MATHEMATICSP1

COMMONTEST

JUNE2017 MEMORANDUM

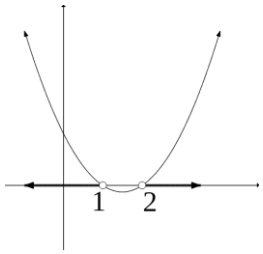
NATIONAL SENIOR CERTFIFCATE

GRADE 11

MARKS: 100

N.B. This marking guideline consists of 8 pages.

QUESTION 1

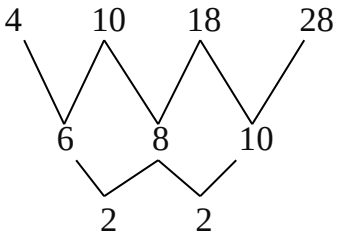
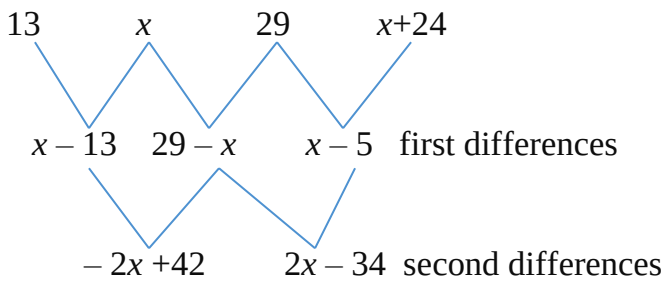
1.1.1	$(x+3)(x-5)=9$ $x^2-2x-15=9$ $x^2-2x-24=0$ $(x+4)(x-6)=0$ $x=-4$ or $x=6$	1A for multiplying out 1CA for factors 1CA for answers (3)
1.1.2	$x-\sqrt{2x-1}=2$ $\sqrt{2x-1}=x-2$ $2x-1=(x-2)^2$ $2x-1=x^2-4x+4$ $x^2-6x+5=0$ $(x-5)(x-1)=0$ $x=5$ or $x=1$ N/A	1A for isolating surd 1CA for squaring both sides 1CA for factors 1CA for $x=5$ (4)
1.1.3	$1<(2x-3)^2$ $1<4x^2-12x+9$ $-4x^2+12x-8<0$ $4x^2-12x+8>0$ $x^2-3x+2>0$ $(x-2)(x-1)>0$ CVs: 1; 2  $x<1$ or $x>2$ **OR** $(-\infty;1)\cup(2;\infty)$	1A for $-4x^2+12x+8<0$ 1CA for $4x^2-12x+8>0$ 1CA for factorisation 2CA for answer (5)
1.2.1	$3x^2=3x+5$ $3x^2-3x-5=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-3)\pm\sqrt{(-3)^2-4(3)(-5)}}{2(3)}$ $\frac{-(-2)\pm\sqrt{(-2)^2-4(3)(-5)}}{2(3)}$ $=1{,}88$ or $-0{,}88$	1A for formula 1A for substitution 2CA for answers (4)

1.2.2	$y + 1 = 1{,}88$ OR $y + 1 = -0{,}88$ $y = 0{,}88$ or $y = -1{,}88$	2CA for answers (2)
1.3	$x = \frac{3 \pm \sqrt{69}}{6}$ The roots are real, irrational and unequal.	1CA for irrational 1CA for unequal (2)
1.4	$y = -2x + 1$ equation 1 $2x^2 - xy + y^2 = 4$ equation 2 Substitute equation 1 into equation 2: $2x^2 - x(-2x+1) + (-2x+1)^2 = 4$ $2x^2 + 2x^2 - x + 4x^2 - 4x + 1 = 4$ $8x^2 - 5x - 3 = 0$ $(8x+3)(x-1) = 0$ $x = -\frac{3}{8}$ or $x = 1$ $y = \frac{7}{4}$ or $y = -1$	1A for making y the subject of the formula 1CA for substitution 1CA for standard form 1CA for factorization 1CA for both x-values 1CA for both y-values (6) **[26]**

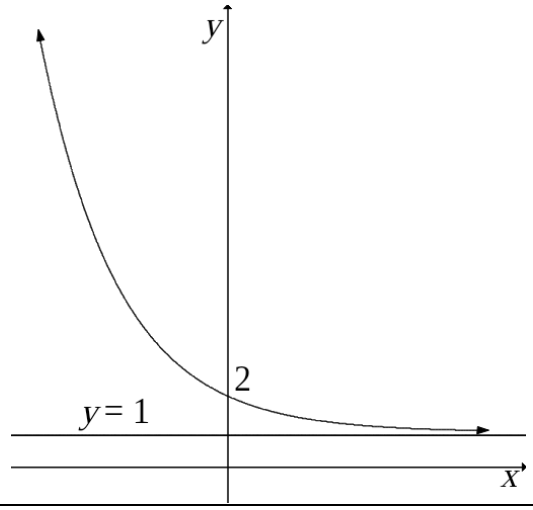
QUESTION 2

2.1.1	$\frac{\sqrt{75}-\sqrt{12}}{x}=\sqrt{48}$ $\frac{5\sqrt{3}-2\sqrt{3}}{x}=4\sqrt{3}$ $\frac{3\sqrt{3}}{x}=4\sqrt{3}$ $x=\frac{3\sqrt{3}}{4\sqrt{3}}$ $=\frac{3}{4}$	1A for $5\sqrt{3}-2\sqrt{3}$ 1A for $4\sqrt{3}$ 1CA for simplification 1CA for answer (4)
2.1.2	$5x^{\frac{3}{2}}-256=x^{\frac{3}{2}}$ $4x^{\frac{3}{2}}=256$ $x^{\frac{3}{2}}=64$ $x=64^{\frac{2}{3}}$ $=\left(2^6\right)^{\frac{2}{3}}$ $=2^4$ $=16$	1A for $x^{\frac{3}{2}}$ 1A for $4x^{\frac{3}{2}}$ 1A for $(64)^{\frac{2}{3}}$ 1 CA for answer (4)
2.2.1	$\left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2$ $=\frac{1}{2}+2+2$ $=4\frac{1}{2}$	1 A for $\frac{1}{2}$ 1A for answer (2)
2.2.2	$\sqrt[m]{\frac{6^m+5\left(3^m\right)}{10^m+5^{m+1}}}$ $=\sqrt[m]{\frac{2^m.3^m+5.3^m}{5^m.2^m+5.5^m}}$ $=\sqrt[m]{\frac{3^m\left(2^m+5\right)}{5^m\left(2^m+5\right)}}$ $=\sqrt[m]{\frac{3^m}{5^m}}$ $=\sqrt[m]{\left(\frac{3}{5}\right)^m}$ $=\frac{3}{5}$	1 A for expanding 1 CA for factorisation 1 CA for simplification 1 CA for answer (4) **[14]**

QUESTION 3

3.1.1	40	1A for answer (1)
3.1.2	 $2a = 2$ $3a + b = 1$ $a + b + c = 4$ $a = 1$ $b = 3$ $c = 0$ $T_n = n^2 + 3n$	1A for $a = 1$ 1CA for $b = 3$ 1CA for $c = 0$ 1CA for T_n (4)
3.1.3	$n^2 + 3n = 460$ $n^2 + 3n - 460 = 0$ $(n - 20)(n + 23) = 0$ $n = 20$ $T_{21} = 21^2 + 3(21)$ $= 504$	1CA for equating T_n to 460 1CA for factorisation 1CA for value of n 1CA for value of the next term (4)
3.1.4	First differences: 6; 8; 10; … $T_n = 2n + 4$	1A for $2n$ 1A for + 4 (2)
3.1.5	$2n + 4 = 64$ $n = 30$ Between T_{30} and T_{31}	1A for $n = 30$ 1A for T_{30} 1A for T_{31} (3)
3.2	 $-2x + 42 = 2x - 34$ $4x = 76$ $x = 19$	1A for $x - 13$ 1 A for $29 - x$ and $x - 5$ 1CA for 2nd differences 1CA for equating second differences 1CA for answer (5) **[19]**

QUESTION 4

4.1	$h(0) = 2^0 + 1$ $= 2$	1A for substitution 1A for answer (2)
4.2	$y = 1$	1A for answer (1)
4.3		1A for shape 1CA for *y*-intercept 1CA for asymptote (3)
4.4	Average gradient $= \frac{f(0) - f(-2)}{0 - (-2)}$ $= \frac{2 - 5}{2}$ $= -\frac{3}{2}$	1A for formula 1A for $f(-2) = 5$ 1CA for answer (3)
4.5	$x < -2$	2A for answer (2) **[11]**

QUESTION 5

5.1	$p = 3$ $q = -2$ $y = \frac{a}{x+3} - 2$ Substitute $(-5;0)$: OR Substitute $(1;-3)$: $0 = \frac{a}{-5+3} - 2$ $\quad -3 = \frac{a}{1+3} - 2$ $2 = \frac{a}{-2}$ $\quad -1 = \frac{a}{4}$ $a = -4$ $\quad a = -4$	1A for $p = 3$ 1A for $q = -2$ 1CA for substitution 1CA for answer (4)
5.2	$x \in \Re$, but $x \neq -3$ OR $(-\infty;-3)$ or $(-3;\infty)$	2A for answer (2)
5.3	Substitute $(-3;-2)$ in $y = x + k$: $-2 = -3 + k$ $k = 1$	1A for substitution 1A for answer (2)
5.4	$-5 \leq x < -3$ or $x \geq 1$ OR $[-5;-3) \cup [1;\infty)$	2A for $-5 \leq x < -3$ 1A for $x \geq 1$ (3)
5.5	Gradient $= \frac{-3-0}{1+5}$ $= -\frac{1}{2}$ $y = -\frac{1}{2}x - \frac{5}{2}$	1A for gradient 1CA for answer (2) **[13]**

QUESTION 6

6.1.1	$x = \frac{-b}{2a}$ $= \frac{-(-1)}{2\left(-\frac{1}{2}\right)}$ $= -1$ $f(-1) = -\frac{1}{2}(-1)^2 - (-1) + 4 = 4\frac{1}{2}$ $B\left(-1;\ 4\frac{1}{2}\right)$	1A for substitution 1A for answer (x-coordinate) 1CA for y-coordinate (3)
6.1.2	$C(0;\ 4)$	1A for answer (1)
6.2	$-\frac{1}{2}x^2 - x + 4 = 0$ $x^2 + 2x - 8 = 0$ $(x+4)(x-2) = 0$ $x = -4$ or $x = 2$ $D(-4;\ 0)$ $E(2;\ 0)$	1A for $-\frac{1}{2}x^2 - x + 4 = 0$ 1A for factors 2CA for answers (3)
6.3	$y = a(x+4)^2$ $4 = a(-2+4)^2$ $4 = a(2)^2$ $a = 1$ $y = (x+4)^2$	1A for $y = a(x+4)^2$ 1A for substituting $(-2;\ 4)$ 1CA for answer (3)
6.4	$y = (x-4)^2$ $= x^2 - 8x + 16$	$(x-4)^2$ OR $x^2 - 8x + 16$ 2A for answer (2)
6.5	$k > 4\frac{1}{2}$	2A for answer (2)
6.6	$f(x) - g(x)$ $= -\frac{1}{2}x^2 - x + 4 - (x+4)^2$ $= -\frac{1}{2}x^2 - x + 4 - x^2 - 8x - 16$ $= -\frac{3}{2}x^2 - 9x - 12$ $f(-3) - g(-3)$ $= -\frac{3}{2}(-3)^2 - 9(-3) - 12$ $= \frac{3}{2}$	1A: $-\frac{1}{2}x^2 - x + 4 - (x+4)^2$ 1A: simplification 1CA: answer (3) **[17]**

TOTAL: 100