



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2011

**MATHEMATICS P2
MEMORANDUM**

MARKS: 150

This memorandum consists of 11 pages.

QUESTION 1

$$1.1 \quad \text{Mean} = \frac{40 + 35 + 60 + 58 + 59 + 37 + 52 + 60 + 33 + 40}{10}$$

$$\text{Mean} = \frac{474}{10}$$

$$\text{Mean} = 47,4$$

✓ $\frac{474}{10}$
 ✓ answer
 answer only:
 2/2

(2)

1.2

x	$x - \bar{x}$	$(x - \bar{x})^2$
40	- 7,4	54,76
35	- 12,4	153,76
60	12,6	158,76
58	10,6	112,36
59	11,6	134,56
37	- 10,4	108,16
52	4,6	21,16
60	12,6	158,76
33	- 14,4	207,36
40	- 7,4	54,76
Sum		1164,4

✓ table
 ✓ sum
 ✓ answer

answer
 only: 3/3

$$\text{Standard deviation} = \sqrt{\frac{1164,4}{10}}$$

$$= 10,79$$

OR

$$\text{Standard deviation} = 10,79$$

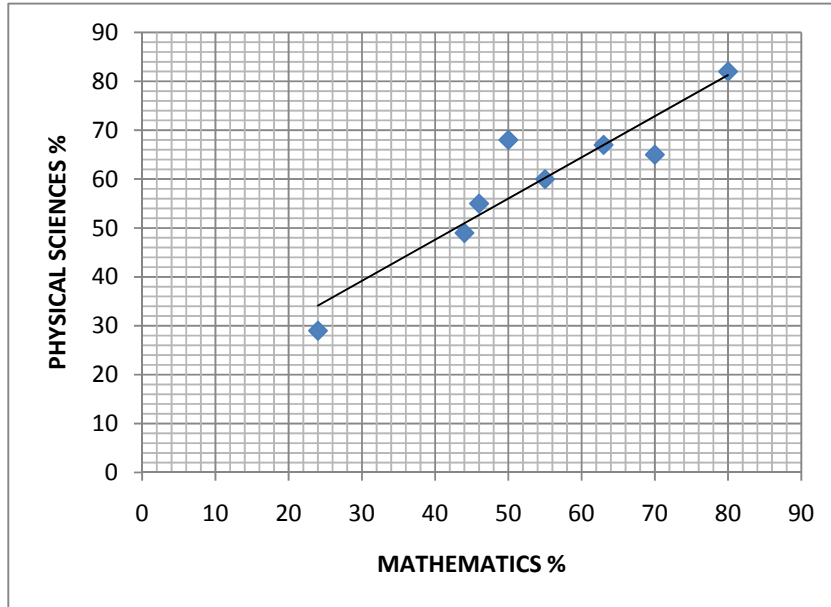
(3)

1.3 From 47,4 – 10,79 to 47,4 + 10,79
 From 36,61 to 58,19

$$\frac{5}{10} \times 100\% = 50\%$$

✓ 36,61 to
 58,19
 ✓ 5
 ✓ answer

(3)
[8]

QUESTION 2**2.1 MATHEMATICS AND PHYSICAL SCIENCES
PERCENTAGES OF LEARNERS**

- ✓ 4 points potted
- ✓ remaining 4 point plotted

(2)

2.2 Yes. The trend shows a positive correlation

- ✓ yes
- ✓ positive correlation (2)

2.3 See Graph in 2.1

- ✓ correct line (1)

2.4 Mathematics % \approx 38%
Accept answers from 36% to 40%

- ✓ answer
- ✓ answer (2)

[7]

QUESTION 3

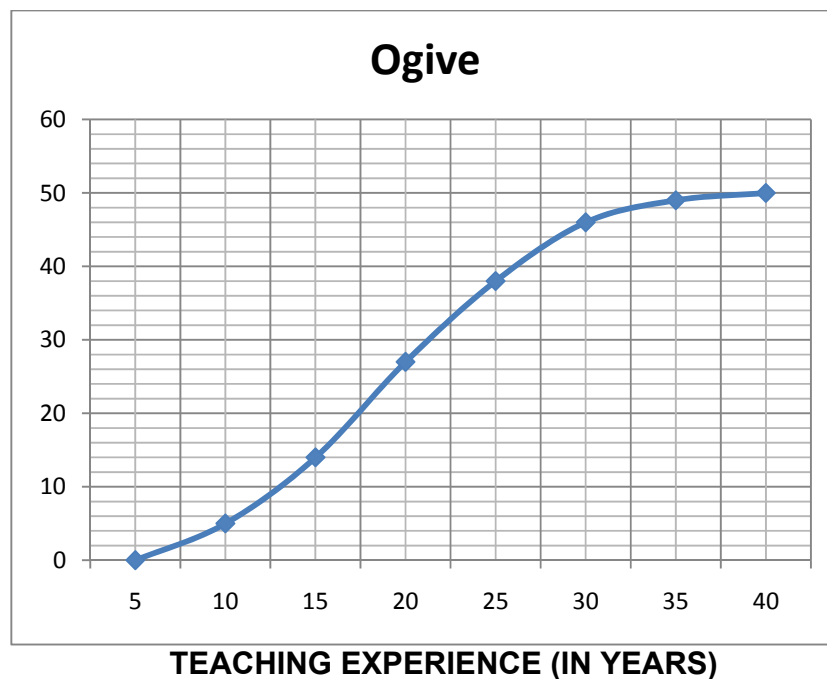
3.1

TEACHING EXPERIENCE (IN YEARS)	FREQUENCY	CUMULATIVE FREQUENCY
	5	5
	9	14
	13	27
	11	38
	8	46
	3	49
	1	50

- ✓ frequency
- ✓ cumulative frequency

(2)

3.2



- ✓ points at upper limits
- ✓ grounding
- ✓ shape

(3)

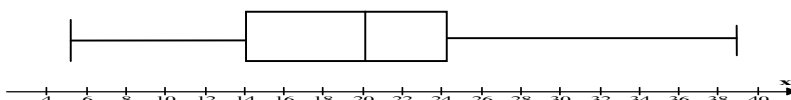
3.3

Min = 5
 $Q_1 \approx 14$
 $Q_2 \approx 20$
 $Q_3 \approx 24$
 Max = 39

- ✓ min and max
- ✓ Q_1
- ✓ Q_2
- ✓ Q_3

(4)

3.4



- ✓ min. and max.
- ✓ box with median

(2)

3.5 Skewed to the left/ negatively skewed

✓ answer (1)
[12]**QUESTION 4**

$$4.1 \quad m_{PQ} = \frac{6-4}{1+3}$$

$$m_{PQ} = \frac{1}{2}$$

✓ substitution
✓ answer (2)

$$4.2 \quad M_{QS} = \left(\frac{1+2}{2}, \frac{6+1}{2} \right)$$

$$\therefore M_{QS} = \left(\frac{3}{2}, \frac{7}{2} \right)$$

✓ x-value
✓ y-value (2)

$$4.3 \quad \frac{3}{2} = \frac{-3+a}{2}$$

$$a = 6$$

$$\frac{7}{2} = \frac{4+b}{2}$$

$$b = 3$$

$$R(6;3)$$

$$\text{OR}$$

✓ substitution
✓ a = 6
✓ b = 3 (3)

$$m_{PQ} = m_{RS}$$

$$b = 1 + 2 \quad \text{and} \quad a = 2 + 4$$

$$b = 3 \quad \text{and} \quad a = 6$$

✓ $m_{PQ} = m_{RS}$
✓ a = 6
✓ b = 3
answer only:
full marks. (3)

$$4.4 \quad m_{RS} = \frac{1}{2} \quad (PQ \parallel RS)$$

$$y - 1 = \frac{1}{2}(x - 2)$$

$$y = \frac{1}{2}x$$

OR

$$y = mx + c$$

$$1 = \frac{1}{2}(2) + c$$

$$c = 0$$

$$y = \frac{1}{2}x$$

✓ $m_{RS} = \frac{1}{2}$
✓ correct
formula
✓ substitution
✓ answer (4)✓ correct
formula
✓ substitution
✓ c = 0
✓ answer (4)

$$\begin{aligned}
 4.5 \quad m_{OP} &= -\frac{4}{3} & \checkmark \tan P\hat{O}X &= -\frac{4}{3} \\
 \tan P\hat{O}X &= -\frac{4}{3} & \checkmark P\hat{O}X &= 126,87^\circ \\
 P\hat{O}X &= 126,87^\circ & \checkmark m_{OR} &= \frac{1}{2} \\
 m_{OR} &= \frac{1}{2} & \checkmark R\hat{O}X &= 26,57^\circ \\
 \tan R\hat{O}X &= \frac{1}{2} & \checkmark \text{answer} & \\
 R\hat{O}X &= 26,57^\circ & & \\
 P\hat{O}S &= 126,87^\circ - 26,57^\circ & & \\
 P\hat{O}S &= 100,30^\circ & & (5)
 \end{aligned}$$

$$\begin{aligned}
 4.6 \quad PQ &= \sqrt{(1+3)^2 + (6-4)^2} & \checkmark \text{substitution} \\
 PQ &= \sqrt{20} & \checkmark PQ &= \sqrt{20} \\
 PS &= \sqrt{(2+3)^2 + (1-4)^2} & \checkmark \text{substitution} \\
 RS &= \sqrt{34} & \checkmark PS &= \sqrt{34} \\
 PQRS &\text{ is not a rhombus as sides are not equal} & \checkmark \text{not a rhombus} & \\
 & & & (5) \\
 & & & [21]
 \end{aligned}$$

QUESTION 5

$$\begin{aligned}
 5.1 \quad BC &= \sqrt{(-1+1)^2 + (26-1)^2} & \checkmark BC &= 25 \\
 BC &= 25 & \checkmark \text{Pythagoras} & \\
 AB^2 &= 25^2 - 20^2 & \checkmark AB &= 15 \\
 AB &= 15 & \checkmark \tan \theta &= \frac{20}{15} \\
 \tan \theta &= \frac{20}{15} & & (4)
 \end{aligned}$$

$$\begin{aligned}
 5.2 \quad r &= 15 \text{ and Centre } (-1;1) & \checkmark r &= 15 \\
 (x+1)^2 + (y-1)^2 &= 15^2 & \checkmark \text{substitution} & \\
 \text{or } (x+1)^2 + (y-1)^2 &= 225 & \checkmark \text{substitution} & (3)
 \end{aligned}$$

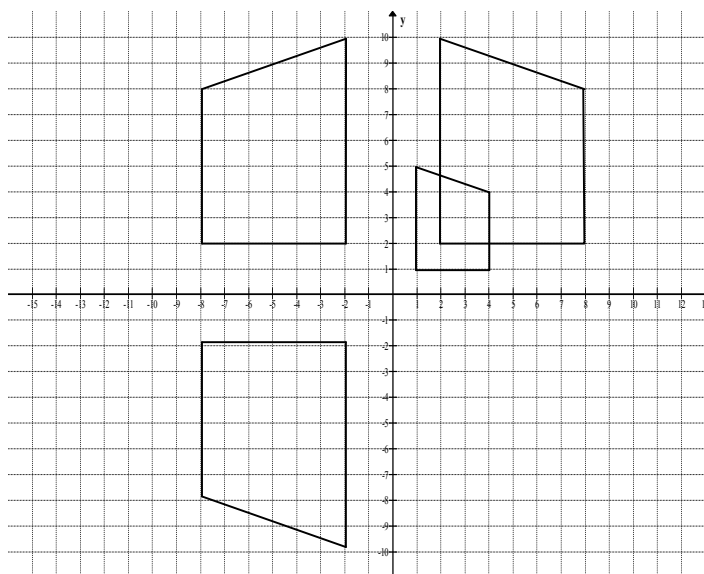
$$\begin{aligned}
 5.3 \quad m_{CR} &= \tan \theta & \checkmark m_{CR} &= \tan \theta \\
 m_{CR} &= \frac{20}{15} & \checkmark m_{CR} &= \frac{4}{3} \\
 m_{CR} &= \frac{4}{3} & & \\
 y - 26 &= \frac{4}{3}(x + 1) & \checkmark \text{substitution} & \\
 3y &= 4x + 82 & \checkmark \text{answer} & \\
 y &= \frac{4}{3}x + 27\frac{1}{3} & & (4)
 \end{aligned}$$

- 5.4 $m_{AB} = -\frac{3}{4}$ (rad. is perp. to tan.) ✓ $m_{AB} = -\frac{3}{4}$
- $$y - 1 = -\frac{3}{4}(x + 1)$$
- $$4y = -3x + 1$$
- $$y = -\frac{3}{4}x + \frac{1}{4}$$
- ✓ substitution
✓ answer (3)
- 5.5 $\frac{4}{3}x + 27\frac{1}{3} = -\frac{3}{4}x + \frac{1}{4}$ ✓ equating
- $$16x + 328 = -9x + 3$$
- $$x = -13$$
- $$y = 10$$
- $$A(-13; 10)$$
- ✓ simplification
✓ $x = -13$
✓ $y = 10$ (4)
[18]

QUESTION 6

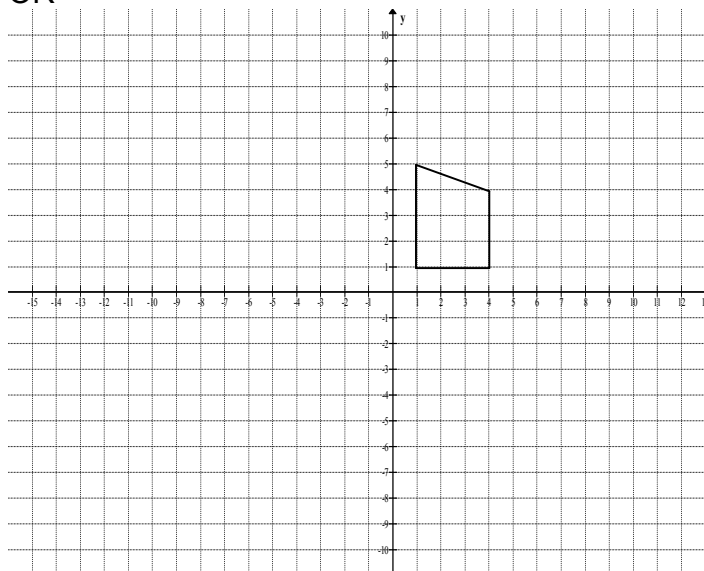
- 6.1 6.1.1 $E'(1; -5)$ ✓ x-value
✓ y-value (2)
- 6.1.2 $E'(0; 1)$ ✓ x-value
✓ y-value (2)
- 6.1.3 $E'(1; 5)$ ✓ x-value
✓ y-value (2)
- 6.2 6.2.1 $(x; y) \rightarrow (x; -y) \rightarrow (-x; y) \rightarrow (-\frac{1}{2}x; \frac{1}{2}y)$ ✓ x
✓ $-y$
✓ $-x$
✓ y
✓ $-\frac{1}{2}x$
✓ $\frac{1}{2}y$ (6)

6.2.2



- ✓ reflection about the line $y = 0$
 - ✓ rotation through 180°
 - ✓ reduction
- (3)

OR



- ✓ two correctly plotted points
- ✓ remaining two points
- ✓ shape

NB: CA from 6.2.1 must apply.

(3)

6.2.3 Transformation of REAL to $R'''E'''A'''L'''$ is not rigid since the size changes.

- ✓ not rigid
 - ✓ size changes
- (2)

6.2.4 Perimeter of $R'''E'''A'''L''' = \frac{1}{2} p$ units
Area of $R'''E'''A'''L''' = \frac{1}{4} q^2$ square units

- ✓ perimeter $\frac{1}{2} p$
 - ✓ area $\frac{1}{4} q^2$
- (3)

[20]

QUESTION 7

7.1 $x' = x\cos\theta + y\sin\theta$

$p = -4\cos 120^\circ + q\sin 120^\circ$

$p = 2 + \frac{\sqrt{3}}{2}q \quad (1)$

$y' = y\cos\theta - x\sin\theta$

$2 = q\cos 120^\circ + 4\sin 120^\circ$

$2 = -\frac{1}{2}q + 4\left(\frac{\sqrt{3}}{2}\right)$

$q = 4\sqrt{3} - 4 \quad (2)$

$p = 2 + \frac{\sqrt{3}}{2}(4\sqrt{3} - 4)$

$p = 8 - 2\sqrt{3}$

OR

$x\cos\theta - y\sin\theta$

$p = -4\cos(-120^\circ) - q\sin(-120^\circ)$

$p = 2 + \frac{\sqrt{3}}{2}q \quad (1)$

$y' = y\cos\theta + x\sin\theta$

$2 = q\cos(-120^\circ) + 4\sin(-120^\circ)$

$2 = -\frac{1}{2}q + 4\left(\frac{\sqrt{3}}{2}\right)$

$q = 4\sqrt{3} - 4 \quad (2)$

$p = 2 + \frac{\sqrt{3}}{2}(4\sqrt{3} - 4)$

$p = 8 - 2\sqrt{3}$

✓ substitution

✓ $p = 2 + \frac{\sqrt{3}}{2}q$

✓ substitution

✓ $q = 4\sqrt{3} - 4$

✓ $p = 8 - 2\sqrt{3} \quad (5)$

✓ substitution

✓ $p = 2 + \frac{\sqrt{3}}{2}q$

✓ substitution

✓ $q = 4\sqrt{3} - 4$

✓ $p = 8 - 2\sqrt{3}$

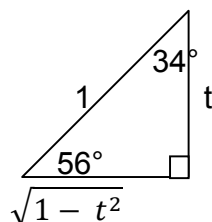
(5)
[5]

QUESTION 8

8.1 8.1.1 $\sin(-236^\circ) = \sin 56^\circ$
 $= t$

✓ $\sin 56^\circ$ ✓ $t \quad (2)$

8.1.2



✓ correct diagram

✓ $\cos 56^\circ$ ✓ answer (3)

$$\sin 34^\circ = \cos 56^\circ$$
$$= \sqrt{1 - t^2}$$

OR

$$\sin 34^\circ = \cos 56^\circ$$
$$= \sqrt{1 - \sin^2 56^\circ}$$
$$= \sqrt{1 - t^2}$$

✓ $\cos 56^\circ$ ✓ $\sqrt{1 - \sin^2 56^\circ}$ ✓ answer (3)

$$\begin{aligned}
 8.1.3 \quad \cos 4^\circ &= \cos (60^\circ - 56^\circ) \\
 &= \cos 60^\circ \cos 56^\circ + \sin 60^\circ \sin 56^\circ \\
 &= \frac{1}{2} \cdot \sqrt{1-t^2} + \frac{\sqrt{3}}{2} \cdot t
 \end{aligned}$$

- ✓ $60^\circ - 56^\circ$
- ✓ Expansion
- ✓ substitution
- ✓ substitution

(4)

$$\begin{aligned}
 8.2 \quad \frac{\sin(P+Q)}{\cos P \cos Q} &= \frac{\sin P \cos Q + \cos P \sin Q}{\cos P \cos Q} \\
 &= \frac{\sin P}{\cos P} + \frac{\sin Q}{\cos Q} \\
 &= \tan P + \tan Q \\
 &= 1 + 2 \\
 &= 3
 \end{aligned}$$

- ✓ $\sin P \cos Q + \cos P \sin Q$
- ✓ $\frac{\sin P}{\cos P} + \frac{\sin Q}{\cos Q}$

- ✓ $\tan P + \tan Q$

- ✓ answer

(4)
[13]

QUESTION 9

$$\begin{aligned}
 9.1 \quad \frac{\cos(x - 180^\circ) \cdot \tan x \cdot \sin 538^\circ}{\sin(180^\circ - 2x) \cdot \cos 92^\circ} \\
 &= \frac{-\cos x \cdot \frac{\sin x}{\cos x} \cdot \sin 2^\circ}{\sin 2x \cdot (-\sin 2^\circ)} \\
 &= \frac{\sin x}{2 \sin x \cos x} \\
 &= \frac{1}{2 \cos x}
 \end{aligned}$$

- ✓ $-\cos x$
- ✓ $\frac{\sin x}{\cos x}$
- ✓ $\sin 2^\circ$
- ✓ $\sin 2x$
- ✓ $-\sin 2^\circ$

- ✓ $2 \sin x \cos x$

- ✓ answer

(7)

$$\begin{aligned}
 9.2 \quad 9.2.1 \quad \text{LHS} &= \frac{\sin^2 x}{\frac{\cos x - \cos^2 x}{1 - \cos^2 x}} \\
 &= \frac{\cos x(1 - \cos x)}{(1 + \cos x)(1 - \cos x)} \\
 &= \frac{\cos x(1 - \cos x)}{1 - \cos^2 x} \\
 &= \frac{1 + \cos x}{\cos x} = \text{RHS}
 \end{aligned}$$

- ✓ $1 - \cos^2 x$
- ✓ $\cos x(1 - \cos x)$
- ✓ $(1 + \cos x)(1 - \cos x)$

- ✓ answer

(4)

$$\begin{aligned}
 9.2.2 \quad x &= 0^\circ \\
 x &= 90^\circ
 \end{aligned}$$

- ✓ $x = 0^\circ$
- ✓ $x = 90^\circ$

(2)

$$\begin{aligned}
 9.3 \quad \cos 2x - 2 \sin 2x &= -1 \\
 2 \cos^2 x - 1 - 4 \sin x \cos x &= -1 \\
 2 \cos x (\cos x - 2 \sin x) &= 0 \\
 \cos x = 0 \text{ or } 2 \sin x &= \cos x \\
 \cos x = 0 \text{ or } \tan x &= 0,5 \\
 x = 90^\circ + k \cdot 360^\circ \\
 \text{or} \\
 x = 270^\circ + k \cdot 360^\circ \text{ or} \\
 x = 26,57^\circ + k \cdot 180^\circ \\
 (k \in \mathbb{Z})
 \end{aligned}$$

- ✓ $2 \cos^2 x - 1$
- ✓ $4 \sin x \cos x$
- ✓ factors
- ✓ $\cos x = 0$
- ✓ $\tan x = 0,5$
- ✓ $90^\circ + k \cdot 360^\circ$
- ✓ $270^\circ + k \cdot 360^\circ$
- ✓ $26,57^\circ + k \cdot 180^\circ$
- ✓ $k \in \mathbb{Z}$

(9)
[22]

QUESTION 10

$$10.1 \quad \frac{LM}{\sin 11,8^\circ} = \frac{30}{\sin 150^\circ}$$

$$LM = 60 \sin 11,8^\circ$$

$$\tan \theta = \frac{KL}{LM}$$

$$KL = LM \tan \theta$$

$$KL = 60 \tan \theta \sin 11,8^\circ$$

- ✓ $11,8^\circ$
- ✓ subst. in sine rule
- ✓ $LM = 60 \sin 11,8^\circ$
- ✓ $\tan \theta = \frac{KL}{LM}$
- ✓ answer

(5)

$$10.2 \quad KL = 60 \tan \theta \sin 11,8^\circ$$

$$KL = 60 \tan 52,7^\circ \cdot \sin 11,8^\circ$$

$$KL = 16,11 \text{ m}$$

- ✓ substitution
- ✓ answer

(2)

$$10.3 \quad \text{area of } \triangle LMN = \frac{1}{2} (30)(12,27) \sin 18,2^\circ$$

$$= 57,49 \text{ m}^2$$

- ✓ substitution
- ✓ answer

(2)

[9]

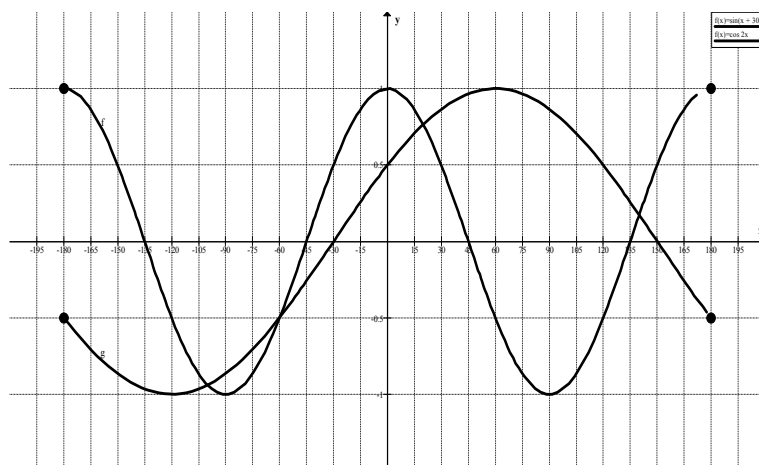
QUESTION 11

$$11.1 \quad 180^\circ$$

- ✓ answer

(1)

11.2



- ✓ $\sin(x + 30^\circ)$
- ✓ x-intercepts
- ✓ y-intercept
- ✓ amplitude
- ✓ $\cos 2x$
- ✓ x-intercept
- ✓ y-intercept
- ✓ amplitude

(6)

$$11.3 \quad 4$$

- ✓ answer

(1)

$$11.4 \quad f(x) = \sin(x - 30^\circ)$$

$$g(x) = \cos 2x + 2$$

- ✓ $\sin(x - 30^\circ)$
- ✓ $\cos 2x + 2$

(2)

$$11.5 \quad 2$$

- ✓ answer
- ✓ answer

(2)

$$11.6 \quad -90^\circ < x < 0^\circ$$

$$\text{OR}$$

$$x \in (-90^\circ; 0^\circ)$$

- ✓ values
- ✓ notation

(2)

[15]**TOTAL: 150**