



Province of the  
**EASTERN CAPE**  
EDUCATION

EC CURRICULUM: FET MATHEMATICS, MATHEMATICAL LITERACY AND TECHNICAL MATHEMATICS

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS TOPIC TEST 3 OF 2020:  
TRIGONOMETRY  
MARKING GUIDELINES**

**MARKS: 40**

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This Marking Guidelines consists of 5 pages.

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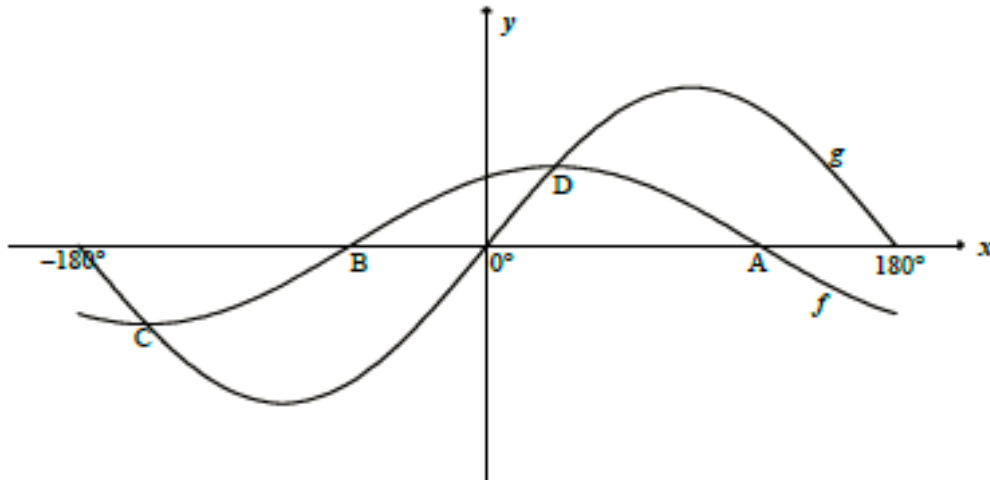
**QUESTION/VR44G 1**

1.1.1	$\sin 191^\circ$ $= -\sin 11^\circ$	$\checkmark -\sin 11^\circ$  (1)
1.1.2	$\cos 22^\circ$ $= \cos(2 \times 11^\circ)$ $= 1 - 2\sin^2 11^\circ$	$\checkmark$ answer  (1)
1.2	$\cos(x - 180^\circ) + \sqrt{2} \sin(x + 45^\circ)$ $= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= -\cos x + \sqrt{2}\left(\sin x \left(\frac{1}{\sqrt{2}}\right) + \cos x \left(\frac{1}{\sqrt{2}}\right)\right)$ $= -\cos x + \sin x + \cos x$ $= \sin x$ <p>OR</p> $\cos(x - 180^\circ) + \sqrt{2} \sin(x + 45^\circ)$ $= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= -\cos x + \sqrt{2}\left(\sin x \left(\frac{\sqrt{2}}{2}\right) + \cos x \left(\frac{\sqrt{2}}{2}\right)\right)$ $= -\cos x + \sin x + \cos x$ $= \sin x$	$\checkmark -\cos x$ $\checkmark$ expansion  $\checkmark$ special angle ratios  $\checkmark$ simplification of last 2 terms $\checkmark$ answer  (5)
1.3	$\sin P + \sin Q = \sin P + \cos P$ $(\sin P + \cos P)^2 = \left(\frac{7}{5}\right)^2$ $\sin^2 P + 2\sin P \cos P + \cos^2 P = \frac{49}{25}$ $2\sin P \cos P = \frac{49}{25} - 1$ $\sin 2P = \left(\frac{49}{25} - \frac{25}{25}\right)$ $= \frac{24}{25}$	$\checkmark \sin Q = \cos P$  $\checkmark$ squaring  $\checkmark$ expansion  $\checkmark \sin^2 P + \cos^2 P = 1$  $\checkmark$ answer  (5)
		[12]

**QUESTION/VRAAG 2**

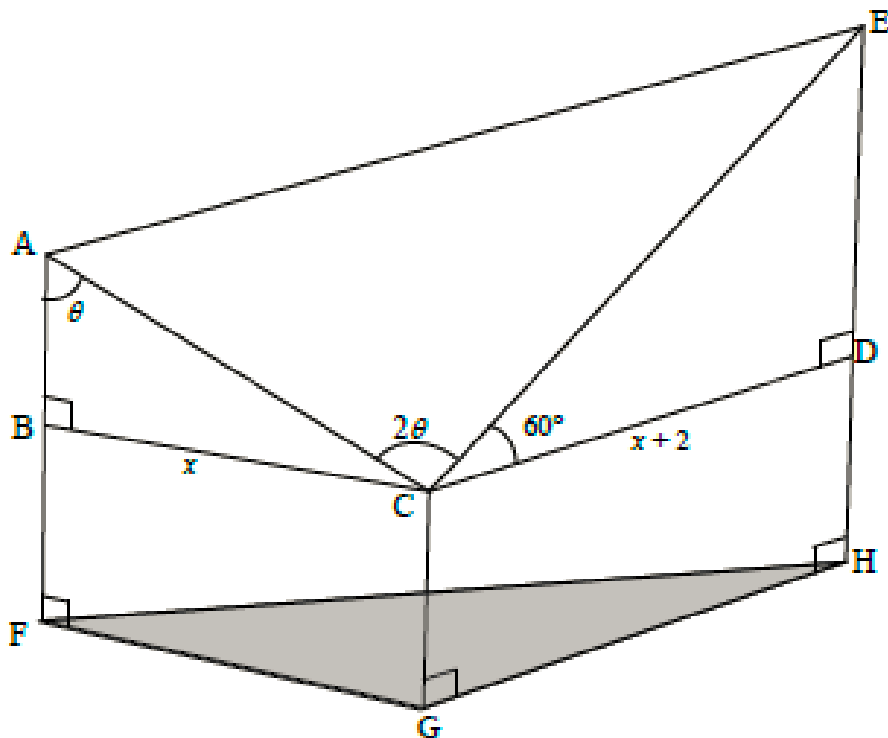
2.1	$\cos(x - 30^\circ) = 2 \sin x$ $\cos x \cos 30^\circ + \sin x \sin 30^\circ = 2 \sin x$ $\frac{\sqrt{3}}{2} \cos x + \frac{1}{2} \sin x = 2 \sin x$ $\frac{\sqrt{3}}{2} \cos x = \frac{3}{2} \sin x$ $\tan x = \frac{\sqrt{3}}{3}$ $x = 30^\circ + k \cdot 180^\circ; \quad k \in \mathbb{Z}$ <p><b>OR</b></p> $x = 30^\circ + k \cdot 360^\circ \text{ or } x = 210^\circ + k \cdot 360^\circ; \quad k \in \mathbb{Z}$	✓ expansion ✓ special $\angle$ s  ✓ simplification ✓ equation in tan ✓ $30^\circ$ ✓ $k \cdot 180^\circ; k \in \mathbb{Z}$ <b>OR</b> ✓ $30^\circ$ and $210^\circ$ ✓ $k \cdot 360^\circ; k \in \mathbb{Z}$
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(6)



2.2.1	(a) $A(120^\circ; 0)$	✓ answer (1)
2.2.1	(b) $C(-150^\circ; -1)$	✓ x value ✓ y value (2)
2.2.2	(a) $x \in (-90^\circ; 30^\circ)$ OR $-90^\circ < x < 30^\circ$	✓ endpoints ✓ correct interval (2)
2.2.2	(b) $x \in (-160^\circ; 20^\circ)$ OR $-160^\circ < x < 20^\circ$	✓ endpoints ✓ correct interval (2)
2.2.3	$y = 2^{2 \sin x + 3}$ Range of $y = 2 \sin x$ : $y \in [-2; 2]$ OR $-2 \leq y \leq 2$ Range of $y = 2 \sin x + 3$ : $y \in [1; 5]$ OR $1 \leq y \leq 5$ Range: $y = 2^{2 \sin x + 3}$ : $y \in [2; 32]$ OR $2 \leq y \leq 32$	✓ 1 ✓ 5 ✓ 2 ✓ 32 ✓ correct interval (5)
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>		[18]

**QUESTION/VRAAG 3**



3.1.1	$\sin \theta = \frac{x}{AC} \quad \text{OR} \quad \frac{\sin \theta}{x} = \frac{\sin 90^\circ}{AC}$ $AC = \frac{x}{\sin \theta} \quad \text{OR} \quad AC = \frac{x}{\sin \theta}$	✓ trig ratio ✓ simplification (2)
3.1.2	$\cos 60^\circ = \frac{x+2}{CE} \quad \text{OR} \quad \frac{\sin 30^\circ}{x+2} = \frac{\sin 90^\circ}{CE}$ $CE = \frac{x+2}{\cos 60^\circ} \quad \text{OR} \quad CE = \frac{x+2}{\sin 30^\circ}$ $= \frac{x+2}{\frac{1}{2}} = 2(x+2) \quad \text{OR} \quad = 2(x+2)$	✓ trig ratio ✓ making CE the subject (2)
3.2	$\text{Area } \triangle ACE = \frac{1}{2} AC \cdot EC \cdot \sin \hat{ACE}$ $= \frac{1}{2} \left( \frac{x}{\sin \theta} \right) (2(x+2)) \sin 2\theta$ $= \frac{x(x+2) \times 2 \sin \theta \cos \theta}{\sin \theta}$ $= 2x(x+2) \cos \theta$	✓ use area rule correctly ✓ substitution of $\frac{x}{\sin \theta} (2(x+2))$ ✓ substitution of $\sin 2\theta$ (3)

3.3	$EC = 2(12 + 2) = 28$ $AE^2 = AC^2 + EC^2 - 2(AC)(EC)\cos A\hat{C}E$ $= \left(\frac{12}{\sin 55^\circ}\right)^2 + 28^2 - 2\left(\frac{12}{\sin 55^\circ}\right)(28)\cos 110^\circ$ $AE = 35,77m$	✓ EC ✓ substitution ✓ answer (3)
		[10]

**TOTAL: 40**