Province of the
EASTERN CAPE
EDUCATION

SAT / file

LEARNER'S NAME: *LEERDER SE NAAM:*	SOLUTIONS

GRADE 12: *GRAAD 12:*	

NATIONAL/*NASIONALE* SENIOR CERTIFICATE/*SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2022

MATHEMATICS P2/*WISKUNDE V2*
SPECIAL ANSWER BOOK/*SPESIALE ANTWOORDEBOEK*

Marker/*Merker*				Moderator's Initials / *Moderator se paraaf*																
Question *Vraag*	Mark *Punt*			Initial Parafeer	Marks *Punte*			S M	Marks *Punte*			D M	Marks *Punte*			P M	Marks *Punte*			NM
1																				
2																				
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7																				
8																				
9																				
10																				
11																				
TOTAL *TOTAAL*																				

This special answer book consists of 19 pages.
Hierdie spesiale antwoordeboek bestaan uit 19 bladsye.

QUESTION/*VRAAG* 1

1.1	B ✓	(1)
1.2	B ✓	(1)
1.3	?? accept : any value > 75 %	(1)
1.4	σ would stay the same ✓	(1)
1.5	$S\text{-}IQR_B = \frac{75 - 30}{2}$ $= 22,5$ ✓	(1)
		[5]

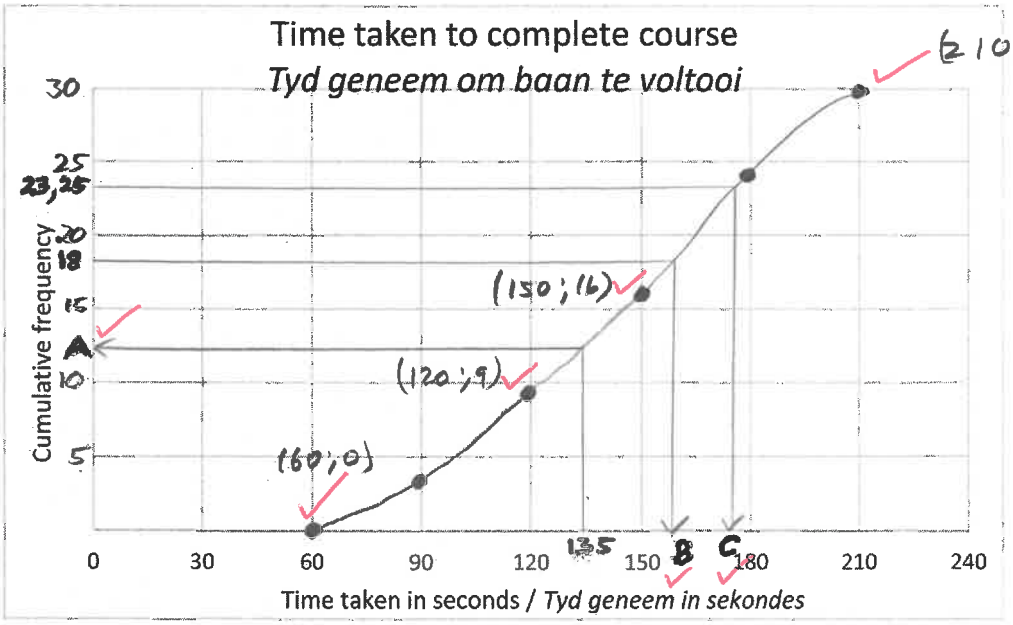
5

QUESTION/*VRAAG* 2

2.1		(1)

Time taken / *Tyd geneem*	No. of pupils *Aantal leerlinge*	Cumulative frequency *Kummulatiewe frekwensie*
$60 \leq t \leq 90$	3	3
$90 \leq t \leq 120$	6	9
$120 \leq t \leq 150$	7	16 ✓
$150 \leq t \leq 180$	8	24
$180 \leq t \leq 210$	6	30

1

2.2		(4)
2.3.1	A	(1)
2.3.2	B $\frac{60}{100} \times 30 = 18$ learners	(1)
2.3.3	C $P_{75} = T_{\frac{75}{100}(1+30)} = T_{23,25}$	(1)
		[8]

4

3

QUESTION/*VRAAG* 3

3.1

$T_1; \cdots; T_{11}$ $\quad M = T_{\frac{1}{2}(1+11)} = T_6 = 2x$ ✓

(1)

3.2

$$\bar{x} = \frac{4(x+3) + 3.2x + 2(x-1) + 2.6}{11}$$ ✓ x.f ✓

$$= \frac{4x+12+6x+2x-2+12}{11}$$

$$= \frac{12x+22}{11}$$ ✓

$$= \frac{12}{11}x + 2$$

(3)

3.3

$x = 5$: $5+3;\ 2(5);\ 5-1;\ 6$

$8;\ 10;\ 4;\ 6$ ✓ values

$\therefore\ \sigma = 2,24$ ✓ ans

ans only 1/2

(2)

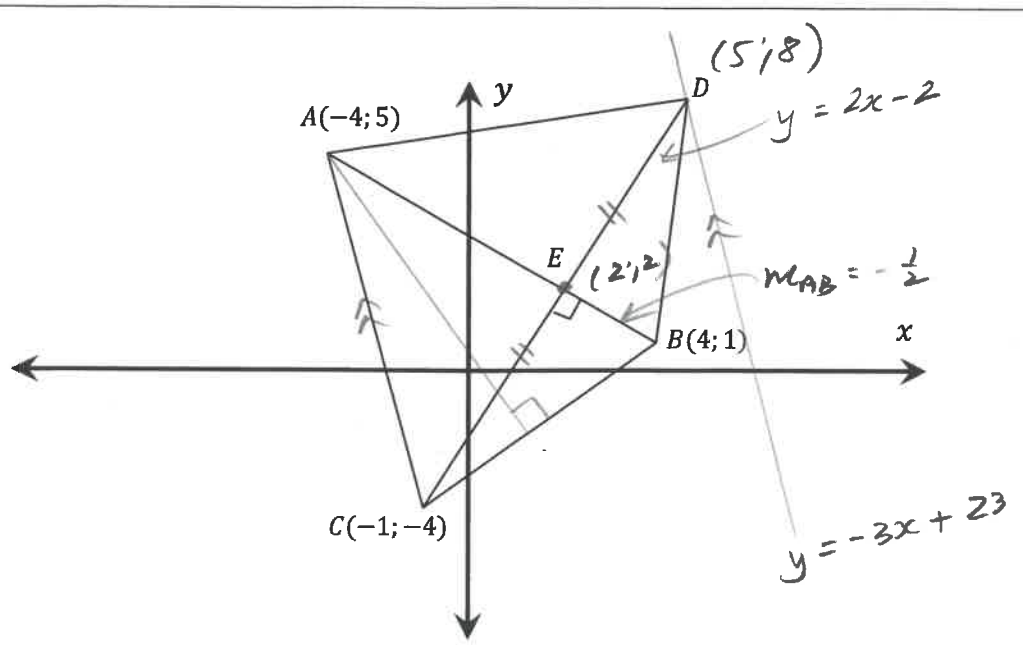
[6]

1

3

2

QUESTION 4/*VRAAG 4*



4.1

$m_{AB} = \frac{1-5}{4-(-4)}$ ✓ A(−4; 5) B(4; 1)

$= -\frac{1}{2}$ ✓

(2)

4.2

$m_{CD} = 2$ ✓ ⊥

$y = 2x + c$

Sub C(−1; −4) ✓

$-4 = 2(-1) + c$

$-2 = c$ ✓ ∴ $y = 2x - 2$ ✓

(4)

4.3

AB: $y = -\frac{1}{2}x + c$ Sub B(4; 1) $1 = -\frac{1}{2}(4) + c$ ✓

• $y = -\frac{1}{2}x + 3$ ✓ $3 = c$

AB ∩ CD: $2x - 2 = -\frac{1}{2}x + 3$ ✓

$\frac{5}{2}x = 5$

$x = 2$ ✓

$y = 2(2) - 2 = 2$ ✓

∴ E(2; 2)

(6)

4.4

$\frac{-1+x_D}{2} = 2$

$x_D = 5$ $\quad C(-1;-4)$ // $E(2;2)$ // D

$\frac{-4+y_D}{2} = 2$ ✓ ✓

$y_D = 8$ $\quad \therefore D(5;8)$ ⟶

(2)

2

4.5

$m_{AC} = \frac{-4-5}{-1-(-4)}$ ✓ $\quad A(-4;5)$ $C(-1;-4)$

$= -3$ ✓

$y = -3x + c$ //

sub $D(5;8)$

$8 = -3(5) + c$

$23 = c$ ✓ $\quad \therefore y = -3x + 23$ ✓ ⟶

(4)

4

4.6

$CD: y = 2x - 2$ $\quad m_{BC} = \frac{-4-1}{-1-4}$ $B(4;1)$ $C(-1;-4)$

x int: $0 = 2x - 2$ $\quad = 1$ ✓

$1 = x$ ✓ $\quad \therefore y = -x + c$ ✓ $\perp$

$(1;0)$ $\quad$ sub $A(-4;5)$

$5 = -(-4) + c$ ✓

$1 = c$

$y = -x + 1$ ✓

sub $(1;0)$

LHS = 0 $\quad$ RHS = $-(1) + 1 = 0$

$\therefore$ LHS = RHS

$\therefore$ Yes x int on $\perp$ h from A to BC ⟶

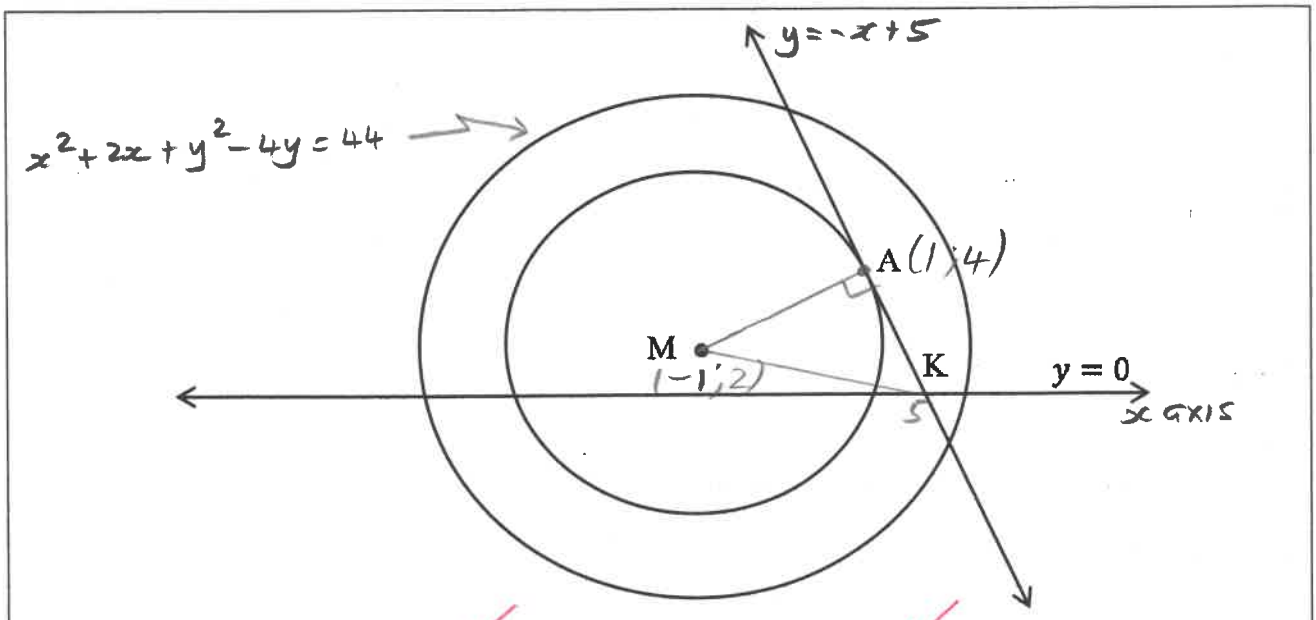
(6)

conclusion ✓

6

[24]

QUESTION 5/*VRAAG 5*



5.1

$x^2 + 2x + (+1)^2 + y^2 - 4y + (-2)^2 = 44 + 1 + 4$ ✓ ✓

$(x+1)^2 + (y-2)^2$ ✓ $= 49$

$\therefore M(-1;2)$ ✓

4

(4)

5.2

$m_{AM} = 1$ ✓ tan ⊥ rad

$\therefore y = x + c$

sub $M(-1;2)$

$2 = -1 + c$ ✓

$3 = c$ $\therefore y = x + 3$ ✓

$AK \wedge MA$ $x + 3 = -x + 5$ ✓

$2x = 2$

$x = 1$

$\therefore y = 1 + 3 = 4$

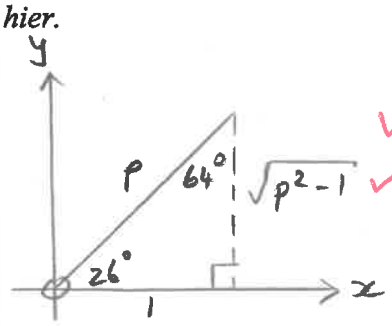
$\therefore A(1;4)$ ✓

5

(5)

5.3	$(x+1)^2+(y-2)^2=r^2$ Sub $A(1;4)$ $(1+1)^2+(4-2)^2=r^2$ ✓ $8=r^2$ ✓ $\therefore (x+1)^2+(y-2)^2=8$ ✓	(3)
5.4	x int: $0=-x+5$ $\therefore x=5$ $\therefore K(5;0)$ ✓	(1)
5.5	$M(-1;2)$ $A(1;4)$ $K(5;0)$ $AM=\sqrt{(4-2)^2+(1-(-1))^2}$ $AK=\sqrt{(0-4)^2+(5-1)^2}$ $=\sqrt{8}$ ✓ $=\sqrt{32}$ ✓ area $\Delta AMK=\frac{1}{2}\sqrt{8}\sqrt{32}$ $=8\ u^2$ ✓	(3)
		[16]

QUESTION 6/*VRAAG 6*

6.1	Draw your sketch here / *Teken jou skets hier.*  QI ✓ ✓	Do your calculations here / *Doen jou berekeninge hier.* $\cos 26^\circ=\frac{1}{p}=\frac{x}{r}$ $(1)^2+y^2=(p)^2$ Pythag $y^2=p^2-1$ $y=\pm\sqrt{p^2-1}$ reject - $y=\sqrt{p^2-1}$ 64° : sum $\angle$'s in $\Delta=180^\circ$
6.1.1	$\sin 26^\circ=\frac{y}{r}$ $=\frac{\sqrt{p^2-1}}{p}$ ✓	(3)
6.1.2	$\cos 2x=2\cos^2 x-1$ $x=26^\circ$ $\cos 2.26^\circ=2\cos^2 26^\circ-1$ ✓ $\cos 52^\circ=2\left(\frac{1}{p}\right)^2-1$ ✓ $=\frac{2}{p^2}-1$ ✓	(3)

6.1.3

$\tan^2 64° \times (p+1)$

$= \left(\frac{o}{a}\right)^2 \times (p+1)$ ✓

$= \left(\frac{1}{\sqrt{p^2-1}}\right)^2 \times (p+1)$ ✓

$= \frac{1}{p^2-1} \times (p+1)$ ✓

$= \frac{1}{(p-1)(p+1)} \times (p+1)$ ✓

$= \frac{1}{p-1}$ ✓

4

(4)

6.2

- $\sin(-\beta) = -\sin\beta$
- $\sin(360° - \beta) = -\sin\beta$
- $\sin(180° - \beta) = +\sin\beta$
- $\sin 180° = 0$

$\therefore \frac{(-\sin\beta) + (-\sin\beta)}{\sin\beta + 0} = \frac{-\sin\beta - \sin\beta}{\sin\beta}$ ✓ ✓ ✓

$= \frac{-2\sin\beta}{\sin\beta}$ ✓ num

$= -2$ ✓

5

(5)

6.3

$2p \tan\left(\frac{82°}{2}\right) = \sin(2.82°)$ ✓

$2p \cdot 0,869\ldots = 0,275\ldots$ ✓

$p = 0,16$ ✓

ans only 3/3

3

(3)

6.4

$RHS = \sin 4\theta$

$= 2\sin 2\theta \cos 2\theta$

$= 2.2\sin\theta\cos\theta(\cos^2\theta - \sin^2\theta)$

$= 4\sin\theta\cos\theta(\cos^2\theta - \sin^2\theta)$

$= 4\sin\theta\cos^3\theta - 4\cos\theta\sin^3\theta$

$= LHS$

6

(6)

[24]

QUESTION 7/*VRAAG 7* $f(x) = \sin(x - 30^\circ)$ $g(x) = \cos 3x$

7.1

$\cos 3x = \sin(x - 30^\circ)$ $\cos A = \sin B$

$A = 3x$ $B = x - 30^\circ$ $\cos(90^\circ - B)$ $\cos(270^\circ + B)$

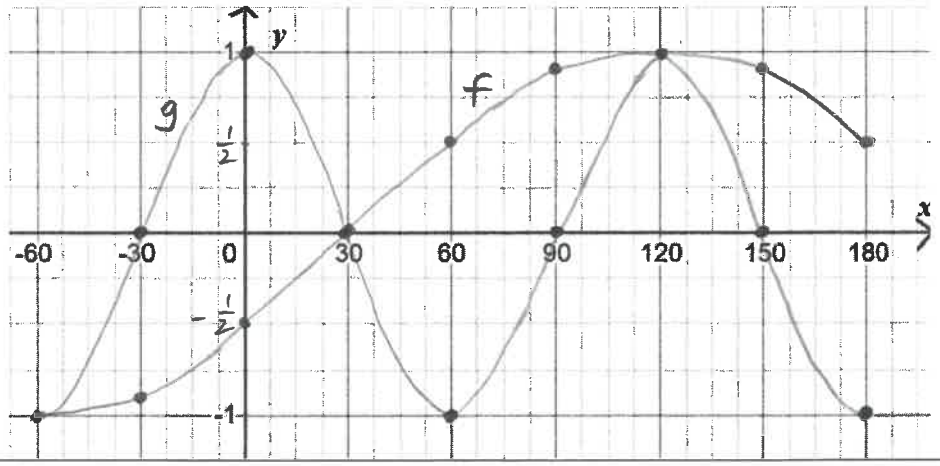
$\cos A = \cos(90^\circ - B)$ or $\cos A = \cos(270^\circ + B)$

$A = 90^\circ - B + k \cdot 360^\circ$	$A = 270^\circ + B + k \cdot 360^\circ$
$3x = 90^\circ - (x - 30^\circ) + k\ 360^\circ$ ✓	$3x = 270^\circ + (x - 30^\circ) + k \cdot 360^\circ$ ✓
$3x = 90^\circ - x + 30^\circ + k 360^\circ$	$3x = 270^\circ + x - 30^\circ + k \cdot 360^\circ$
$4x = 120^\circ + k \cdot 360^\circ$	$2x = 240^\circ + k \cdot 360^\circ$
$x = 30^\circ + k \cdot 90^\circ ; k \in \mathbb{Z}$ ✓	$x = 120^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ ✓
$-60^\circ ; 30^\circ ; 120^\circ$	$-60^\circ ; 120^\circ$

$\therefore x = -60^\circ ; 30^\circ$ or 120° ✓ ✓ ✓

(7)

7.2



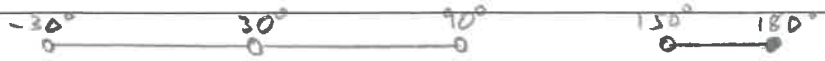
f ✓ g ✓ x int ✓ st/end pts ✓ y int + shape ✓ ✓

(6)

7.3

$f(x) \times g(x) < 0$

$y_f \cdot y_g$ −

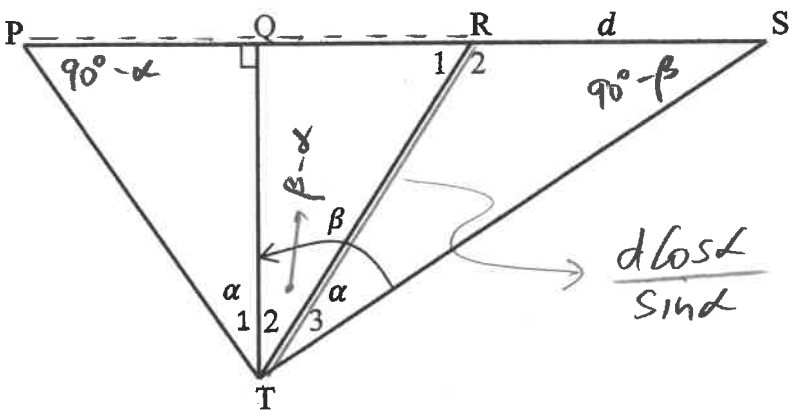


$x \in (-30^\circ ; 30^\circ)$ or $(30^\circ ; 90^\circ)$ or $(150^\circ ; 180^\circ]$ ✓✓ ✓ ✓

(4)

[17]

QUESTION 8/*VRAAG 8*



8.1

$Q\hat{T}R = \hat{T}_2 = \beta - \alpha$ ✓

(1)

8.2

ΔSQT : $\hat{S} = 90° - \beta$ ✓ sum ^'s in $\Delta = 180°$

(1)

8.3

ΔPQT : $\hat{P} = 90° - \alpha$ ✓ sum ^'s in $\Delta = 180°$

(1)

8.4

$$\frac{RT}{\sin(90° - \beta)} = \frac{d}{\sin \alpha}$$ ✓

$$\frac{RT}{\cos \beta} = \frac{d}{\sin \alpha}$$ ✓cos β

$$RT = \frac{d \cos \beta}{\sin \alpha}$$ ✓

(3)

8.5

$$\frac{PR}{\sin(\alpha + \beta - \alpha)} = \frac{RT}{\sin(90° - \alpha)}$$ ✓

$$\frac{PR}{\sin \beta} = \frac{RT}{\cos \alpha}$$ ✓den LHS & RHS

$$PR = \frac{RT \sin \beta}{\cos \alpha}$$

$$= RT \cdot \frac{\sin \beta}{\cos \alpha}$$

$$= \frac{d \cos \beta}{\sin \alpha} \cdot \frac{\sin \beta}{\cos \alpha}$$ ✓

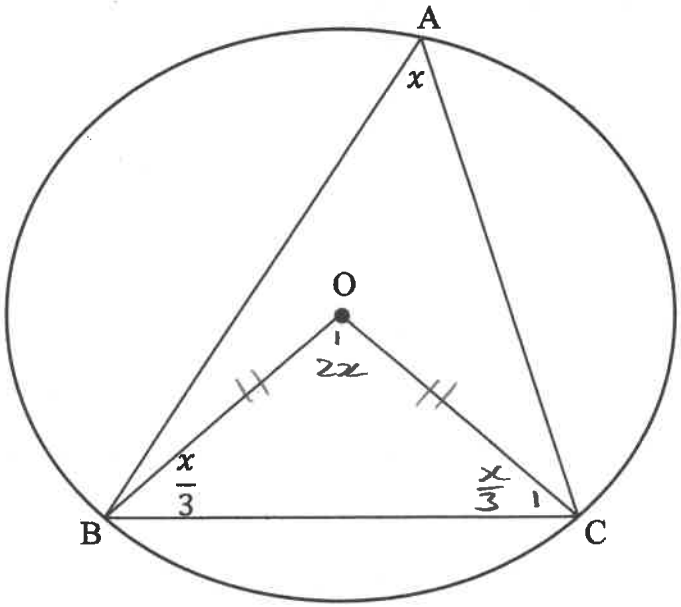
$$= \frac{d \cos \beta \sin \beta}{\sin \alpha \cos \alpha}$$

(3)

[9]

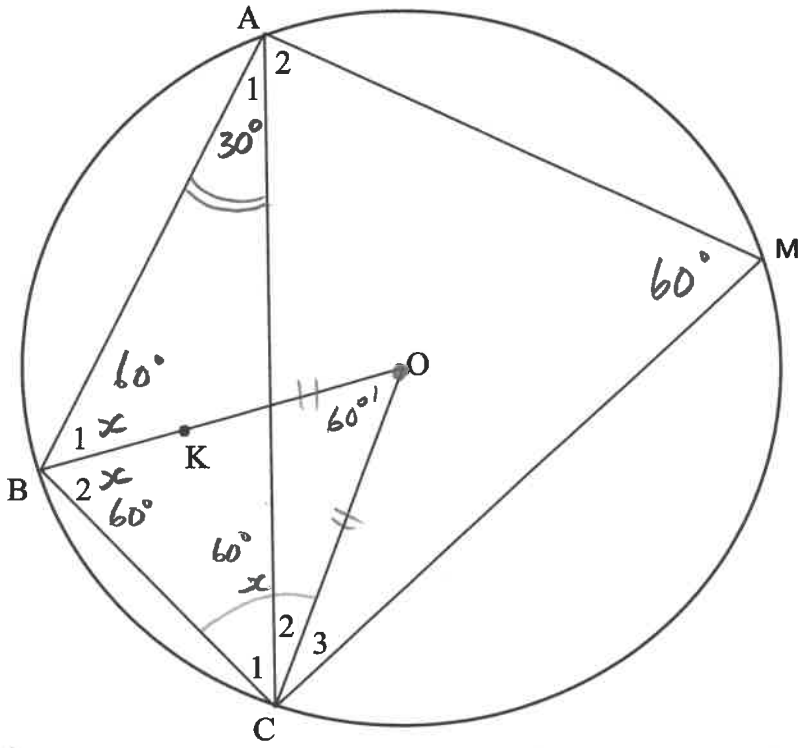
QUESTION 9/*VRAAG 9*

9.1	centre ✓	(1)



9.2	$\hat{O}_1 = 2x$ ✓S	R ✓	∠@ centre = 2× ∠@ circum	(6)
	$\hat{C}_1 = \frac{x}{3}$ ✓S	R ✓	radii	
			∠'s opp = sides	
	$2x + \frac{x}{3} + \frac{x}{3} = 180°$ ✓	SR	sum ∠'s in Δ = 180°	
	$\frac{8}{3}x = 180°$			
	$x = 67,5°$ ✓S		$\frac{135°}{2}$	

6



9.3.1

Let $\hat{B}_1 = \hat{B}_2 = x$ given

$\hat{O}_1 = 60°$ ✓S ✓R ∠ @ centre = 2x ∠ @ circum

$\hat{B}_2 = \hat{C}_1 + \hat{C}_2$ ✓SR radii

∠'s opp = sides

$\therefore \hat{B}_2 = 60°$ ✓SR sum ∠'s in Δ = 180°

$\therefore \hat{B}_1 = 60°$ ✓SR = x

5

(5)

9.3.2

$\hat{M} = 60°$ ✓S ✓R opp ∠'s cyclic quad = 180°

$= 2 . 30°$ } ✓ conclusion

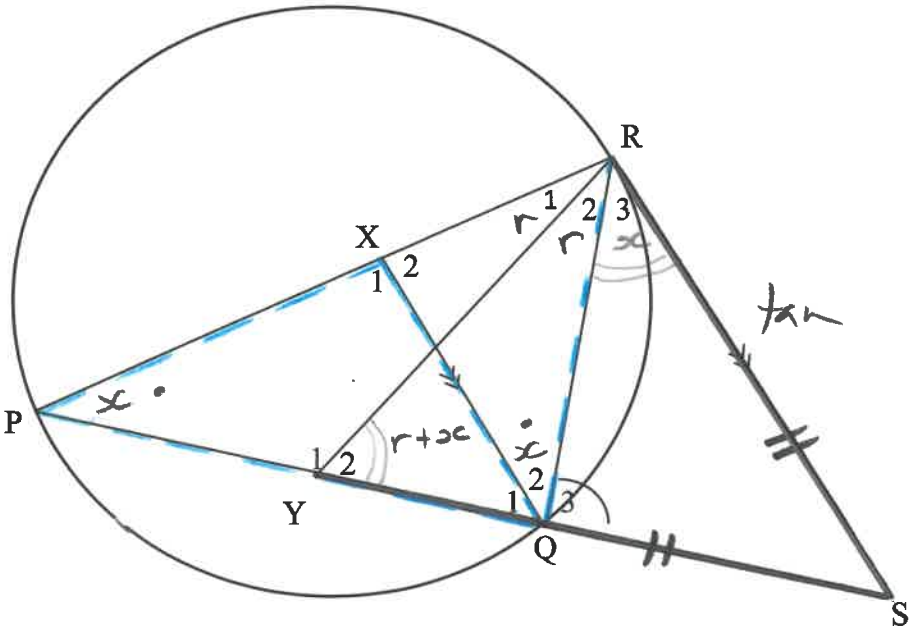
$= 2 . \hat{A}_1$

3

(3)

[15]

QUESTION 10/*VRAAG 10*



10.1

Let $\hat{R}_1 = \hat{R}_2 = r$; $\hat{R}_3 = x$ ✓S given

$\therefore \hat{Y}_2 = r + x$ ✓S ✓R ∠'s opp = sides

$\therefore \hat{P} + r = r + x$ ✓SR ext ∠ Δ

$\therefore \hat{P} = x$ ✓S

$\therefore \hat{P} = \hat{R}_3$ both = x

$\therefore$ RS is tan ✓R conv ∠ tan chord (6)

10.2

$\hat{Q}_2 = x$ ✓SR all ∠'s =, QX ∥ SR

$\therefore \hat{P} = \hat{Q}_2$ ✓S both = x

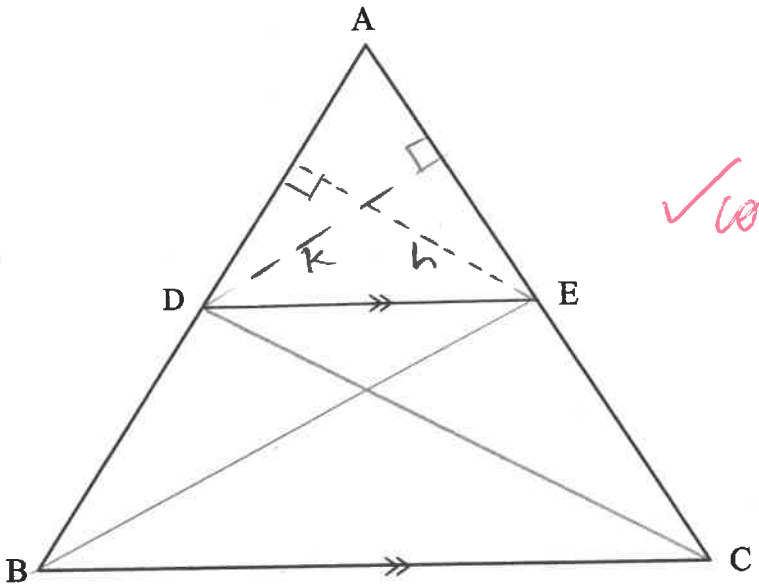
$\therefore$ QR is tan ✓R conv ∠ tan chord (3)

[9]

6

3

QUESTION 11/*VRAAG 11*



✓ constr

11.1

$\frac{\text{area } \triangle ADE}{\text{area } \triangle DBE} = \frac{\frac{1}{2} AD \cdot h}{\frac{1}{2} DB \cdot h} = \frac{AD}{DB}$ ✓S

$\frac{\text{area } \triangle AED}{\text{area } \triangle ECD} = \frac{\frac{1}{2} AE \cdot k}{\frac{1}{2} EC \cdot k} = \frac{AE}{EC}$ ✓S

- area $\triangle ADE$ = area $\triangle AED$

  same $\triangle$

- area $\triangle DBE$ = area $\triangle ECD$ ✓S

  same b, DE

  same h, DE // BC } ✓R

$\therefore \frac{\text{area } \triangle ADE}{\text{area } \triangle DBE} = \frac{\text{area } \triangle AED}{\text{area } \triangle ECD}$ ✓S

$\therefore \frac{AD}{DB} = \frac{AE}{EC}$

6

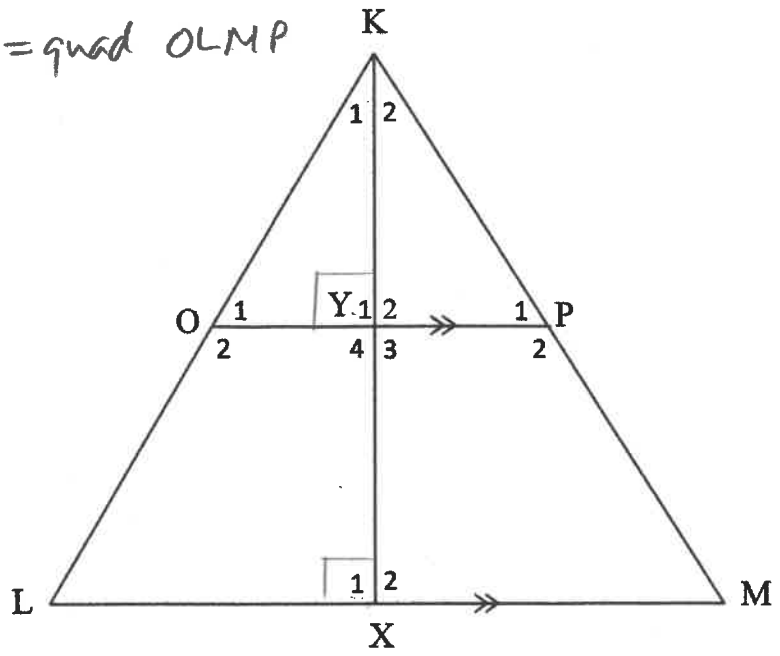
(6)

D

11.2

areas

ΔKOP = quad OLMP



11.2.1

In Δ's $K_{1+2}OP$, $K_{1+2}LM$

1 $\hat{K}_1 + \hat{K}_2 = \hat{K}_1 + \hat{K}_2$ ✓SR common

2 $\hat{O}_1 = \hat{L}$ ✓SR corr ∠'s =, OP ∥ LM

$\therefore \Delta KOP \,|||\, \Delta KLM$ AAA ✓R (3)

3

11.2.2

$\frac{KY}{KX} = \frac{KO}{KL}$ ✓SR line ∥ 1 side of Δ

$\frac{KO}{KL} = \frac{OP}{LM}$ ✓SR $\Delta K\hat{O}\hat{P} \,|||\, \Delta K\hat{L}\hat{M}$

$\therefore \frac{KY}{KX} = \frac{OP}{LM}$ both = $\frac{KO}{KL}$ (2)

2

11.2.3

Let area ΔK_{1+2} = A ∴ area quad OLMP = A

∴ area ΔKLM = 2A

$\frac{\text{area } \Delta KOP}{\text{area } \Delta KLM} = \frac{\frac{1}{2}OP.KY}{\frac{1}{2}LM.KX} = \frac{A}{2A}$ ✓

$\frac{OP}{LM} \cdot \frac{KY}{KX} = \frac{1}{2}$ ✓

✓✓ $\frac{KO}{KL} \cdot \frac{KO}{KL} = \frac{1}{2}$ (11.2.2.)

$\left(\frac{KO}{KL}\right)^2 = \frac{1}{2}$ ✓

$\frac{KO}{KL} = \sqrt{\frac{1}{2}}$ ✓ $\frac{\sqrt{1}}{\sqrt{2}}$

$= \frac{1}{\sqrt{2}}$ (6) [17]

6

TOTAL/*TOTAAL*: 150