

**Grade 12 Mathematics**

**Test/Assignment**

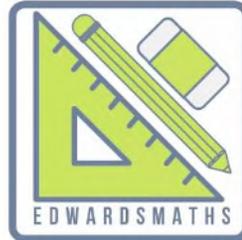
**Term 1-2022**

**Examiner:**

**Moderator:**

**Total: 50**

**Time: 1 hour**



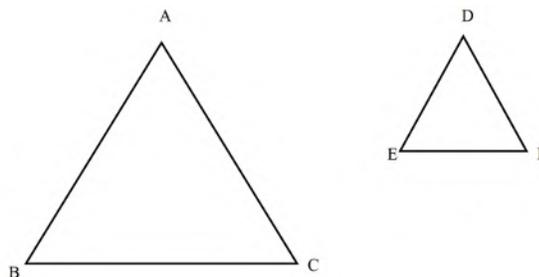
This paper consists of 4 pages.

**INSTRUCTIONS AND INFORMATION**

1. Read the following instructions carefully before answering the questions.
2. This question paper consists of 3 questions.
3. Answer ALL the questions.
4. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Number the answers correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.

**Question 1**

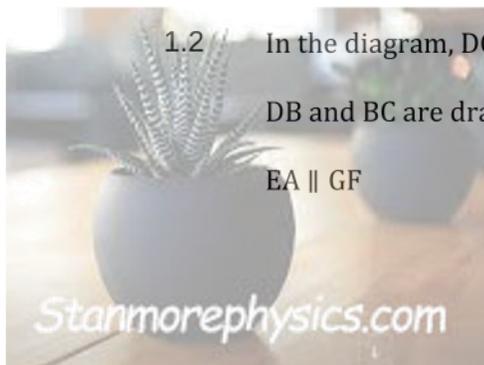
1.1 In the diagram below,  $\triangle ABC$  and  $\triangle DEF$  are drawn with  $\hat{A} = \hat{D}$ ;  $\hat{B} = \hat{E}$  and  $\hat{C} = \hat{F}$ .



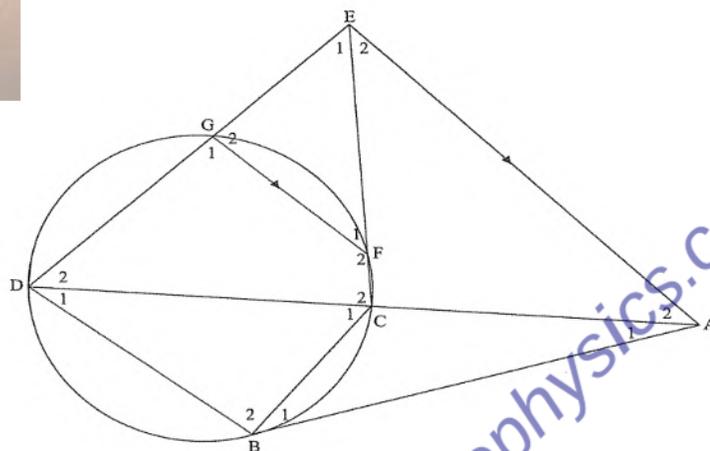
Prove the theorem that states that if two triangles are similar, then the sides are

proportional, i.e.  $\frac{DE}{AB} = \frac{EF}{BC} = \frac{DF}{AC}$

(5)



1.2 In the diagram, DGFC is a cyclic quadrilateral and  $AB$  is a tangent to the circle at  $B$ . Chords  $DB$  and  $BC$  are drawn.  $DG$  produced and  $CF$  produced meet in  $E$  and  $DC$  is produced to  $A$ .  
 $EA \parallel GF$



1.2.1 Give a reason why  $\hat{B}_1 = \hat{D}_1$ . (1)

1.2.2 Prove  $\triangle ABC \parallel \triangle ADB$ . (3)

1.2.3 Prove  $\hat{E}_2 = \hat{D}_2$  (4)

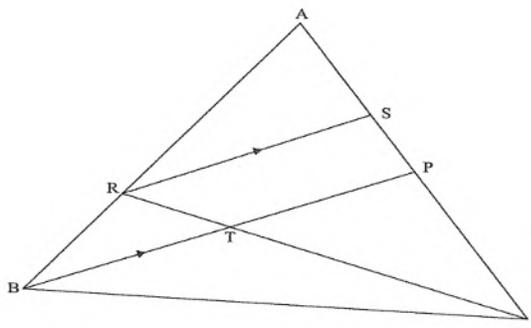
1.2.4 Prove  $AE = \sqrt{AD \times AC}$ . (5)

1.2.5 Hence, show that  $AE = AB$ . (3)

[21]

**Question 2**

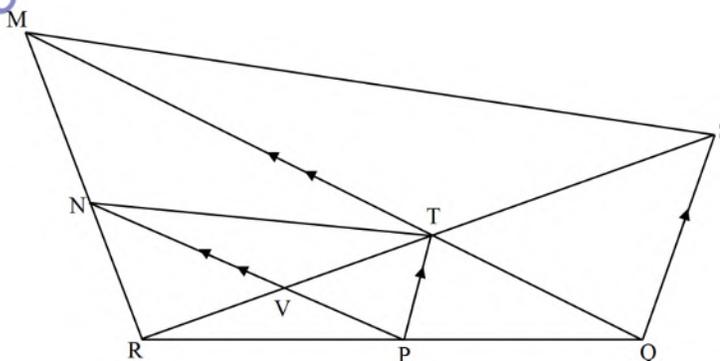
- 2.1 In the diagram below,  $P$  is the midpoint of  $AC$  in  $\triangle ABC$ .  $R$  is a point on  $AB$  such that  $RS \parallel BP$  and  $\frac{AR}{AB} = \frac{3}{5}$ .  $RC$  intersects  $BP$  in  $T$ .



Determine, with reasons, the following ratios:

- 2.1.1  $\frac{AS}{SC}$  (3)
- 2.1.2  $\frac{RT}{TC}$  (3)
- 2.1.3  $\frac{\text{Area of } \triangle RAS}{\text{Area of } \triangle RSC}$  (2)
- 2.1.4  $\frac{\text{Area of } \triangle TPC}{\text{Area of } \triangle RSC}$  (3)

- 2.2 In the diagram below,  $RQSM$  is a quadrilateral.  $N$  and  $P$  are points on  $MR$  and  $RQ$  respectively such that  $MN \parallel NP$ . The diagonals intersect at  $T$ .  $P$  is a point on  $RQ$  such that  $TP \parallel SQ$ .  $TR$  and  $NP$  intersect at  $V$ .



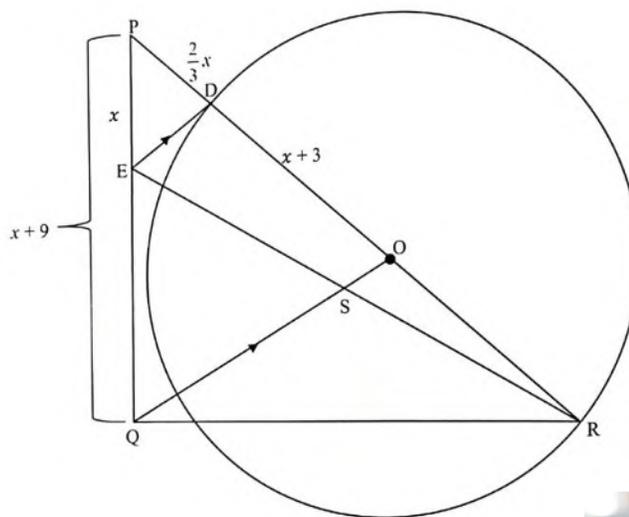
- 2.2.1 Prove that  $NT \parallel MS$ . (4)
- 2.2.2 If  $RN = \frac{3}{5} NM$  and  $RS = 32$ , determine  $VT$ . (4)

**Question 3**

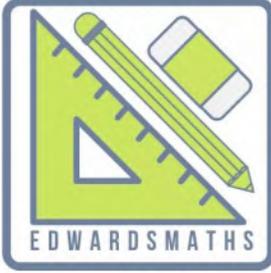
In the diagram below, the circle with centre  $O$  is drawn.  $OQ$  is drawn parallel to a tangent to the circle at  $D$ .  $ER$  is drawn with  $S$  on  $OQ$ .

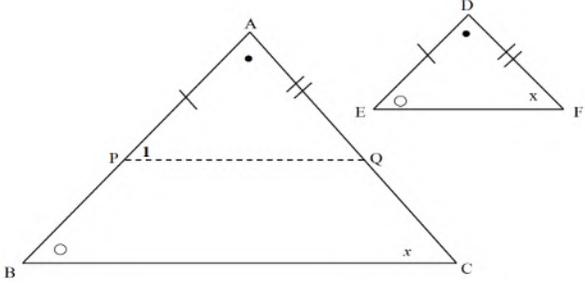
$RD$  is produced to  $P$  and  $PQ$  is joined.

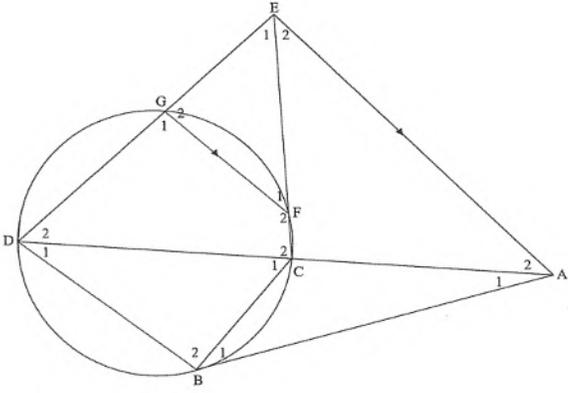
$PE = x$  units,  $PQ = x + 9$  units,  $PD = \frac{2}{3}x$  units and  $DO = x + 3$  units.



- 3.1 Calculate the length of  $RO$ . (4)
  - 3.2 If  $OS = 1,4$  units and  $S$  is the midpoint of  $ER$ , determine the length of  $DE$ . (2)
  - 3.3 If the area of  $\triangle PED = 2,7$  units <sup>2</sup>, find the area of  $\triangle PER$ . (4)
- [10]

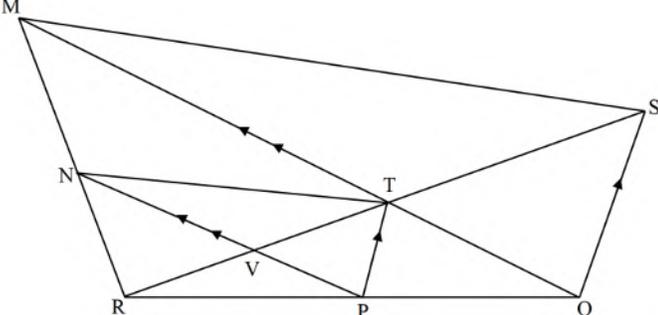
<u>Graad 12 Wiskunde</u> <u>Toets/Opdrag-Memo</u> <u>Kwartaal 1-2022</u>	<u>Grade 12 Mathematics</u> <u>Test/Assignment-Memo</u> <u>Term 1-2022</u>
<b>Eksaminator:</b> <b>Moderator:</b> <b>Totaal : 50</b> <b>Tyd: 1 uur</b>	<b>Examiner:</b> <b>Moderator:</b> <b>Total: 50</b> <b>Time: 1 hour</b>
	

Vraag 1/Question 1			
1.1	 <p> <math>\hat{A} = \hat{D}</math> [ given / gegee ]  <math>AQ = DF</math> [ construction / konstruksie ]  <math>AP = DE</math> [ construction / konstruksie ]  <math>\therefore \Delta APQ \equiv \Delta DEF</math> [SLS]  <math>\hat{P}_1 = \hat{E}</math>  <math>\hat{P}_1 = \hat{B}</math> [ <math>\hat{E} = \hat{B}</math> ]  <math>PQ \parallel BC</math> [ corresp <math>\angle</math>'s / ooreenkomstige <math>\angle e</math> ]  <math>\frac{AP}{AB} = \frac{AQ}{AC}</math> [ <math>PQ \parallel BC</math> ]            But/ maar <math>AP = DE</math> and / en <math>AQ = DF</math>  <math>\therefore \frac{DE}{AB} = \frac{DF}{AC}</math> </p>	<p> <math>\checkmark</math> construction/            konstruksie  <math>\checkmark</math> S/R  <math>\checkmark \hat{P}_1 = \hat{E}</math>  <math>\checkmark</math> S/R  <math>\checkmark</math> S         </p>	(5)

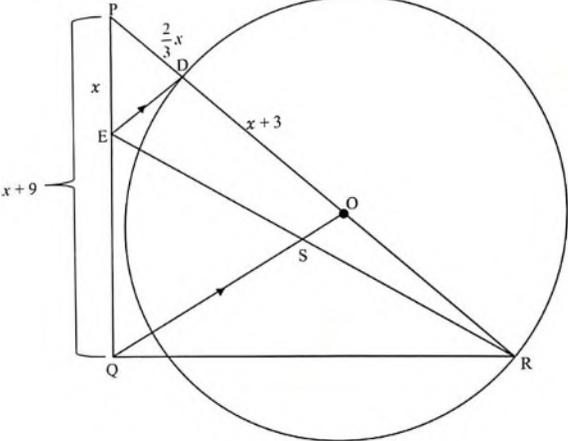
1.2			
1.2.1	tangent-chord theorem/raaklyn-koordstelling	$\checkmark R$	(1)
1.2.2	<p>In <math>\triangle ABC</math> and/en <math>\triangle ADB</math></p> <p><math>\hat{A}_1 = \hat{A}_1</math> [ common/gemeenskaplik ]</p> <p><math>\hat{B}_1 = \hat{D}_1</math> [ proven / bewys in 9.1 ]</p> <p><math>\therefore \triangle ABC \parallel \triangle ADB</math> [<math>\angle</math>; <math>\angle</math>; <math>\angle</math>]</p> <p>OR/OF</p> <p>In <math>\triangle ABC</math> and/en <math>\triangle ADB</math>:</p> <p><math>\hat{A}_1 = \hat{A}_1</math> [ common/gemeenskaplik ]</p> <p><math>\hat{B}_1 = \hat{D}_1</math> [ proven / bewys in 9.1 ]</p> <p><math>\angle BCA = \angle ABD</math> [<math>\angle</math>s of <math>\Delta = 180^\circ</math> / <math>\angle e</math> van <math>\Delta = 180^\circ</math>]</p> <p><math>\therefore \triangle ABC \parallel \triangle ADB</math></p>	$\checkmark S$ $\checkmark S$ $\checkmark R$ $\checkmark S$ $\checkmark S$	(3)
1.2.3	<p><math>\hat{E}_2 = \hat{F}_1</math> [alternate <math>\angle</math>s/ verwiss <math>\angle e</math>; <math>EA \parallel GF</math> ]</p> <p><math>\hat{F}_1 = \hat{D}_2</math> [ext <math>\angle</math> of cyc quad <math>DGFC</math>/buite <math>\angle v</math> <i>kdvh</i> <math>DGFC</math>]</p> <p><math>\therefore \hat{E}_2 = \hat{D}_2</math></p>	$\checkmark S \checkmark R$ $\checkmark S \checkmark R$	(4)
1.2.4	<p>In <math>\triangle AEC</math> and/en <math>\triangle ADE</math> :</p> <p><math>\hat{A}_2 = \hat{A}_2</math> [common/gemeenskaplik]</p> <p><math>\hat{E}_2 = \hat{D}_2</math> [proven/bewys in 9.3]</p> <p><math>\therefore \triangle AEC \parallel \triangle ADE</math> [<math>\angle</math>; <math>\angle</math>; <math>\angle</math>]</p> <p><math>\therefore \frac{AE}{AD} = \frac{AC}{AE}</math> [from <math>\parallel \Delta</math>s/ uit <math>\parallel \Delta e</math>]</p> <p><math>\therefore AE^2 = AD \times AC</math></p> <p><math>\therefore AE = \sqrt{AD \times AC}</math></p>	$\boxtimes S$ $\boxtimes S$ $\boxtimes R$ $\boxtimes S$ $\boxtimes S$	

	<p>OR/OF</p> <p>In <math>\triangle AEC</math> and/en <math>\triangle ADE</math> :</p> <p><math>\hat{A}_2 = \hat{A}_2</math> [common/gemeenskaplik]</p> <p><math>\hat{E}_2 = \hat{D}_2</math> [proven/bewys in 9.3]</p> <p><math>\angle ACE = \angle AED</math> [<math>\angle</math>s of <math>\Delta = 180^\circ / \angle</math>e van <math>\Delta = 180^\circ</math>]</p> <p><math>\therefore \triangle AEC \parallel \triangle ADE</math></p> <p><math>\therefore \frac{AE}{AD} = \frac{AC}{AE}</math> [from <math>\parallel \Delta</math>s/ uit <math>\parallel \Delta</math>e]</p> <p><math>\therefore AE^2 = AD \times AC</math></p> <p><math>\therefore AE = \sqrt{AD \times AC}</math></p>	<p>2 S</p> <p>2 S</p> <p>2 S</p> <p>2 S</p> <p>2 S</p>	(5)
1.2.5	<p><math>\frac{AB}{AD} = \frac{AC}{AB}</math> [from <math>\parallel \Delta</math>s/ uit <math>\parallel \Delta</math>e] from / van 9.2</p> <p><math>AB^2 = AD \times AC</math></p> <p><math>= AE^2</math> [from/van 9.4]</p> <p><math>\therefore AB = AE</math></p>	<p>2 S</p> <p>2 S</p> <p>2 S</p>	(3) [21]

<b>Vraag 2/Question 2</b>			
2.1			
2.1.1	<p><math>\frac{AS}{SP} = \frac{AR}{RB}</math> [line <math>\parallel</math> side of <math>\Delta</math>/lyn <math>\parallel</math> sy van <math>\Delta</math>]</p> <p><math>= \frac{3}{2}</math> OR/OF [RS <math>\parallel</math> BP]</p> <p><math>\frac{AS}{SC} = \frac{3}{7}</math> [AP = PC]</p>	<p><math>\sqrt{S \ \&amp; \ R}</math></p> <p><math>\sqrt{\frac{3}{2}}</math></p> <p><math>\sqrt{\frac{3}{7}}</math></p>	(3)

2.1.2	$\frac{RT}{TC} = \frac{SP}{PC}$ <p>[ line <math>\parallel</math> side of <math>\Delta</math>/lyn <math>\parallel</math> sy van <math>\Delta</math> ]</p> $= \frac{2}{5}$ <p>OR/OF [RS <math>\parallel</math> TP]</p>	$\checkmark S \quad \checkmark R$  $\checkmark$ answer/antwoord	(3)
2.1.3	$\frac{\text{Area of } \Delta RAS}{\text{Area of } \Delta RSC} = \frac{AS}{SC} = \frac{3}{7}$ <p>[ common height / gemeenskaplike hoogte ]</p>	$\checkmark \frac{3}{7}$  $\checkmark R$	(2)
2.1.4	$\frac{\text{Area } \Delta TPC}{\text{Area } \Delta RSC} = \frac{\frac{1}{2} TC \cdot PC \cdot \sin TCP}{\frac{1}{2} RC \cdot SC \cdot \sin TCP}$ $= \frac{TC}{RC} \times \frac{PC}{SC}$ $= \frac{5}{7} \times \frac{5}{7}$ $= \frac{25}{49}$	$\boxtimes$ Correct subst into area rule/ Korrekte vervang. in area-reël  $\boxtimes \frac{5}{7}$  $\boxtimes$ answer/antwoord	(3)
2.2			
2.2.1	$\frac{ON}{NM} = \frac{OT}{TS} \text{ [ prop theorem/eweredigh ]}$ $\frac{ON}{NM} = \frac{OP}{PQ} \text{ [ prop theorem/eweredigh ]}$ $\therefore \frac{OT}{TS} = \frac{OP}{PQ}$ $\therefore NT \parallel MS$	$\checkmark S \quad \checkmark R$  $\checkmark S$  $\checkmark S$	(4)

2.2.2	$\frac{ON}{NM} = \frac{OT}{TS} = \frac{3}{5} \text{ [prop theorem/eweredigh]}$ $OT = \frac{3}{8} \times 32$ $= 12$ $VT = \frac{5}{8} \times 12$ $= \frac{15}{2} \text{ or } 7,5$	$\checkmark S/R$  $\checkmark OT$  $\checkmark \text{method/metode}$  $\checkmark \text{answer/antw}$	(4)          [19]
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<b>Vraag 3/Question 3</b>			
			
3.1	$\frac{PE}{EQ} = \frac{PD}{DO}$ $\frac{x}{9} = \frac{\frac{2}{3}x}{x+3}$ $x^2 + 3x = 6x$ $x^2 - 3x = 0$ $x(x - 3) = 0$ $x = 0 \text{ or/of } x = 3$ <p>N.A / n.v.t</p> $DO = 6$ $DO = OR$ $OR = 6 \text{ units / eenhede}$	<p>line <math>\parallel</math> one side <math>\triangle POQ</math> OR  prop theorem <math>ED \parallel OQ</math>/  lyn <math>\parallel</math> een sy <math>\triangle POQ</math> OF  eweredigheid stelling <math>ED \parallel OQ</math></p> $\checkmark S$  $\checkmark R$       $\checkmark x = 3$       $\checkmark OR = 6$	(4)

3.2	<p>S is the midpoint of RE/S is die middelpunt van <math>RE</math>  <math>DE = 2OS</math>  <math>DE = 2,8</math> units / eenhede midpoint theorem /  middelpunt stelling</p>	<p>✓ <math>R</math>  ✓  answer/antwoord</p>	(2)
3.3	<p><math>\frac{\text{Area } \triangle PED}{\text{Area } \triangle PER} = \frac{PD}{PR}</math>  <math>= \frac{2}{14}</math>  <math>= \frac{1}{7}</math>  Area <math>\triangle PER = 7 \times</math> Area <math>\triangle PED</math>  <math>= 18,9</math> units <math>^2</math> / eenhede <math>^2</math></p> <p style="text-align: right;">same height (<math>DE</math>)/  dieselfde hoogte (<math>DE</math>)</p>	<p>✓ <math>S</math>  ✓ <math>R</math>  ✓ <math>\frac{1}{7}</math>  ✓ 18,9</p>	(4) [10]