This memorandum consists of 10 pages.
NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

**QUESTION 1**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>$\text{Mean} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{929}{19} = 48.89$</td>
<td>$\sqrt{929}$</td>
<td>19</td>
<td>$\checkmark$ answer</td>
<td>(2)</td>
</tr>
<tr>
<td>1.2</td>
<td>31 ; 31 ; 34 ; 36 ; 37 ; 39 ; 40 ; 43 ; 46 ; 46 ; 48 ; 52 ; 56 ; 60 ; 62 ; 63 ; 65 ; 66 ; 74.</td>
<td>$\checkmark$ arranging in ascending order</td>
<td>median</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median = 46</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Lower quartile = 37</td>
<td>$\checkmark$ lower quartile</td>
<td>$\checkmark$ upper quartile</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper quartile = 62</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td>$\checkmark$ box with median</td>
<td>$\checkmark$ whisker</td>
<td>(2)</td>
<td>[8]</td>
</tr>
</tbody>
</table>
QUESTION 2

2.1 The modal class is $2500 \leq x < 4500$

2.2

<table>
<thead>
<tr>
<th>Gross Vehicle Mass (GVM) (in kg)</th>
<th>Frequency</th>
<th>Midpoint</th>
<th>Frequency $\times$ midpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2500 \leq x &lt; 4500$</td>
<td>103</td>
<td>3500</td>
<td>360 500</td>
</tr>
<tr>
<td>$4500 \leq x &lt; 6500$</td>
<td>19</td>
<td>5500</td>
<td>104 500</td>
</tr>
<tr>
<td>$6500 \leq x &lt; 8500$</td>
<td>70</td>
<td>7500</td>
<td>525 000</td>
</tr>
<tr>
<td>$8500 \leq x &lt; 10500$</td>
<td>77</td>
<td>9500</td>
<td>731 500</td>
</tr>
<tr>
<td>$10500 \leq x &lt; 12500$</td>
<td>85</td>
<td>11500</td>
<td>977 500</td>
</tr>
<tr>
<td>$12500 \leq x &lt; 14500$</td>
<td>99</td>
<td>13500</td>
<td>1 336 500</td>
</tr>
<tr>
<td>Sum</td>
<td>453</td>
<td>4035 500</td>
<td></td>
</tr>
</tbody>
</table>

Estimated mean \(\overline{X} = \frac{4035 500}{453} = 8908.39\) kg.

2.3 The estimated mean. It is more at the centre of the data set. The modal class is found at the extreme left-hand side of the data set.

\[\checkmark\text{estimated mean with reason}\]

\[\checkmark\text{midpoints}\]

\[\checkmark\text{frequencies } \times \text{midpoint}\]

\[\checkmark\text{4 035 500}\]

\[\checkmark\text{answer}\]

\[\checkmark\text{2500 } \leq x < 4500\]

\[\checkmark\text{7} \tag{1}\]

\[\checkmark\text{7} \tag{7}\]
### QUESTION 3

![Graph showing points D(-3;3), E(3;-5), and F(-1;k)]

#### 3.1.1

\[ \text{DE} = \sqrt{(-3 - 3)^2 + (3 - (-5))^2} \]
\[ = \sqrt{100} \]
\[ = 10 \]

✓ substitution into distance formula
✓ answer

(2)

#### 3.1.2

\[ m_{DE} = \frac{-5 - 3}{3 - (-3)} \]
\[ = \frac{-4}{3} \]

✓ substitution into gradient formula
✓ answer

(2)

#### 3.1.3

\[ m_{EF} = \frac{3}{4} \quad \text{EF} \perp \text{DE} \]
\[ -5 - k = \frac{3}{4} \]
\[ -20 - 4k = 12 \]
\[ -4k = 32 \]
\[ k = -8 \]

✓ \( m_{EF} = \frac{3}{4} \)
✓ simplification
✓ \( k = -8 \)

(4)

#### 3.1.4

\[ M\left(\frac{-3 + (-1)}{2}; \frac{3 + (-8)}{2}\right) \]
\[ = \left(-2; \frac{-5}{2}\right) \]

✓ substitution into midpoint formula
✓ answer

(2)
3.1.5 If DEFG is a rectangle then M is also the midpoint of EG.
Let the coordinates of G be \((x ; y)\)

\[
\left(\frac{x + 3}{2} ; \frac{y + (-5)}{2}\right) = \left(-2 ; -\frac{5}{2}\right)
\]

\[
\frac{x + 3}{2} = -2 \quad \frac{y - 5}{2} = -\frac{5}{2}
\]

\[
x + 3 = -4 \quad \text{and} \quad y - 5 = -5
\]

\[
x = -7 \quad y = 0
\]

\[\therefore \text{G}(-7 ; 0)\]

**OR**

The translation that sends \(E(3 ; -5)\) to \(F(-1; -8)\) also sends \(D(-3 ; 3)\) to \(G\).

\((-1 ; -8) = (3 - 4 ; -5 - 3)\)

\[\therefore \text{G} = (-3 - 4 ; 3 - 3) = (-7 ; 0)\]

**OR**

The translation that sends \(E(3 ; -5)\) to \(D(-3 ; 3)\) also sends \(F(-1; -8)\) to \(G\).

\((-3 ; 3) = (3 - 6 ; -5 + 8)\)

\[\therefore \text{G} = (-1 - 6 ; -8 + 8) = (-7 ; 0)\]

3.2 \[\sqrt{(x-1)^2 + (5-(-2))^2} = \sqrt{53}\]

\[(x-1)^2 + 49 = 53\]

\[x^2 - 2x + 1 + 49 - 53 = 0\]

\[x^2 - 2x - 3 = 0\]

\[(x + 1)(x - 3) = 0\]

\[x = -1 \quad \text{or} \quad x = 3\]

but \(D\) is in the second quadrant

\[\therefore \text{only} \ x = -1 \text{ is valid}\]

\[\sqrt{x + 3}{2} = -2\]

\[\sqrt{x + 3}{2} = -7\]

\[\frac{y - 5}{2} = -\frac{5}{2}\]

\[\frac{y - 5}{2} = -\frac{5}{2}\]

\[\frac{y}{2} = 0\]
**QUESTION 4**

| 4.1.1  | \( \sin C = \frac{AB}{AC} \) | ✔️ AC  
| 4.1.2  | \( \cot A = \frac{AB}{BC} \) | ✔️ \( \cot A \)  
| 4.2    | \( \sin 60^\circ \cdot \tan 30^\circ \) \( \sec 45^\circ \)  
|        | \( \left( \frac{\sqrt{3}}{2} \right) \left( \frac{1}{\sqrt{3}} \right) \) \( \frac{1}{\sqrt{2}} \) \( \frac{\sqrt{2}}{2} \) \( \frac{1}{2} \times \frac{1}{\sqrt{2}} \) \( \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \) \( \frac{\sqrt{2}}{4} \) | ✔️ substitution ✔️ simplification ✔️ answer  
| 4.3.1  | \( r^2 = (-5)^2 + (12)^2 \) \( r^2 = 169 \) \( r = 13 \) \( \cos \theta = -\frac{5}{13} \) | ✔️ \( r^2 = (-5)^2 + (12)^2 \) ✔️ \( r = 13 \) ✔️ answer  
| 4.3.2  | \( \csc^2 \theta + 1 \)  
|        | \( \left( \frac{13}{12} \right)^2 + 1 \) \( \frac{169}{144} + 144 \) \( \frac{313}{144} \) | ✔️ \( = \frac{13}{12} \) ✔️ simplification ✔️ answer  

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### QUESTION 5

| 5.1.1 | $5 \cos x = 3$  
$\cos x = \frac{3}{5}$  
$x = \cos^{-1}\left(\frac{3}{5}\right)$  
$x = 53,1^\circ$ | ✓ $\cos x = \frac{3}{5}$  
✓ $x = 53,1^\circ$  
(2) |
| 5.1.2 | $\tan 2x = 1,19$  
$2x = \tan^{-1}(1,19)$  
$2x = 49,95845.....^\circ$  
$x = 25^\circ$ | ✓ $2x = 49,958....^\circ$  
✓ $x = 25^\circ$  
(3) |
| 5.1.3 | $4 \sec x - 3 = 5$  
$4 \sec x = 8$  
$\sec x = 2$  
$\frac{1}{\sec x} = \frac{1}{2}$  
$\cos x = \frac{1}{2}$  
$x = \cos^{-1}\left(\frac{1}{2}\right)$  
$x = 60^\circ$ | ✓ $\sec x = 2$  
✓ inverting both sides  
✓ $\cos x$  
✓ $x = 60^\circ$  
(4) |
| 5.2.1 | $\hat{JKD} = 8^\circ$ alternate angles | ✓ $\hat{JKD} = 8^\circ$  
(1) |
| 5.2.2 | $\tan 8^\circ = \frac{5}{DK}$  
$DK = \frac{5}{\tan 8^\circ}$  
$DK = 35,57684.....$ km  
$DK = 35,577$ m | ✓ $\tan 8^\circ = \frac{5}{DK}$  
✓ $DK = \frac{5}{\tan 8^\circ}$  
✓ $DK = 35,577$ m  
(3) |
| 5.2.3 | $DS = 35,58 - 8 = 27,58$ km | ✓ $DS = 35,58 - 8 = 27,58$ km  
(1) |
| 5.2.4 | $\tan D\hat{SJ} = \frac{5}{27,58}$  
$D\hat{SJ} = \tan^{-1}\left(\frac{5}{27,58}\right)$  
$D\hat{SJ} = 10,3^\circ$ | ✓ $\tan D\hat{SJ} = \frac{5}{27,58}$  
✓ $D\hat{SJ} = 10,3^\circ$  
(2)  
[16] |
QUESTION 6

6.1.1  

\[ y = 2 \tan x \]

\[ a = 4 \]

\[ \text{Range is } -2 \leq y \leq 6 \]
### QUESTION 7

**7.1.1**

\[ AH^2 = 0,8^2 + 1,5^2 \]
\[ AH = 1,7 \]

**7.1.2**

Surface area of roof = \( 4 \times \frac{1}{2} (3 \times 1,7) \)
\[ = 10,2 \text{ m}^2 \]

**7.1.3**

Surface area of walls = \( 4 \times 3 \times 2,1 \)
\[ = 25,2 \text{ m}^2 \]

Total surface area = \( 10,2 \text{ m}^2 + 25,2 \text{ m}^2 = 35,4 \text{ m}^2 \)

**7.2.1**

Volume = \( 4 \times \frac{4}{3} \pi (8)^3 \)
\[ = 2144,66 \text{ mm}^3 \]

**7.2.2**

New volume : original volume = \( 2^3 : 1 \)
\[ = 8 : 1 \]

**7.2.3**

Volume including silver = \( 4 \times \frac{4}{3} \pi (9)^3 \)
\[ = 3053,63 \text{ mm}^3 \]

Volume of silver = \( 3053,63 - 2144,66 \)
\[ = 908,97 \text{ mm}^3 \)

### QUESTION 8

**8.1**

OQ = 2 cm
\[ \ldots \text{(the long diagonal of a kite bisects the shorter diagonal)} \]

**8.2**

P\(\hat{O}\)Q = 90°
\[ \ldots \text{(the diagonals of a kite intersect at right angles)} \]

**8.3**

Q\(\hat{P}\)O = 20°
\[ \ldots \text{(the longer diagonal bisects the angles of a kite)} \]
\[ \therefore Q\hat{P}S = 20° + 20° = 40° \]
QUESTION 9

9.1

O is the midpoint of BD. .... (Diagonals of parm BCDE bisect each other)

F is the midpoint of OE. .... (Diagonals of parm AODE bisect each other)

∴ OF || AB .... (The line joining the midpoints of two sides in a Δ is || to third side)

9.2

AE || OD

∴ AE || OB .... (Opp sides of parm AODE are parallel)

OF || AB

∴ OE || AB .... (proven above)

∴ ABOE is a parallelogram .... (both pairs of opposite sides of quad are parallel)

9.3

In Δ ABO and Δ EOD

1. AB = EO ...(Opp sides of parm ABOE are equal)

2. AO = ED ...(Opp sides of parm AODE are equal)

3. BO = DO ...(Diagonals of parm BCDE bisect each other)

∴ Δ ABO ≡ Δ EOD (S, S, S)

O is the midpoint of BD
✓ reason – diagonals of parm
✓ F is the midpoint of OE
✓ reason – midpoint theorem

AE || OB
✓ reason

OE || AB
✓ reason – opp sides parallel

AB = EO
✓ AO = ED
✓ reason – opp sides are equal
✓ BO = DO
✓ reason – diagonals of parm

[5] [13]

TOTAL: 100