This memorandum consists of 15 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.

**QUESTION 1**

<table>
<thead>
<tr>
<th>1.1</th>
<th><img src="image" alt="Venn Diagram" /></th>
</tr>
</thead>
</table>
| 1.2 | $5 + 12 + 2 + x + 75 - x + 66 - x + 3 + 2 = 103$
$x = 62$

**Note:**
Although CA applies to the question, the candidate cannot have negative or fraction answers.

<table>
<thead>
<tr>
<th>1.3.1</th>
<th>$P(\text{only eats chicken and fish and no vegetables}) = \frac{4}{103}$</th>
</tr>
</thead>
</table>

| 1.3.2 | $P(\text{any two}) = \frac{12 + 4 + 13}{103} = \frac{29}{103}$

**Accept**

$P(\text{any two}) = \frac{91}{103}$

**Note:**
Although CA applies to the question, the candidate cannot have negative or value greater than 1.
**QUESTION 2**

| 2.1 | No. The chose a Wednesday morning, when most people are at work. This is not a reliable time to do a survey about customer satisfaction. Most supermarkets are not busy at this time. Only 130 customers of a possible very large sample were interviewed. This is a very small number in comparison to the total number of customers that use a supermarket in a week. | No ✓ ✓ acceptable reason |
|     | **Accept:** Yes, with a reasonable justification related to real life situations for example: very small rural community. | Yes ✓ ✓ acceptable reason (2) |
|     | **Note:** If the candidate answers YES or NO ONLY, then 0 / 2 marks. |

| 2.2 | \[
\frac{22}{100} \times 130 = 28,6 \quad \text{OR} \quad \frac{78}{100} \times 130 = 101,4 \\
130 - 101,4 = 28,6
\] | ✓ \(\frac{22}{100}\) or 22% ✓ 28 or 29 or 28,6 (2) |

|     | **Accept:** 28 or 29 |

| 2.3 | Choose a time when your store is busy, possibly Saturday or Sunday mornings. Interview more people to get a realistic point of view on customer service. Observe customer service over a longer period of time. Make use of questionnaires. | ✓ ✓ any two valid reasons (2) |

| **Note:** If yes in 2.1, the reasons must be relevant. | 6 |
QUESTION 3

3.1

\[
\frac{68}{100} \times 20000 = 13600
\]

OR

\[
\frac{66.7}{100} \times 20000 = 13340
\]

OR

\[
\frac{68.3}{100} \times 20000 = 13660
\]

✓ 68 or 66.7 or 68.3 or \( \frac{2}{3} \)
✓ answer

3.2

Lowest weight

\[
= 182 - 3(0.454)
\]

= 180,638 grams

Range = 183,362 – 180,638

= 2,724

OR

Range = 6 \times 0.454

= 2,724

Answer only: full marks

If candidate uses one or two standard deviations:

max 2 marks

✓ correct 3 sd
✓ lowest weight
✓ highest weight
✓ difference

✓ 6
✓ 0.454
✓ answer

Accept:

Range = 8 \times 0.454

= 3,632

[6]
QUESTION 4

4.1 Scatter plot showing resting heart rate vs heart rate after exercising

- All 12 points plotted correctly
- 7 – 11 points plotted correctly
- 2 – 6 points plotted correctly

4.2 $a = 25.23 \ (25.22587269\ldots)$
   $b = 0.81 \ (0.8143737166\ldots)$
   \[ \hat{y} = a + bx \]
   \[ \hat{y} = 25.23 + 0.81x \]

   **If using pen and paper method:**
   \[ \bar{x} = 71.25 \]
   \[ \bar{y} = 83.25 \]
   \[ a = 25.23 \ (25.22587269\ldots) \]
   \[ b = 0.81 \ (0.8143737166\ldots) \]
   \[ \hat{y} = a + bx \]
   \[ \hat{y} = 25.23 + 0.81x \]

   **Note:**
   If the line of best fit is drawn and its equation then calculated: 0 / 4 marks

4.3 $r = 0.898$
   \[ = 0.90 \ (0.8979098935\ldots) \]

4.4 It is a very strong positive relationship.

   **strong**
   **positive**

4.5 \[ \hat{y} = 25.23 + 0.81x \]
   \[ 86 = 25.23 + 0.81x \]
   \[ x = 75.024\ldots \]

   Resting heart rate could be 75 beats per minute.

   If $a$ and $b$ are not rounded off in the calculation,
   \[ x = 74.626 \ldots \]
   \[ x = 74.63 \]

   If candidate draws in the least square regression line and reads of $x$-value where $y = 86$: full marks

   **substitute**
   \[ \hat{y} = 86 \]

   **answer**
   \[ x = 74.63 \] [13]
**QUESTION 5**

<table>
<thead>
<tr>
<th></th>
<th>Number licence plates available</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>(21 \times 21 \times 21 \times 10 \times 10 \times 10)</td>
<td>21 (\times 10) (\times ) answer (\text{(3)})</td>
</tr>
<tr>
<td></td>
<td>(= 21^3 \times 10^3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(= 9 , 261,000)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>P(starting with Y)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>(\frac{1 \times 21 \times 21 \times 10 \times 10 \times 10}{21 \times 21 \times 21 \times 10 \times 10 \times 10})</td>
<td>21 (\times 10^3) (\text{(CA with 5.1)})</td>
</tr>
<tr>
<td></td>
<td>(= \frac{441,000}{926,100})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(= \frac{1}{21})</td>
<td>Answer only: full marks (\text{(3)})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>P(contains number 7)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3</td>
<td>(\frac{21 \times 21 \times 21 \times 1 \times 9 \times 9 + 21 \times 21 \times 21 \times 9 \times 1 \times 9 + 21 \times 21 \times 21 \times 9 \times 9 \times 1}{926,100})</td>
<td>3 (\times) denominator (\text{(3)})</td>
</tr>
<tr>
<td></td>
<td>(= \frac{243}{1000}) or 0.243</td>
<td>If did not multiply by 3: max 2 (\text{(3)})</td>
</tr>
</tbody>
</table>

**OR**

<table>
<thead>
<tr>
<th></th>
<th>P(contains number 7)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3</td>
<td>(\frac{1 \times 9 \times 9 + 9 \times 1 \times 9 + 9 \times 9 \times 1}{1000})</td>
<td>3 or 1(\times 9 \times 9 + 9 \times 1 \times 9 + 9 \times 9 \times 1) (\text{(3)})</td>
</tr>
<tr>
<td></td>
<td>(= \frac{243}{1000}) or 0.243</td>
<td>1.9.9 (\text{denominator})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number of unique number plates available with no repetition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4</td>
<td>(21 \times 20 \times 19 \times 10 \times 9 \times 8)</td>
<td>21 (\times 20 \times 19) (\text{(3)})</td>
</tr>
<tr>
<td></td>
<td>(= 5 , 745 , 600)</td>
<td></td>
</tr>
</tbody>
</table>

**OR**

<table>
<thead>
<tr>
<th></th>
<th>(^{21}P_3 \times ^{10}P_3)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4</td>
<td>(\frac{2! \times 10!}{18! \times 7!})</td>
<td>21 (P_3) (\text{(3)})</td>
</tr>
<tr>
<td></td>
<td>(= 5 , 745 , 600)</td>
<td>(10 \times 9 \times 8) (\text{answer})</td>
</tr>
</tbody>
</table>
## QUESTION 6

### 6.1

<table>
<thead>
<tr>
<th>$T_1$</th>
<th>$T_{1+1}$</th>
<th>$T_{2+1}$</th>
<th>$T_{3+1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>$3 - 4(1) + 5 = 4$</td>
<td>$4 - 4(2) + 5 = 1$</td>
<td>$1 - 4(3) + 5 = -6$</td>
</tr>
</tbody>
</table>

If $3 ; 0 ; -7 ; -18$ : max 2 marks

### 6.2

**Quadratic sequence.**

It adds a linear sequence to the preceding term.

**OR**

$$
\begin{align*}
3 & \quad 4 & \quad 1 & \quad -7 & \quad -6 \\
1 & \quad -3 & \quad 1 & \quad -4 & \quad -4
\end{align*}
$$

**Quadratic Sequence**

Constant second difference of $-4$

**OR**

**Recursive**

Need the previous term to calculate the next term

[3]

[5]
QUESTION 7

\[
\begin{align*}
\hat{D}_1 &= 33^\circ \quad (\angle \text{ in same segment}) \\
\hat{A}_E\hat{D} &= 90^\circ \quad \text{(given)} \\
\hat{A}_1 &= 57^\circ \quad (\angle \text{ sum } \triangle)
\end{align*}
\]

OR

\[
\begin{align*}
\hat{B}_C\hat{E} &= 90^\circ \quad \text{(given)} \\
\hat{B}_1 &= 57^\circ \quad (\angle \text{ sum } \triangle) \\
\hat{A}_1 &= 57^\circ \quad (\angle \text{ in same segment})
\end{align*}
\]

OR

\[
\begin{align*}
\text{DE} &= \text{EB} \quad \text{(line from circ cent } \perp \text{ ch bis ch)} \\
\text{AE} &= \text{common} \\
\hat{A}_E\hat{D} &= \hat{E}_1 = 90^\circ \quad \text{(given)} \\
\triangle AED &= \triangle AEB \quad \text{(SAS)} \\
\hat{A}_C\hat{B} &= 90^\circ \quad (\angle \text{s in semi-circle}) \\
\hat{A}_1 &= \hat{A}_2 = 57^\circ \quad (\angle \text{ sum } \triangle)
\end{align*}
\]

7.2

\[
\begin{align*}
\hat{D}_2 + \hat{D}_1 &= 57^\circ \quad (OD = OA = \text{radii}) \\
\hat{D}_2 &= 24^\circ
\end{align*}
\]

OR

\[
\begin{align*}
\hat{D}\hat{O}\hat{C} &= 114^\circ \quad (OD = OA = \text{radii}) \text{ OR } \angle \text{ at the centre theorem} \\
\hat{E}_2 &= 90^\circ \\
\hat{D}_2 &= 114^\circ - 90^\circ \\
&= 24^\circ
\end{align*}
\]
| 7.3 | \( \triangle ABC = 90^\circ \) (\( \angle \) in semi-circle) \( \hat{A}_2 = 57^\circ \) (\( \angle \) sum \( \triangle \)) \( = \hat{A}_1 \) AE bisects \( \triangle DAB \) |
| OR | DE = EB (line from circ centre bis ch) AE is common \( \hat{E}_1 = \hat{AEB} = 90^\circ \) (given) \( \triangle ADE \equiv \triangle ABE \) (SAS) \( \hat{A}_2 = \hat{A}_1 \) |

✓ \( \triangle ABC = 90^\circ \)
✓ \( \angle \) in semi-circle
✓ \( \hat{A}_2 = \hat{A}_1 \) or AE bisects \( \triangle DAB \)

(3)

✓ DE = EB (S/R)
✓ \( \triangle AED \equiv \triangle AEB \) (SAS)
✓ \( \hat{A}_2 = \hat{A}_1 \) or AE bisects \( \triangle DAB \)

(3)[8]
QUESTION 8

8.1 Draw diameter TP.
Join P to J.
\( \hat{T}_1 + \hat{T}_2 = 90^\circ \) (tan \( \perp \) diameter)
\( \hat{J}_1 + \hat{J}_2 = 90^\circ \) (\( \measuredangle \) in semi-circle)
\( \hat{J}_2 = \hat{T}_2 \) (\( \measuredangle \) in same seg)
TJK = \( \hat{T}_1 \)

OR

Draw radii OT and OK
Let \( x = \hat{T}_2 \) (\( \measuredangle \) opp = radii)
\( \hat{T}_1 = 90^\circ - x \) (rad \( \perp \) tan)
TOK = \( 180^\circ - 2x \) (\( \measuredangle \) sum \( \Delta \))
TJK = \( 90^\circ - x \) (\( \measuredangle \) circ cent)
TJK = \( \hat{T}_1 \) (= \( 90^\circ - x \))

NOTE:
If there is no construction: 0 / 5 marks
If candidate changes lettering and states “Similarly”: max full marks

OR

Draw GT extend to H. Draw tangent KH at K.
TH = KH (tan from comm pt)
\( \hat{K}_1 = \hat{T}_1 \) (\( \measuredangle \) opp = sides)
TOK = \( 2\hat{T}_1 \)JJK
(\( \measuredangle \) circ cent = \( 2\measuredangle \) circumf)
\( \hat{K}_1 + \hat{T}_2 = 90^\circ \) (tan \( \perp \) radius)
TOK = \( 180^\circ - (90^\circ - \hat{T}_1 + 90^\circ - \hat{K}_1) \)
\[ = \hat{T}_1 + \hat{K}_1 \]
\[ = \hat{T}_1 + \hat{T}_1 \]
\[ = 2\hat{T}_1 \]
\( \hat{T}_1 = \frac{1}{2} \hat{K}OT \)
\[ = \hat{T}\overline{JK} \)
OR

Construct OT, OJ and OK
\[ \hat{T}_1 = \hat{J}_1 = x \quad \text{(radii)} \]
\[ \hat{T}_2 = \hat{K}_1 = z \quad \text{(radii)} \]
\[ \hat{K}_2 = \hat{J}_2 = y \quad \text{(radii)} \]
\[ 2x + 2y + 2z = 180^\circ \quad (\angle \text{ sum } \Delta) \]
\[ x + y + z = 90^\circ \]
\[ x + y = 90^\circ - z \]

O\(\hat{T}H\) = 90° (rad \(\perp\) tan)
\[ \hat{T}_3 = 90^\circ - z \]
\[ = 90^\circ - (90^\circ - (x + y)) \]
\[ = 90^\circ - z \]
\[ = \text{TJK} \]
### 8.2

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8.2.1</strong></td>
<td>$\hat{B}_4 = x$</td>
<td>(tan chord theorem)</td>
</tr>
<tr>
<td></td>
<td>$\hat{A} = \hat{B}_4 = x$</td>
<td>(corres $\triangle$; BD $\parallel$ AO)</td>
</tr>
<tr>
<td></td>
<td>$\hat{B}_2 = x$</td>
<td>(BO = EO = radii)</td>
</tr>
<tr>
<td>Note:</td>
<td>$\hat{B}_4 = x$</td>
<td>tan chord theorem</td>
</tr>
<tr>
<td></td>
<td>$\hat{A} = \hat{B}_4 = x$ with reason</td>
<td>$\hat{B}_2 = x$</td>
</tr>
<tr>
<td></td>
<td>$\hat{B}_4 = x$</td>
<td>(proved in 8.2.2)</td>
</tr>
<tr>
<td><strong>8.2.2</strong></td>
<td>$\angle DBE = 90^\circ$</td>
<td>($\angle$ in semi-circle)</td>
</tr>
<tr>
<td></td>
<td>$\angle CBE = 90^\circ + x$</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>$\angle COB = 90^\circ$</td>
<td>(rad $\perp$ tan)</td>
</tr>
<tr>
<td></td>
<td>$\angle CBE = 90^\circ + x$</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>$\hat{O}_1 = 2x$</td>
<td>($\angle$ circ cent)</td>
</tr>
<tr>
<td></td>
<td>$\hat{B}_1 = \hat{D}_1 = 90^\circ - x$</td>
<td>(radii)</td>
</tr>
<tr>
<td></td>
<td>$\angle CBE = x + (90^\circ - x) + x$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 90^\circ + x$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\hat{O}_1 = 2x$</td>
<td>($\angle$ circ cent)</td>
</tr>
<tr>
<td></td>
<td>$\angle CBE = 90^\circ + x$</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>8.2.3</strong></td>
<td>$\angle DBE = 90^\circ$</td>
<td>(proved in 8.2.2)</td>
</tr>
<tr>
<td></td>
<td>$\angle BF0 = 90^\circ$</td>
<td>(co-int angles supp; BD $\parallel$ AO)</td>
</tr>
<tr>
<td></td>
<td>$BF = FE$</td>
<td>(line from circ cent $\perp$ ch bisect ch)</td>
</tr>
<tr>
<td></td>
<td>F is the midpoint of EB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\hat{D}BE = 90^\circ$</td>
<td>($\angle$ in semi-circle)</td>
</tr>
<tr>
<td></td>
<td>$\angle BF0 = 90^\circ$ and reason</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$BF = FE$</td>
<td>($\angle$ from circ cent $\perp$ ch bisect ch)</td>
</tr>
<tr>
<td></td>
<td>$\angle BF0 = 90^\circ$</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>OR</td>
<td>OD = OE (radii)</td>
<td>✓ OD = OE</td>
</tr>
<tr>
<td></td>
<td>BF = FE (BD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F is the midpoint of EB</td>
<td>✓ BF = FE</td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td>✓ BD</td>
</tr>
<tr>
<td>OR</td>
<td>BFO = EFO = 90° (BD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OF is common</td>
<td>✓ BO = OE</td>
</tr>
<tr>
<td></td>
<td>BO = OE (radii)</td>
<td>✓ ΔBOF ≡ ΔEOF</td>
</tr>
<tr>
<td></td>
<td>ΔBOF ≡ ΔEOF (90°HS)</td>
<td>✓ BF = FE</td>
</tr>
<tr>
<td></td>
<td>BF = FE (≡ Δs)</td>
<td>✓ line from circ cent ⊥ ch bisects ch</td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>OR</td>
<td>ˆB₂ = ˆA = x (proven)</td>
<td>✓ ΔAOB</td>
</tr>
<tr>
<td></td>
<td>ˆO₂ is common</td>
<td>✓ ABO = BFO</td>
</tr>
<tr>
<td></td>
<td>ΔAOB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABO = BFO</td>
<td>✓ line from circ cent ⊥ ch bisects ch</td>
</tr>
<tr>
<td></td>
<td>ABO = 90° (proven)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>ABO = BFO = 90°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BF = FE (line from circ cent ⊥ ch bisects ch)</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>DBE = 90° ((\angle) in semi-circle)</td>
<td>✓ DBE = 90°</td>
</tr>
<tr>
<td></td>
<td>ˆB₃ = 90° - x</td>
<td>✓ ˆF₁ = 90°</td>
</tr>
<tr>
<td></td>
<td>ˆO₂ = 90° - x (alt (\angle); BD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ˆF₁ = 90° ((\angle) sum Δ)</td>
<td>✓ line from circ cent ⊥ ch bisects ch</td>
</tr>
<tr>
<td></td>
<td>BF = FE (line from circ cent ⊥ ch bisects ch)</td>
<td>(4)</td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>In ΔOBF and ΔOEF</td>
<td>✓ OB = OE</td>
</tr>
<tr>
<td></td>
<td>1. OB = OE (radii)</td>
<td>✓ BFO = EFO = 90° (BD</td>
</tr>
<tr>
<td></td>
<td>2. BFO = EFO = 90° (BD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. ˆB₂ = ˆE (radii)</td>
<td>✓ BF = FE</td>
</tr>
<tr>
<td></td>
<td>ΔOBF ≡ ΔOEF (AAS)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>BF = FE</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.2.4</td>
<td>In ΔCBD and ΔCEB</td>
<td>✓ ˆE = ˆB₄ = x</td>
</tr>
<tr>
<td></td>
<td>1. ˆE = ˆB₄ = x (proven in 8.2.1)</td>
<td>✓ ˆC is common</td>
</tr>
<tr>
<td></td>
<td>Or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. ˆC is common</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>3. ˆD₄ = CBE = 90° + x</td>
<td>✓ ˆD₄ = CBE = 90° + x</td>
</tr>
<tr>
<td></td>
<td>ΔCBD</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.2.5 \[ \frac{EB}{BD} = \frac{CE}{CB} \quad \text{(sim \( \triangle \)s \( \therefore \) sides in proportion)} \]

\[ EB.CB = CE.BD \]

but \( EB = 2EF \) (F is the midpoint of BE)

\[ 2EF.CB = CE.BD \]

\[ \frac{EB}{BD} = \frac{CE}{CB} \checkmark \]

\[ EB.CB = CE.BD \checkmark \]

\[ EB = 2EF \checkmark \]

\[ \text{QUESTION 9} \]

9. \[ \hat{A} = \hat{D} \quad (\angle \text{ in same seg}) \]

\[ \hat{B} = \hat{C} \quad (\angle \text{ in same seg}) \]

\[ \hat{AEB} = \hat{DEC} \quad (\text{vert opp } \angle\text{s}) \]

\[ \Delta DEC \parallel\Delta AEB \quad (\angle \angle \angle) \]

\[ \frac{DE}{EC} = \frac{DC}{AE} = \frac{DC}{AB} \quad \text{(sides in prop)} \]

Let \( AC = 11a \)

\[ x = \frac{7a}{4a} = \frac{7}{4} \]

\[ x = 3.5a \]

\[ y = \frac{8}{7a} \]

\[ y = \frac{64}{7a} \]

\[ \text{If candidate proves similarity of two triangles: full marks.} \]

\[ \text{If candidate does not prove similarity max 3 marks. The triangles have to} \]

\[ \text{be in the correct order in order to be given 3 marks.} \]
QUESTION 10

10.1 \( \hat{M}EC = 90^\circ \) (tan \( \perp \) rad) 
\( \hat{M}DC = 90^\circ \) (line from cent bisects ch) 
\( \hat{M}EC + \hat{M}DC = 180^\circ \) 
\( \therefore \) MDCE a cyclic quad (opp \( \angle s \) of quad supplementary)

OR 
\( \hat{M}EC = 90^\circ \) (tan \( \perp \) rad) 
\( \hat{M}DA = 90^\circ \) (line from cent bisects ch) 
\( \hat{M}EC = \hat{M}DA \) 
\( \therefore \) MDCE a cyclic quad (ext \( \angle \) quad = int opp)

NOTE: If the word cyclic is used in the last reason: max 2 / 3 marks

10.2 \( MD^2 = MB^2 - DB^2 \) (Pythagoras; \( \triangle MBD \)) 
\( MC^2 = MD^2 + DC^2 \) (Pythagoras; \( \triangle MDC \)) 
\( = MB^2 - DB^2 + DC^2 \)

10.3 DB = 30 (given) 
MB = 40 (radii) 
\( MC^2 = (40)^2 + (50)^2 - (30)^2 \) 
\( = 3 \, 200 \) 
MC = 40\( \sqrt{2} \) = 56.57 
\( MC^2 = ME^2 + CE^2 \) (Pythagoras) 
\( CE^2 = 3 \, 200 - 1 \, 600 \) 
\( CE^2 = 1 \, 600 \) 
CE = 40 mm 

OR 
\( MC^2 = CE^2 + ME^2 - 2CE.ME \cos \hat{M}EC \) 
3200 = \( CE^2 + (40)^2 - 2CE.(40).\cos 90^\circ \) 
\( = CE^2 + 1600 \) 
\( CE^2 = 1600 \) 
CE = 40

\( \sqrt{ } \) MB = ME 
\( \sqrt{ } \) DB = 30 
\( \sqrt{ } \) MC = 40\( \sqrt{2} \) 
(3) 
\( \sqrt{ } \) MB = ME 
\( \sqrt{ } \) DB = 30 
\( \sqrt{ } \) MC = 40\( \sqrt{2} \) or MC = 56.57 
(4) 

\( \sqrt{ } \) cosine rule 
\( \sqrt{ } \) ME = 40 
\( \sqrt{ } \) MC = 3200 
(3) 
\( \sqrt{ } \) answer 
(4) 

TOTAL: 100