This memorandum consists of 12 pages.
QUESTION 1

| 1.1 | $AC = \sqrt{(-5 - 3)^2 + (-3 - 9)^2}$  
     | $= \sqrt{64 + 144}$  
     | $= \sqrt{208}$  
     | ✓ substitution  
     | ✓ simplification  
     | ✓ answer | (3) |
| 1.2 | Midpoint is $\left( \frac{-5 + 3}{2}; \frac{-3 + 9}{2} \right)$  
     | $M(-1 ; 3)$  
     | ✓ substitution  
     | ✓ answer | (2) |
| 1.3 | $m_{AC} = \frac{9 + 3}{3 + 5} = \frac{3}{2}$  
     | ✓ substitution  
     | ✓ answer | (2) |
| 1.4 | $\therefore m_{BN} = \frac{2}{3}$  
     | $y = \frac{2}{3}x + c$  
     | ✓ gradient of BN  
     | ✓ substitution of point | (3) |
     | Subst. (7 ; 2) :  
     | $2 = \frac{2}{3}(7) + c$  
     | $2 = \frac{-14}{3} + c$  
     | $c = \frac{20}{3}$  
     | ✓ equation | |
     | $y = \frac{2}{3}x + \frac{20}{3}$  
     | ✓ substitution of point | |
| 1.5 | $BN = \sqrt{(7 - 1)^2 + (2 - 6)^2}$  
     | $= \sqrt{36 + 16}$  
     | $= \sqrt{52}$  
     | ✓ substitution  
     | ✓ answer | (4) |
     | Area $\triangle ABC$  
     | $= \frac{1}{2} \cdot AC \cdot BN$  
     | $= \frac{1}{2} \cdot \sqrt{208} \cdot \sqrt{52}$  
     | $= \frac{1}{2} \cdot \sqrt{10816}$  
     | $= 52$ square units  
     | ✓ substitution into area formula  
     | ✓ answer | (4) |
1.6 Let $\alpha$ be the inclination of $AC$ and $\beta$ be the inclination of $AB$.

\[
m_{AC} = \frac{3}{2}
\]
\[
\therefore \tan \alpha = 1.5
\]
\[
\alpha \approx 56.30^\circ
\]
\[
m_{AB} = \frac{5}{12}
\]
\[
\therefore \beta \approx 22.61^\circ
\]
\[
\therefore \angle CAB = 56.3^\circ - 22.6^\circ \approx 33.7^\circ
\]
\[
\text{OR}
\]
\[
\theta = \tan^{-1}(\frac{3}{2}) - \tan^{-1}(\frac{5}{12})
\]
\[
\approx 33.7^\circ
\]
\[
\text{OR}
\]
\[
AN = \sqrt{(5 - 1)^2 + (-3 - 6)^2}
\]
\[
= \sqrt{117}
\]
\[
\tan \theta = \frac{\sqrt{52}}{\sqrt{117}}
\]
\[
\theta \approx 33.7^\circ
\]
## QUESTION 2

### 2.1
\[ r^2 = (3)^2 + (-4)^2 \]
\[ = 25 \]
\[ \therefore x^2 + y^2 = 25 \]

- subst \( (3 \; ; -4) \)
- simplification
- equation

### 2.2
radius = 5 units.
therefore \( AB = 10 \) units

- radius
- \( AB = 10 \)

### 2.3
\[(x - 3)^2 + (y + 4)^2 = 10^2 \]
\[ x^2 - 6x + 9 + y^2 + 8y + 16 = 100 \]
\[ x^2 - 6x + y^2 + 8y - 75 = 0 \]

- substitution
- expansion
- simplification

### 2.4
A is the image of B when B is rotated through an angle of 180º about the origin.

- rotation
- 180º about the origin

### 2.5
\[ m_{AB} = -4 - 0 \]
\[ \frac{3}{0} \]
\[ = \frac{-4}{3} \]

- substitution
- answer

### 2.6
\[ m_{BC} = \frac{3}{4} \] ... tangent \( \perp \) radius

Substitute \( (3 \; ; -4) \)
\[ -4 = \frac{3}{4}(3) + c \]
\[ -4 = \frac{9}{4} + c \]
\[ -16 = 9 + 4c \]
\[ c = -\frac{25}{4} \]
\[ \therefore y = \frac{3}{4}x - \frac{25}{4} \]

- gradient of tangent
- substitution
- simplification
- value of \( c \)
- equation

### 2.7
Substitute \( (k \; ; 1) \) into \[ y = \frac{3}{4}x - \frac{25}{4} \]
\[ 1 = \frac{3}{4}(k) - \frac{25}{4} \]
\[ 4 = 3k - 25 \]
\[ 29 = 3k \]
\[ k = \frac{29}{3} \]

- substitution
- simplification
- answer
### QUESTION 3

**3.1.1** Reflection about the y-axis.
- ✔ reflection
- ✔ y-axis

**3.1.2** Translation 3 units to the left and 6 units upwards.
- ✔ translation
- ✔ 3 left and 6 upwards

**3.1.3** Rotation about the origin through 90° in an anticlockwise direction.
- ✔ rotation
- ✔ 90° (anticlockwise direction)

**3.2.1** \((x; y) \rightarrow (2x; 2y)\)
- ✔ answer

**3.2.2 & 3.2.6**
- ✔ correct coordinates

**3.2.3** \(A'C' = 2\sqrt{5}\)
- ✔ ✔ answer

**3.2.4** Area of \(\triangle A'B'C' = 2^2 \times \text{Area of } \triangle ABC\)
- ✔ ✔ Area of \(\triangle ABC\)

\[= 4 \times \frac{3}{2}\]
\[= 6 \text{ square units}\]
- ✔ ✔ answer

**3.2.5** \(A''(-1 + 8; -2) = (7; -2)\)
- ✔ substitution
- ✔ ✔ answer
3.3.1 The coordinates for the image of C are
\[ (x \cos(60^\circ) - y \sin(60^\circ) ; y \cos(60^\circ) + x \sin(60^\circ)) \]
\[ = \left( x \left( \frac{1}{2} \right) - y \left( \frac{\sqrt{3}}{2} \right) ; y \left( \frac{1}{2} \right) + x \left( \frac{\sqrt{3}}{2} \right) \right) \]
\[ = \left( x \frac{\sqrt{3}y}{2} + y \frac{\sqrt{3}x}{2} \right) \]

\[ = \left( \frac{x}{2} - \frac{\sqrt{3}y}{2} ; \frac{y}{2} + \frac{\sqrt{3}x}{2} \right) \]

3.3.2
\[ \left( \frac{x}{2} - \frac{\sqrt{3}y}{2} ; \frac{y}{2} + \frac{\sqrt{3}x}{2} \right) \]
\[ = \left( -6 - 4\sqrt{3} - 4 - 6\sqrt{3} \right) \]
\[ = (-3 - 2\sqrt{3} ; 2 - 3\sqrt{3}) \]

**QUESTION 4**

4.1.1
\[ \frac{(\cos 30^\circ)(-\tan 30^\circ)(\sin 12^\circ)}{(-\tan 45^\circ)(\cos 258^\circ)} \]
\[ = \frac{\left( \frac{\sqrt{3}}{2} \right) \left( -\frac{1}{\sqrt{3}} \right) (\sin 12^\circ)}{(-1)(-\cos 78^\circ)} \]
\[ = \frac{\left( -\frac{1}{2} \right) (\sin 12^\circ)}{(-1)(-\sin 12^\circ)} \]
\[ = \frac{-1}{2} \]

4.1.2
\[ \frac{\sin 2x \cos x}{2 \sin x} - (-\tan x)(-\cos x)(-\sin(720^\circ + x)) \]
\[ = \frac{2 \sin x \cos x \cos x}{2 \sin x} + \left( \frac{\sin x}{\cos x} \right)(\cos x)(\sin x) \]
\[ = \cos^2 x + \sin^2 x \]
\[ = 1 \]
### QUESTION 5

**5.1.1**

\[ \tan x = \frac{\sqrt{1 - t}}{\sqrt{t}} \]

\[ \begin{array}{c}
\text{Sketch} \\
\text{Answer}
\end{array} \]

**5.1.2**

\[ \sin 2x = 2 \sin x \cos x \]

\[ = 2 \left( \frac{\sqrt{1 - t}}{1} \right) \left( \frac{\sqrt{t}}{1} \right) \]

\[ = 2 \sqrt{t - t^2} \]

\[ \begin{array}{c}
\text{Expansion} \\
\text{Substitution} \\
\text{Answer}
\end{array} \]

**5.2.1**

\[ LHS = \frac{\sin x \cos x}{1 - \sin^2 x + \cos^2 x} \]

\[ = \frac{\sin x \cos x}{\cos^2 x + \cos^2 x} \]

\[ = \frac{\sin x \cos x}{2 \cos^2 x} \]

\[ = \frac{\sin x}{2 \cos x} \]

\[ = \frac{1}{2} \tan x \]

\[ \begin{array}{c}
\text{Identity} \\
\text{Adding Terms} \\
\text{Simplification} \\
\text{Identity}
\end{array} \]

**5.2.2**

\[ \frac{1}{2} \tan x = 0 \]

\[ \tan x = 0 \]

\[ x = 0^\circ + k.180^\circ; k \in \mathbb{Z} \]

\[ \begin{array}{c}
\text{Answer}
\end{array} \]
**QUESTION 6**

### 6.1

The functions $f$ and $g$ are shown on the graph.

- **f**:
  - Shape
  - Intercepts
  - Turning points

- **g**:
  - Shape
  - Intercepts
  - Turning points

### 6.2

\[
\cos 2x = 2 \sin x \\
1 - 2 \sin^2 x - 2 \sin x = 0 \\
2 \sin^2 x + 2 \sin x - 1 = 0 \\
\sin x = \frac{-2 \pm \sqrt{4 - 4(2)(-1)}}{2(2)} \\
\sin x = -1.366 \text{ (n/a)} \quad \text{or} \quad \sin x = 0.366 \\
\therefore x = 21.5^\circ \text{ or } x = 158.5^\circ
\]

- **Identity**
- **Quadratic equation**
- **Use of quadratic formula**
- **Solutions for \( \sin x \)**
- **Answer for \( x \)**

### 6.3

\[
x = 90^\circ
\]

- **Answer**

(1)

[13]
### QUESTION 7

#### 7.1

\[ \frac{\sin M}{e} = \frac{\sin 150^\circ}{f} \]
\[ \sin M = \frac{e \sin 30^\circ}{f} \]
\[ = \frac{e}{2f} \]
- using sin rule
- reduction
- special angle

(3)

#### 7.2.1

\[ \sin 55^\circ = \frac{50}{AC} \]
\[ \therefore AC = \frac{50}{\sin 55^\circ} \]
\[ AC = 61m \]
\[ \sin 48^\circ = \frac{50}{AD} \]
\[ \therefore AD = \frac{50}{\sin 48^\circ} \]
\[ AD = 67.3m \]
- ratio
- answer
- ratio
- answer

(4)

#### 7.2.2

\[ CD^2 = AC^2 + AD^2 - 2AC \cdot AD \cos 71^\circ \]
\[ = (61)^2 + (67.3)^2 - 2(61)(67.3) \cos 71^\circ \]
\[ = 5577.18 \]
\[ CD = 74.68 \]
- cosine rule
- substitution
- simplification
- answer

(5)

#### 7.2.3

Area of \( \triangle ACD = \frac{1}{2} AC \cdot AD \sin 71^\circ \)
\[ = \frac{1}{2} (61)(67.3) \sin 71^\circ \]
\[ = 1940.82 \ m^2 \]
- area rule
- substitution
- answer

(4) [16]
### QUESTION 8

| 8.1 | Median is 2 | ✓ answer | (1) |
| 8.2 | Upper quartile is 5  <br> Lower quartile is 1 | ✓ upper quartile  <br> ✓ lower quartile | (2) |
| 8.3 | Minimum value is 1 and maximum value is 51. | ✓ minimum and maximum  <br> ✓ box  <br> ✓ whisker | (3) |
| 8.4 | The data is positively skewed, that is the data is skewed to the right. There is no left whisker. This implies that of the countries that won gold medals at least 25% of them won only one. The long whisker on the right shows that some countries, namely China and the USA, performed exceptionally well in the Olympics. One could say that these countries could be considered as outliers in this context. | ✓ positively skewed  <br> ✓ explanation about whiskers | (2)  <br> [8] |

### QUESTION 9

| 9.1 & 9.2 | A quadratic function would best fit this data. | ✓ plotting points  <br> ✓ labels  <br> ✓ quadratic function  <br> ✓ line of best fit | (3)  <br> (2) |

![Consumer Price Index for month of June](chart.png)
9.3 | CPI for January 2008 is estimated at 9%. | ✓ answer close to 9% (1) [6]

QUESTION 10

10.1 | NOTE that candidates are urged to make use of available technology. By using a calculator $\sigma_n \approx 1.69$ (1,68518…) | ✓✓✓ answer (3)

10.2 | The standard deviation of 1.69 shows that there was a small variation in the maximum daily temperatures for the given period. This is confirmed by the fact that the range in the maximum temperatures is only 6°C for the period. | ✓ small variation (1) [4]

QUESTION 11

11.1 | AMOUNT SPENT ON AIRTIME (IN RANDS) | NUMBER OF TEENAGERS | CUMULATIVE FREQUENCY | ✓✓ correct totals in cumulative frequency column (2)
---|---|---|---
0 to less than 20 | 19 | 19
20 to less than 40 | 46 | 65
40 to less than 60 | 54 | 119
60 to less than 80 | 30 | 149
80 to less than 100 | 8 | 157
100 to less than 120 | 3 | 160

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### 11.2

**Amount spent on airtime in a certain month**

- 19 teenagers spent less than R20.
- 46 teenagers spent less than R40.
- 54 teenagers spent less than R60.
- 30 teenagers spent less than R80.
- 8 teenagers spent less than R100.
- 3 teenagers spent less than R120.

**Cumulative frequency distribution**

- 0 to less than 20: 19
- 20 to less than 40: 46
- 40 to less than 60: 54
- 60 to less than 80: 30
- 80 to less than 100: 8
- 100 to less than 120: 3

**Midpoint of interval**

- 0 to less than 20: 10
- 20 to less than 40: 30
- 40 to less than 60: 50
- 60 to less than 80: 70
- 80 to less than 100: 90
- 100 to less than 120: 110

**Teenagers × midpoint**

- 0 to less than 20: 190
- 20 to less than 40: 1380
- 40 to less than 60: 2700
- 60 to less than 80: 2100
- 80 to less than 100: 720
- 100 to less than 120: 330

**Sum:** 7420

**Mean:** $\frac{7420}{160} \approx R46.38$

- **Correct labels:** ✓
- **Correct points plotted:** ✓
- **Correctly answered:** 2

### 11.3

- About 92 learners spend R50 or less on airtime.

- **Answer read off from ogive:** ✓
- **Correctly answered:** 1

### 11.4

**Amount spent on airtime (in Rands)**

- Number of teenagers
- Midpoint of interval
- Teenagers × midpoint

<table>
<thead>
<tr>
<th>Amount spent on airtime (in Rands)</th>
<th>Number of teenagers</th>
<th>Midpoint of interval</th>
<th>Teenagers × midpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to less than 20</td>
<td>19</td>
<td>10</td>
<td>190</td>
</tr>
<tr>
<td>20 to less than 40</td>
<td>46</td>
<td>30</td>
<td>1380</td>
</tr>
<tr>
<td>40 to less than 60</td>
<td>54</td>
<td>50</td>
<td>2700</td>
</tr>
<tr>
<td>60 to less than 80</td>
<td>30</td>
<td>70</td>
<td>2100</td>
</tr>
<tr>
<td>80 to less than 100</td>
<td>8</td>
<td>90</td>
<td>720</td>
</tr>
<tr>
<td>100 to less than 120</td>
<td>3</td>
<td>110</td>
<td>330</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td></td>
<td><strong>7420</strong></td>
<td></td>
</tr>
</tbody>
</table>

- **Correct midpoint column:** ✓
- **Correct learners × midpoint column:** ✓
- **Correct mean:** ✓
- **Correctly answered:** 4

**TOTAL:** 150