Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

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MARKING GUIDELINE

NATIONAL SENIOR CERTIFICATE

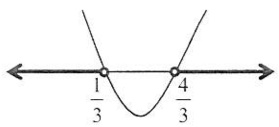
GRADE 11

MARKS: 75

This marking guideline consists of 8 pages.

QUESTION 1

1.1.1	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-10 \pm \sqrt{(10)^2 - 4(3)(-5)}}{2(3)}$ $x = 0,44$ *or* $x = -3,77$	✓ quadratic formula ✓ substitution ✓✓ answers (4)
1.1.2	$3^{x+1} - 3^{x+3} = -\frac{8}{27}$ $3^x(3^1 - 3^3) = -\frac{8}{27}$ $3^x = -\frac{8}{27} \div -24$ $3^x = \frac{1}{81}$ $3^x = 3^{-4}$ $x = -4$	✓ factorising LHS ✓ dividing by −24 ✓ simplifying RHS ✓ answer (4)
1.1.3	$5 - x = \sqrt{4x+1}$ $(5-x)^2 = \left(\sqrt{4x+1}\right)^2$ $25 - 10x + x^2 = 4x + 1$ $x^2 - 14x + 24 = 0$ $(x-12)(x-2) = 0$ $x \neq 12$ or $x = 2$	✓ squaring both sides ✓ standard form ✓ factors ✓ both answers ✓ rejecting $x = 12$ (5)
1.2	$y + 7 = 2x$ $y = 2x - 7$ $x^2 - x(2x-7) + 3(2x-7)^2 = 15$ $x^2 - 2x^2 + 7x + 3(4x^2 - 28x + 49) = 15$ $x^2 - 2x^2 + 7x + 12x^2 - 84x + 147 = 15$ $11x^2 - 77x + 132 = 0$ $x^2 - 7x + 12 = 0$ $(x-4)(x-3) = 0$ $x = 4$ *or* $x = 3$ $y = 2(4) - 7$, $y = 1$; $y = 2(3) - 7$, $y = -1$	✓ rewriting y in terms of x ✓ substitution ✓ standard form ✓ factors ✓ both answers for x ✓ both answers for y (6)

1.3.1	$9x^2-15x+4>0$ $(3x-4)(3x-1)>0$ $CVs: x=\frac{4}{3}$ *or* $x=\frac{1}{3}$  $x<\frac{1}{3}$ *or* $x>\frac{4}{3}$	✓ factors ✓✓ $x<\frac{1}{3}$ or $x>\frac{4}{3}$ (3)
1.3.2	$9x^2-15x+4=3$ $9x^2-15x+7=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{15\pm\sqrt{(-15)^2-4(9)(7)}}{2(9)}$ $=\frac{15\pm\sqrt{-27}}{18}$ Because $\sqrt{-27}$ is not real, both roots are not real. **OR** $\Delta=b^2-4ac$ $=(-15)^2-4(9)(7)$ $=-27$ Because $\Delta<0$, the equation has no real roots.	✓ standard form ✓ substituting in Δ or formula for roots of quadratic equation ✓ $x=\frac{15\pm\sqrt{-27}}{18}$ or $\Delta=-27$ ✓ conclusion (4)
		[26]

QUESTION 2

2.1	$\frac{12^{n+1}.27^{n-2}}{18^{2n-1}.\sqrt{9^{-3}}}+8^0$ $=\frac{(3.2^2)^{n+1}.(3^3)^{n-2}}{(2.3^2)^{2n-1}.(3^2)^{-\frac{3}{2}}}+1$ $=\frac{3^{n+1}.2^{2n+2}.3^{3n-6}}{2^{2n-1}.3^{4n-2}.3^{-3}}+1$ $=2^{(2n+2)-(2n-1)}.3^{(n+1)+(3n-6)-(4n-2)-(-3)}+1$ $=2^3.3^0+1$ $=8+1$ $=9$	✓ $8^0=1$ ✓ writing as prime bases ✓ converting surd to exponent ✓ simplification using laws ✓ answer (5)
2.2	$\sqrt[3]{16}\times\sqrt[3]{625}\times\sqrt{10}$ $=\sqrt[3]{2^4}\times\sqrt[3]{5^4}\times\sqrt{10}$ $=(2)^{\frac{4}{3}}\times(5)^{\frac{4}{3}}\times(10)^{\frac{1}{2}}$ $=(10)^{\frac{4}{3}}\times(10)^{\frac{1}{2}}$ $=(10)^{\frac{11}{6}}$ $=10^1\times(10)^{\frac{5}{6}}$ $=10y$	✓ writing with bases of 2 and 5 ✓ surd to exponential form with base 10 ✓ simplification ✓ answer (4)
		[9]

QUESTION 3

3.1.1	10; 0	✓✓ answers (2)
3.1.2	64 ; 42 ; 24 ; 10 -22 ; -18 ; -14 4 ; 4 $2a = 4$ $a = 2$ $3(2) + b = -22$ $b = -28$ $2 + (-28) + c = 64$ $c = 90$ $T_n = 2n^2 - 28n + 90$	✓ value of a ✓ value of b ✓ value of c ✓ answer (4)
3.1.3	$T_{20} = 2(20)^2 - 28(20) + 90$ $= 330$	✓ substitution of 20 into T_n ✓ answer (2)
3.1.4	The sequence of first differences form the linear pattern: $-22 ; -18 ; -14 ; \ldots$ The general term for the sequence of first differences is : $T_n = 4n - 26$	✓ $4n$ ✓ -26 (2)
3.1.5	$4n - 26 = 174$ $4n = 200$ $n = 50$ $\therefore$ the difference between T_{50} and T_{51} of the quadratic sequence is 174. **OR** $T_{n+1} - T_n = 174$ $2(n+1)^2 - 28(n+1) + 90 - (2n^2 - 28n + 90) = 174$ $2n^2 + 4n + 2 - 28n - 28 + 90 - 2n^2 + 28n - 90 = 174$ $4n - 26 = 174$ $4n = 200$ $n = 50$ $\therefore$ the difference between T_{50} and T_{51} of the quadratic sequence is 174.	✓ equating T_n to 174 ✓answer (2) **OR** ✓ substituting into $T_{n+1} - T_n = 174$ ✓answer (2)

3.2	p ; 11 ; 21 ; $6p$ $11 - p$; 10 ; $6p - 21$ $10 - (11 - p)$; $6p - 21 - 10$ $10 - (11 - p) = 6p - 21 - 10$ $10 - 11 + p = 6p - 31$ $p - 6p = -31 + 1$ $-5p = -30$ $p = 6$	✓ calculating first differences ✓ calculating second differences ✓ equating second differences ✓answer (4)
		[16]

QUESTION 4

4.1.1	$DC=\sqrt{(3-(-1))^2+(0-(-2))^2}$ $=\sqrt{20}$	✓ substitution into distance formula ✓ answer (2)
4.1.2	$AB=\sqrt{20}$	✓ correct answer (1)
4.1.3	By inspection: $p=-2$ and $q=2$ (D is 4 units to left of C; therefore A also 4 units to left of B. D is 2 units below C; therefore A also 2 units below B.) **OR** Midpoint of BD is $M\left(\frac{2-1}{2};\frac{4-2}{2}\right)=M\left(\frac{1}{2};1\right)$ $\frac{1}{2}=\frac{p+3}{2}$ *and* $1=\frac{q+0}{2}$ $p=-2$ *and* $q=2$	✓ value of p ✓ value of q (2) **OR** ✓ value of p ✓ value of q (2)
4.1.4	$m_{AB}=\frac{4-2}{2+2}=\frac{1}{2}$ $\therefore m_{OE}=-2$ The equation of OE is $y=-2x$	✓ substitution ✓ gradient of AB ✓ gradient of OE ✓ answer (4)
4.1.5	Equation of AB: Substitute (2 ; 4) in $y=\frac{1}{2}x+c$: $4=\frac{1}{2}(2)+c$ $c=3$ $y=\frac{1}{2}x+3$ Equate equations of AB and OE: $-2x=\frac{1}{2}x+3$ $-\frac{5}{2}x=3$ $x=-\frac{6}{5}$ $y=\frac{1}{2}\left(-\frac{6}{5}\right)+3=\frac{12}{5}$ $E\left(-\frac{6}{5};\frac{12}{5}\right)$	✓ equation of AB ✓ equating equations of AB and OE ✓ value of x-coordinate ✓ value of y-coordinate (4)

4.2.1	$m_{PS}=\frac{7-4}{3+3}=\frac{1}{2}$ $\tan A\hat{S}Q=m_{PS}=\frac{1}{2}$ $A\hat{S}Q=26,57^\circ$	✓ gradient of PS ✓ $\tan A\hat{S}Q=m_{PS}$ ✓ answer (3)
4.2.2	$m_{RQ}=\frac{-6-4}{1+3}=-\frac{5}{2}$ $\tan T\hat{A}Q=m_{RQ}$ $T\hat{A}Q=180^\circ-68,20^\circ$ $=111,80^\circ$ $R\hat{Q}S=111,80^\circ-68,20^\circ$ $=85,23^\circ$	✓ gradient of RQ ✓ size of $T\hat{A}Q$ ✓ subtracting ✓ answer (4)
4.2.3	$m_{NR}=\frac{-6-(-11)}{1-3}$ $=-\frac{5}{2}$ $m_{RQ}=-\frac{5}{2}$ Because $m_{RQ}=m_{NR}$, N, R and Q are collinear. Take note: Alternatively the gradients of NQ and NR may also be shown to be equal. Or: NQ and QR.	✓ substitution ✓ value of gradient ✓ equal gradients ✓ concluding (4)
		[24]

TOTAL: 75