education

Department:
Education
PROVINCE OF KWAZULU-NATAL

MATHEMATICS P2

COMMON TEST

JUNE 2018

MARKING GUIDELINE

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS: 100

This marking guideline consists of 8 pages.

QUESTION 1

1.1.1	$m_{CD} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{8-0}{10-4}$ $= \frac{4}{3}$	✓ substituting in gradient formula ✓ answer (2)
1.1.2	$\tan\theta = m_{CD}$ $= \frac{4}{3}$ $\theta = 53{,}13^\circ$	✓ $\tan\theta = \frac{4}{3}$ ✓ answer (2)
1.2	$m_{BC} = \frac{3-0}{0-4}$ $= -\frac{3}{4}$ $m_{CD} \times m_{BC} = \frac{4}{3} \times -\frac{3}{4}$ $= -1$ Therefore $B\hat{C}D = 90^\circ$.	✓ gradient of BC ✓ multiplying gradients ✓ answer of -1 and concluding (3)
1.3.1	$m_{AD} = -\frac{3}{4}$	✓ answer (1)
1.3.2	$-\frac{3}{4} = \frac{w-8}{0-10}$ $30 = 4(w-8)$ $30 = 4w - 32$ $w = \frac{31}{2}$ $= 15\frac{1}{2}$	✓ substitution in gradient formula ✓ simplification ✓ answer (3)
1.4	$AD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(0-10)^2 + (\frac{31}{2} - 8)^2}$ $= \sqrt{\frac{625}{4}}$ $= \frac{25}{2}$ $= 12\frac{1}{2}$ units	✓ substitution into quadratic formula ✓ simplification ✓ answer (3)

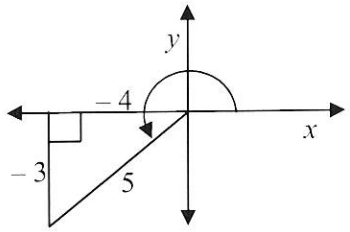
1.5	$BC = \sqrt{(0-4)^2+(3-0)^2} = 5$	✓ length of BC
	$CD = \sqrt{(10-4)^2+(8-0)^2} = 10$	✓ length of CD
	Area of ABCD = area of trapezium = ½(sum of parallel sides)× height $= \frac{1}{2}(5+12\frac{1}{2})(10)$ $= 87\frac{1}{2}$ square units	✓ formula ✓ substitution of $(5+12\frac{1}{2})$ ✓ substitution of 10 ✓ answer (6)
	OR	**OR**
	$BC = \sqrt{(0-4)^2+(3-0)^2} = 5$	✓ length of BC
	$CD = \sqrt{(10-4)^2+(8-0)^2} = 10$	✓ length of CD
	Area of ABCD = area of rectangle + area of triangle $= (\ell \times b)+(\frac{1}{2}bh)$ $= (5\times 10)+\left[\frac{1}{2}\times 10\times(12\frac{1}{2}-5)\right]$ $= 87\frac{1}{2}$ square units	✓ substitution of (5×10) ✓✓ $\left[\frac{1}{2}\times 10\times(12\frac{1}{2}-5)\right]$ ✓ answer (6)
	OR	**OR**
	$BC = \sqrt{(0-4)^2+(3-0)^2} = 5$	✓ length of BC
	$CD = \sqrt{(10-4)^2+(8-0)^2} = 10$	✓ length of CD
	Area of ABCD = area of ΔBCD + area of ΔABD $= (\frac{1}{2}\times 5\times 10)+\left[\frac{1}{2}\times(15\frac{1}{2}-3)\times 10\right]$ $= 25 + 62\frac{1}{2}$ $= 87\frac{1}{2}$ square units	✓ $(\frac{1}{2}\times 5\times 10)$ ✓✓ $\left[\frac{1}{2}\times(15\frac{1}{2}-3)\times 10\right]$ ✓ answer (6)
		[18]

QUESTION 2

2.1	$x_M = \frac{x_1 + x_2}{2}$ $\quad y_M = \frac{y_1 + y_2}{2}$ $= \frac{1+5}{2}$ $\quad = \frac{2+0}{2}$ $= 3$ $\quad = 1$ M(3;1)	✓ substitution for x_M ✓ answer for x_M ✓ substitution for y_M ✓ answer for y_M (4)
2.2	$BC = CD$ $\sqrt{(-2-1)^2 + (p-2)^2} = \sqrt{(-2-5)^2 + (p-0)^2}$ $\sqrt{9 + p^2 - 4p + 4} = \sqrt{49 + p^2}$ $\sqrt{p^2 - 4p + 13} = \sqrt{p^2 + 49}$ $p^2 - pk + 13 = p^2 + 49$ $-4p = 36$ $p = -9$	✓ $BC = CD$ ✓ LHS substitution in distance formula ✓ RHS substitution in distance formula ✓ simplifying ✓ squaring both sides ✓ answer (6)
2.3	$m_{CM} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{1-(-9)}{3-(-2)}$ $= 2$ $y = 2x + c$ Substitute $(-2;-9)$: $-9 = 2(-2) + c$ $c = -5$ $y = 2x - 5$	✓ substitute in gradient formula ✓ value of gradient ✓ substitute in straight line formula ✓ value of c ✓ equation (5)
2.4	$m_{BD} = \frac{0-2}{5-1}$ $= -\frac{1}{2}$ $\tan B\hat{D}X = -\frac{1}{2}$ $B\hat{D}X = 180^\circ - 26,57^\circ$ $= 153,43^\circ$ Angle of inclination of AD $= 153,43^\circ - 45^\circ$ $= 108,43^\circ$	✓ gradient of BD ✓ $\tan B\hat{D}X = m_{BD}$ ✓ angle of inclination of BD ✓ $153,43^\circ - 45^\circ$ ✓ answer (5)

2.5	$m_{AD} = \tan 108,43^\circ$ $= -3$ Equation of AD: $y = -3x + c$ Substitute $(5;0)$: $0 = -3(5) + c$ $c = 15$ $y = -3x + 15$ Solve simultaneous equations for AC and AD: $2x - 5 = -3x + 15$ $5x = 20$ $x = 4$ $y = 3$ A(4;3)	✓ gradient of AD ✓ substituting (5 ; 0) ✓ equation of AD ✓ solving simultaneously ✓ value of x ✓ value of y (6)
	OR	**OR**
	DM = AM = BM [sides opposite equal angles] $= \sqrt{5}$ AB = AD $= \sqrt{10}$ [Theorem of Pythagoras]	✓ DM = AM = BM = $\sqrt{5}$
	$AB = AD$ $\sqrt{(x-1)^2 + (y-2)^2} = \sqrt{(x-5)^2 + (y-0)^2}$ $x^2 - 2x + 1 + y^2 - 4y + 4 = x^2 - 10x + 25 + y^2$ $8x - 4y = 20$ $y = 2x - 5$.....line 1 $AD = \sqrt{10}$ $\sqrt{(x-5)^2 + (y-0)^2} = \sqrt{10}$ $x^2 - 10x + 25 + y^2 = 10$ .....line 2 $x^2 - 10x + 25 + (2x-5)^2 = 10$ $x^2 - 10x + 25 + 4x^2 - 20x + 25 = 10$ $5x^2 - 30x + 40 = 0$ $x^2 - 6x + 8 = 0$ $(x-4)(x-2) = 0$ $x = 2$ or $x = 4$ N/A $y = 3$	✓ $\sqrt{(x-1)^2 + (y-2)^2}$ $= \sqrt{(x-5)^2 + (y-0)^2}$ ✓ simplification to $y = 2x - 5$ ✓ $\sqrt{(x-5)^2 + (y-0)^2} = \sqrt{10}$ ✓ $x = 4$ ✓ $y = 3$ (6)
		[26]

QUESTION 3

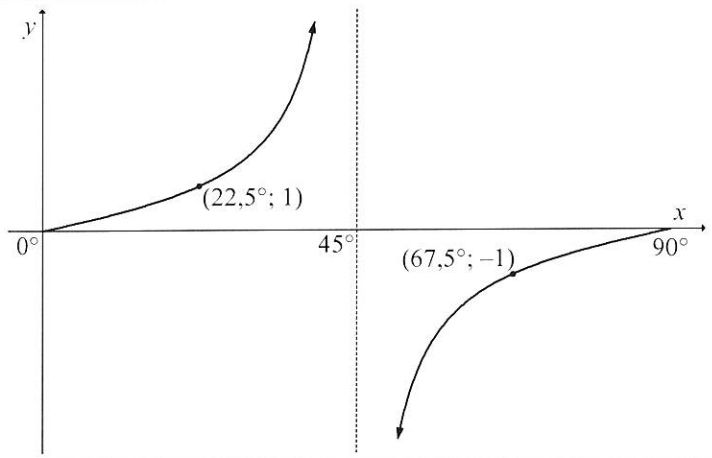
3.1	 $2\sin\theta\cos\theta$ $=2\left(-\frac{3}{5}\right)\left(-\frac{4}{5}\right)$ $=\frac{24}{25}$	✓ sketch ✓ substitution of $-\frac{3}{5}$ ✓ substitution of $-\frac{4}{5}$ ✓ answer (4)
3.2.1	$\frac{\sin(360^\circ - x)+\cos(90^\circ + x)}{\sin(180^\circ - x)+\tan 540^\circ}$ $=\frac{-\sin x+(-\sin x)}{\sin x+\tan 180^\circ}$ $=\frac{-2\sin x}{\sin x+0}$ $=-2$	✓ $-\sin x$ and ✓ $-\sin x$ in numerator ✓ $\sin x$ and ✓ $\tan 180^\circ$ in denominator ✓ answer (5)
3.2.2	$\cos 330^\circ.\tan(-120^\circ)+\sin 73^\circ.\left(\frac{1}{\cos 197^\circ}\right)$ $=\cos 30^\circ.-\tan 120^\circ+\sin 73^\circ.\left(\frac{1}{-\cos 17^\circ}\right)$ $=\cos 30^\circ.\tan 60^\circ-\frac{\sin 73^\circ}{\sin 73^\circ}$ $=\left(\frac{\sqrt{3}}{2}\right).\left(\frac{\sqrt{3}}{1}\right)-1$ $=\frac{3}{2}-1$ $=\frac{1}{2}$	✓ $\cos 30^\circ$ ✓ $-\cos 17^\circ$ ✓ $\tan 60^\circ$ ✓ $-\frac{\sin 73^\circ}{\sin 73^\circ}$ (**OR**: $-\frac{\cos 17^\circ}{\cos 17^\circ}$) ✓ special angle values ✓ answer (6)
		[15]

QUESTION 4

4.1.1	$\frac{(\sin x-\cos x)^2-1}{\sin^2 x-1}$ $=\frac{\sin^2 x-2\sin x\cos x+\cos^2 x-1}{\sin^2 x-1}$ $=\frac{-2\sin x\cos x+\sin^2 x+\cos^2 x-1}{\sin^2 x-1}$ $=\frac{-2\sin x\cos x+1-1}{-(1-\sin^2 x)}$ $=\frac{-2\sin x\cos x}{-\cos^2 x}$ $=\frac{2\sin x}{\cos x}$ $=2\tan x$	✓ multiplying out ✓ applying identity $\sin^2 x+\cos^2 x=1$ ✓ $-(1-\sin^2 x)$ ✓ applying identity $1-\sin^2 x=\cos^2 x$ ✓ simplification (5)
4.1.2	$\sin^2 x-1=0$ $\sin^2 x=1$ $\sin x=-1$ or $\sin x=1$ $x=270^\circ$ or $x=90^\circ$	✓ $\sin^2 x-1=0$ ✓ 270° ✓ 90° (3)
4.2	$\tan(3x+40^\circ)=-1$ reference angle: 45° $3x+40^\circ=180^\circ-45^\circ+n.360^\circ$ or $3x+40^\circ=360^\circ-45^\circ+n.360^\circ$ $3x=95^\circ+n.360^\circ$ $3x=275^\circ+n.360^\circ$ $x=31,67^\circ+n.120^\circ$ $x=91,67^\circ+n.120^\circ$ $x=-88,33^\circ$ or $31,67^\circ$ $x=-28,33^\circ$ where $n\in Z$ **OR** $3x+40^\circ=180^\circ-45^\circ+n.180^\circ$ $3x=95^\circ+n.180^\circ$ $x=31,67^\circ+n.60^\circ$ $x=-88,33^\circ$ or $-28,33^\circ$ or $31,67^\circ$ where $n\in Z$	✓ $3x+40^\circ=180^\circ-45^\circ+n.360^\circ$ ✓ $3x+40^\circ=360^\circ-45^\circ+n.360^\circ$ ✓ $-88,33^\circ$ ✓ $31,67^\circ$ ✓ $-28,33^\circ$ (5) **OR** ✓ $180^\circ-45^\circ$ ✓ $+n.180^\circ$ ✓ $-88,33^\circ$ ✓ $31,67^\circ$ ✓ $-28,33^\circ$ (5)

4.3	$2\sin x = \sqrt{3+3\cos x}$ $4\sin^2 x = 3+3\cos x$ $4\left(1-\cos^2 x\right) = 3+3\cos x$ $4-4\cos^2 x = 3+3\cos x$ $4\cos^2 x+3\cos x-1=0$ $(4\cos x-1)(\cos x+1)=0$ $\cos x = \frac{1}{4}$ or $\cos x = -1$ $x = 75,52^\circ + n.360^\circ$ or $x = 284,48^\circ + n.360^\circ$ or $x = 180^\circ + n.360^\circ$ for $n \in Z$	✓ squaring both sides ✓ $1-\cos^2 x$ ✓ standard form ✓ $\cos x = \frac{1}{4}$ or $\cos x = -1$ ✓✓✓ answers ✓ $n \in Z$ (8)
		[21]

QUESTION 5

5.1.1	$a = 1$ $b = -45^\circ$ $c = -2$	✓ $a = 1$ ✓ $b = -45^\circ$ ✓ $c = -2$ factors (3)
5.1.2	$k = 0,51$ $m = 165,36^\circ$	✓✓ $k = 0,51$ ✓✓ $m = 165,36^\circ$ (4)
5.1.3(a)	$-180^\circ < x < -14,64^\circ$	✓✓ answer (2)
5.1.3(b)	$-45^\circ \leq x \leq 0^\circ$	✓✓ answer (2)
5.1.4	$-1 + 2 = 1$	✓✓ answer (2)
5.2.1		✓ shape ✓ asymptote at $x = 45^\circ$ ✓ indicated $(22,5^\circ;1)$ and $(67,5^\circ;-1)$ (3)
5.2.2	m has to be translated (shifted) by 25° to the left.	✓ shifted to the left ✓ by 25° (2)
		[18]

TOTAL: 100