basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P2

NOVEMBER 2018

MARKS: 150

TIME: 3 hours

This question paper consists of 16 pages and a 24-page answer book.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you used to determine the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. If necessary, round off answers to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. Write neatly and legibly.

QUESTION 1

A school held a sports day. One of the items on the programme was an obstacle race. Teams of 10 parents and learners participated in this race. The table below shows the time taken, in minutes, by each member of a particular team to complete the race.

4	12	13	16	17	18	20	22	22	25

1.1 How long, in minutes, did it take for the fastest member of this team to complete the race? (1)

1.2 Determine the mean time taken by this team. (2)

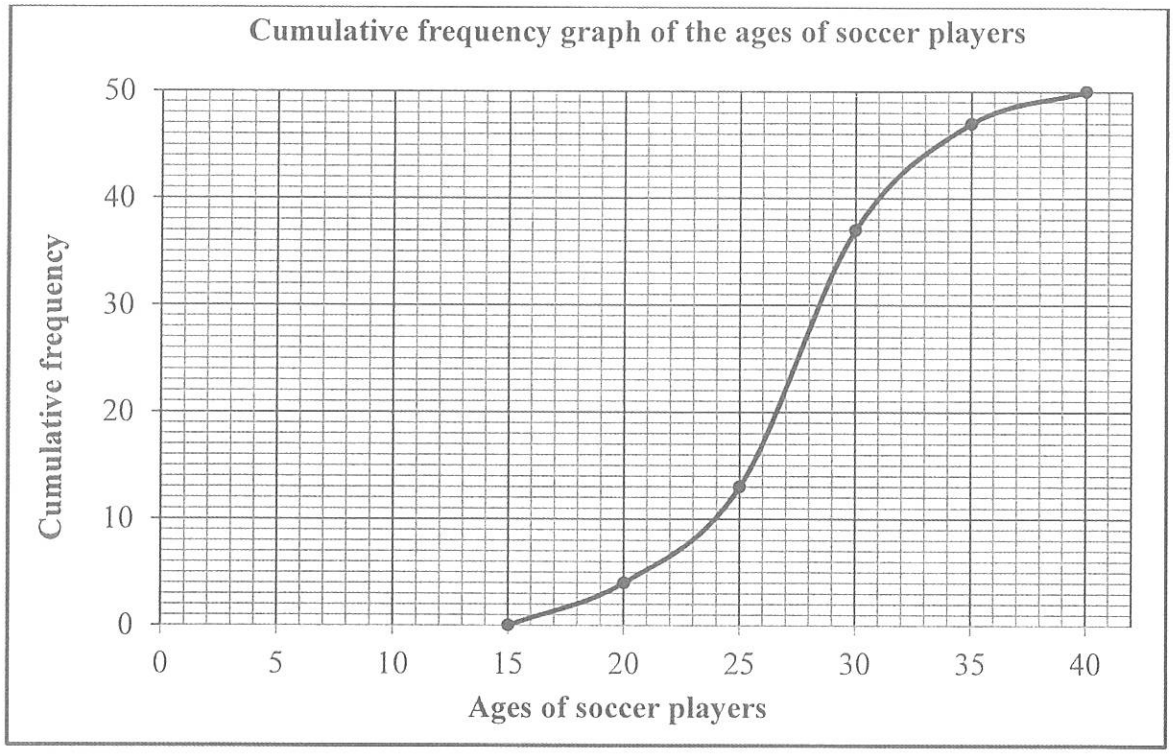
1.3 Calculate the standard deviation for the data. (1)

1.4 How many members of the team completed the obstacle race outside of two standard deviations of the mean? (3)

1.5 It took another team a total time of $x+5$ minutes to complete the race. Calculate the value of x if the overall mean of the two teams combined was 18 minutes. (3)
[10]

QUESTION 2

2.1 A survey was conducted of the ages of players at a soccer tournament. The results are shown in the cumulative frequency graph (ogive) below.



2.1.1 How many players took part in the soccer tournament? (1)

2.1.2 Determine the number of players between the ages of 24 and 31 years old. (2)

2.1.3 Complete the frequency column of the table below in the ANSWER BOOK.

CLASS INTERVAL	FREQUENCY	CUMULATIVE FREQUENCY
$15 \leq x < 20$		4
$20 \leq x < 25$		13
$25 \leq x < 30$		37
$30 \leq x < 35$		47
$35 \leq x < 40$		50

(3)

2.1.4 Use the grid provided in the ANSWER BOOK to draw a frequency polygon for the data. (4)

2.2 Two Grade 11 Mathematics classes have the same number of learners. The five-number summaries of the marks obtained by these classes for a test are shown below.

CLASS A (30 ; 48 ; 65 ; 82 ; 90)

CLASS B (50 ; 58 ; 65 ; 75 ; 90)

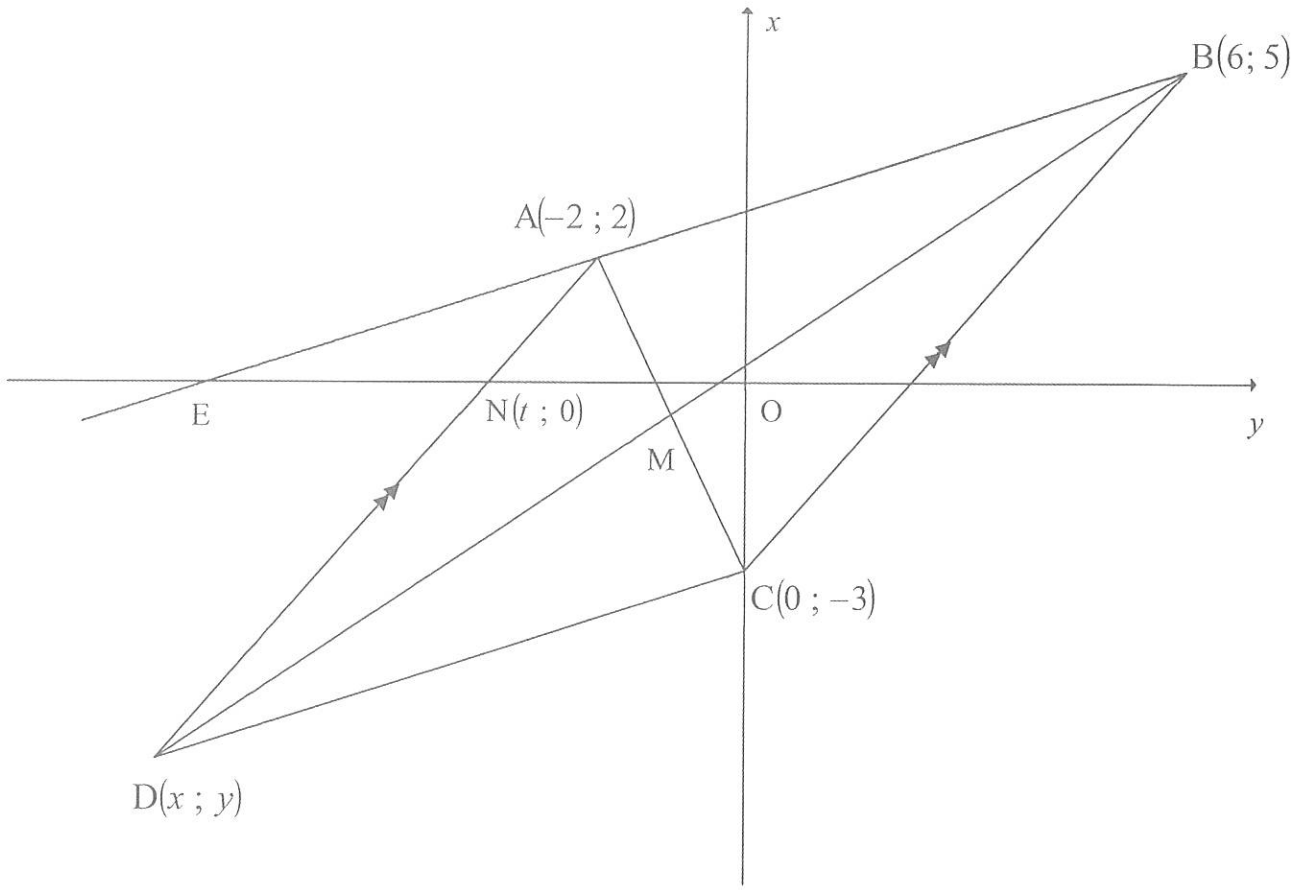
The parents of learners in CLASS A and CLASS B observe that both classes have the same median and the same maximum mark and therefore claim that there is no difference in the performance between these classes.

Do you agree with this claim? Use at least TWO different arguments to justify your answer. (3)

[13]

QUESTION 3

In the diagram, A(–2 ; 2), B(6 ; 5), C(0 ; –3) and D(x ; y) are the vertices of a quadrilateral having AD || BC. BA produced has an x-intercept at E. BD and AC intersect at M. N(t ; 0) is a point on AD.



3.1 Calculate the gradient of BC. (2)

3.2 Determine the equation of AD. (3)

3.3 Determine the value of t. (2)

3.4 Calculate the length of AN. (2)

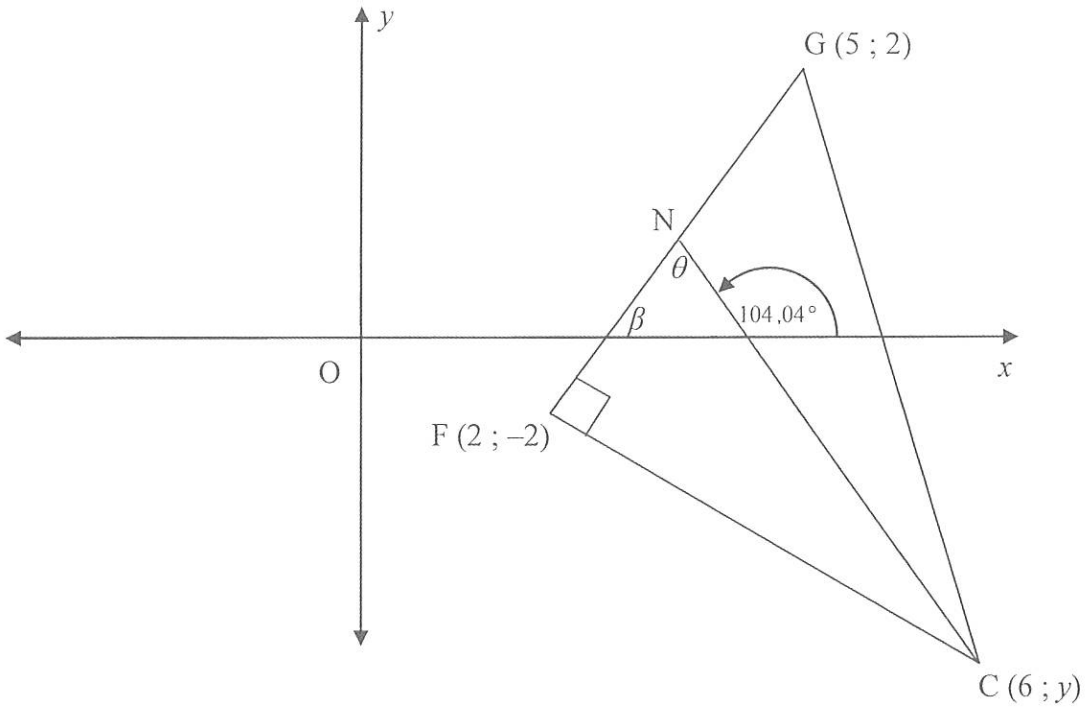
3.5 If DC is defined by $y = \frac{3}{8}x - 3$, determine the coordinates of D. (4)

3.6 Prove that ABCD is a parallelogram. (3)

3.7 Calculate the coordinates of M. (3)
[19]

QUESTION 4

In the diagram, F(2 ; –2), G(5 ; 2) and C(6 ; y) are the vertices of ΔFGC. FG $\perp$ FC.
N is a point on FG such that the inclination of NC is 104,04°.
The angle of inclination of FG is β and $\hat{FNC} = \theta$.



4.1 Calculate the gradient of FG. (2)

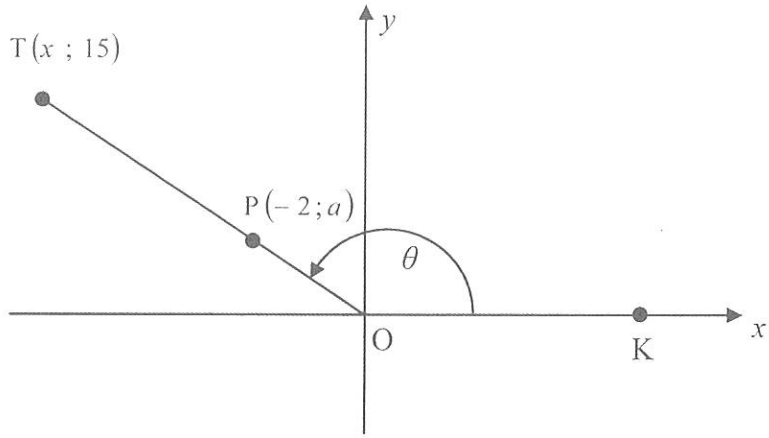
4.2 Calculate the value of y. (3)

4.3 Calculate the size of θ. (3)

4.4 Calculate the length of NC. (4)
[12]

QUESTION 5

5.1 In the diagram below, $T(x\,;15)$ is a point in the Cartesian plane such that $OT = 17$ units. $P(-2\,;a)$ lies on OT. K is a point on the positive x-axis and $\hat{TOK} = \theta$.



Determine, with the aid of the diagram, the following:

5.1.1 The value of x (2)

5.1.2 $\tan\theta$ (1)

5.1.3 $\cos(180° - \theta)$ (2)

5.1.4 $\sin^2\theta$ (2)

5.1.5 The value of a (3)

5.2 Simplify WITHOUT using a calculator:

$$\frac{\sin 120°.\cos 210°.\tan 315°.\cos 27°}{\sin 63°.\cos 540°}$$ (7)

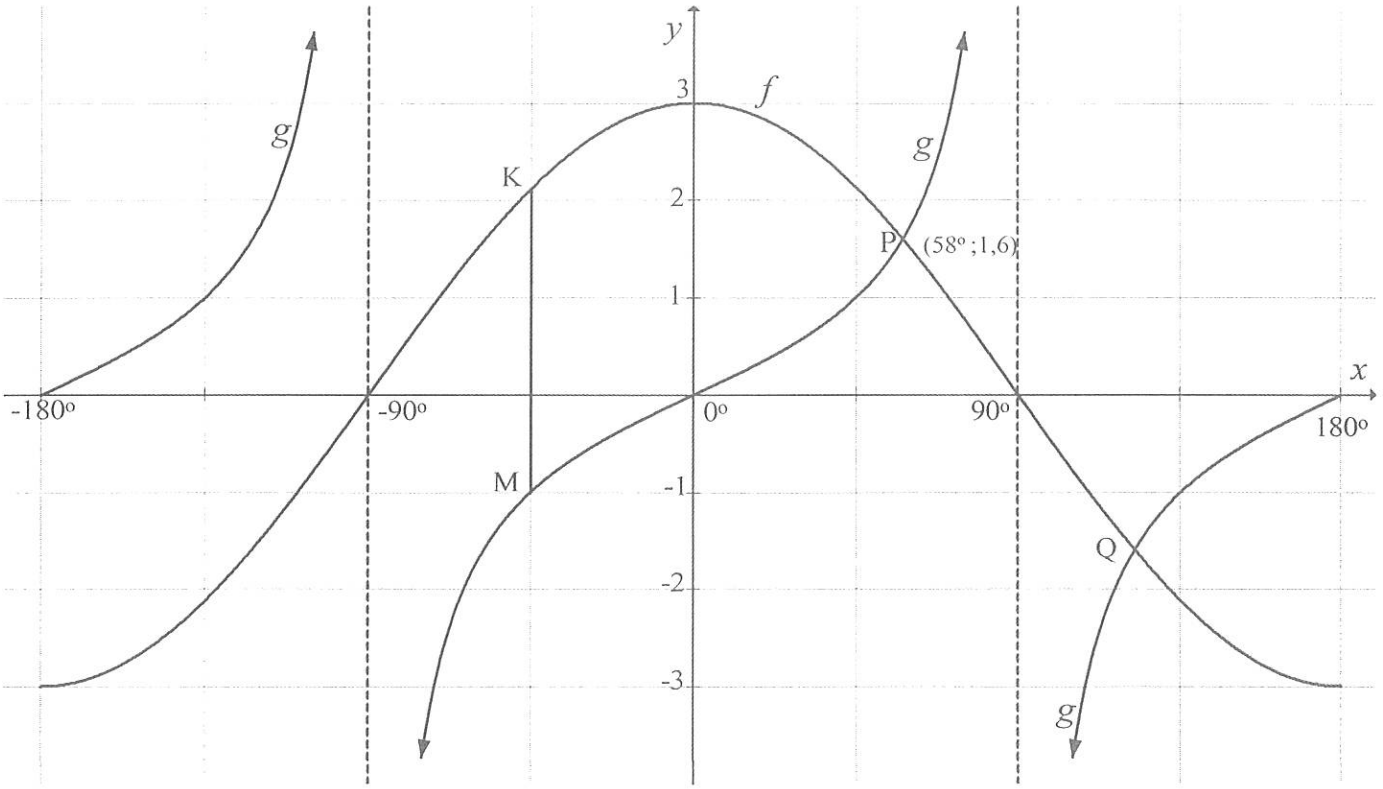
5.3 Prove the identity:

$$\frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta} = \tan\theta$$ (5)

5.4 Determine the general solution of $3\sin x = 2\tan x$ (6)
[28]

QUESTION 6

The graphs of the functions $f(x) = a\cos b\theta$ and $g(x) = c\tan\theta$ for $x \in [-180° ; 180°]$ are sketched below. The graphs intersect at P(58° ; 1,6) and Q.



6.1 Write down the range of f. (2)

6.2 If M(–45° ; –1) lies on g, determine the value of c. (1)

6.3 Write down the values of a and b. (2)

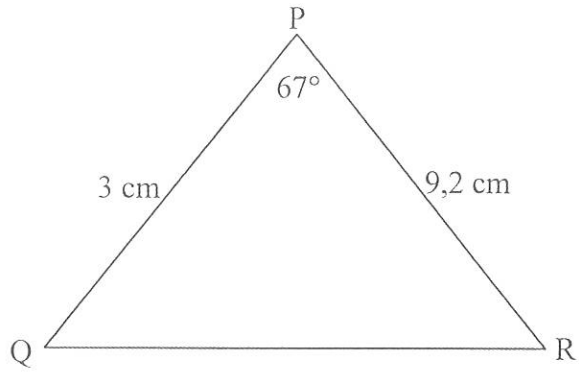
6.4 Determine the coordinates of Q. (2)

6.5 K lies on f such that KM is parallel to the y-axis.
Calculate the length of KM . (2)

6.6 If the system of axes is shifted 45° to the left and the graphs remain fixed, write down the equation that is now represented by graph f. (2)
[11]

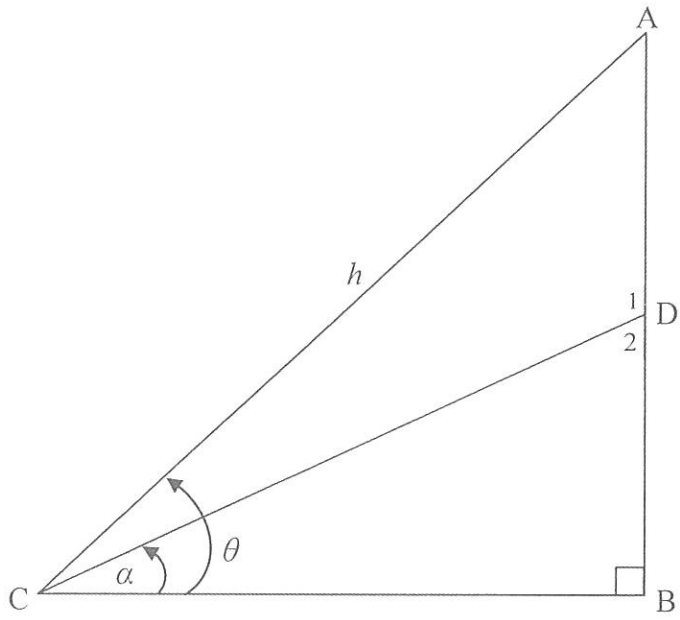
QUESTION 7

7.1 In the diagram, $\hat{P} = 67°$, PQ = 3 cm and PR = 9,2 cm.
Determine the length of QR.



(3)

7.2 In the diagram below, $D\hat{C}B = \alpha$, AC = h units and $A\hat{C}B = \theta$.



7.2.1 Determine size of $A\hat{C}D$ in terms of θ and α. (1)

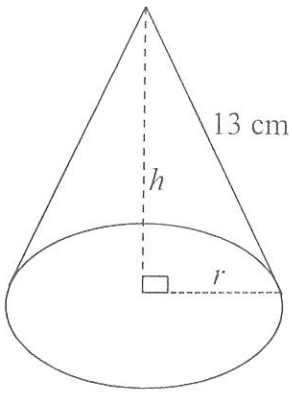
7.2.2 Prove that $AD = \dfrac{h\sin(\theta - \alpha)}{\cos\alpha}$ (4)

7.2.3 Determine the length of AD if $h = 17$ units, $\theta = 58°$ and $\alpha = 23°$. (2)

7.2.4 Calculate the area of ΔADC. (3)
[13]

QUESTION 8

The diagram below shows a cone with a perpendicular height of h cm, a radius of r cm and a slant height of 13 cm.



Volume of cone $= \frac{1}{3}\pi r^2 h$

Total surface area of the cone
$= \pi r^2 + \pi r s$

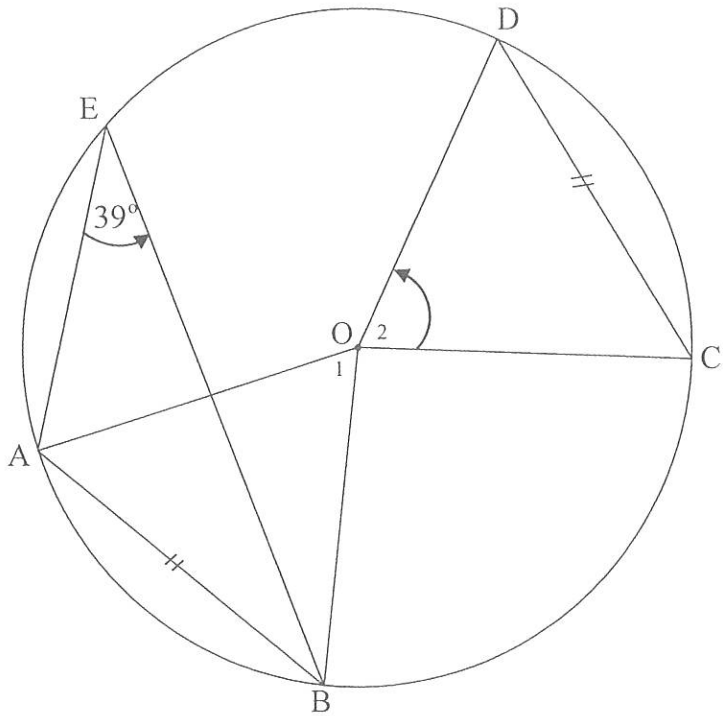
8.1 Show that the volume of the cone is given by $V = \frac{169\pi h - \pi h^3}{3}$ (4)

8.2 If $h = 12$ cm, determine the total surface area of the cone. (3)
[7]

Give reasons for your statements and calculations in QUESTIONS 9, 10 and 11.

QUESTION 9

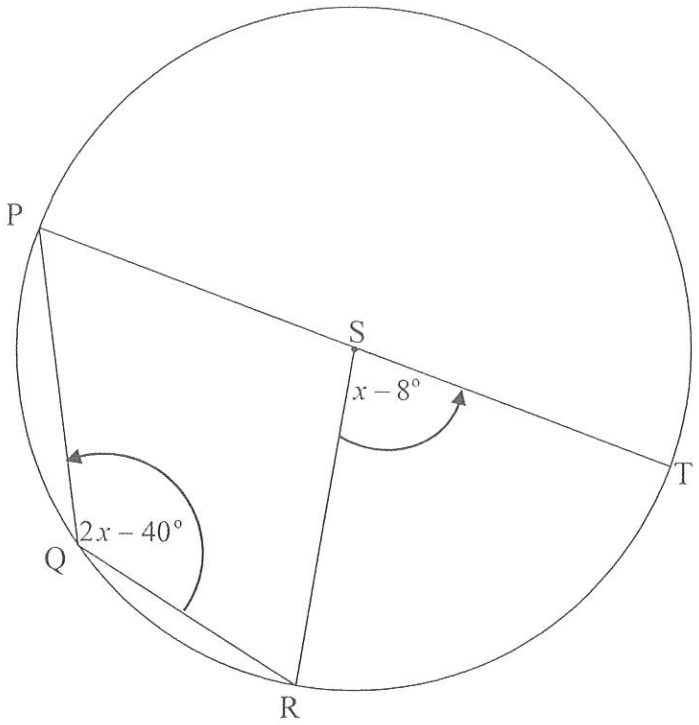
9.1 In the figure, O is the centre of the circle. A, B, C, D and E lie on the circle such that chord AB and chord DC are equal in length and $A\hat{E}B = 39°$.



9.1.1 Determine the size of $\hat{O}_1$. (2)

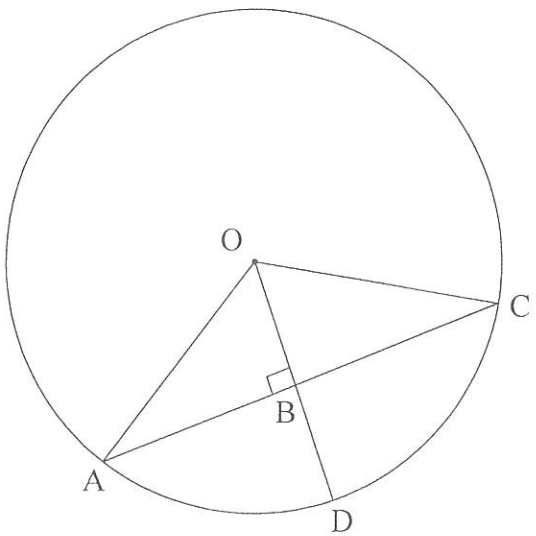
9.1.2 Determine the size of $\hat{O}_2$. (2)

9.2 In the diagram, S is the centre of circle PQRT. PT is a diameter. $R\hat{S}T = x - 8°$ and $P\hat{Q}R = 2x - 40°$.



Determine the value of x. (4)

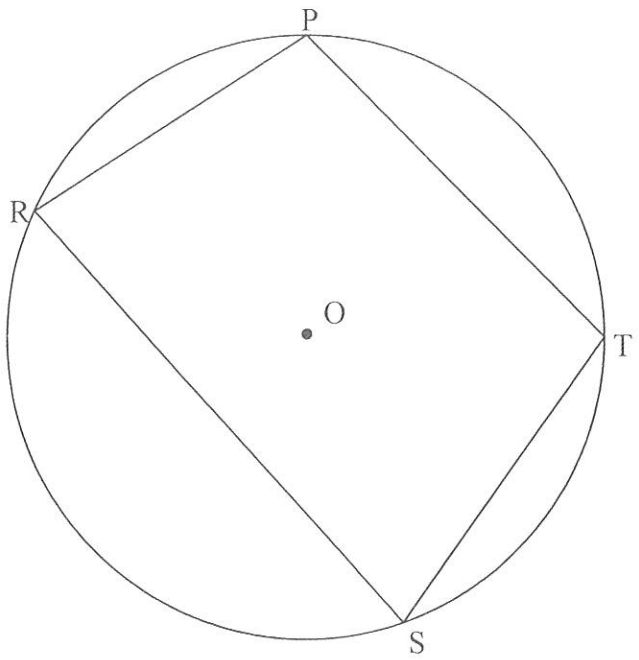
9.3 In the diagram, O is the centre of the circle. Chord AC is perpendicular to radius OD at B. OB = $2x$ units and AC = $8x$ units.



Show that the length of BD is $2x\left(\sqrt{5}-1\right)$ units. (5)
[13]

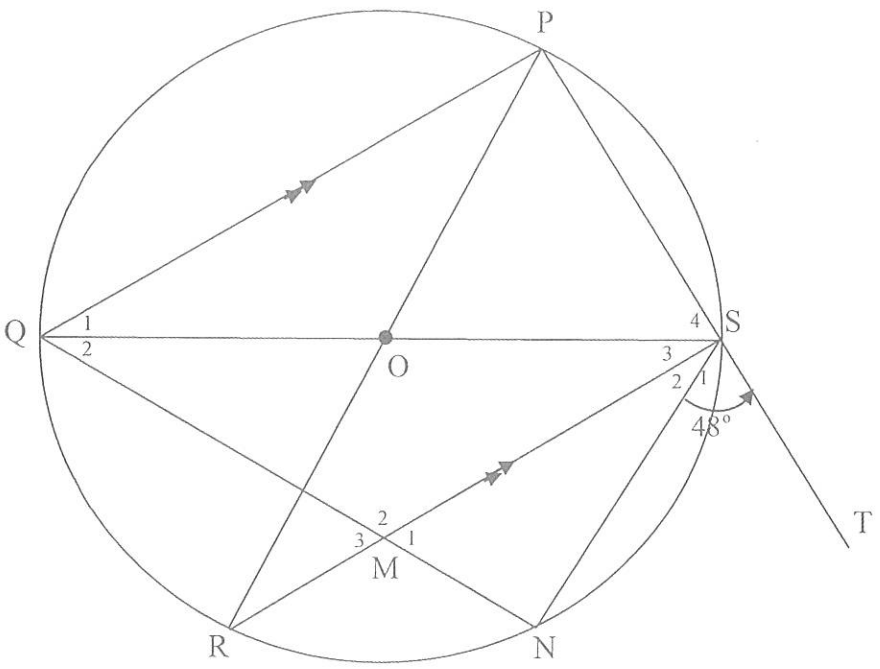
QUESTION 10

10.1 In the diagram below, O is the centre of the circle and PTSR is a cyclic quadrilateral.



Prove the theorem that states that $\hat{P} + \hat{S} = 180°$. (5)

10.2 In the figure, QS and PR are diameters of the circle with centre O such that PQ || SR. PS is produced to T. N is a point on the circle such that $\hat{Q}_1 = \hat{Q}_2$. SN is drawn.
RS intersects QN at M. $\hat{S}_1 = 48^\circ$



10.2.1 Determine, with reasons, the size of:

(a) $\hat{Q}_1$ (3)

(b) $\hat{R}$ (2)

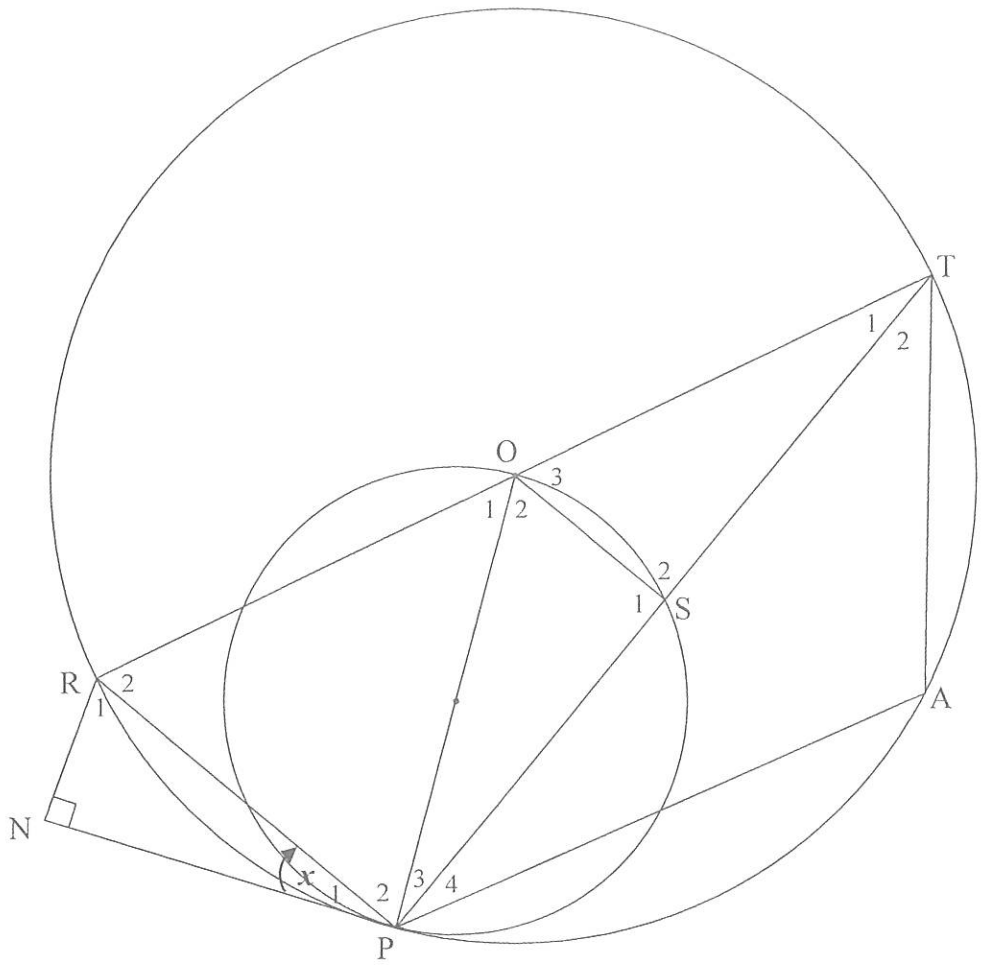
(c) $\hat{M}_1$ (2)

10.2.2 Prove that ST is a tangent to the circle passing through M, N and S. (2)
[14]

QUESTION 11

O is the centre of the larger circle RTAP. OP is the diameter of the smaller circle PSO. NP is a tangent to both circles at P. RN ⊥ NP.

Let $\hat{P}_1 = x$.



11.1 Prove that PR bisects $O\hat{R}N$. (5)

11.2 Prove that $R\hat{O}S = P\hat{A}T$. (5)

[10]

TOTAL: 150

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NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 11

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2018

MARKING GUIDELINES/ *NASIENRIGLYNE*

MARKS/*PUNTE*: 150

This marking guideline consists of 28 pages.
Hierdie nasienriglyne bestaan uit 28 bladsye.

Approved
2018-11-21

NOTE:

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

LET WEL:

- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

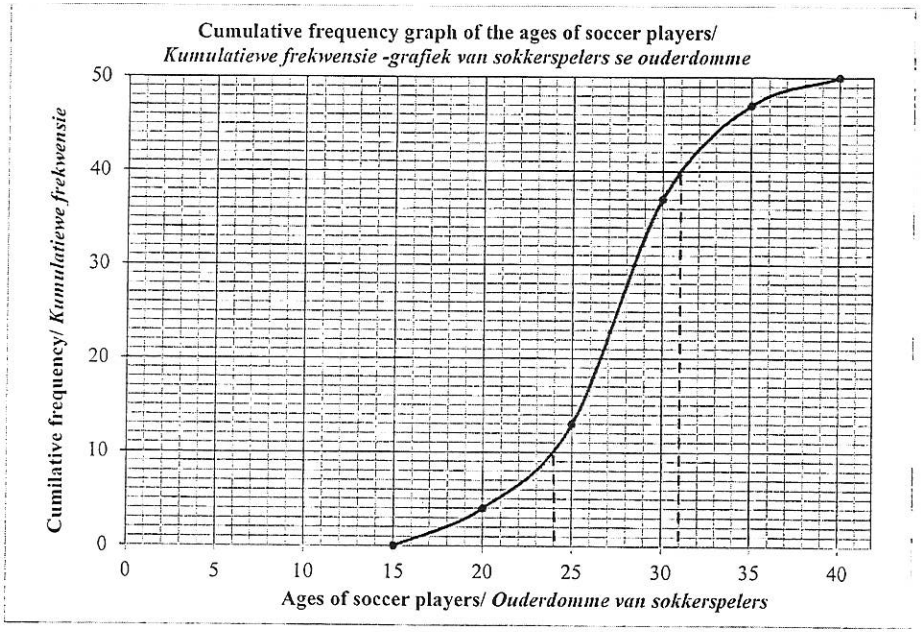
QUESTION/*VRAAG* 1

4	12	13	16	17	18	20	22	22	25

A

1.1	4 minutes/ *minute*	✓ answer/ *antwoord* (1)
1.2	Mean/ *gemiddeld* $=\frac{169}{10}=16,9$	✓169 ✓ answer/ *antwoord* (2)
1.3	Standard deviation/ *Standardafwyking* = 5,79	✓answer/ *antwoord* (1)
1.4	$(16,9-2\times5,79;16,9+2\times5,79)$ $(5,32\ ;\ 28,48)$ $\therefore$ 1 member of the team completed the obstacle race outside of 2 standard deviations of the mean./ *1 lid van die span het die hundernisbaan buite twee standardafwykings van die gemiddeld voltooi.*	✓ $\bar{x}-2\sigma$ ✓ $\bar{x}+2\sigma$ ✓ answer/ *antwoord* (3)
1.5	$\frac{169+x+5}{20}=18$ $x=18\times20-174$ $x=186$	✓$169+x+5$ ✓dividing by 20/ *deel deur 20* ✓answer/ *antwoord* (3) **[10]**

QUESTION/*VRAAG* 2



A

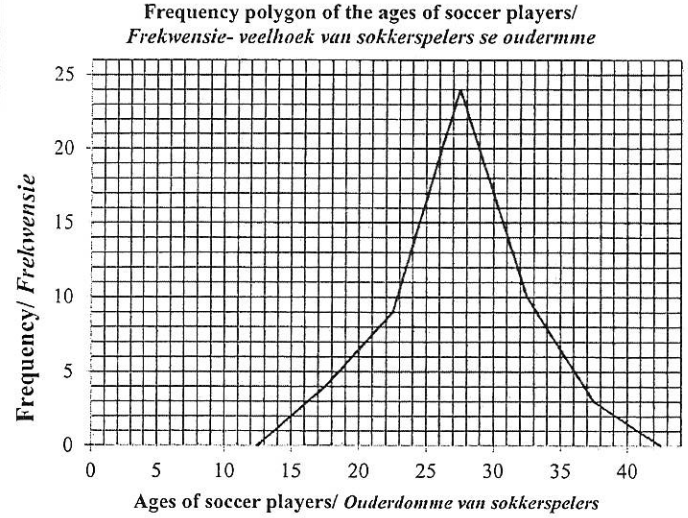
2.1.1	50 players/ *spelers*	DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X895, PRETORIA 0001 2018 -11- 21 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓ answer/ *antwoord* (1)
2.1.2	40 – 10 = 30 players/ *spelers*		✓40 and/ *en* 10 ✓answer/ *antwoord* (2)
2.1.3			✓ two correct values/ *twee korrekte waardes* ✓ three correct values/ *drie korrekte waardes* ✓ all correct values/ *al die waardes korrek* (3)

Class interval/ *Klas interval*	Frequency/ *Frekwensie*	Cumulative frequency *Kumulatiewe frekwensie*
$15 \le x < 20$	4	4
$20 \le x < 25$	9	13
$25 \le x < 30$	24	37
$30 \le x < 35$	10	47
$35 \le x < 40$	3	50

2.1.4

Class interval/ *Klas- interval*	Class midpoint/ *Klas- middelpunt*	Frequency/ *Frekwensie*
$15 \le x < 20$	17,5	4
$20 \le x < 25$	22,5	9
$25 \le x < 30$	27,5	24
$30 \le x < 35$	32,5	10
$35 \le x < 40$	37,5	3

DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X895, PRETORIA 0001 2018 -11- 21 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION



✓ using midpoints / *gebruik middelpunte*

✓plotting the points correctly/ *korrekte punte geplot*

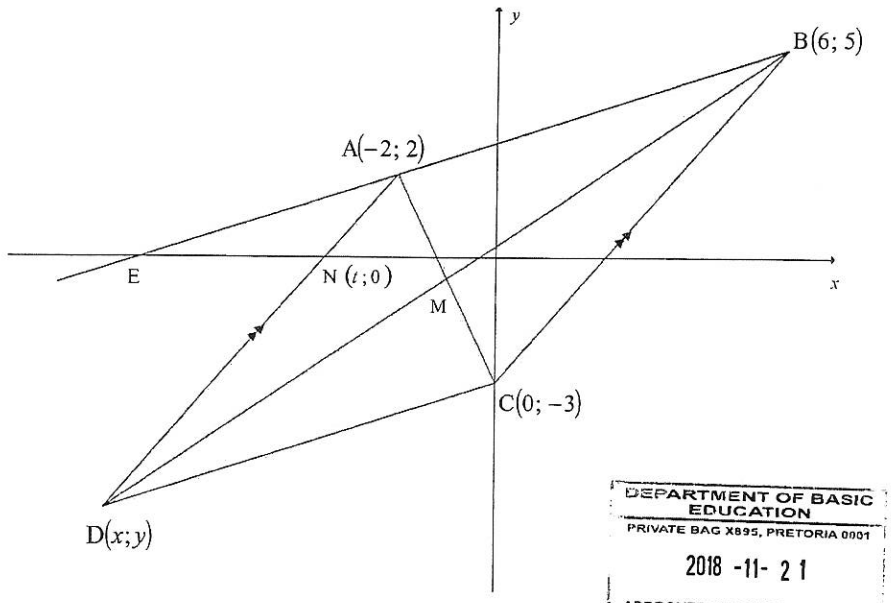
✓points joined by straight line/ *punte verbind met 'n reguitlyn*

✓ grounding at/ *geanker by* (12,5;0) and/ *en* (42,5 ; 0)

(4)

2.2	The claim is not valid. / *Die bewering is nie geldig nie*	✓ claim not valid/ *bewering nie geldig nie*
a	Range of class/ *Omvang van klas* A = 60 Range of class/ *Omvang van klas* B = 40	
b	The range of class A is bigger than the range of class B. Therefore the marks of class A are more spread out than the class B./ *Die omvang van klas A is groter as die omvang van klas B. Dus is die punte in klas A meer verspreid as klas B*	✓ comment on the overall spread/ *kommentaar oor die algehele verspreiding*
c	At least 25% of class A have lower marks than any learner in class B./ *ten minste 25% van klas A het laer punte as enige leerder in klas B.*	✓ comparison of the lower marks/ *vergelyk laer punte* (3) **[13]**
d	Class A performed worse at the bottom end. / *Klas A het slegter gevorder aan die onderste groep*	

QUESTION/*VRAAG* 3



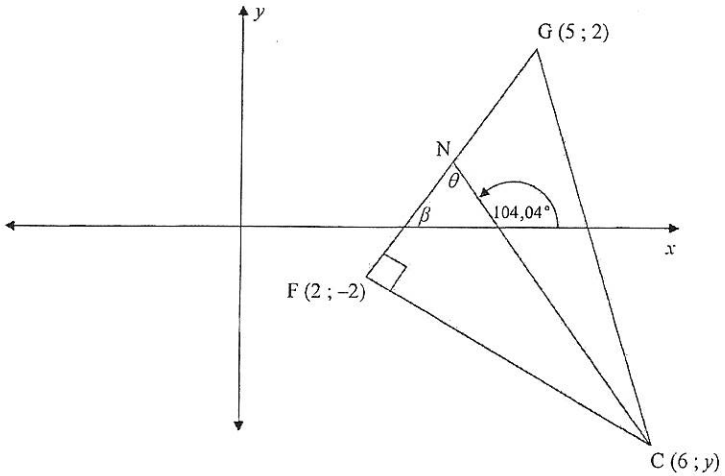
3.1	B(6;5) C(0;−3) $m_{BC}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{-3-5}{0-6}$ $=\frac{-8}{-6}$ $=\frac{4}{3}$ OR/ OF $m_{BC}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{5-(-3)}{6-0}$ $=\frac{8}{6}$ $=\frac{4}{3}$	✓subst into correct grad.form / *verv in grad form.* ✓ answer/ *antwoord* (2)

3.2	$m_{AD}=m_{BC}=\frac{4}{3}$ (AD ∥ BC) $y=\frac{4}{3}x+c$ $2=\frac{4}{3}(-2)+c$ $\frac{14}{3}=c$ $\therefore y=\frac{4}{3}x+\frac{14}{3}$ **OR/OF** $m_{AD}=\frac{4}{3}$ (AD ∥ BC) $y-2=\frac{4}{3}(x-(-2))$ $y=\frac{4}{3}x+\frac{14}{3}$ $\therefore y=\frac{4}{3}x+\frac{14}{3}$	✓ $m_{AD}=\frac{4}{3}$ ✓subst of m and point $(-2;2)$ / *verv. m en punt* $(-2;2)$ ✓ answer/ *antwoord* (3) ✓ $m_{AD}=\frac{4}{3}$ ✓subst of m and point $(-2;2)$ / *verv. m en punt* $(-2;2)$/ ✓ answer/ *antwoord* (3)
3.3	$y=\frac{4}{3}x+\frac{14}{3}$ $0=\frac{4}{3}t+\frac{14}{3}$ $\frac{-14}{3}=\frac{4}{3}t$ $t=\frac{-14}{4}=\frac{-7}{2}$	✓ subst/ *verv.* $y=0$ ✓ answer/ *antwoord* (2)
3.4	$AN=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $=\sqrt{\left((-2)-\left(-\frac{7}{2}\right)\right)^2+(2-0)^2}$ $=\sqrt{\frac{25}{4}}$ $=\frac{5}{2}$	✓subst. in distance formula/ *verv. in afstand formule* ✓answer/ *antwoord* (2)

3.5	$\frac{3}{8}x-3=\frac{4}{3}x+\frac{14}{3}$ $\frac{23}{24}x=-\frac{23}{3}$ $x=-8$ $y=\frac{4}{3}(-8)+\frac{14}{3}$ $=-6$ $D(-8;-6)$	✓ equating/ *vergelyk* ✓simplifcation/ *vereenv.* ✓ *x*- value/ *waarde* ✓ *y*- value/ *waarde* (4)
3.6	$m_{AB}=\frac{5-2}{6-(-2)}=\frac{3}{8}$ $m_{AB}=m_{DC}$ ∴ AB‖DC but/*maar* AD‖BC ∴ ABCD is a parallelogram [opp sides are‖/ *teenoorst sye is*‖] **OR/OF** $AD=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $=\sqrt{((-2)-(-8))^2+(2-6)^2}$ $=\sqrt{100}$ $=10$ $BC=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $=\sqrt{(6-0)^2+(5-(-3))^2}$ $=\sqrt{100}$ $=10$ ∴ AD = BC but/*maar* AD‖BC ∴ ABCD is a parallelogram [2 opp sides are = *and*‖ / *teenoorst sye is* = *en* ‖] **OR/OF**	✓ $m_{AB}=\frac{3}{8}$ ✓ AB‖DC ✓reason/ *rede* (3) ✓ length of AD/ *lengte van AD* ✓ length of BC/ *lengte van BC* ✓reason/ *rede* (3)

	M is the midpoint of AC *M is die middelpunt van AC* $M\left(\frac{(-2)+0}{2};\frac{2+(-3)}{2}\right)$ $M\left(-1;-\frac{1}{2}\right)$ M is the midpoint of BD *M is die middelpunt van BD* $M\left(\frac{(-8)+6}{2};\frac{(-6)+5}{2}\right)$ $M\left(-1;-\frac{1}{2}\right)$ ∴ ABCD is a parallelogram [diagonals bisect each other / *hoeklyne halveer mekaar*]	✓ midpoint of AC/ *middelpunt van AC* ✓ midpoint of BD/ *middelpunt van AC* ✓reason/ *rede* (3)
3.7	M is the midpoint of AC [diagonals bisect] *M is die middelpunt van AC* [*hoelyne halveer*] $M\left(\frac{(-2)+0}{2};\frac{2+(-3)}{2}\right)$ $M\left(-1;-\frac{1}{2}\right)$	✓ Substitution into the correct formula/ *Verv. in korrekte form.* ✓ *x*- value / *waarde* ✓ *y*- value / *waarde* (3) **[19]**

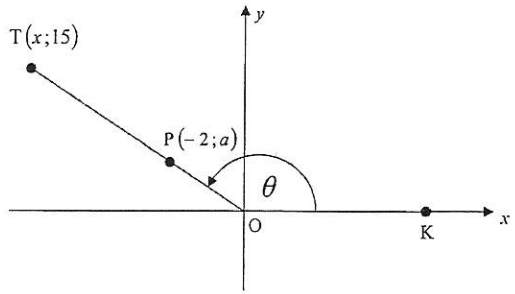
QUESTION/*VRAAG* 4



4.1	$m_{FG} = \frac{2-(-2)}{5-2}$ $= \frac{4}{3}$	✓ subst. into correct gradient form./ *vervang in gradiënt formule* ✓ answer (2)
4.2	$m_{FC} = \frac{-3}{4}$ (FC⊥FG) $\frac{y+2}{6-2} = \frac{-3}{4}$ $y = -5$ **OR/OF**	✓ $m_{FC} = \frac{-3}{4}$ ✓equating gradients/ *stel gradiënte gelyk* ✓answer/ *antwoord* (3)

	$m_{FC} \times m_{FG} = -1$ (FC⊥FG) $\frac{y+2}{6-2} \times \frac{4}{3} = -1$ $4(y+2) = -12$ $y+2 = -3$ $y = -5$	✓ $m_{FC} \times m_{FG} = -1$ ✓ substitution/ *verv.* ✓answer/ *antwoord* (3)
4.3	$\tan\beta = \frac{4}{3}$ $\beta = 53{,}13°$ $\theta = 104{,}04° - 53{,}13°$ [ext ∠of Δ/ *buite* ∠van Δ] $\theta = 50{,}91°$	✓ $\tan\beta = \frac{4}{3}$ ✓ $\beta = 53{,}13°$ ✓ answer/ *antwoord* (3)
4.4	$FC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(6-2)^2 + (-5-(-2))^2}$ $= \sqrt{16+9}$ $= 5$ $\sin\theta = \frac{FC}{NC}$ $\sin 50{,}91° = \frac{5}{NC}$ $NC = \frac{5}{\sin 50{,}91°}$ $= 6{,}44$ unit	✓subst. into distance formula/ *verv. in afst. form.* ✓ length of FC / *lengte van* FC ✓ $\sin 50{,}91° = \frac{5}{NC}$ ✓ answer/ *antwoord* (4) **[12]**

QUESTION/*VRAAG* 5



5.1.1	$x^2+y^2=r^2$ [*Pythagoras*] $(x)^2+(15)^2=17^2$ $x^2=64$ $x=-8$ (P is in quadrant 2/ *is in kwadrant* 2)	✓ subst in pyth/ *verv in pyth* ✓ answer/ *antwoord* (2)
5.1.2	$\tan\theta=\frac{15}{-8}$	✓ answer/ *antwoord* (1)
5.1.3	$\cos(180°-\theta)$ $=-\cos\theta$ $=-\left(\frac{-8}{17}\right)$ $=\frac{8}{17}$ answer only Full marks	✓ $-\cos\theta$ ✓ answer/ *antwoord* (2)
5.1.4	$\sin^2\theta$ $=\left(\frac{15}{17}\right)^2$ $=\frac{225}{289}$	✓ substitution/ *vervanging* ✓ answer/ *antwoord* (2)

$\tan\theta=\frac{8}{15}$ (ses 1. 2)

$\theta=28,07°$

$\tan 28,07=\frac{-2}{a}$

$a=-3,75$

5.1.5	$\tan\theta=\frac{a}{-2}=\frac{15}{-8}$ $\frac{a}{-2}=\frac{15}{-8}$ $a=\frac{15}{4}$ / 3,75 / $3\frac{3}{4}$ **OR/OF** $m=\frac{15}{-8}$ $y=\frac{15}{-8}x$ $a=\frac{15}{-8}(-2)$ $a=\frac{15}{4}$	✓ $\tan\theta=\frac{a}{-2}$ ✓ equating/ *stel gelyk* ✓ answer/ *antwoord* (3) ✓ $y=\frac{15}{-8}x$ ✓ substitution of $P(-2;a)$/ *vervanging van* $P(-2;a)$ ✓ answer/ *antwoord* (3)
5.2	$\text{LHS}=\frac{\sin120°.\cos210°.\tan315°.\cos27°}{\cos540°.\sin63°}$ $=\frac{\sin60°.(-\cos30°)(-\tan45°).\sin63°}{\cos180°.\sin63°}$ $=\frac{\frac{\sqrt{3}}{2}.\frac{-\sqrt{3}}{2}(-1)}{-1}$ $=-\frac{3}{4}$ answer only 6 marks	✓ $\sin60°/\cos30°$ ✓ $-\cos30°$ ✓ $-\tan45°$ ✓ $\sin63°/\cos27°$ ✓ $\cos180°$ ✓ special angle ratios/ *spesiale hoeke verhoudings* ✓ answer/ *antwoord* (7)

5.3

$$LHS = \frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta}$$

$$= \frac{1+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{1+\sin\theta-(1-\sin^2\theta)}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin\theta(1+\sin\theta)}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin\theta}{\cos\theta}$$

$$= \tan\theta$$

$$= RHS$$

OR/OF

$$LHS = \frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta}$$

$$= \frac{1+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{(1-\cos^2\theta)+\sin\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin^2\theta+\sin\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin\theta(1+\sin\theta)}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin\theta}{\cos\theta}$$

$$= \tan\theta$$

$$= RHS$$

OR/OF

✓common denominator/ *gemene noemer*

✓$1-\sin^2\theta$

✓simplification/ *vereenv.*

✓factors/ *faktore*

✓ $\frac{\sin\theta}{\cos\theta}$

(5)

✓common denominator/ *gemene noemer*

✓$1-\cos^2\theta$

✓simplification/ *vereenv.*

✓factors/ *faktore*

✓ $\frac{\sin\theta}{\cos\theta}$

(5)

$$LHS = \frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta}$$

$$= \frac{1+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin^2\theta+\cos^2\theta+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin^2\theta+\sin\theta}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin\theta(1+\sin\theta)}{\cos\theta(1+\sin\theta)}$$

$$= \frac{\sin\theta}{\cos\theta}$$

$$= \tan\theta$$

$$= RHS$$

✓common denominator/ *gemene noemer*

✓$\sin^2\theta+\cos^2\theta$

✓simplification/ *vereenv.*

✓factors/ *faktore*

✓ $\frac{\sin\theta}{\cos\theta}$

(5)

5.4

$$3\sin x = 2\tan x.$$

$$3\sin x = 2\times\frac{\sin x}{\cos x}$$

$$3\sin x\cos x = 2\sin x$$

$$3\sin x\cos x - 2\sin x = 0$$

$$\sin x(3\cos x - 2) = 0$$

$\sin x = 0$

$x = 360°k,\ k \in Z$

or

$x = 180° + 360°k,\ k \in Z$

or

$\cos x = \frac{2}{3}$

$x = 48{,}19° + 360°.k,\ k \in Z$

or

$x = 311{,}81° + 360°.k,\ k \in Z$

OR/ OF

✓ $\frac{\sin x}{\cos x}$

✓ factors/ *faktore*

✓ both equations/ *beide vergelykings*

✓ both general solutions/ *beide algemene oplossings*

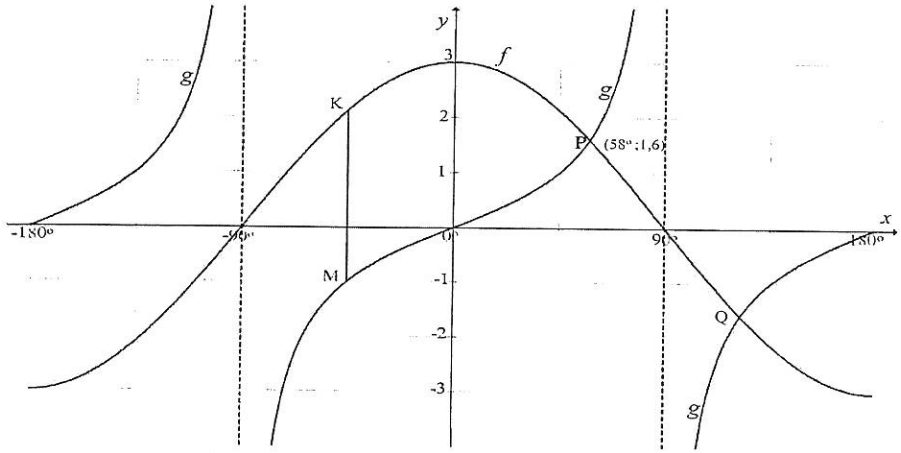
✓ both general solutions/ *beide algemene oplossings*

✓ $k \in Z$

(6)

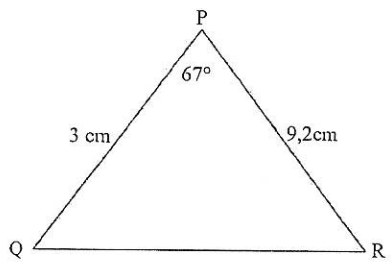
	$3\sin x = 2\tan x.$ $3\sin x = 2 \times \frac{\sin x}{\cos x}$ $3\sin x\cos x = 2\sin x$ $3\sin x\cos x - 2\sin x = 0$ $\sin x(3\cos x - 2) = 0$ $\sin x = 0$ $x = 180°.k,\ k \in Z$ $\cos x = \frac{2}{3}$ $x = \pm 48{,}19° + 360°.k,\ k \in Z$	✓ $\frac{\sin x}{\cos x}$ ✓ factors/ *faktore* ✓ both equations/ *beide vergelykings* ✓ general solution/ *algemene oplossing* ✓ both general solutions/ *beide algemene oplossings* ✓ $k \in Z$ (6) **[28]**

QUESTION/*VRAAG* 6

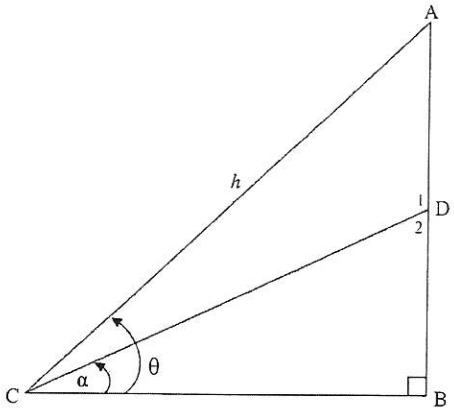


6.1	$-3 \le y \le 3$ or/ *of* $y \in [-3;3]$	✓ end points/ *eindpunte* ✓ notation/ *notasie* (2)
6.2	$c = 1$	✓ answer/ *antwoord* (1)
6.3	$a = 3,\ b = 1$	✓ $a = 3$ ✓ $b = 1$ (2)
6.4	$Q(122°;-1{,}6)$	✓ x- value/ *waarde* ✓ y- value/ *waarde* (2)
6.5	$K(-45°;\frac{3\sqrt{2}}{2})$ $M(-45°;-1)$ $KM = \frac{3\sqrt{2}}{2} + 1$ $= \frac{3\sqrt{2}+2}{2}$ $= 3{,}12$	✓ coordinates of/ *koördinate van* K ✓ length of/ *lengte van* KM (2)
6.6	$f(x) = 3\cos(\theta - 45°)$	✓ 3 ✓ $-45°$ (2)
		[11]

QUESTION/*VRAAG 7*



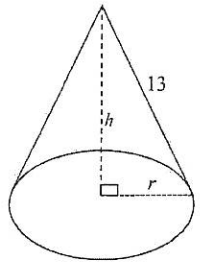
7.1	$QR^2 = PR^2 + PQ^2 - 2PR.PQ\cos\hat{P}$ $QR^2 = (3)^2 + (9,2)^2 - 2(3)(9,2)\cos 67°$ $QR = \sqrt{(3)^2 + (9,2)^2 - 2(3)(9,2)\cos 67°}$ $QR = 8,49\text{cm}$	✓using cos rule/ *gebruik cos reël* ✓substitution/ *vervanging* ✓ answer/ *antwoord* (3)



7.2.1	$A\hat{C}D = \theta - \alpha$	✓ answer/*antw.* (1)
7.2.2	$\hat{D}_1 = 90° + \alpha$ $\frac{\sin(90° + \alpha)}{h} = \frac{\sin(\theta - \alpha)}{AD}$ $\frac{\cos\alpha}{h} = \frac{\sin(\theta - \alpha)}{AD}$ $AD = \frac{h\sin(\theta - \alpha)}{\cos\alpha}$	✓ $\hat{D}_1 = 90° + \alpha$ ✓ $\frac{\sin(90° + \alpha)}{h}$ ✓ $\frac{\sin(\theta - \alpha)}{AD}$ ✓ $\sin(90° + \alpha) = \cos\alpha$ (4)
7.2.3	$AD = \frac{17\sin(58° - 23°)}{\cos 23°}$ $AD = 10,59$ units	✓ subst/ *verv.* ✓ answer/*antw.* (2)
7.2.4	Area of $\Delta ADC = \frac{1}{2} \times AD \times AC \times \sin\hat{A}$ $= \frac{1}{2} \times 10,59 \times 17 \times \sin 32°$ $= 47,70\text{ unit}^2$ **OR/ OF**	✓ correct area rule/ korrekte *area reël* ✓32° ✓ answer/*antw.* (3)

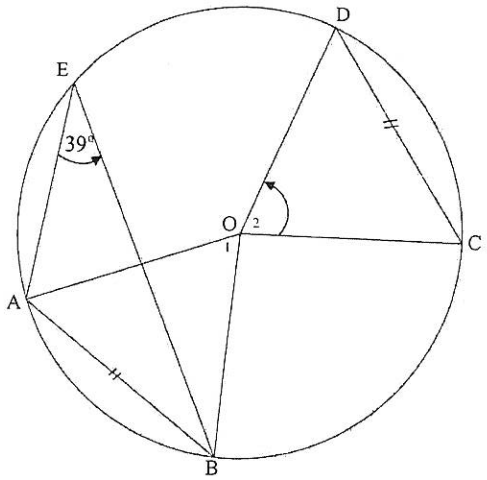
	$\sin 58° = \frac{AB}{17}$ $AB = 17\sin 58°$ $= 14{,}41682....$ $BD = 14{,}41682.... - 10{,}59289... = 3{,}82393...$ $\sin 23° = \frac{3{,}82393...}{CD}$ $CD = \frac{3{,}82393...}{\sin 23°}$ $= 9{,}78660...$ Area of $\Delta ADC = \frac{1}{2} \times CD \times AC \times \sin 35°$ $= \frac{1}{2} \times 9{,}78660... \times 17 \times \sin 35°$ $= 47{,}71\ \text{unit}^2$	✓length of BD / *lengte van BD* ✓length of CD/ *lengte van CD* ✓ answer/*antw.* (3) **[28]**

QUESTION/*VRAAG 8*

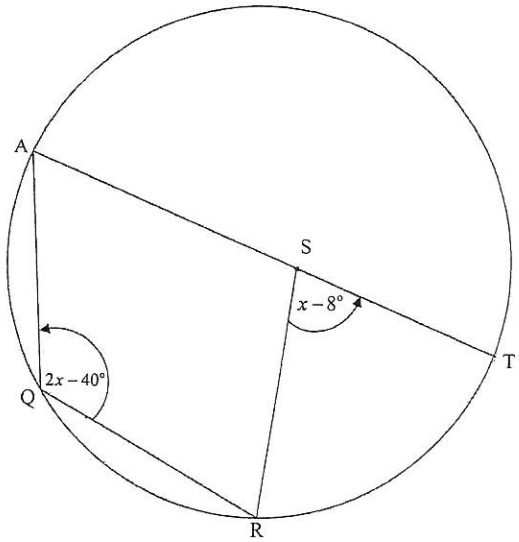


8.1	$r^2 = 13^2 - h^2$ (Pythagoras) $r^2 = 169 - h^2$ $V = \frac{1}{3}Ah$ $= \frac{1}{3}\pi r^2 h$ $= \frac{1}{3}\pi(169 - h^2)h$ $= \frac{169\pi h - \pi h^3}{3}$	✓using theorem of pythagoras/ *gebruik stelling van pythagoras* ✓ $r^2 = 169 - h^2$ ✓ substitution/ *vervanging* ✓simplification/ *vereenvoudig* (4)
8.2	$r = \sqrt{13^2 - 12^2}$ (Pythagoras) $= 5$ Total surface area/ *buite oppervlakte* $= \pi r^2 + \pi r s$ $= \pi(5^2) + \pi(5)(13)$ $= 90\pi$ $= 282{,}74\ \text{cm}^2$	✓ value of/ *waarde van r* ✓ subst. / *verv.* ✓ answer/ *antwoord* (3) **[7]**

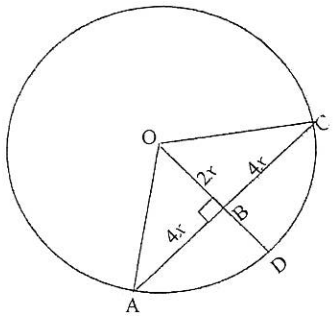
QUESTION/*VRAAG* 9



9.1.1	$\hat{O}_1 = 78°$ [angle at centre = 2 × ∠ at circumference] [*middelpuntshoek = 2 × omtrekshoek*]	✓ S ✓ R (2)
9.1.2	$\hat{O}_2 = 78°$ [equal chords; equal ∠^{s} / *gelyke koorde; gelyke hoeke*]	✓ S ✓ R (2)

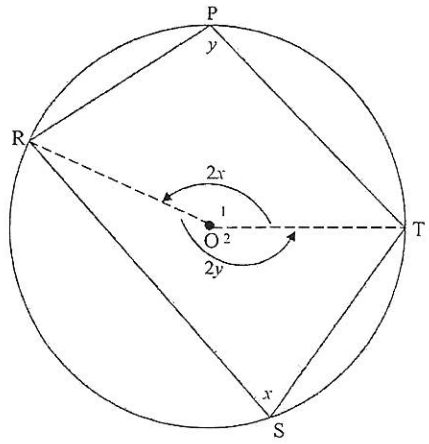


9.2	$x-8°+180° = 2(2x-40°)$ [angle at centre = 2 × ∠ at circumference/ *middelpuntshoek = 2 × omtrekshoek*] $4x-80° = 172°+x$ $3x = 252°$ $x = 84°$ OR/OF Join T and R/ *verbind* T *en* R $\hat{T} = 180° - (2x-40°)$ [opp ∠'s of cyclic quad/ *teenoorst.∠^{e} van koordevierhoek*] $\hat{R} = \hat{T} = 220° - 2x$ [∠^{s} opp. = sides / ∠^{s} *teeoor gelyke sye*] $x-8°+220°-2x+220°-2x = 180°$ [*sum of* int ∠^{s} *of* Δ / *som binne* ∠^{e} *van* Δ] $-3x = -252°$ $x = 84°$	✓ S ✓ R ✓ simplification/ *vereenvoudiging* ✓ answer/ *antwoord* (4) ✓ S ✓ R ✓ S ✓ answer/ *antwoord* (4)

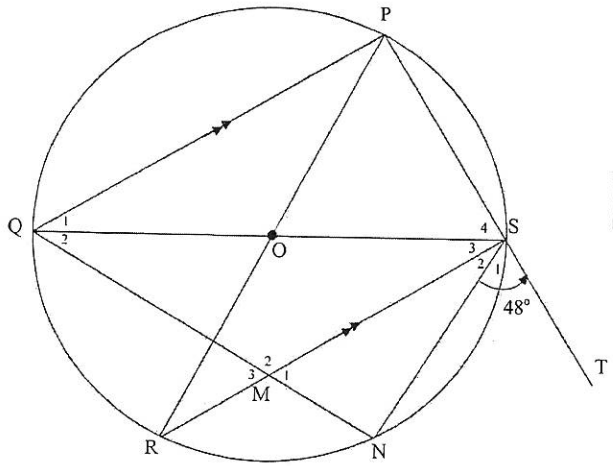


9.3	$AB = BC = 4x$ [line from centre ⊥ to chord / *lyn van middelpunt ⊥ aan koord*] $OA^2 = (4x)^2 + (2x)^2$ [Pythagoras] $OA = \sqrt{16x^2 + 4x^2}$ $= \sqrt{20x^2}$ $= 2\sqrt{5}x$ $OD = OA = 2\sqrt{5}x$ [radii] $BD = 2\sqrt{5}x - 2x$ $= 2x(\sqrt{5} - 1)$	✓ S ✓ R ✓ Substitution/ *vervanging* ✓ length of OA / *lente van* OA ✓ $BD = 2\sqrt{5}x - 2x$ (5) **[13]**

QUESTION/*VRAAG* 10

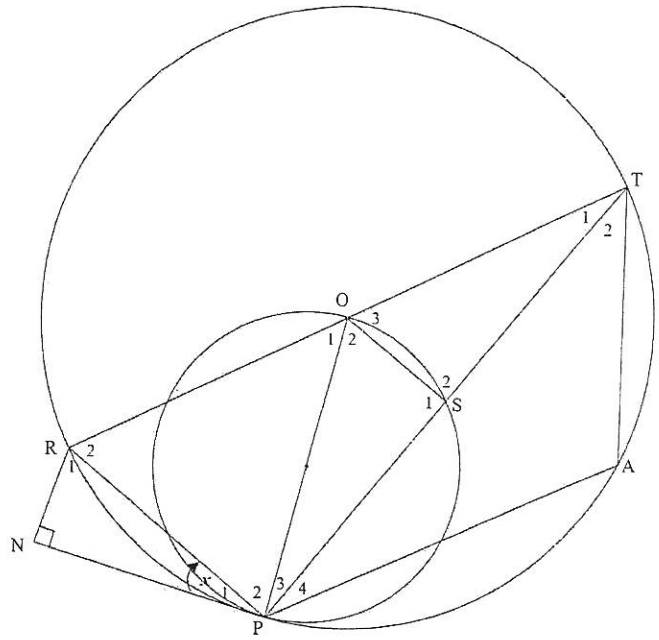


10.1	Construction: Draw radii OR and OT *Konstruksie: teken raduise OR en OT* Let/ *laat*: $\hat{S} = x$ and/*en* $\hat{P} = y$ $\hat{O}_1 = 2\hat{S}$ [angle at centre = 2 times angle at circumference/ *middelpuntshoek = 2 keer omtrekshoek*] $\hat{O}_1 = 2x$ Similarly/ *in die selfde manier*: $\hat{O}_2 = 2y$ $2x + 2y = 360°$ [anlges around a pt / *hoeke om 'n punt*] $x + y = 180°$ $\therefore \hat{S} + \hat{P} = 180°$	✓ construction/ *konstruksie* ✓ S ✓ R ✓ S ✓ S/R (5)



10.2.1(a)	$\hat{Q}=\hat{S}_1=48°$ [ext ∠ of cyclic quad/ *buite ∠ van 'n koodervierhoek*] $\hat{Q}_1=\hat{Q}_2=24°$ [QS bisects/ *halveer* PQ̂N]	✓S ✓R ✓S (3)
10.2.1(b)	$\hat{R}=\hat{Q}_1=24°$ [$\angle^s$ in the same segment/ *in dieselfde segment*]	✓S ✓R (2)
10.2.1(c)	$\hat{M}_1=\hat{Q}=48°$ [corresp/ *ooreenkomst* $\angle^s$, PQ || SR] **OR/OF** $\hat{S}_3=\hat{Q}_1=24°$ [alt $\angle^s$/ *ooreenkomst* $\angle^s$, PQ || SR] $\hat{M}_1=48°$ [ext ∠ of Δ / *buite ∠ van* Δ]	✓S ✓R (2) ✓S / R ✓answer/ *antwoord* (2)
10.2.2	$\hat{M}_1=\hat{S}_1=48°$ ∴ST is a tangent to circle MNS. [converse tan – chord theorem] *∴ ST is 'n raaklyn aan MNS* [*omgekrd raaklyn-koord st.*]	✓S ✓R (2) **[14]**

QUESTION/*VRAAG* 11



11.1	$\hat{T}_1=x$ [tan – chord theorem / *raaklyn-koord st*] $\hat{O}_1=2x$ [∠ at centre = 2 × ∠ at circumference/ *middelpuntshoek = 2 keer omtrekshoek*] $\hat{P}_2=90°-x$ [tan ⊥ diameter/ raaklyn ⊥ *middellyn*] $\hat{R}_2=90°-x$ [$\angle^s$ opp. = sides / $\angle^s$ *teeoor gelyke sye*] ∴ $\hat{R}_1=\hat{R}_2$ PR bisects / *halveer* OR̂N **OR/ OF**	✓S/R ✓S ✓S ✓ $\hat{R}_2=90°-x$ ✓S (5)

	$R\hat{P}T = 90°$ [∠ in the semi circle/ *in dieselfde segment*]	✓ S
	$\hat{T}_1 = x$ [tan – chord theorem/ *raaklyn-koord st*]	✓ S/R
	$\hat{R}_2 = 90° - x$ [sum int ∠^{s} of Δ / *som binne ∠^{s} van Δ*]	✓S
	$\hat{R}_1 = 90° - x$ [sum int ∠^{s} of Δ / *som binne ∠^{s} van Δ*]	✓S
	$\therefore \hat{R}_1 = \hat{R}_2$	
	PR bisects/ *halveer* $O\hat{R}N$	✓ S
	OR/ OF	(5)
	$\hat{T}_1 = x$ [tan – chord theorem/ *raaklyn-koord st*]	✓ S/R
	$\hat{P}_3 = x$ [∠^{s} opp.=sides/ ∠^{s} *teeoor gelyke sye*]	✓ S
	$\hat{O}_1 = 2x$ [ext∠ of Δ / *buite∠ van Δ*]	✓S
	$\hat{R}_2 = \hat{P}_2 = \frac{180° - 2x}{2}$ [∠^{s} opp.=sides/ ∠^{s} *teeoor gelyke sye*]	✓S
	$\hat{R}_2 = 90° - x$	
	$\hat{R}_1 = 90° - x$ [sum int ∠^{s} of Δ / *som binne ∠^{s} van Δ*]	✓ S
	$\therefore \hat{R}_1 = \hat{R}_2$	(5)
	PR bisects/ *halveer* $O\hat{R}N$	
11.2	$P\hat{A}T = 90° + x$ [opp∠'s of cyclic quad/ *teenoorst. hoeke van koordevierhoek*]	✓S ✓R
	$\hat{S}_2 = 90°$ [Line from centre ⊥ to chord / *lyn van mdpt ⊥ aan koo*	✓S ✓R
	$R\hat{O}S = 90° + x$ [ext∠ of Δ / buite∠ van Δ]	✓S/R
	$\therefore R\hat{O}S = P\hat{A}T$	
	OR/ OF	(5)

	$R\hat{P}T = 90°$ [∠ in the semi circle/ *in dieselfde segment*]	✓S
	$N\hat{P}T = 90° + x$	
	$P\hat{A}T = N\hat{P}T = 90° + x$ [tan – chord theorem / *raaklyn-koord st*	✓S ✓R
	$\hat{P}_3 = x$ [∠^{s} opp.=sides / ∠^{s} *teeoor gelyke sye*]	
	$\hat{S}_1 = 90°$ [Line from centre ⊥ to chord / *lyn van mdpt ⊥ aan koord*	✓S/R
	$\therefore \hat{O}_2 = 90° - x$ [*sum of* int ∠^{s} *of* Δ]	
	$R\hat{O}S = \hat{O}_1 + \hat{O}_2$	
	$= 2x + 90° - x$	
	$= 90° + x$	✓S
	$\therefore R\hat{O}S = P\hat{A}T$	(5)
		[10]

TOTAL/*TOTAAL*: 150

GRADE 11 MATHEMATICS
NOVEMBER 2018: PAPER 2
ADDENDUM TO THE MARKING GUIDELINES

These notes have been created to provide options that learners may use and the appropriate mark allocation for their answers.

1.2	• Answer only: award 2 marks • CA on answer only if incorrect sum is divided by 10
1.4	• CA from mean from 1.2 and standard deviation from 1.3 • If candidate makes an error with the number of standard deviations used in the formulae, then award a maximum of 2 marks. • Answer only: award 1 mark
1.5	• No CA on final answer if not dividing $174 + x$ by 20. • Alternate solution Overall mean $= \frac{\bar{x}_1 + \bar{x}_2}{2}$ $\frac{\frac{169}{10} + \frac{x+5}{10}}{2} = 18$ $\frac{169}{10} + \frac{x+5}{10} = 36$ $169 + x + 5 = 360$ $x = 186$ $\frac{\frac{169}{10} + \frac{x+5}{10}}{2}$ ✓ =18 ✓ ✓ answer
2.1.2	• To compensate for slight error in readings (9,5 – 10,5 and 39,5 to 40,5), accept a final answer between of 29 to 31. • No CA on final answer for the subtraction of random values that are not related to the answer.
2.2	Comment about the difference in the Interquartile range of the two classes does not conclusively suggest that the performance in one class is better than the other. It only compares the middle 50% of the data. Therefore, no mark is awarded for stating that the IQR of Class A is bigger than the IQR of Class B.
3.1	• CA on the answer only if incorrect substitution into the correct gradient formula. • If candidates used $m = \frac{x_2 - x_1}{y_2 - y_1}$, this constitutes a B/D. No marks are awarded.
3.2	CA on gradient from 3.1
3.3	• CA on equation of AD from 3.2 • Although the question requires the candidate to calculate the value of t, accept the final answer as $x = \ldots$, without any penalty.
3.4	CA on value of t from 3.3
3.5	• CA on equation of AD from 3.3 • Candidates who assume that AD = BC and use transformation to arrive at the coordinates of D must be awarded 0 marks.
5.1.1	Only award the mark for the answer if the final answer has a negative value.
5.1.2	CA on the value of x from 5.1.1
5.1.3	• CA on the value of x from 5.1.1 • If the answer in 5.1.1 is $x = -8$ and the candidates wrote down the answer only to 5.1.3, then award 2 marks.

5.1.5	CA on value of $\tan\theta$ from 5.1.2
5.2	Answer only: award 0 marks
5.4	• The mark for $k \in Z$ is only awarded in the context of a general solution. • If candidates divided both sides of the original equation by either sinx or tanx, they should arrive at a basic trigonometric equation. In this case, a maximum of three marks can be awarded for the following: o Using the identity $\tan x = \frac{\sin x}{\cos x}$ o Both general solutions to the equation o $k \in Z$
6.5	• CA on the y–coordinate of K using the values of a and b from 6.3 • Where candidates read of inaccurately from the graph, CA the final answer.
6.6	CA on the value of a from 6.3 in this answer.
7.2.4	CA on the length of AD from 7.2.3
9.1.2	CA on the size of $\hat{O}_1$ from 9.1.1
9.2.2	Incorrect selection of angle at centre: $x - 8° = 2(2x - 40°)$ angle at centre... $x - 8° = 4x - 80°$ $3x = 72°$ $x = 24°$ ✓ simplification ✓ answer
10.1	• The mark for construction is awarded for explicitly stating it in the proof OR it could be drawn in the diagram. • If no construction is stated or drawn, the B/D. Award 0 marks.
10.2	If the candidate writes an incorrect statement but the reason corresponds with the reason shown in the marking guideline, then the mark for the reason is not awarded. The reason must correspond with the statement in order for the mark for the reason to be awarded.
10.2.1(b)	CA on the size of $\hat{Q}_1$ from 10.2.1(a)
10.2.1(c)	• CA on the size of $\hat{Q}$ from 10.2.1(a) • The candidate must state which lines are parallel if the use alternate angles or corresponding angles as a reason.
11	If the candidate writes an incorrect statement but the reason corresponds with the reason shown in the marking guideline, then the mark for the reason is not awarded.

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SPECIAL INSTRUCTIONS

QUESTION 3

It has come to our attention that there is a typing error in the diagram of Question 3. The axes are not labelled correctly. This poses many possible scenarios.

Scenario 1

Candidates may have read in the question that "D(x ; y)" is a vertex of the quadrilateral and that "BA produced has an x-intercept at E.". They may have then ignored the incorrect labels and proceeded to answer the question as if the horizontal axis is labelled as x and the vertical axis labelled as y. From the limited exposure that we have to candidates' scripts, it would seem like this was the most popular response to the situation.

In this instance, responses must be marked in accordance with the marking guideline.

Scenario 2

Candidates may have ignored "BA produced has an x-intercept at E." and used the axes labels exactly as provided in the diagram. In this instance, the coordinates of the points in the diagram will be in the form (y ; x). For example, the y-coordinate of A will be –2 and the x-coordinate of A will be 2.

For this interpretation to make sense, the x and y variables in all formulae must be switched around. Please see memo below.

3.1	B(6;5) C(0;−3) $m_{BC}=\frac{x_2-x_1}{y_2-y_1}$ $=\frac{-3-5}{0-6}$ $=\frac{-8}{-6}$ $=\frac{4}{3}$ OR/ OF $m_{BC}=\frac{x_2-x_1}{y_2-y_1}$ $=\frac{5-(-3)}{6-0}$ $=\frac{8}{6}$ $=\frac{4}{3}$	✓subst into grad.form / *verv in grad form.* ✓ answer/ *antwoord* (2)

3.2	$m_{AD}=m_{BC}=\frac{4}{3}$ (AD||BC) $x=\frac{4}{3}y+c$ $2=\frac{4}{3}(-2)+c$ $\frac{14}{3}=c$ $\therefore x=\frac{4}{3}y+\frac{14}{3}$ OR/OF $m_{AD}=\frac{4}{3}$ (AD||BC) $x-2=\frac{4}{3}(y-(-2))$ $x=\frac{4}{3}y+\frac{14}{3}$ $\therefore x=\frac{4}{3}y+\frac{14}{3}$	✓ $m_{AD}=\frac{4}{3}$ ✓subst of m and point $(-2;2)$ / *verv. m en punt* $(-2;2)$ ✓ answer/ *antwoord* (3) ✓ $m_{AD}=\frac{4}{3}$ ✓subst of m and point $(-2;2)$ / *verv. m en punt* $(-2;2)$/ ✓ answer/ *antwoord* (3)
3.3	$x=\frac{4}{3}y+\frac{14}{3}$ $0=\frac{4}{3}t+\frac{14}{3}$ $\frac{-14}{3}=\frac{4}{3}t$ $t=\frac{-14}{4}=\frac{-7}{2}$	✓ subst/ *verv.* $x=0$ ✓ answer/ *antwoord* (2)
3.4	$AN=\sqrt{(y_2-y_1)^2+(x_2-x_1)^2}$ $=\sqrt{\left((-2)-\left(-\frac{7}{2}\right)\right)^2+(2-0)^2}$ $=\sqrt{\frac{25}{4}}$ $=\frac{5}{2}$	✓subst. in distance formula/ *verv. in afstand formule* ✓answer/ *antwoord* (2)
3.5	$\frac{3}{8}y-3=\frac{4}{3}y+\frac{14}{3}$ $\frac{23}{24}y=-\frac{23}{3}$ $y=-8$ $x=\frac{4}{3}(-8)+\frac{14}{3}$ $=-6$ D(−8;−6)	✓ equating/ *vergelyk* ✓simplifcation/ *vereenv.* ✓ y- value/ *waarde* ✓ x- value/ *waarde* (4)

3.6	$m_{AB} = m_{DC}$ $\therefore$ AB ∥ DC but/*maar* AD ∥ BC $\therefore$ ABCD is a parallelogram [opp sides are∥/ *teenoorst sye is*∥] OR/OF $AD = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$ $= \sqrt{((-2)-(-8))^2 + (2-6)^2}$ $= \sqrt{100}$ $= 10$ $BC = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$ $= \sqrt{(6-0)^2 + (5-(-3))^2}$ $= \sqrt{100}$ $= 10$ $\therefore$ AD = BC but/*maar* AD∥BC $\therefore$ ABCD is a parallelogram [2 opp sides are = *and*∥ / *teenoorst sye is = en* ∥] OR/OF M is the midpoint of AC *M is die middelpunt van AC* $M\left(\frac{(-2)+0}{2}; \frac{2+(-3)}{2}\right)$ $M\left(-1; -\frac{1}{2}\right)$ M is the midpoint of BD *M is die middelpunt van BD* $M\left(\frac{(-8)+6}{2}; \frac{(-6)+5}{2}\right)$ $M\left(-1; -\frac{1}{2}\right)$ $\therefore$ ABCD is a parallelogram [diagonals bisect each other / *hoeklyne halveer mekaar*]	✓ $m_{AB} = \frac{3}{8}$ ✓ AB ∥ DC ✓reason/ *rede* (3) ✓ length of AD/ *lengte van AD* ✓ length of BC/ *lengte van BC* ✓reason/ *rede* (3) ✓ midpoint of AC/ *middelpunt van AC* ✓ midpoint of BD/ *middelpunt van AC* ✓reason/ *rede* (3)

3.7	M is the midpoint of AC [diagonals bisect] *M is die middelpunt van AC* [*hoelyne halveer*] $M\left(\frac{(-2)+0}{2}; \frac{2+(-3)}{2}\right)$ $M\left(-1; -\frac{1}{2}\right)$	✓ Substitution into the correct formula/ *Verv. in korrekte form.* ✓*y*- value / *waarde* ✓*x*- value / *waarde* (3) **[19]**

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Scenario 3

Candidates may have ignored "BA produced has an x-intercept at E." and used the axes labels exactly as provided in the diagram. In this instance, the coordinates of the points in the diagram will be in the form $(y\,;x)$. For example, the y-coordinate of A will be –2 and the x-coordinate of A will be 2. However, candidates use the formulae without switching the x and y variables.

In this interpretation, the formulae will not make sense.

For example, in the gradient formula: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in horizontal distance}}{\text{change in vertical distance}}$.

This results in fundamental conceptual error and is therefore marked as a breakdown.

Scenario 4

Candidates note that "BA produced has an x-intercept at E.". However, E lies on the y-axis on the diagram. This creates a contradiction and candidates are unable to proceed with answering the question.

In this instance, Question 3 must not be marked. The paper must be marked out of a total of 131 marks. The final mark will then be scaled up to 150.

The formula for this purpose will be: $\text{Adjusted mark} = \frac{\text{Mark obtained by learner}}{131} \times 150$

QUESTION 7

It has come to our attention that the label of 67° is placed correctly in the diagram in the question paper but incorrectly placed in the diagram in the answer book.

Scenario 1

Candidates read in the question "$\hat{P} = 67°$", observed the same in the diagram in the question paper and hence made the correction to the labelling in the diagram in the answer book. From the limited opportunity that we had to engage with candidate scripts, it would seem that this was the most popular way of dealing with this challenge.

In this instance, the responses will be marked in accordance with the marking guideline.

Scenario 2

In addition to $\hat{Q}=67°$, candidates further indicated that $\hat{P}=67°$ in the diagram in the answer book. This will result in ΔPQR being isosceles.

The candidate's response:

QR = 9,2 cm sides opposite equal angles

must be awarded 3 marks.

Scenario 3

Candidates did not read through the question carefully and only referred to the diagram in the answer book to calculate the length of QR.

In this instance, the solution of QR is far more complex than the original question intended. Candidates will have to do a lot more working to arrive at the answer for QR. The first step is to calculate $\hat{R}$, then to calculate $\hat{P}$ and finally to calculate QR. Such candidates are being prejudiced over the ones that answered the question as it intended.

In order to give these candidates the same level of access to this question, only the calculation of $\hat{R}$ must be marked according to the following memo.

$\frac{\sin\hat{Q}}{PR}=\frac{\sin\hat{R}}{PQ}$	✓ using the sine rule
$\frac{\sin 67°}{9,2}=\frac{\sin\hat{R}}{3}$	✓ substitution
$\sin\hat{R}=\frac{3\sin 67°}{9,2}$	
$\hat{R}=17,46°$	✓ answer (3)