KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS

MARKING GUIDELINE

COMMON TEST

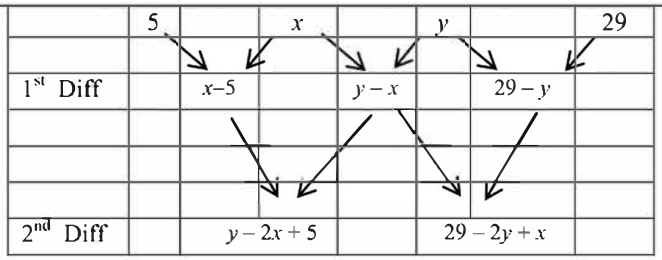
MARCH 2022

MARKS: 100

This memorandum consists of 9 pages.

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QUESTION 1

1.1	 $y - 2x + 5 = 4$ $y - 2x = -1$ ... (1) $29 - 2y + x = 4$ $-2y + x = -25$ ... (2) (1) × 2: $2y - 4x = -2$ ... (3) (3) + (2): $-3x = -27 \quad \therefore x = 9$ $\therefore y = 17$	A✓setting up equation 1st line A✓setting up equation 1st line CA✓x – value CA✓ y – value	(4)
1.2	$2a = 4 \quad \therefore a = 2$ $3a + b = 4 \quad \therefore b = -2$ $a + b + c = 5 \quad \therefore c = 5$ $T_n = 2n^2 - 2n + 5$ **OR** $2a = 4 \quad \therefore a = 2$ $3a + b = 5 \quad \therefore b = -2$ $\therefore c = T_0 = 5$ $T_n = 2n^2 - 2n + 5$ **OR** $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)}{2}d_2$ **OR** $T_n = \frac{(n-1)}{2}[2a + (n-2)d] + T_1$	A✓ a – value CA✓b – value CA✓c – value CA✓n^{th} term **OR** A✓a – value CA✓b – value CA✓c – value CA✓n^{th} term **OR** **OR**	(4) (4)
1.3	$T_{50} = 2(50)^2 - 2(50) + 5 = 4905$	CA✓substitution (from 1.2) CA✓answer	(2)
			[10]

QUESTION 2

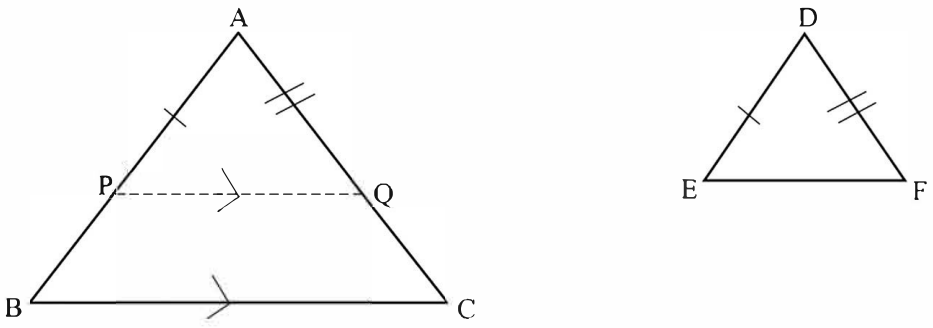
2	$a + d = 8 \quad \rightarrow (1)$ $a + 6d = 11a \quad \rightarrow (2)$ $d = 8 - a \quad \rightarrow (3)$ $a + 6(8 - a) = 11a$ $a + 48 - 6a = 11a$ $48 = 16a$ $a = 3$ $d = 5$ $3 ; 8 ; 13 ; \ldots$	A✓equation (1) A✓equation (2) CA✓making *d/a* the subject CA✓correct substitution of *d/a* CA✓*a/d* value CA✓*d/a* value CA✓sequence	[7]

QUESTION 3

3.1.1	$1 ; \frac{1}{p} ; \frac{1}{p^2}$	A✓All three terms	(1)
3.1.2	$-1 < r < 1$ $-1 < \frac{1}{p} < 1$ $p < -1 \text{ or } p > 1$	A✓condition for convergence CA✓*r* value in terms of *p* CACA✓✓answers	(4)
3.2	$S_n = 4 - 4\left(\frac{1}{2}\right)^n$ $T_1 = S_1 = 4 - 4\left(\frac{1}{2}\right)^1 = 2$ $T_1 + T_2 = S_2 = 4 - 4\left(\frac{1}{2}\right)^2 = 3$ $T_1 + T_2 + T_3 = S_3 = 4 - 4\left(\frac{1}{2}\right)^3 = 3\frac{1}{2}$ $\therefore T_2 = 1$ $\therefore T_3 = \frac{1}{2}$	A✓ first term value A✓ Sum of first two terms A✓Sum of first 3 terms CA✓second term value CA✓third term value	(5)
			[10]

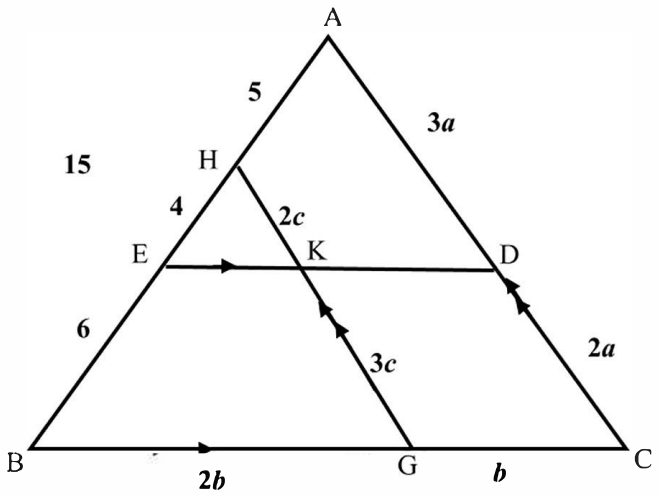
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QUESTION 4



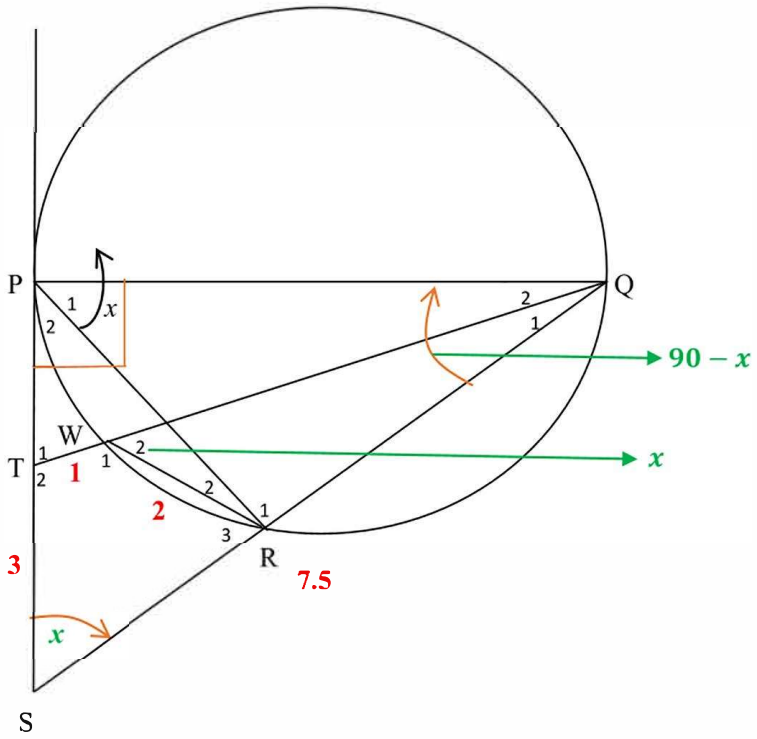
4.1	On AB mark off a point P such that AP = DE and on AC mark off a point Q such that AQ = DF. Join PQ. In ΔABC **and** ΔDEF 1. AP = DE (Construction) 2. AQ = DF (Construction) 3. $\hat{A} = \hat{D}$ (Given) $\therefore \Delta APQ \equiv \Delta DEF$ (SAS) Now $A\hat{P}Q = D\hat{E}F$ But $D\hat{E}F = \hat{B}$ (Given) $\therefore A\hat{P}Q = \hat{B}$ PQ ‖ BC (Corresponding angles =) $\frac{AB}{AP} = \frac{AC}{AQ}$ (Prop. Thm. PQ‖BC) $\frac{AB}{DE} = \frac{AC}{DF}$ (Construction AP = DE and AQ = DF)	✓S Construction ✓S/R ✓S ✓S ✓S/R ✓S/R ✓R	[7]

4.2



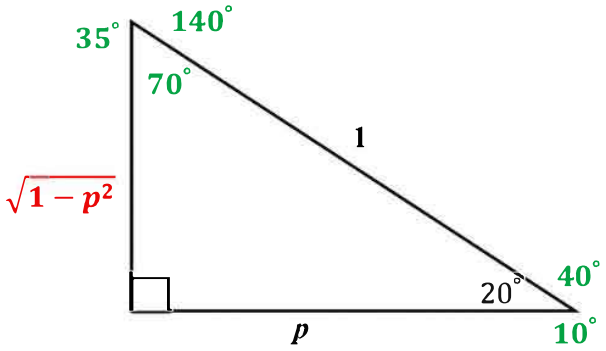
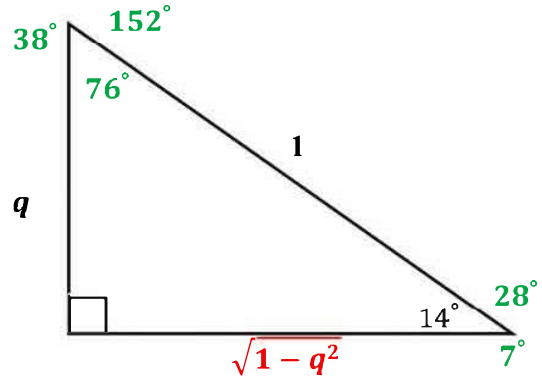
4.2.1	$\frac{AE}{15} = \frac{AD}{AC} = \frac{3}{5}$ … (Prop. Thm. ED ‖ BC) $AE = 9$ units	✓S✓R ✓Answer		(3)
4.2.2	$\frac{AH}{15} = \frac{CG}{CB} = \frac{1}{3}$ … (Prop. Thm. HG ‖ AC) $AH = 5$ units	✓S✓R ✓Answer		(3)
4.2.3	HE = 4 units and BH = 6 units $\frac{GK}{KH} = \frac{BE}{EH} = \frac{6}{4} = \frac{3}{2}$ … (Prop. Thm. EK ‖ BG)	CA✓HE = 4 units CA✓ S A✓ R		(3)
4.2.4	$\frac{\Delta HEK}{\Delta HEG} = \frac{2}{5}$ … (Δs with equal altitudes) $\frac{\Delta HEG}{\Delta HBG} = \frac{4}{10} = \frac{2}{5}$ … (Δs with equal altitudes) $\frac{\text{Area of } \Delta HEK}{\text{Area of } \Delta HBG} = \frac{\Delta HEK}{\Delta HEG} \times \frac{\Delta HEG}{\Delta HBG} = \frac{2}{5} \times \frac{2}{5} = \frac{4}{25}$ **OR** $\frac{\Delta HEK}{\Delta HBG} = \frac{\frac{1}{2}.(4)(2c)\sin E\hat{H}K}{\frac{1}{2}.(10)(5c)\sin E\hat{H}K}$ $\frac{\Delta HEK}{\Delta HBG} = \frac{4}{25}$ **OR** $\Delta HEK = \frac{2}{5}(\Delta HEG)$ … (Δs with equal altitudes) $= \frac{2}{5}\left(\frac{2}{5}\Delta HBG\right)$ … (Δs with equal altitudes) $\frac{\text{Area of } \Delta HEK}{\text{Area of } \Delta HBG} = \frac{4}{25}$	✓S/R ✓S/R ✓Answer **OR** ✓Area of numerator ✓Area of Denominator ✓Answer **OR** ✓S/R ✓S/R ✓Answer		(3) (3) (3)
				[19]

QUESTION 5



5.1	Angle subtended by the diameter on a circle/ Angle in a semi-circle	✓ R	(1)
5.2	$\hat{PQR} = 90^\circ - x$ … (Sum of angles of Δ) $\hat{SPQ} = 90^\circ$ … (Diameter perpendicular to tangent) $\hat{S} = x$ … (Sum of angles of Δ)	✓S ✓S✓R	(3)
5.3	$\hat{QWR} = x$ … (Angles in the same segment are equal) $\hat{QWR} = \hat{S} = x$ SRWT is a cyclic quad. … (Converse of exterior angle of cyclic quad equal to interior opposite angle)	✓S/R ✓$\hat{QWR} = \hat{S} = x$ ✓R	(3)
5.4	In Δ's QWR and QST 1) $\hat{QWR} = \hat{S} = x$ …….. (Proven) 2) $\hat{Q}_1$ is common 3) $\hat{T}_2 = \hat{WRQ}$ …… (Remaining angles of Δ's) ΔQWR ||| ΔQST …. (AAA)	✓S ✓S ✓R	(3)
5.5.1	$\frac{QW}{QS} = \frac{WR}{ST} = \frac{QR}{QT}$…. (ΔQWR ||| ΔQST) $\frac{2}{ST} = \frac{4}{6}$ ST = 3 cm	✓S/R ✓substitution CA✓Answer	(3)
5.5.2	$\frac{5}{QS} = \frac{2}{3}$ …. (ΔQWR ||| ΔQST) QS = 7,5 cm	CA✓ S ✓R CA✓Answer	(3)
			[16]

QUESTION 6

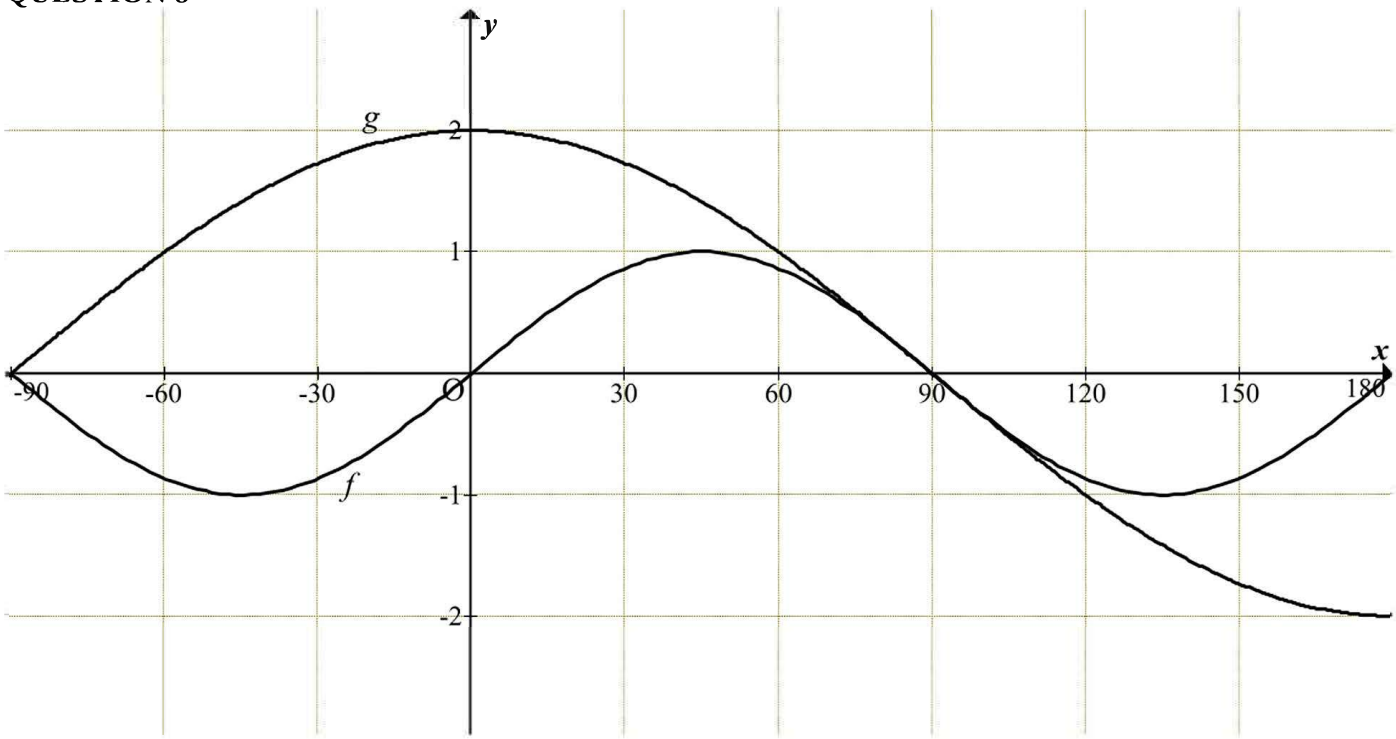
6.1.1	  $\sin 20^\circ = \sqrt{1-p^2}$	M✓ A✓ Answer	(2)
6.1.2	$\cos 6^\circ = \cos(20^\circ - 14^\circ)$ $= \cos 20 \cos 14 + \sin 20 \sin 14$ $= p.\sqrt{1-q^2} + \sqrt{1-p^2}.q$	A✓Writing as difference A✓Expansion A ✓ $(\cos 20^\circ)$ value CA ✓$\sqrt{1-q^2}$CA✓$\sqrt{1-p^2}$ A ✓ $(\sin 14^\circ)$ value	(6)
6.2	$\sqrt{\dfrac{\frac{1}{2}\sin 2x}{\tan(540^\circ + x)\left(\frac{1}{\cos^2 x} - \tan^2 x\right)}}$ $= \sqrt{\dfrac{\frac{1}{2}(2\sin x \cos x)}{\tan x.\left(\frac{1-\sin^2 x}{\cos^2 x}\right)}}$ $= \sqrt{\dfrac{\frac{1}{2}(2\sin x \cos x)}{\frac{\sin x}{\cos x}.\frac{\cos^2 x}{\cos^2 x}}}$ $= \sqrt{\sin x \cos x \times \dfrac{\cos x}{\sin x}}$ $= \sqrt{\cos^2 x}$ $= \cos x$	A✓expansion of sin 2x A✓reduction to tan x A✓$1 - \sin^2 x = \cos^2 x$ A✓$\tan x = \frac{\sin x}{\cos x}$ CA✓simplifying $\sqrt{\cos^2 x}$ CA✓answer	(6)
			[14]

QUESTION 7

7.1.1	$\cos 4x$ $= \cos(2.2x)$ $= 2\cos^2 2x - 1$ $= 2(2\cos^2 x - 1)^2 - 1$ $= 2(4\cos^4 x - 4\cos^2 x + 1) - 1$ $= 8\cos^4 x - 8\cos^2 x + 1$	A✓ $\cos 4x = \cos(2.2x)$ A✓expansion of $\cos 4x$ A✓ expansion of $\cos 2x$ A✓ squaring bracket	(4)
7.1.2	$2\cos 4x = 1$ $\cos 4x = \frac{1}{2}$ $4x = 60^\circ + 360k \ or \ 4x = 300^\circ / -60^\circ + 360k$ $x = 15^\circ + 90k \ or \ x = 75^\circ / -15^\circ + 90k \ ; k \epsilon Z$	A✓setting up equation CA✓both solutions A✓$90k$ A✓ $k \in Z$ CA✓ $x = 15^\circ, 75^\circ / -15^\circ$	(5)
7.1.3	$16\cos^4 x - 16\cos^2 x + 2$ $= 2\cos 4x$ $\therefore$ **Minimum Value** $= -2$	A✓ A✓	(2)
7.2	$\frac{2\sin^2 22.5^\circ - 1}{4\sin 22.5^\circ \cos 22.5^\circ}$ $= \frac{-(1 - 2\sin^2 22.5^\circ)}{2.2 \sin 22.5^\circ \cos 22.5^\circ}$ $= \frac{-\cos 45^\circ}{2.\sin 45^\circ}$ $= \frac{-1}{2} \times \frac{\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}}$ $= -\frac{1}{2} \times 1 = -\frac{1}{2}$	A✓re-writing numerator and denominator A✓Numerator A✓Denominator A✓ Special angle values/ co - ratios A✓Answer	(5)
			[16]

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QUESTION 8



8.1	f: x-int., Maximum and Minimum and Shape g : y-int., Maximum and Minimum and Shape	AAA✓✓✓ AAA✓✓✓	(6)
8.2	$\frac{g(x)}{f(x)} \geq 1$ $g(x) \geq f(x); f(x) > 0$ $x \in (0^\circ; 180^\circ); x \neq 90^\circ$	AA✓✓Answer	(2)
			[8]

Total Marks: 100

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