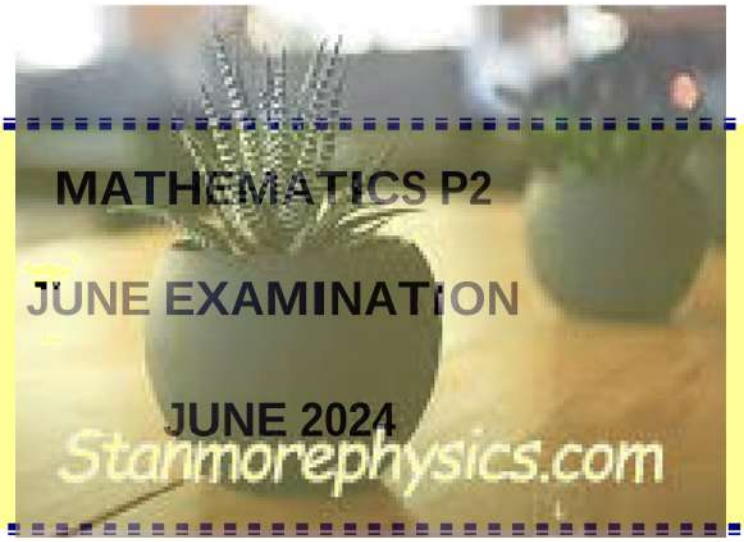
education

Department of Education
FREE STATE PROVINCE

GRADE 12



MARKS: 150

TIME: 3 hours

This question paper consists of 12 pages

NSC

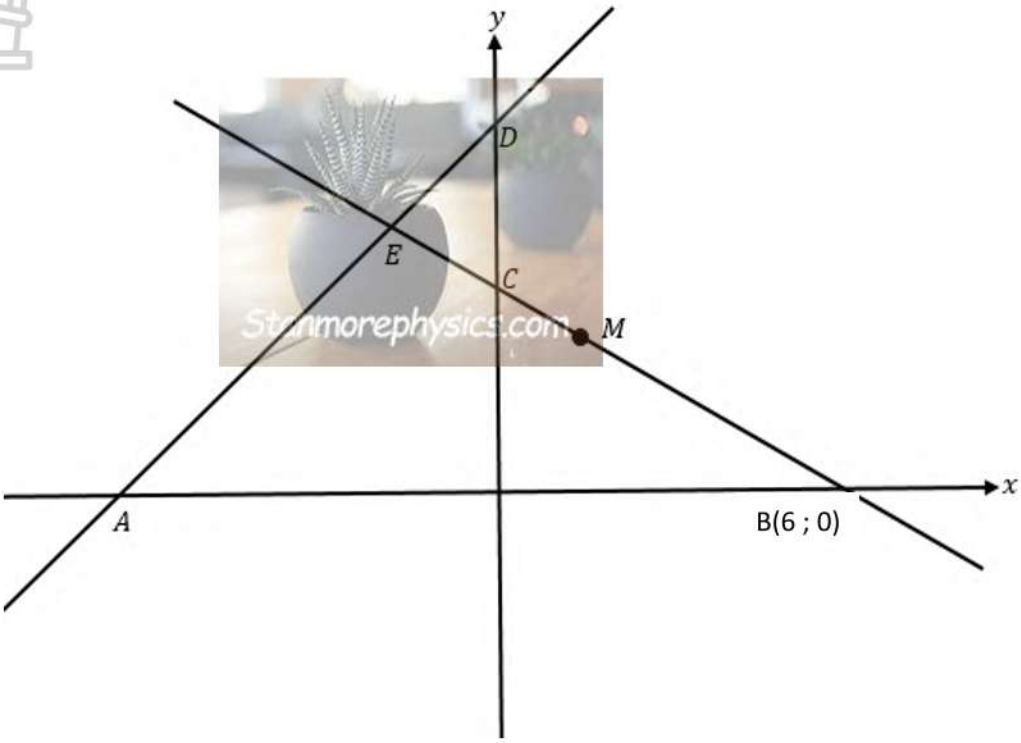
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 8 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used to determine the answer.
4. An approved calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
5. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
6. An INFORMATION SHEET with formulae is included at the end of the question paper.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.
9. Answers only will NOT necessarily be awarded full marks.

QUESTION 1

In the diagram, A and D are the x-and y-coordinates of line AD respectively. Line BE cuts the x-axis at B and the y-axis at C. The equations of AD and EB are y= $2x + 10$ and $y = -x + 6$ respectively. M is the midpoint of line BE, $\text{AE} = \frac{11}{3}\sqrt{5}$. CB and AD intersect at $\text{E}(-4\,;8)$.



1.1 Write down the coordinates of C (1)

1.2 Calculate the angle of inclination of line BC. (2)

1.3 Calculate the length of line CD. (2)

1.4 Determine the equation of line through M, parallel to AD, in the form y = … (4)

1.5 Calculate the size of $\text{A}\widehat{\text{E}}\text{B}$ (4)

1.6 Calculate the coordinates of G, such that ABGE is a parallelogram. (4)

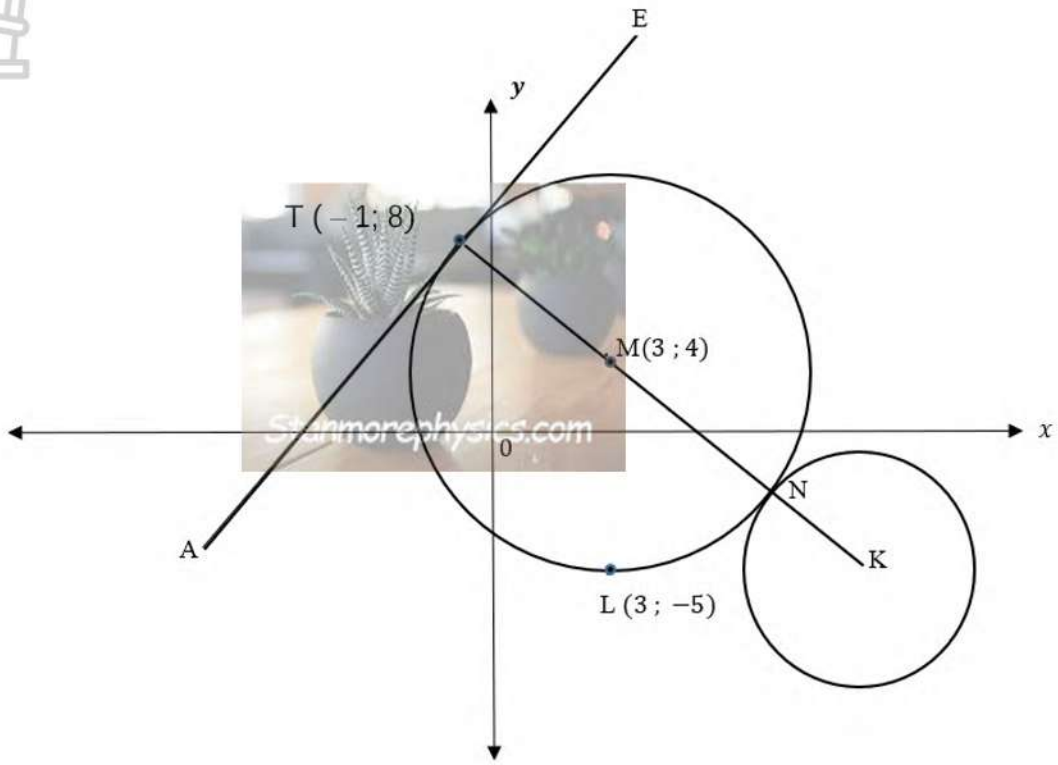
1.7 Calculated the area of parallelogram ABGE (5)

1.8 If it is given that CD is a diameter of a circle passing through C and D, determine how many units must M be translated so that it becomes the center of the new circle. (4)

[26]

QUESTION 2

Drawn below is the BIGGER circle centered at M and SMALLER circle centered at K. ATE is a tangent to the bigger circle at T. TN is a diameter of the bigger circle and NK is a radius of the smaller circle. The coordinates of T (– 1; 8), M (3 ; 4) and L (3 ; – 5)



2.1 Determine the equation of the circle in the form $(x-a)^2+(y-b)^2=r^2$. (2)

2.2 Determine the equation of the tangent through point T. (5)

2.3 Does point P(7; 3) lie inside, outside or on the circle. Show all calculations. (4)

2.4 If it is further given that KL is a tangent at L, to the circle centered at M. Determine the coordinates of K, the center of the smaller circle. (5)

[16]

QUESTION 3

3.1 Given : $\sin\beta=\frac{1}{3}$ where $\beta \in (90°; 270°)$, determine the following by using a sketch and without the use of a calculator:

3.1.1 $\tan\beta$ (3)

3.1.2 $\cos 2\beta$ (2)

3.1.3 $\cos(-\beta - 450°)$ (2)

3.2 Simplify the following to a single trigonometric ratio:

$$\frac{4\cos(-x).\cos(90° + x)}{\sin(30° - x).\cos x + \cos(30° - x).\sin x}$$ (6)

3.3 If $cos23° = a$, express the following in terms of a:

3.3.1 $tan203°$ (3)

3.3.2 $sin46°$ (3)

3.4 Determine the values of the following, without using a calculator:

3.4.1 $sin105°$ (4)

3.4.2 $cos69°.cos9° + cos81°.cos21°$ (3)

3.5 Prove the following identity: $\frac{\sin 2x - \cos x}{1 - \cos 2x - \sin x} = \frac{1}{\tan x}$ (5)

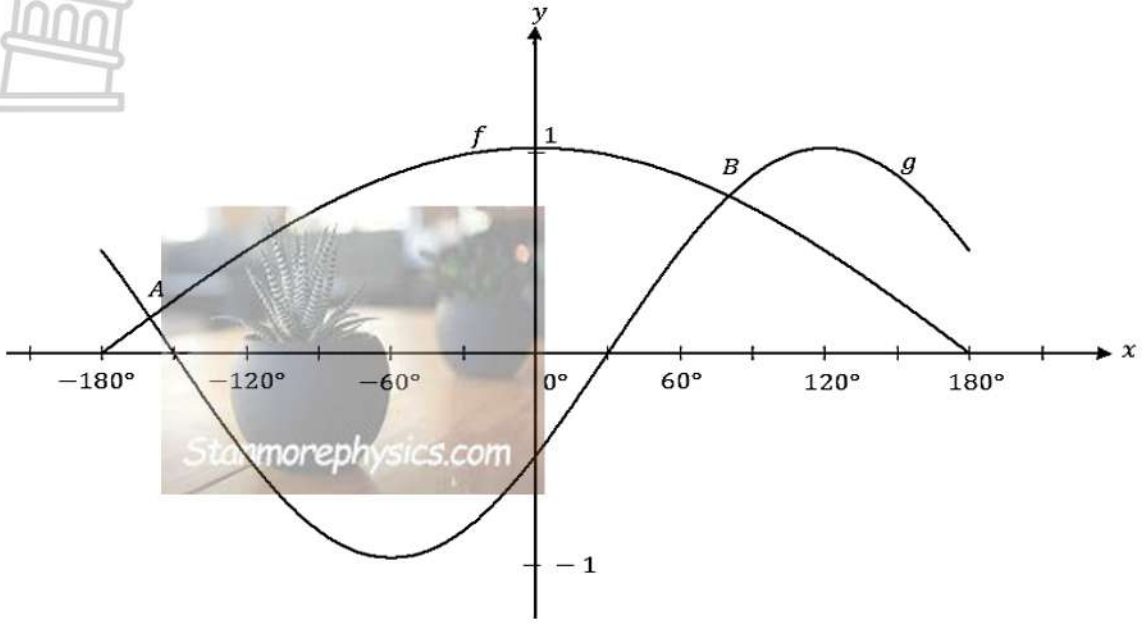
3.6 Calculate the value of x, if $x \in [-180°; 360°]$

$cos2x = cosx + 2$ (7)

[38]

QUESTION 4

The graphs of $f(x) = \cos\frac{x}{2}$ and $g(x) = \sin(x - 30°)$ for $x \in [-180°; 180°]$ are drawn below. The graphs intersect at points A and B.



4.1 Write down the value of $f(0°) - g(0°)$ (1)

4.2 Give the period of $f(4x)$ (2)

4.3 Write down the range of $4g(x)$ (2)

4.4 Given that the general solution of $f(x) = g(x)$ is: $x = 80° - k.240°, k \in z.$

Determine the x values of A and B. (2)

4.5 For which value(s) of x will.

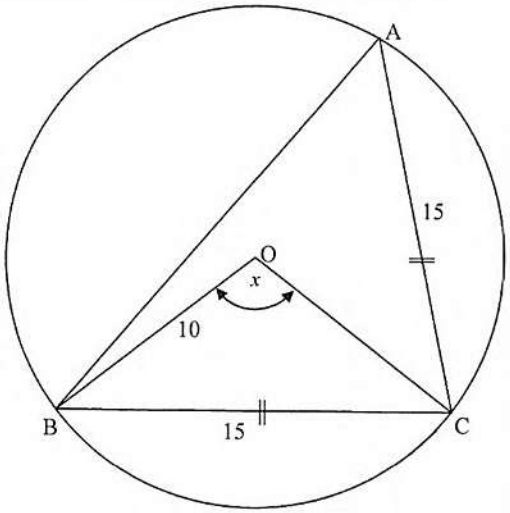
4.5.1 $f(x) > g(x)$ (2)

4.5.2 $f'(x).g(x) > 0$ where $x > 0°$ (2)

[11]

QUESTION 5

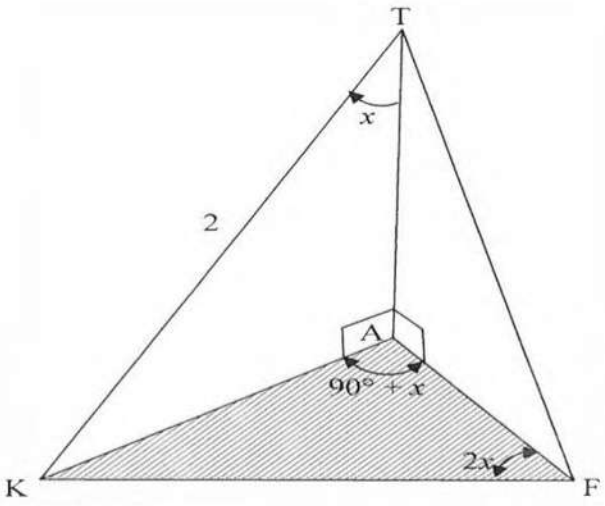
5.1 In the diagram below, a circle with centre O passes through A, B and C. BC = AC = 15 units. BO and OC are joined. OB = 10 units and $B\hat{O}C = x$



5.1.1 Calculate the size of x. (3)

5.1.2 Calculate the area of triangle ABC. (4)

5.2 In the figure, points K, A and F lie in the same horizontal plane and TA represents a vertical tower. $A\hat{T}K = x$, $K\hat{A}F = 90° + x$ and $K\hat{F}A = 2x$ where $0° < x < 30°$ and TK = 2 units.



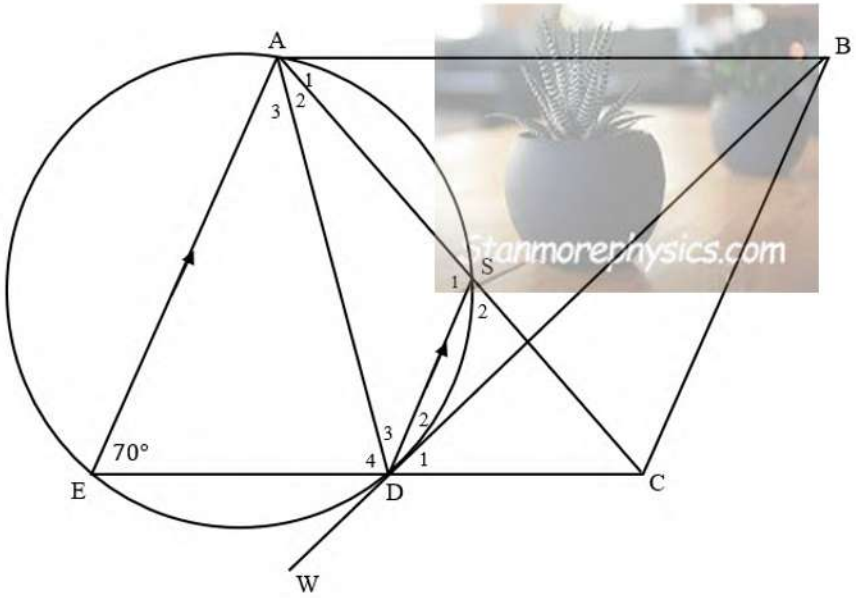
5.2.1 Express AK in terms of $\sin x$. (2)

5.2.2 Determine the value of KF (5)

[14]

QUESTION 6

AB is a tangent to circle ASDE at point A with AE // SD. Chords AS and ED produced meet at C, such that ED = DC. BDW is a straight line and in parallelogram ABCE, $\hat{E} = 70°$ and BC = 16cm.



6.1 Determine with reasons:

6.1.1 $\hat{S}_2$ (2)

6.1.2 $\hat{A}_1$ (3)

6.1.3 $\hat{D}_3$ (2)

6.1.4 The length of SD. (3)

6.2 If it is further given that $A\hat{D}S = B\hat{D}C$, prove with reasons:

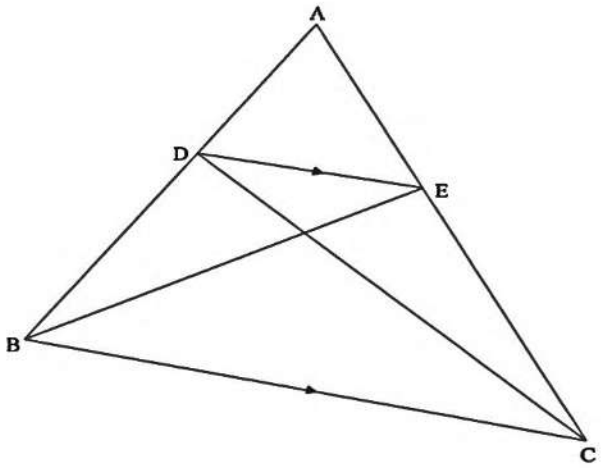
6.2.1 ABCD is a cyclic quadrilateral (2)

6.2.2 DB is a tangent to circle through A, S and D. (5)

[17]

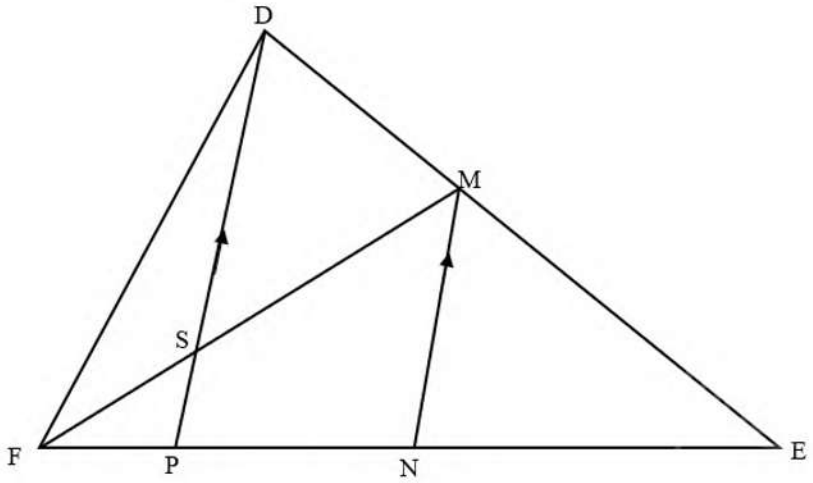
QUESTION 7

7.1 In the diagram below, ΔABC is drawn. D is a point on AB and E is a point on AC such that DE // BC. BE and DC are drawn.



Use the diagram above to prove the theorem which states that a line drawn parallel to one side of a triangle divides the other two sides proportionally, in other words prove that $\frac{AD}{DB} = \frac{AE}{EC}$ (5)

7.2 In ΔDEF below, DM : ME = 2 : 3

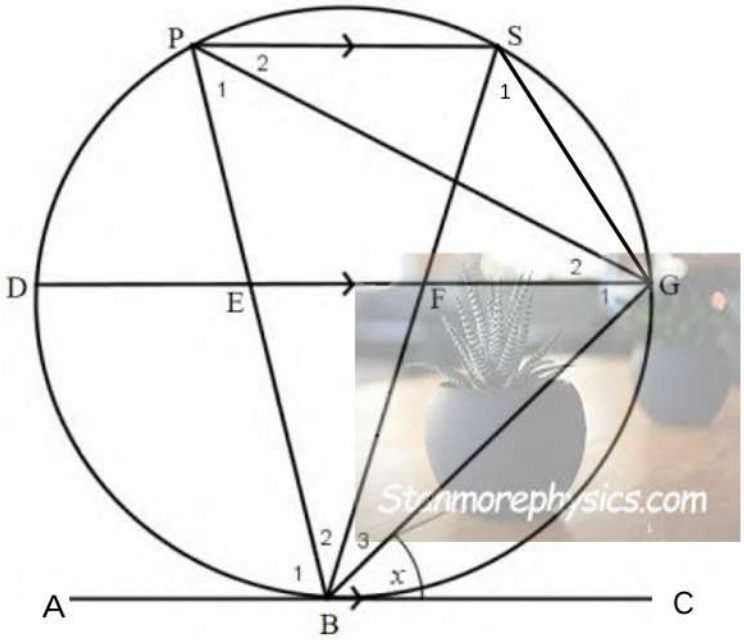


Given PE = 35 cm and 2FP = PN.
Determine:

7.2.1 PN (2)

7.2.2 FS (3)

7.3 In the diagram, P, S, G, B and D are points on the circumference of the circle such that PS // DG // AC. ABC is a tangent to the circle at B. $\widehat{GBC} = x$.



Prove that:

7.3.1 $\Delta PGB \text{ III } \Delta GEB$ (4)

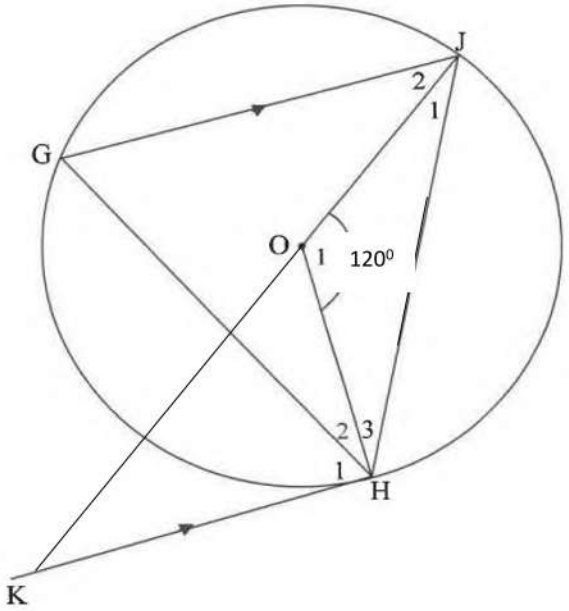
7.3.2 $SB.FB = EB.PB$ (3)

7.3.3 If GB = GE = 9cm and EB = $\frac{3}{5}$ PG, determine the length of PG. (3)

[20]

QUESTION 8

In the diagram, O is the centre of the circle. GJ, JH and GH are chords of the circle. GJ // KH. $\hat{O}_1 = 120°$. JOK is a straight line.



8.1 Determine, with reasons, the size of the following angles:

8.1.1 $\hat{G}$ (2)

8.1.2 $\hat{H}_3$ (3)

8.2 If KH is a tangent to the circle at H.

Prove: $\cos 120° = -\frac{OJ}{OK}$ (3)

[8]

TOTAL 150

INFORMATION SHEET/INLIGTINGSBLAD

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$A = P(1+ni)$ $\quad A = P(1-ni)$ $\quad A = P(1-i)^n$ $\quad A = P(1+i)^n$

$T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}[2a + (n-1)d]$

$T_n = ar^{n-1}$ $\quad S_n = \frac{a(r^n - 1)}{r-1}$; $r \neq 1$ $\quad S_\infty = \frac{a}{1-r}$; $-1 < r < 1$

$F = \frac{x[(1+i)^n - 1]}{i}$ $\quad P = \frac{x[1-(1+i)^{-n}]}{i}$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad y - y_1 = m(x - x_1)$ $\quad m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad m = \tan\theta$

$(x-a)^2 + (y-b)^2 = r^2$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc.\cos A$

area $\Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\quad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\quad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$$

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

$\bar{x} = \frac{\sum x}{n}$ $\quad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $\quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $\quad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$

education

Department of Education
FREE STATE PROVINCE

GRADE 12

MATHEMATICS P2

JUNE EXAMINATION
2024

MARKING GUIDELINES

MARKS: 150

This Marking Guidelines consists of 19 pages

QUESTION/ VRAAG 1

1.1	$C(0;6)$	$C(0;6)$✓ (1)
1.2	$tanCX = m$ $tanC\hat{B}X = -1$ $C\hat{B}X = 135°$	Substitution ✓ $135°$ ✓ (2)
1.3	$D(0;10)$ $CD = 10 - 6$ $CD = 4$ **OR** $CD = \sqrt{(0-0)^2 + (6-10)^2}$ $CD = 4$	$CD = 10 - 6$ ✓ $CD = 4$ ✓ **OR** $CD = \sqrt{(0-0)^2 + (6-10)^2}$ ✓ $CD = 4$ ✓ (2)
1.4	E(– 4;8) $M\left(\frac{-4+6}{2};\frac{8+0}{2}\right)$ $M(1;4)$ $y - y_1 = m(x - x_1)$ $y - 4 = 2(x - 1)$ $y = 2x + 2$	$E\left(-\frac{4}{3};\frac{22}{3}\right)$ $M\left(\frac{-\frac{4}{3}+6}{2};\frac{\frac{22}{3}+0}{2}\right)$ $M\left(\frac{7}{3};\frac{11}{3}\right)$ $-\frac{11}{3} = 2\left(-\frac{7}{3}\right) + c$ $y = 2x + 1$	Correct substitution ✓ answer ✓ Correct substitution ✓ equation✓ (3)
1.5	$tanE\hat{A}B = 2$ $E\hat{A}B = 63.43°$ $A\hat{E}B = 135° - 63.43°$ $A\hat{E}B = 71.57°$	$tanE\hat{A}B = 2$ ✓ $E\hat{A}B = 63.43°$ ✓ $A\hat{E}B = 135° - 63.43°$ ✓ $71.57°$ ✓ (4)
1.6	$2x = -10$ $x = -5$ $A(-5;0)$	$A(-5;0)$ ✓

	Using E(– 4 ; 8) midpoint EB = midpoint of AG. $1 = \frac{-5+x}{2}$ $\quad 4 = \frac{0+y}{2}$ $x = 7$ $\quad y = 8$ $G(7;\ 8)$ **OR** $2x = -10$ $x = -5$ $A(-5;0)$ By using translation geometry : A → E $(x\,;y) \rightarrow \quad (x+1\,;y+8)$ ∴ B → G $B(6\,;0) \rightarrow \quad G(6+1\,;0+8)$ $\therefore\ G(7\,;8)$	Method ✓ Midpoint of diagonals $x-$ Co-ordinate. ✓ $y-$ Co-ordinate. ✓ **OR** $A(-5;0)$ ✓ Method ✓ $x-$ Co-ordinate. ✓ $y-$ Co-ordinate. ✓
	Using E $\left(\frac{7}{3};\frac{11}{3}\right)$ midpoint EB = midpoint of AG. $\frac{7}{3} = \frac{-5+x}{2}$ $\quad \frac{11}{3} = \frac{0+y}{2}$ $x = \frac{19}{3}$ $\quad y = \frac{22}{3}$ $G\left(\frac{19}{3};\frac{22}{3}\right)$ **OR** $2x = -10$ $x = -5$ $A(-5;0)$ By using translation geometry : A → E $(x\,;y) \rightarrow \quad (x+0{,}33\,;y+7{,}33)$ ∴ B → G $B(6\,;0) \rightarrow \quad G(6+0{,}33\,;0+7{,}33)$ $G\left(\frac{19}{3};\frac{22}{3}\right)$	(4)

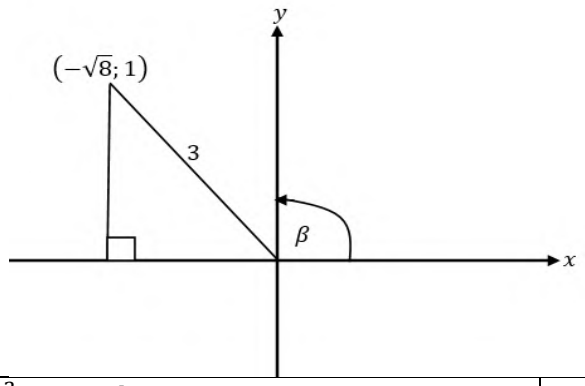
1.7	**Use G(7 ; 8)** In parm ABGE Perp h = 8 $units$ Base = $x_B - x_A = 6 - (-5) = 11\ units$ Area parm ABGE = (perp h)(base) = $(8)(11)$ = 88 units^2 OR In ΔAEB Perp h = 8 $units$ Base = $x_B - x_A = 6 - (-5) = 11\ units$ Area $\Delta AEB = \frac{1}{2}(b)(h)$ $= \frac{1}{2}(11)(8)$ = 44 $units^2$ Area parm ABGE = (2)(Area ΔAEB) = $(2)44 = 88 units^2$ **Use** $G\left(\frac{19}{3};\frac{22}{3}\right)$ In parm ABGE Perp h = $\frac{22}{3}$ units Base = $x_B - x_A = 6 - (-5) = 11\ units$ Area parm ABGE = (perp h)(base) = $11 \times \frac{22}{3} = 80,67$ units^2	Perp h = 8 ✓ Base = 11 $units$ ✓ Substitution ✓ Area ✓ OR Perp h = $\frac{22}{3}$ ✓ Base = 11 $units$ ✓ Substitution ✓ Area parm ABGE ✓ (4)
1.8	Midpoint of CD $(0\ ;8)$ M$(3\ ;4) \rightarrow$ C$(0;8)$ M must be translated 3 units left and 4 units up.	midpoint ✓ ✓✓3 units left ✓✓4 units up (5)
		[24]

QUESTION/ VRAAG 2

2.1	$ML = 4 - (-5) = 9$ units. $(x-3)^2 + (y-4)^2 = 9^2$ $(x-3)^2 + (y-4)^2 = 81$	 Substitution ✓ Answer ✓ (2)
2.2	T(– 1;8) $m_r = \frac{8-4}{-1-3} = -1$ $m_{rad} \times m_{tan} = -1$ $m_{tan} = 1$ $y - y_1 = m(x - x_1)$ $y - (8) = (x - (-1))$ $y = x + 7$ **T**$(-1; 4+\sqrt{65})$ $m = \frac{4+\sqrt{65}-4}{-1-3}$ $m = -2,02$ $m_{rad} \times m_{tan} = -1$ $m = \frac{4}{\sqrt{65}}$ $y = \frac{4}{\sqrt{65}}x + 8 + \sqrt{65}$	T(– 4 ; 8) $m_r = \frac{8-4}{-4-3} = -\frac{4}{7}$ $m_{rad} \times m_{tan} = -1$ $m_{tan} = \frac{7}{4}$ $8 = \frac{7}{4}(-4) + c$ $y = \frac{7}{4}x + 15$	m_{rad} ✓ $m_{rad} \times m_{tan} = -1$ ✓ m_{tan}✓ Substitution ✓ equation✓ (5)
2.3	$(x-3)^2 + (y-4)^2 = {r_2}^2$ $(7-3)^2 + (3-4)^2 = 17$ ${r_2}^2 < {r_1}^2$ $17 < 81$ $\therefore$ *Inside the circle* **OR**	Substitution ✓ ${r_2}^2 = 17$ ✓ $17 < 81$ ✓ *Inside* ✓ (4) **OR**

	$d = \sqrt{(3-7)^2 + (4-3)^2}$ $d = \sqrt{17} = 4.12$ $d < r$ $\therefore$ *Inside the circle*	Substitution ✓ $d = \sqrt{17}$ ✓ $d < r$ ✓ *Inside* ✓ (4)
2.4	T(– 1;8) T(– 4 ; 8) $y_k = y_l = -5$ $y_k = y_l = -5$ $m_{rad} = m_{MK} = -1$ (collinear points) $-1 = \frac{4-(-5)}{3-x_k}$ $-\frac{4}{7} = \frac{4-(-5)}{3-x}$ $-3 + x = 9$ $-12 + 4x = 36$ $12 = x_k$ $12 = x_k$ **T**$(-1; 4+\sqrt{65})$ $y_k = y_l = -5$ $m_{rad} = m_{MK} = -1$ $-\frac{\sqrt{65}}{4} = \frac{9}{3-x}$ $-3\sqrt{65} + \sqrt{65}x = 36$ $7{,}47 = x_k$	$y_k = -5$ ✓ $m_{rad} = m_{MK}$ ✓✓ substitution✓ x-value✓ (5)
		[14]

QUESTION/VRAAG 3

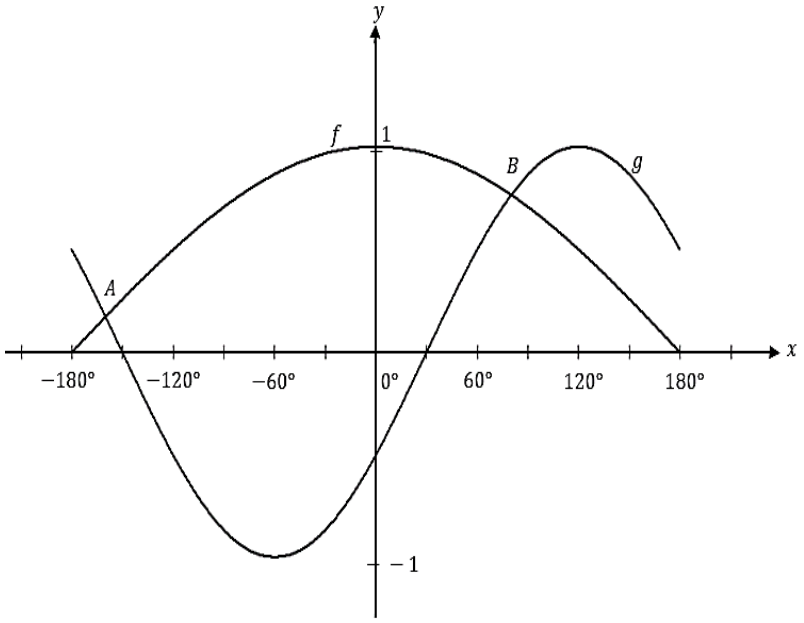


3.1.1	$r^2 = x^2 + y^2$ pyth $3^2 = x^2 + 1^2$ $x = -\sqrt{8}$ $tan\beta = -\frac{1}{\sqrt{8}}$	Method ✓ $x = -\sqrt{8}$ ✓ answer ✓ (3)
3.1.2	$cos2\beta = 1 - 2sin^2\beta$ $= 1 - 2\left(\frac{1}{3}\right)^2$ $= \frac{7}{9}$	double angle identity ✓ answer ✓ (2)
3.1.3	$\cos\left(-\beta - 450^\circ\right) = \cos(-\beta - 90°)$ $= -\cos(90° + \beta)$ $= \sin\beta = \frac{1}{3}$	$-\cos(90° + \beta)$ ✓ Answer ✓ (2)
3.2	$\frac{4\cos(-x).\cos(90^\circ + x)}{\sin(30^\circ - x).\cos x + \cos(30^\circ - x).\sin x}$ $= \frac{-4\cos x \sin x}{\frac{1}{2}\left(\cos^2 x + \sin^2 x\right)}$ $= \frac{-4\cos x \sin x}{\frac{1}{2}\left(1 - \sin^2 x + \sin^2 x\right)}$ $= -8\, sinxcosx = -4\sin 2x$	$4cosx$ ✓ $-sinx$ ✓ $\left(\cos^2 x + \sin^2 x\right)$ ✓ $\frac{1}{2}$ ✓ $-8sinx\cos x$ ✓ $-4sin2x$ ✓ (6)
3.3.1	$tan203°$	$\tan 23°$ ✓

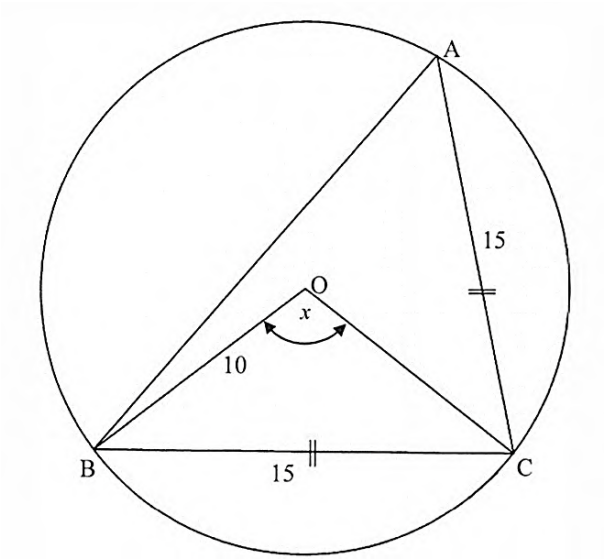
	$tan23° = \frac{\sqrt{1-a^2}}{a}$	$\sqrt{1-a^2}$ ✓ Answer ✓ (3)
3.3.2	$sin46°$ $= \sin 2(23°)$ $= 2sin23°cos23°$ $= 2a\sqrt{1-a^2}$	 double angle ✓ Expansion ✓ Answer ✓ (3)
3.4.1	$\sin(60° + 45°)$ $= sin60°.cos45° + cos60°.sin45°$ $= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{2}}\right) + \left(\frac{1}{2}\right)\left(\frac{1}{\sqrt{2}}\right)$ $= \frac{\sqrt{3}+1}{2\sqrt{2}}$ OR $\frac{\sqrt{6}+\sqrt{2}}{4}$ OR $= \sin(180° - 75°)$ $= sin75°$ $= sin30°.cos45° + cos30°.sin45°$ $= \left(\frac{1}{2}\right)\left(\frac{1}{\sqrt{2}}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{2}}\right)$ $= \frac{\sqrt{3}+1}{2\sqrt{2}}$ OR $\frac{\sqrt{6}+\sqrt{2}}{4}$	compound angles ✓ expansion ✓ substitution ✓ answer ✓ (4) OR $sin75°$✓ expansion ✓ substitution ✓ answer ✓
3.4.2	$cos69°.cos9 + cos81°.cos21°$ $= cos69°.cos9° + sin9°.sin69°$ $= cos60°$ $= \frac{1}{2}$	co-function : $cos81°.cos21° = sin9°.sin69°$ ✓ $cos60°$✓ answer ✓ OR

	OR $sin21°.cos9° + cos21°.sin9°$ $= sin30°$ $= \frac{1}{2}$	co-function $cos69°.cos9° = sin21°.cos9°$ ✓ $sin30°$✓ answer ✓ (3)
3.5	$LHS = \frac{2sinx.cosx-cosx}{1-(1-2sin^2x)-sinx}$ $= \frac{2sinx.cosx-cosx}{2sin^2x-sinx}$ $= \frac{cosx(2sinx-1)}{sinx(2sinx-1)}$ $= \frac{cosx}{sinx}$ $= \frac{1}{\frac{sinx}{cosx}}$ $\frac{1}{tanx} = RHS$	$2sinx.cosx$ ✓ $1-2sin^2x$ ✓ factorization ✓ simplification ✓ identity for $\tan x$ ✓ (5)
3.6	$\cos 2x = \cos x + 2$ $2\cos^2 x - 1 - \cos x - 2 = 0$ $2\cos^2 x - \cos x - 3 = 0$ $(2\cos x - 3)(\cos x + 1) = 0$ $\cos x \neq \frac{3}{2}$ or $\cos x = -1$ $x = 180°$	✓ expansion ✓ standard form ✓factors ✓✓answers ✓ rejection ✓ $x = 180°$ (7)
		[38]

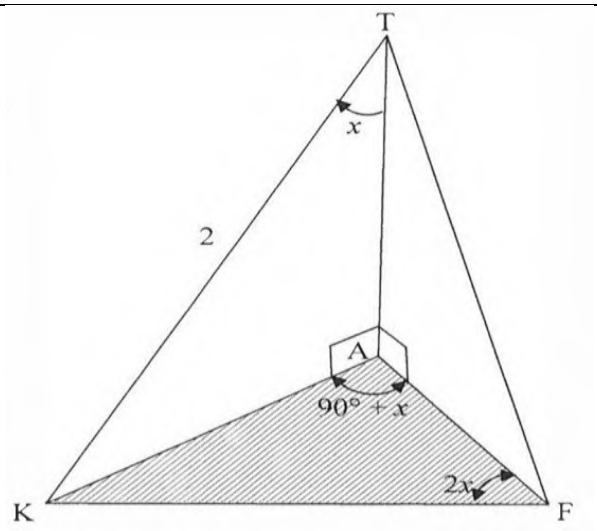
QUESTION/VRAAG 4

4		
4.1	$f(0°) - g(0°) = 1 - \left(-\frac{1}{2}\right) = \frac{3}{2}$ units	✓Answer ✓ (1)
4.2	Period of $f(4x) = \frac{360°}{4\left(\frac{1}{2}\right)}$ $= 180°$	✓substitution ✓answer (2)
4.3	Range : $y \in [-4\,;\,4]$ or $-4 \leq y \leq 4$	✓ ✓ answer (2)
4.4	$x_A = -160°$ $x_B = 80°$	$x_A = -160°$ ✓ $x_B = 80°$ ✓ (2)
4.5.1	$-160° < x < 80°$	✓ ✓ answer (2)
4.5.2	$0° < x < 30°$	✓ ✓ answer (2)
		[**11**]

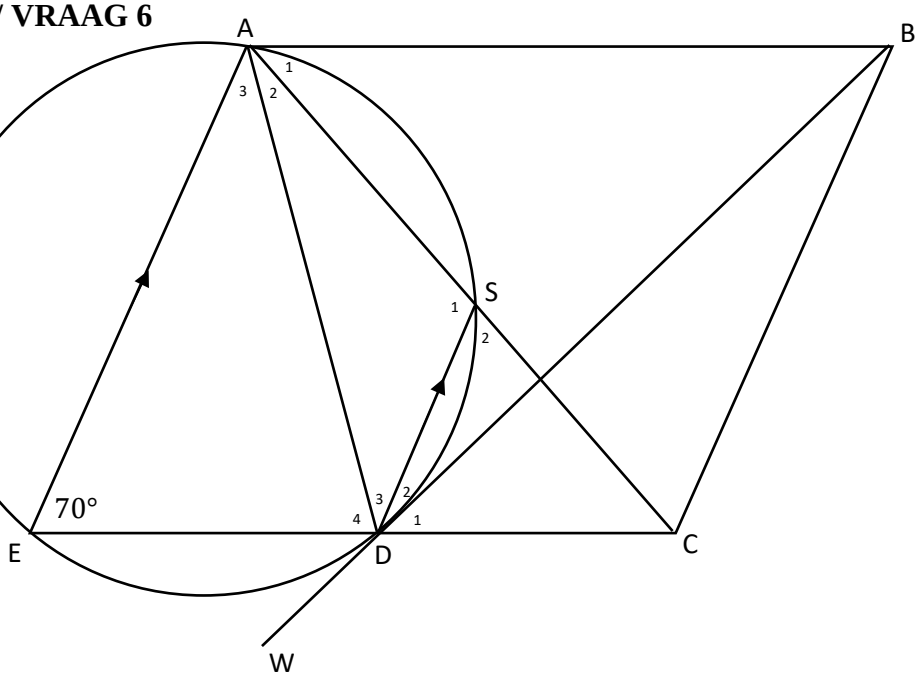
QUESTION/VRAAG 5



5.1.1	In ΔBOG : $15^2 = 10^2 + 10^2 - 2(10)(10)cosx$ $225 = 100 + 100 - 200cosx$ $\cos x = -\frac{25}{200}$ $x = 97{,}18°$	Substitution into cosine rule ✓ simplification ✓ Answer ✓ (3)
5.1.2	$\hat{A} = \frac{1}{2}(\hat{O}) = 48{,}59°$ ∠ center = 2 ∠ circumference $\hat{C} = 180° - 2(48{,}59°) = 82{,}82°$ Area = $\frac{1}{2}(15)(15)sin82{,}82°$ $= 111{,}62 units^2$	$\hat{A} = 48{,}59°$ ✓ $\hat{C} = 82{,}82°$ ✓ Area rule ✓ Answer ✓ (4)

5.2		
5.2.1	$\frac{AK}{2} = sinx$ $AK = 2\sin x$	$\frac{AK}{2} = sinx$ ✓ Answer ✓ (2)
5.2.2	$\frac{KF}{\sin(90°+x)} = \frac{AK}{sin2x}$ $\frac{KF}{\cos x} = \frac{2sinx}{2sinxcosx}$ $\frac{KF}{\cos x} = \frac{1}{cosx}$ KF = 1 unit	Substitution into sine rule ✓ $cos\ x$ ✓ $2sinxcosx$ ✓ Simplification ✓ Answer ✓ (5)
		[14]

QUESTION/ VRAAG 6

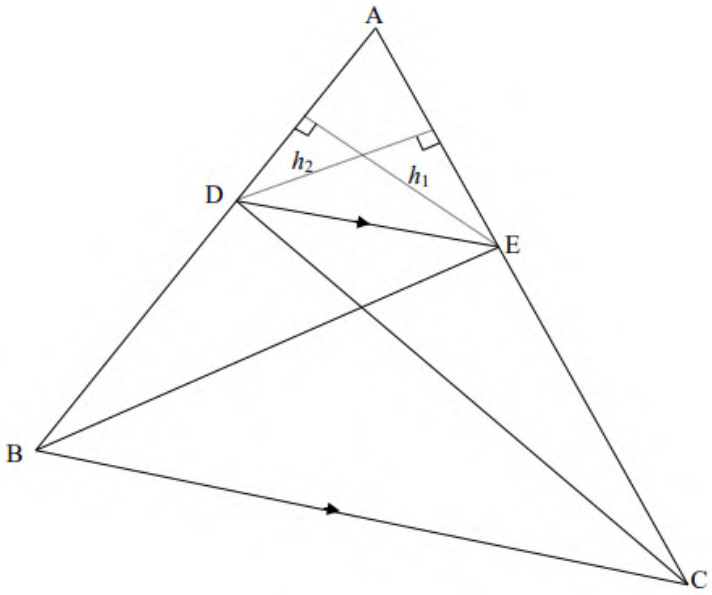


6.1.1	$\hat{S}_2 = \hat{E} = 70°$	ext ∠ of cyclic quad / buite ∠van kvh	✓ S ✓ R (2)
6.1.2	$\hat{S}_2 = \hat{A}_2 + \hat{A}_3 = 70°$ $\hat{A} + \hat{E} = 180°$ $\therefore \hat{A}_1 = 40°$	corresp ∠s; AE || DS / ooreenk. ∠e ; AE || DS co-int ∠s; AB || EC / ko-binne ∠e ; AB || EC	✓S/R ✓S/R ✓S (3)
6.1.3	$\hat{D}_3 = \hat{A}_1 = 40°$	tan chord theorem / raakl koord stelling	✓S ✓R (2)
6.1.4	AE = BC ED=DC and AE//SD ∴ AS = SC ∴ SD = ½ AE SD = 8 cm	Opp sides of parm / Teenoorst. Sye parm Given / gegee Converse midpt th. / Omgekeerde middelpt st.	✓S ✓S ✓ 8 cm (3)

6.2.1	$\hat{D}_3 = \hat{D}_1 = 40°$ $\therefore \hat{D}_1 = \hat{A}_1$ $\therefore ABCD$ is cq / kvh	Given / Gegee converse ∠s in the same seg omgekeerde ∠e in dies. Θ segm	✓S ✓R (2)
6.2.2	$\hat{B} = \hat{E} = 70°$ $A\hat{D}C + \hat{B} = 180°$ $\therefore \hat{D}_2 = 30°$ $\hat{S}_2 = \hat{A}_2 + \hat{D}_3$ $\therefore \hat{A}_2 = 30°$ $\therefore \hat{D}_2 = \hat{A}_2$ $\therefore DB$ is a tangent / DB is 'n raaklyn	opp ∠s of parm / teenoorst. ∠e van parm. opp ∠s of cyclic quad / teenoorst. ∠e van kvh ext ∠ of Δ/ buite ∠ van Δ converse tan chord theorem / omgekeerde raakl. koord stelling	✓S/R ✓S 30° ✓S / R ✓S ✓R (5) **[17]**

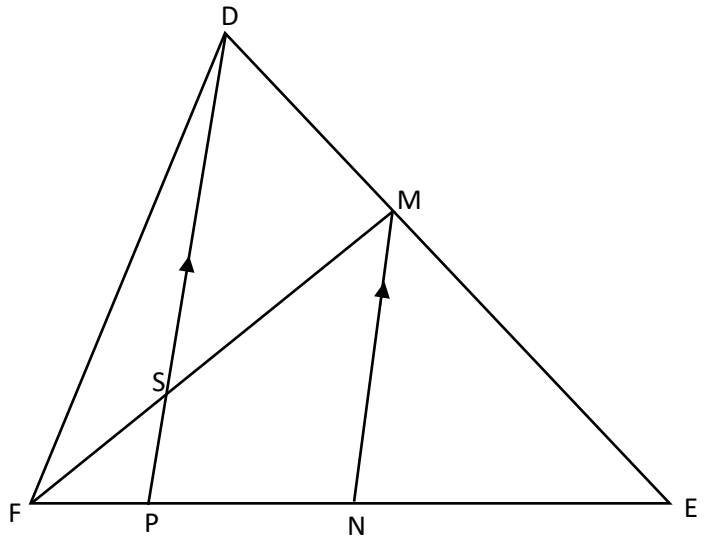
QUESTION / VRAAG 7

7.1



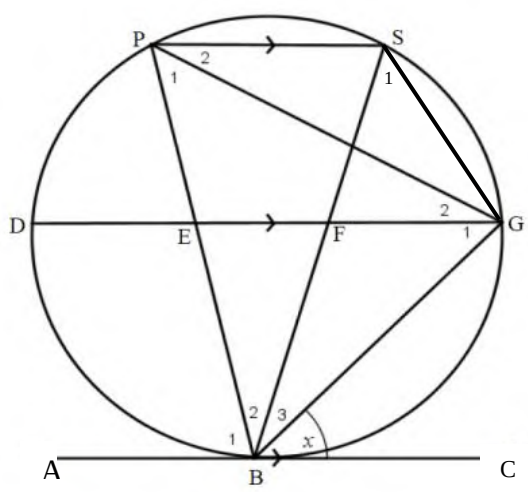
	Constr: Draw h_1 from E $\perp$ AD and h_2 from D $\perp$ AE *Konstr: Trek* h_1 *vanaf* E $\perp$ AD *en* h_2 *vanaf* D $\perp$ AE Proof/*Bewys*: $\frac{\text{area } \Delta ADE}{\text{area } \Delta BDE} = \frac{\frac{1}{2}AD \times h_1}{\frac{1}{2}DB \times h_1} = \frac{AD}{DB}$ $\frac{\text{area } \Delta ADE}{\text{area } \Delta DEC} = \frac{\frac{1}{2}AE \times h_2}{\frac{1}{2}EC \times h_2} = \frac{AE}{EC}$ But area ΔBDE = area ΔDEC [same base & height or DE $\parallel$ BC/ *dies basis & hoogte*; of DE $\parallel$ BC] $\therefore \frac{\text{area } \Delta ADE}{\text{area } \Delta BDE} = \frac{\text{area } \Delta ADE}{\text{area } \Delta DEC}$ $\therefore \frac{AD}{DB} = \frac{AE}{EC}$	✓ constr/*konstr* **OR** **reason: common vertex or same height** ✓ $\frac{\text{area } \Delta ADE}{\text{area } \Delta BDE} = \frac{\frac{1}{2}AD \times h_1}{\frac{1}{2}DB \times h_1}$ ✓ $\frac{\text{area } \Delta ADE}{\text{area } \Delta DEC} = \frac{AE}{EC}$ ✓ S / R ✓ S (5)

7.2



7.2.1	$\frac{PN}{NE} = \frac{DM}{ME}$ $\frac{PN}{NE} = \frac{2}{3}$ $\therefore PN = 35 \times \frac{2}{5}$ $PN = 14\ cm$	line || one side of Δ / lyn || een sy van Δ **or / of** prop theorem,DP//MN eweredighst. DP//MN	✓ S/ R ✓ 14 cm (2)
7.2.2	$\frac{FP}{FN} = \frac{FS}{FM}$ $FP = \frac{14}{2}$ $FP = 7$	line || one side of Δ / lyn || een sy van Δ _____	✓S / R ✓S ✓ A (3) **[10]**

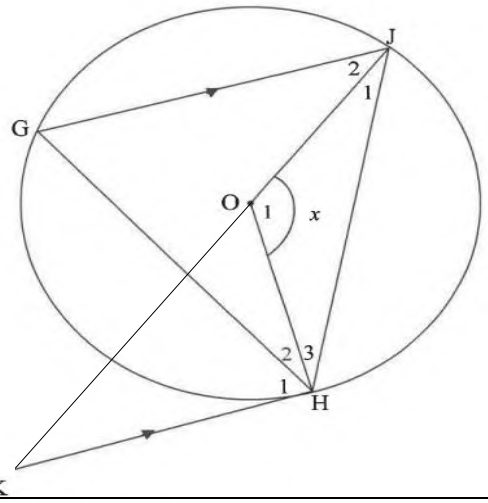
7.3



7.3.1	In ΔPGB and ΔGEB • $\hat{B}$ *is common* / gemeenskaplik - $\hat{G}_1 = x$ alt ∠s; DG || AC / verw. ∠e ; DG || AC - $\hat{P}_1 = x$ tan chord theorem / raakl. koord stelling • $\therefore \hat{P}_1 = \hat{G}_1$ • $P\hat{G}B = G\hat{E}B$ 3rd ∠s / 3de ∠e $\therefore \Delta PGB \text{ III } \Delta GEB$ $(\angle\angle\angle)$	✓R ✓R ✓R ✓R ∠∠∠ (4)
7.3.2	$\frac{PG}{GE} = \frac{GB}{EB} = \frac{PB}{GB}$ $\therefore GB^2 = PB.EB$ In ΔSGB and ΔGFB • $\hat{B}_3$ *is common* gemeenskaplik - $\hat{S}_1 = \hat{P}_1 = x$ ∠s in same segm. / ∠e in dies. segm. • $\therefore \hat{S}_1 = \hat{G}_1$ • $B\hat{F}G = S\hat{G}B$ 3rd ∠s / 3de ∠e $\therefore$ ΔSGB III ΔGFB $(\angle\angle\angle)$ $\therefore GB^2 = SB.FB$ $\therefore SB.FB = EB.PB$	$GB^2 = PB.EB$✓ S/R✓ $GB^2 = SB.FB$ ✓ (3)

7.3.3	$\frac{PG}{GE} = \frac{GB}{EB}$ $\therefore \frac{PG}{9} = \frac{9}{0,6PG}$ $0,6PG^2 = 81$ $PG = \sqrt{135}$ $PG = 11,62cm$	sub 9 ✓ sub 0,6PG ✓ 11,62cm✓ (3) **[10]**

QUESTION/ VRAAG 8



8.1.1	$2\hat{G} = \hat{O}_1$ $\hat{G} = 60^0$	∠ at centre = 2 ×∠ at circumference Midpts∠ = 2 x Omtreks∠	✓ R ✓ answer (2)
8.1.2	$\hat{H}_3 = \hat{J}_1$ $\hat{H}_3 + \hat{J}_1 + \hat{O}_1 = 180°$ $\hat{H}_3 = 30°$	∠s opp equal radii / ∠e teenoor gelyke rad ∠ sum in Δ / binne ∠e van Δ	✓S/R ✓S ✓answer (3)
8.2	$\hat{K} = 120 - 90°$ $\sin(120 - 90°) = \frac{OH}{OK}$ $OH = OJ$ $cosx = -\frac{OJ}{OK}$	ext ∠ of ΔKOH / buite ∠ van ΔKOH ΔOKH Radii / radiuses	✓S ✓trig ratio ✓S (3) **[8]**

TOTAL 150

