               | 300 |  |                                                                      |
| 2.3 | <p style="text-align: center;"><b>CUMULATIVE FREQUENCY/<br/>KUMULATIEWE FREKWENSIE</b></p>                                                                    |                                 |     |  | ✓<br>grounding<br><br>✓Upper<br>boundaries<br>.<br>✓shape<br><br>(3) |
| 2.4 | $Q_1 = 75$<br>$Q_3 = 90$ accept $Q_1$ from 72-75, accept $Q_3$ from 90-93<br>$SIQR = \frac{90 - 75}{2} = 7.5$ CA from Ogive                                   |                                 |     |  | ✓75 ✓90<br>✓Answer<br>(3)                                            |
| 2.5 | $300 - 112 = 188$ cars    (If read from ogive-accept from 187-189)<br>300- 112<br>Could also just add using the table.<br>CA from learners' ogive all the way |                                 |     |  | ✓✓188<br>(2)                                                         |
|     |                                                                                                                                                               |                                 |     |  | [11]                                                                 |



**QUESTION/VRAAG 3**

|       |                                                                                                                                     |                                                                                                                                                                                                  |
|-------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.1   | $m = \frac{6-0}{3-0}$ $= 2$                                                                                                         | <p>Not allowed to use the value of S in q 3.1 - 3.3</p> <p>✓ Substitution</p> <p>✓ Answer (2)</p>                                                                                                |
| 3.2   | $\tan \theta = 2$ $\theta = \tan^{-1}(2)$ $= 63.43^\circ$                                                                           | <p>✓ Substitution</p> <p>✓ Answer (2)</p>                                                                                                                                                        |
| 3.3.1 | $\alpha = 63.43^\circ + 20.23^\circ \text{ (ext } \angle \text{ of } \Delta)$ $\alpha = 83.66^\circ$ $m = \tan 83.66^\circ$ $m = 9$ | <p>✓ <math>\alpha = 83.66^\circ</math></p> <p>✓ substitution</p> <p>✓ Answer (3)</p>                                                                                                             |
| 3.3.2 | $y = 9x + c$ $3 = 9(-2) + c$ $3 + 18 = c$ $c = 21$ $y = 9x + 21$                                                                    | <p>✓✓ substitution</p> <p>✓ Answer (3)</p>                                                                                                                                                       |
| 3.4   | $2x = 9x + 21$ $-7x = 21$ $x = -3$ $y = 2(-3)$ $y = -6$ $S(-3; -6)$                                                                 | <p>Mistake in question paper. S given in paper differs from S calculated in 3.4</p> <p>✓ equating</p> <p>✓ <math>x = -3</math></p> <p>✓ substitution</p> <p>✓ <math>y = -6</math></p> <p>(4)</p> |
| 3.5   | $S(-21; -42)$ $M\left(\frac{-21+3}{2}; \frac{6+(-42)}{2}\right)$ $M(-9; -18)$                                                       | $S(-3; -6)$ $M\left(\frac{-3+3}{2}; \frac{-6+6}{2}\right)$ $M(0; 0)$ <p>✓ x-value</p> <p>✓ y-value (2)</p>                                                                                       |



|     |                                               |                                 |                                                                         |                                                                                                                               |                                                     |
|-----|-----------------------------------------------|---------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 3.6 | $-9 = \frac{-2+x}{2}$ $-18+2=x$ $R(-16; -39)$ | $-18 = \frac{3+y}{2}$ $-36-3=y$ | $0 = \frac{-2+x}{2}$ $x = 2$<br>$0 = \frac{3+y}{2}$ $y = -3$ $R(2; -3)$ | <div style="border: 1px solid black; padding: 5px; width: fit-content;">           Answer only:<br/>full marks         </div> | ✓ substitution<br>✓ x-value<br>✓ y-value<br><br>(3) |
|     |                                               |                                 |                                                                         |                                                                                                                               | [19]                                                |



**QUESTION/VRAAG 4**

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                      |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.1.1 | $0 = \frac{-5}{2}x - 4$<br>$4 = \frac{-5}{2}x$<br>$8 = -5x$<br>$x = -\frac{8}{5}$<br>$E\left(\frac{-8}{5}; 0\right)$                                                                                                                                                                                                                                                                                                                                                                            | $\checkmark 0$<br><br>$\checkmark -\frac{8}{5}$<br><br><br><br><div>(2)</div>                                                                                                                                        |
| 4.1.2 | $x^2 + y^2 = r^2$<br>$(0)^2 + \left(-\frac{8}{5}\right)^2 = r^2$<br>$r^2 = \frac{64}{25}$<br>$x^2 + y^2 = \frac{64}{25}$<br><div>NB It was not given that AMB is a diameter. BUT the sketch is misleading. The option is therefor added to the memo, BUT it is actually INCORRECT to assume that AMB is a diameter.</div>                                                                                                                                                                       | $\checkmark$ substitution<br><br>$\checkmark r^2 = \frac{64}{25}$<br><br>$\checkmark$ answer<br><br><div>(3)</div>                                                                                                   |
| 4.2   | <div><div><div><b>CORRECT</b></div><div><math>M_{AE} = -\frac{5}{2}</math></div><div><math>M_{AM} = \frac{2}{5} (\tan \perp radii)</math></div><div><math>y = \frac{2}{5}x + c</math></div><div><math>c = -4</math></div><div><math>y = \frac{2}{5}x - 4</math></div></div><div><div><math>M_{AM} = \frac{-2 - (-4)}{5 - 0}</math></div><div><math>= \frac{2}{5}</math></div><div><math>c = -4</math></div><div><math>y = \frac{2}{5}x - 4</math></div><div><b>xx ASSUMED</b></div></div></div> | $\checkmark$ gradient of AM<br><br>$\checkmark y = \frac{2}{5}x + c$<br><br>$\checkmark$ Answer<br><br><div>(3)</div>                                                                                                |
| 4.3   | <div><div><div><b>CORRECT</b></div><div><math>-3 = \frac{2}{5}a - 4</math></div><div><math>1 = \frac{2}{5}a</math></div><div><math>a = \frac{5}{2}</math></div><div>OR</div><div><math>a = \frac{5+0}{2}</math></div><div><math>a = \frac{5}{2}</math></div><div><b>xx ASSUMED</b></div></div><div></div></div>                                                                                                                                                                                 | $\checkmark$ substitution<br><br>$\checkmark$ simplification<br><br>$\checkmark$ Answer<br><br><div>(3)</div><br><br>OR<br><br>$\checkmark \checkmark$ substitution<br><br>$\checkmark$ Answer<br><br><div>(3)</div> |



|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                       |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.4 | $\left(x - \frac{5}{2}\right)^2 + (y - (-3))^2 = r^2$ $\left(x - \frac{5}{2}\right)^2 + (y + 3)^2 = r^2$ $\left(0 - \frac{5}{2}\right)^2 + (-4 + 3)^2 = r^2$ $r^2 = \frac{29}{4}$ $\left(x - \frac{5}{2}\right)^2 + (y + 3)^2 = \frac{29}{4}$                                                                                                                                                                                                                                                                                                                                                                                          | $\checkmark \left(x - \frac{5}{2}\right)^2 + (y + 3)^2 = r^2$ $\checkmark \text{ Substitution}$ $\checkmark r^2 = \frac{29}{4}$ $\checkmark \text{ Answer}$ <p style="text-align: right;">(4)</p>                                                                                                                                                                     |
| 4.5 | $\hat{G} = 90^\circ (\angle \text{ in semi-circle})$ $G\left(0; \frac{8}{5}\right)$ $F\left(\frac{8}{5}; 0\right)$ $EG = \sqrt{\left(\frac{-8}{5} - 0\right)^2 + \left(\frac{8}{5} - 0\right)^2} = \frac{8\sqrt{2}}{5}$ $GF = \frac{8\sqrt{2}}{5}$ $\text{Area of } \triangle EFG = \frac{1}{2} \left(\frac{8\sqrt{2}}{5}\right) \left(\frac{8\sqrt{2}}{5}\right)$ $= \frac{64}{25} = 2.56 \text{ units}^2$ <p>OR</p> $\text{Area of } \triangle EFG = \frac{1}{2} \cdot EF \cdot OG$ $\text{Area of } \triangle EFG = \frac{1}{2} \left(2 \cdot \frac{8}{5}\right) \left(\frac{8}{5}\right)$ $= \frac{64}{25} = 2.56 \text{ units}^2$ | $\checkmark \text{ Angle G.}$ $\checkmark \text{ length of EG}$ $\checkmark \text{ length of GF}$ $\checkmark \text{ Substitution}$ $\checkmark \text{ Answer}$ <p style="text-align: right;">(5)</p> <p>OR</p> $\checkmark \checkmark \text{ method}$ $\checkmark \checkmark \text{ substitution}$ $\checkmark \text{ Answer}$ <p style="text-align: right;">(5)</p> |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>[20]</b>                                                                                                                                                                                                                                                                                                                                                           |



**QUESTION/VRAAG 5**

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                             |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 5.1.1 | $(\sqrt{34})^2 = (3)^2 + p^2$<br>$34 - 9 = p^2$<br>$p = -5$                                                                                                                                                                                                                                                                                                                                                                                             | ✓ substitution<br>✓ Answer<br>(2)                                                                                                           |
| 5.1.2 | $\cos(450^\circ - 2\theta)$<br>$= \sin 2\theta$<br>$= 2 \sin \theta \cdot \cos \theta$ First mark awarded here<br>$= 2 \left( \frac{-5}{\sqrt{34}} \right) \left( \frac{3}{\sqrt{34}} \right)$<br>$= \frac{-30}{34}$<br>$= \frac{-15}{17}$                                                                                                                                                                                                              | ✓ $\sin 2\theta = 2 \sin \theta \cos \theta$<br>✓ substitution<br>✓ Answer<br>(3)                                                           |
| 5.1.3 | $\cos(30^\circ - \theta)$<br>$\cos 30^\circ \cdot \cos \theta + \sin 30^\circ \cdot \sin \theta$<br>$\left( \frac{\sqrt{3}}{2} \right) \left( \frac{3}{\sqrt{34}} \right) + \left( \frac{1}{2} \right) \left( \frac{-5}{\sqrt{34}} \right)$<br>$\frac{3\sqrt{3} - 5}{\sqrt{34}}$ Answer<br>$\frac{3\sqrt{102} - 5\sqrt{34}}{34}$                                                                                                                        | ✓ Expansion<br>✓ Substitution<br>✓ Answer<br>(3)                                                                                            |
| 5.2   | $\frac{-2 \sin x - \cos x}{\sin(x + 60^\circ + x)}$ Question paper misleading...does not simplify to a single trigonometric function<br>$\frac{2 \sin x \cdot \cos}{\sin(2x + 60^\circ)}$<br>$\frac{\sin 2x}{\sin 2x \cdot \cos 60^\circ + \cos 2x \cdot \sin 60^\circ}$<br>$\frac{\sin 2x}{\sin 2x}$<br>$\frac{1}{2} \sin 2x + \frac{\sqrt{3}}{2} \cos 2x$<br>$\frac{2 \sin 2x}{\sin 2x + \sqrt{3} \cos 2x}$<br>$\frac{2 \tan 2x}{\tan 2x + \sqrt{3}}$ | ✓ $-\sin x$ ✓ $-\cos x$ ✓ compound angle<br>✓ $\sin 2x$<br>✓ $\sin 2x \cdot \cos 60^\circ + \cos 2x \cdot \sin 60^\circ$<br>✓ Answer<br>(6) |



|       |                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                           |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.3.1 | $f(x) = \cos(x + 45^\circ) \cdot \cos(45^\circ - x)$ $= [\cos x \cdot \cos 45^\circ - \sin x \cdot \sin 45^\circ] [\cos x \cdot \cos 45^\circ + \sin x \cdot \sin 45^\circ]$ $= \left[ \frac{1}{\sqrt{2}} \cos x - \frac{1}{\sqrt{2}} \sin x \right] \left[ \frac{1}{\sqrt{2}} \cos x + \frac{1}{\sqrt{2}} \sin x \right]$ $= \frac{1}{2} \cos^2 x - \frac{1}{2} \sin^2 x$ $= \frac{1}{2} (\cos^2 x - \sin^2 x)$ $= \frac{1}{2} \cos 2x$ | <p>✓ first expansion</p> <p>✓ second expansion</p> <p>✓ <math>\frac{1}{2} \cos^2 x - \frac{1}{2} \sin^2 x</math></p> <p>✓ common factor</p> <p>(4)</p>                                                                                    |
| 5.3.2 | $\frac{1}{2} \cos 2x = 1 - 2 \sin x$ $1 - 2 \sin^2 x = 2 - 4 \sin x$ $2 \sin^2 x - 4 \sin x + 1 = 0$ $\sin x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(1)}}{2(2)}$ $\sin x = \frac{2 - \sqrt{2}}{2} = 0,29 \text{ or } \sin x = \frac{2 + \sqrt{2}}{2} = 1,71$ $x = 17.03^\circ + k.360^\circ \quad \text{no solution}$ $x = 162.97^\circ + k.360^\circ \quad k \in \mathbb{Z}$ <p>CA is learner uses 0,293 etc</p>                          | <p>✓ formulae</p> <p>✓ standard form</p> <p>✓ <math>\sin x</math> value(s)</p> <p>✓ <math>x = 17.03^\circ + k.360^\circ</math></p> <p>✓ <math>x = 162.97^\circ + k.360^\circ</math></p> <p>✓ <math>k \in \mathbb{Z}</math></p> <p>(6)</p> |
| 5.4   | $\cos \theta = 2m \text{ and } \cos 2\theta = 7m$ $2 \cos^2 \theta - 1 = 7m$ $2(2m)^2 - 1 = 7m$ $8m^2 - 7m - 1 = 0$ $(8m + 1)(m - 1) = 0$ $m = \frac{-1}{8} \text{ or } m = 1$ $\therefore m = -\frac{1}{8}$                                                                                                                                                                                                                             | <p>✓ formulae</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ Answer with selection</p> <p>(5)</p>                                                                                                                 |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                          | [29]                                                                                                                                                                                                                                      |



## QUESTION/VRAAG 6

|       |                                                                                                                                                                 |                                                                                        |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 6.1   | $120^\circ$                                                                                                                                                     | ✓ Answer (1)                                                                           |
| 6.2   |                                                                                                                                                                 | g<br>✓ shape<br>✓ x-intercept<br>✓ turning point<br>(3)                                |
| 6.3.1 | $x \in [-90^\circ; -60^\circ)$<br>or $-90^\circ \leq x < -60^\circ$                                                                                             | ✓✓ Answer<br>(2)                                                                       |
| 6.3.2 | $-90^\circ < x < 0^\circ$ or $60^\circ < x < 90^\circ$ , $x \neq -60^\circ$<br>Incorrect, some equal signs omitted                                              | ✓ $-90^\circ < x < 0^\circ$<br>✓ $60^\circ < x < 90^\circ$<br>✓ $x \neq -60^\circ$ (3) |
| 6.3.3 | $x = 30^\circ$<br>Question paper asked wrong way round - the only answer available is a -1. Therefore...actually no solution<br><b>Note: Accept no solution</b> | ✓ Answer<br>(1)                                                                        |
| 6.4   | $h(x) = 2 \cos(x - 30^\circ - 60^\circ)$<br>$= 2 \cos(x - 90^\circ)$<br>$= 2 \sin x$                                                                            | ✓ $2 \cos(x - 90^\circ)$<br>✓ Answer<br>(2)                                            |
|       |                                                                                                                                                                 | [12]                                                                                   |



**QUESTION/VRAAG 7**

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.1 | <p>in <math>\triangle PQS</math></p> $\cos 30^\circ = \frac{x}{PS}$ $\frac{\sqrt{3}}{2} = \frac{x}{PS}$ $PS = \frac{2x}{\sqrt{3}}$ <p>in <math>\triangle PQR</math></p> $\sin 30^\circ = \frac{x}{PR}$ $\frac{1}{2} = \frac{x}{PR}$ $PR = 2x$ <p>in <math>\triangle PSR</math></p> $PR^2 = RS^2 + PS^2 - 2RS \cdot PS \cos \theta$ $(2x)^2 = \left(\frac{2x}{\sqrt{3}}\right)^2 + (\sqrt{3})^2 - 2\left(\frac{2x}{\sqrt{3}}\right)(\sqrt{3}) \cos \theta$ $4x^2 = \frac{4}{3}x^2 + 3 - 4x \cos \theta \quad \times 3$ $12x^2 = 4x^2 + 9 - 12x \cos \theta$ $12x \cos \theta = 9 - 8x^2$ $\cos \theta = \frac{9 - 8x^2}{12x}$ | $\checkmark \cos 30^\circ = \frac{x}{PS}$ $\checkmark PS = \frac{2x}{\sqrt{3}}$ $\checkmark \sin 30^\circ = \frac{x}{PR}$ $\checkmark PR = 2x$ $\checkmark \text{Substitution into Cosine rule}$ $\checkmark 4x^2 = \frac{4}{3}x^2 + 3 - 4x \cos \theta$ <p style="text-align: right;">(6)</p> |
| 7.2 | <p>Area of <math>\triangle PSR = \frac{1}{2}(\sqrt{3})\left(\frac{2(1)}{\sqrt{3}}\right) \sin \theta</math></p> <p style="text-align: center;"><math>= \sin \theta \text{ units}^2</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                | $\checkmark \checkmark \text{Substitution into Area rule}$ <p style="text-align: right;">(2)</p>                                                                                                                                                                                               |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>[8]</b>                                                                                                                                                                                                                                                                                     |



**QUESTION/VRAAG 8**

|     |                                                                                                                                                                                                                                                                                    |                                                                                                                 |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 8.1 | $\hat{QOR} = 228^\circ$ ( $\angle$ around a point)<br>$\hat{QTR} = 114^\circ$ ( $\angle$ at center = $2\angle$ at circumference)<br><br>OR<br>$\hat{RPQ} = 66^\circ$ ( $\angle$ at center = $2\angle$ at circumference)<br>$\hat{QTR} = 114^\circ$ (opp $\angle$ s of cyclic quad) | $\checkmark$ S<br>$\checkmark$ S<br>$\checkmark$ R<br>OR<br>$\checkmark$ S $\checkmark$ R<br>$\checkmark$ S (3) |
| 8.2 | $\hat{OQS} = 90^\circ$ (tan $\perp$ radii)<br>$\hat{ORS} = 90^\circ$ (tan $\perp$ radii)<br>$\therefore$ QORS is a cyclic quadrilateral (opp $\angle$ s are supplementary)<br><br>OR (converse of opp $\angle$ s of cyclic quad)                                                   | $\checkmark$ S/R<br>$\checkmark$ S/R<br>$\checkmark$ R<br>(3)                                                   |
| 8.3 | $\hat{QSR} = 48^\circ$ (Opp $\angle$ s of cyclic quad) OR (sum of $\angle$ s of quad)                                                                                                                                                                                              | $\checkmark$ S<br>$\checkmark$ R (2)                                                                            |
|     |                                                                                                                                                                                                                                                                                    | <b>[8]</b>                                                                                                      |



**QUESTION/VRAAG 9**

|     |                                                                                                                                                                                                                                                                                                                                           |                                         |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 9.1 | $c = x$ (tan-chord theorem) S R<br>$E_1 = 180^\circ - (x + y)$ (sum of $\angle$ s in $\Delta$ ) S/R<br>$E_3 = y$ ( $\angle$ s in str line) / ext $\angle$ of $\Delta DEC$ S/R<br>$\hat{A}BE = y$ ( $\angle$ s opp = sides) S/R<br>$D_1 = \hat{A}BE = y$ R<br>$\therefore ABED$ is a cyclic quad (converse of ext $\angle$ of cyclic quad) | ✓S ✓R<br>✓S/R<br>✓S/R<br>✓S/R<br>✓R (6) |
| 9.2 | $\hat{B}_1 = x$ ( $\angle$ s in same seg) S R<br>$\hat{B}_1 = \hat{C} = x$<br>$AB$ is a tangent to a circle $B, C$ and $D$<br>(converse of tan-chord theorem) or<br>( $\angle$ between a line and chord) R                                                                                                                                | ✓S ✓R<br><br>✓R (3)                     |
|     |                                                                                                                                                                                                                                                                                                                                           | [9]                                     |



## QUESTION/VRAAG 10

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.1 | <div> </div> <p>Construct height <math>h</math> and <math>k</math> perpendicular to <math>AD</math> and <math>AE</math> respectively. Join <math>DC</math> and <math>BE</math>.</p> $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle BDE} = \frac{\frac{1}{2} AD \cdot h}{\frac{1}{2} BD \cdot h} \quad \checkmark \quad (\text{Same height } h)$ $= \frac{AD}{BD}$ $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle CED} = \frac{\frac{1}{2} AE \cdot k}{\frac{1}{2} EC \cdot k} \quad \checkmark \quad (\text{Same height } k)$ $= \frac{AE}{EC}$ <p>But Area of <math>\triangle BDE</math> = Area of <math>\triangle CED</math> (same base <math>DE</math>, same height between <math>\parallel</math> lines.)</p> $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle BDE} = \frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle CED} \quad \checkmark$ $\therefore \frac{AD}{BD} = \frac{AE}{EC}$ | <p><math>\checkmark</math> construction</p> <p><math>\checkmark</math> S</p> <p><math>\checkmark</math> S</p> <p><math>\checkmark</math> S <math>\checkmark</math> R</p> <p><math>\checkmark</math> S</p> <p>(6)</p> |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



|      |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                 |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 10.2 | $\frac{AD}{DB} = \frac{AF}{FC} \text{ (Prop theorem } DF \parallel BC)$<br>$AF = \frac{AD \cdot FC}{DB}$<br>$\text{From } \frac{AF}{FE} = \frac{FC}{EB}$<br>$AF = \frac{FE \cdot FC}{EB}$<br>$\frac{FE \cdot FC}{EB} = \frac{AD \cdot FC}{DB}$<br>$\frac{FE}{EB} = \frac{AD}{DB}$<br>$\therefore DE \parallel AF \text{ (Converse of prop theorem)}$ | ✓S ✓R<br><br>✓<br>$AF = \frac{AD \cdot FC}{DB}$<br><br>✓<br>$AF = \frac{FE \cdot FC}{EB}$<br><br>✓Equating<br><br>✓R<br><br>(6) |
|      |                                                                                                                                                                                                                                                                                                                                                      | [12]                                                                                                                            |



## QUESTION/VRAAG 11

The word "TANGENT" DE was omitted on ENGLISH side

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                 |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.1 | $\hat{F}\hat{G}E = \theta$ (Tan-chord theorem)<br>$\hat{E}_2 = \theta$ ( $\angle s$ opp = sides)<br>$\hat{F}_2 = \theta$ (Alt $\angle s$ , $DE \parallel FH$ )                                                                                                                                                                                                                                                                                                                           | ✓S<br>✓S<br>✓S (3)                                                                                                                                                                                                              |
| 11.2 | In $\triangle DEF$ and $\triangle DGE$ ✓<br>$\hat{D} = \hat{D}$ common ✓<br>$\hat{E}_1 = \hat{G}$ tan chord theorem or (proved in 11.1) ✓<br>$\hat{F}_3 = \hat{E}_1 + \hat{E}_2$ (Sum of $\angle s$ in $\triangle$ )<br>$\triangle DEF \sim \triangle DGE$ (AAA) ✓<br>$\frac{DE}{DG} = \frac{EF}{GE} = \frac{DF}{DE}$ (from $\sim \triangle s$ )<br>$DE^2 = DF \cdot DG$                                                                                                                 | ✓identifying triangles<br>✓S/R<br>✓S<br>✓R(AAA)<br>✓S (5)                                                                                                                                                                       |
| 11.3 | $\frac{DF^2}{DE^2} + \frac{DF}{DE} = \frac{DF^2 + DF \cdot DE}{DE^2}$ $= \frac{DF(DF + DE)}{DE^2}$ $= \frac{DF(DF + FG)}{DF \cdot DG} \quad (DE = FG)$ $= \frac{DF + FG}{DG} \quad (DE^2 = DF \cdot DG)$ $= \frac{DG}{DG} \quad (DG = DF \cdot FG)$ $= 1$ <p>OR</p> $\frac{EF}{GE} = DE^2 = DF \cdot DG$ $= DF \cdot (DF + FG)$ $= DF^2 + DF \cdot FG$ $= DF^2 + DF \cdot DE$ $\frac{DE^2}{DE^2} = \frac{DF^2}{DE^2} + \frac{DF \cdot DE}{DE^2}$ $1 = \frac{DF^2}{DE^2} + \frac{DF}{DE}$ | $\checkmark \frac{DF^2 + DF \cdot DE}{DE^2}$ ✓common factor<br>✓S<br>✓S<br>(4)<br>$\checkmark DF \cdot (DF + FG)$ $\checkmark DF^2 + DF \cdot FG$ $\checkmark DF^2 + DF \cdot DE$ ✓Dividing both sides by $DE^2$<br>(4)<br>[12] |
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TOTAL: 150                                                                                                                                                                                                                      |

