This memorandum consists of 14 pages.
NOTE:
- If a candidate answers a question TWICE and does not delete any attempt, 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.
- A learner cannot use what s/he must prove to prove it (i.e. the circular argument.).

QUESTION 1

1.1 \( T_{k+1} = T_k - 2 \); \( k \geq 1 \); \( T_1 = 12 \)

\[
\begin{align*}
T_1 &= 12 \\
T_2 &= 12 - 2 = 10 \\
T_3 &= 10 - 2 = 8 \\
T_4 &= 8 - 2 = 6
\end{align*}
\]

\( \checkmark 10 \)
\( \checkmark 8 \)
\( \checkmark 6 \)  \hspace{1cm} (3)

1.2 \( 12 + 10 + 8 + 6 + 4 + 2 + 0 + (-2) + (-4) + (-6) + (-8) + (-10) + (-12) = 0 \)

\( \therefore 13 \) terms

Note:
If a learner writes out
12 + 10 + 8 + 6 + 4 + 2 + 0 then 1/3 marks

Note:
Answer only: FULL marks

OR

There are 6 positive terms before the 7th term, which is 0. We need 6 negative terms of equal value to the positive terms so that the sum is zero

6 positive terms + 1 zero term + 6 negative terms
= 13 terms

\( \checkmark 12 \) terms

\( \checkmark 13 \) terms  \hspace{1cm} (3)

OR

\[
\begin{align*}
\frac{n}{2} [2(12) + (n-1)(-2)] &= 0 \\
\frac{n}{2} [24 + 2 - 2n] &= 0 \\
\frac{n}{2} [26 - 2n] &= 0 \\
13n - n^2 &= 0 \\
n(13 - n) &= 0 \\
n \neq 0 \quad \text{or} \quad n = 13
\end{align*}
\]

\( \checkmark \) substitution into the arithmetic sum formula

\( \checkmark \frac{n}{2} [26 - 2n] = 0 \)

\( \checkmark 13 \) terms  \hspace{1cm} (3)
**QUESTION 2**

<table>
<thead>
<tr>
<th>2.1</th>
<th>$42 - 28 = 14$</th>
<th>✓ answer (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Approximately 88 kg</td>
<td>✓ answer (1)</td>
</tr>
<tr>
<td><strong>NOTE:</strong></td>
<td>Accept a range from 86 to 89 kg</td>
<td>✓ Cumulative Frequency value read off the graph when less than 80 ✓ answer (2)</td>
</tr>
<tr>
<td>2.3</td>
<td>15 learners in the sample have a weight of less than 80 kg. One would expect $\frac{15}{50} \times 250 = 75$ learners in the grade to have a weight of less than 80 kg.</td>
<td>✓ Cumulative Frequency value read off the graph when less than 80 ✓ answer (2)</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td>15 learners in the sample have a weight of less than 80 kg. One would expect $15 \times 5 = 75$ learners in the grade to have a weight of less than 80 kg.</td>
<td>✓ Cumulative Frequency value read off the graph when less than 80 ✓ answer (2)</td>
</tr>
<tr>
<td><strong>NOTE:</strong></td>
<td>✓ sensible explanation of random sample (1) [5]</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Accept $\frac{14}{50} \times 250 = 70$</td>
<td>✓ answer (2)</td>
</tr>
<tr>
<td>-</td>
<td>Answer as percentage: 1/2 marks</td>
<td>✓ answer (2)</td>
</tr>
<tr>
<td>-</td>
<td>Answer only: 2/2 marks</td>
<td>✓ answer (2)</td>
</tr>
</tbody>
</table>

| 2.4  | This sampling method is biased towards those who arrive early on a Monday morning. In this way all the learners in the Grade do not have the same chance of being selected for the sample. | ✓ answer (3) [5] |

**QUESTION 3**

| 3.1  | For mutually exclusive events $P(A \text{ or } B) = P(A) + P(B)$ $0,7 = 0,4 + k$ $k = 0,3$ | ✓ 0,7 = 0,4 + $k$ ✓ answer (2) |
| **Note:** | Answer only: FULL marks | ✓ 0,7 = 0,4 + $k$ ✓ answer (2) |
| **NOTE:** | If the candidate writes down $k = 1 - 0,7 = 0,3$: 0/2 marks | ✓ 0,7 = 0,4 + $k$ ✓ answer (2) |

| 3.2  | For independent events $P(A \text{ and } B) = P(A) \cdot P(B)$ $0,4k$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,7 = 0,4 + k - 0,4k$ $0,3 = 0,6k$ $k = 0,5$ | ✓ $P(A \text{ and } B) = P(A) \cdot P(B)$ ✓ $0,4k$ ✓ answer (4) |
| **Note:** | ✓ $P(A \text{ and } B) = P(A) \cdot P(B)$ ✓ $0,4k$ ✓ answer (4) |
| **OR** | $0,7 = 0,4 + k - 0,4k$ $0,3 = 0,6k$ $k = 0,5$ | ✓ $0,7 = 0,4 + k - 0,4k$ ✓ answer (4) |
| - | Answer only: 1/4 marks | ✓ $0,7 = 0,4 + k - 0,4k$ ✓ answer (4) |
| - | Wrong formula: 0/4 marks | ✓ $0,7 = 0,4 + k - 0,4k$ ✓ answer (4) |
QUESTION 4

4.1 21 minutes is 1 standard deviation from the mean
\[ \therefore 34\% \text{ of the pizzas are delivered between 21 and 24 minutes} \]

**Note:** Answer only: FULL marks

4.2 15 minutes is 3 standard deviations to the left of the mean \[ \therefore 50\% \]
27 minutes is 1 standard deviation to the right of the mean \[ \therefore 34\% \]
84\% of the pizzas are delivered between 15 and 27 minutes

**Note:** Answer only: FULL marks

4.3 The required 2\% is the area found to the right of 2 standard deviations on the right hand side of the mean.
Maximum for delivery should be
\[ 24 + 2 \times (3) \]
\[ = 30 \text{ minutes} \]

**Note:** Answer only: FULL marks

QUESTION 5

5.1 Number of unique codes
\[ = 7 \times 7 \times 7 \]
\[ = 7^3 \]
\[ = 343 \]

**Note:** Answer only: FULL marks

5.2 Number of unique codes without repetition
\[ = 7 \times 6 \times 5 \]
\[ = 210 \]

**Note:** Answer only: FULL marks

5.3 Number of codes with repetition that are greater than 300 and divisible by 5
\[ = 4 \times 7 \times 2 \times 1 \]
\[ = 55 \]

**Note:**
- No CA marking for the answer.
- Answer only 3/3 marks

**OR**
For a 100 numbers there are 14 numbers divisible by 5
\[ 14 \times 4 = 56 \]
\[ 56 - 1 = 55 \]

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Please turn over
QUESTION 6

6.1

\[ M \]
\[ 79 - x \]
\[ \checkmark \]
\[ 20 \]
\[ 19 - x \]
\[ \checkmark \]
\[ 11 \]
\[ 16 \]
\[ \checkmark \]
\[ 40 - x \]
\[ S \]
\[ 0 \]

6.2

\[ 79 - x + 20 + x + 11 + 19 - x + 16 + 40 - x = 173 \]
\[ 185 - 2x = 173 \]
\[ \sqrt{x = 6} \]

**OR**

232 complaints and 173 people in total
94 complaints from 47 people
138 complaints from remaining 126 people
For the two to be equal
\[ 126 - x = 138 - 3x \]
\[ 2x = 12 \]
\[ x = 6 \]

**Note:** Check the reasonableness of the answer.

6.3

\[ P(\text{at least two complaints}) = \frac{11 + 20 + 6 + 16}{173} = \frac{53}{173} = 0.31 \] (0.30635838...)

**OR** 30.64%

**Note:** Check the reasonableness of the answer.
### QUESTION 7

<table>
<thead>
<tr>
<th>Noon temperature (in °C)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>7</th>
<th>7</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units of electricity used</td>
<td>37</td>
<td>36</td>
<td>32</td>
<td>33</td>
<td>32</td>
<td>28</td>
<td>27</td>
<td>23</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Scatter plot showing noon temperature vs electricity consumption

- All 9 points plotted correctly
- 2 marks if 5 – 8 points are plotted correctly
- 1 mark if 1 – 4 points are plotted correctly.

7.1 See scatter plot above

**Note:**
Please ignore the point (0 ; 41).
7.2  \( a = 40.97 \quad (40.97108844...) \)
\( b = -1.74 \quad (-1.736394558...) \)
\( \hat{y} = 40.97 - 1.74x \)

**Note:**
- Penalise 1 mark for incorrect rounding to ONE decimal place in either 7.2 or 7.3
- Answer only: FULL marks

**NOTE:**
If the candidate works the coefficients out manually that

\[ b = \frac{-204.2}{117.6} \]

then 2 marks for \( b \).

7.3  \( r = -0.97 \quad (-0.9699269087...) \)

**NOTE:** If the candidate gives \( b = \frac{6.139218}{3.42928} r \) and not simplified then 1 mark.

7.4  There is a strong negative correlation between the noon temperature and the units of electricity used.

**OR**
As the noon temperature increases, the units of electricity used decreases.

**OR**
As the noon temperature decreases, the units of electricity used increases.

7.5  \( \hat{y} \approx 40.97 - 1.74(8) \)
\( \approx 27.05 \)

**Note:**
- Answer only: 2/2 marks
- Accept a range of 26.5 – 27.5 if the least squares regression line is drawn and the answer is read off: 2/2 marks

\[ \hat{y} \approx 27.0799 \approx 27.08 \]
QUESTION 8

8.1 Draw diameter AM and join M to B.
\[ \hat{A}_1 + \hat{A}_2 = 90^\circ \quad (\text{rad} \perp \text{tangent}) \]
\[ \hat{B}_1 + \hat{B}_2 = 90^\circ \quad (\angle \text{s in a semi circle}) \]
\[ \hat{B}_2 = \hat{A}_2 \quad (\angle \text{s in same seg}) \]
\[ \hat{B}_1 = \hat{A}_1 \]

OR

Draw radii OC and OA
Let \( \hat{A}_2 = x \)
\[ \hat{C}_1 = x \quad (\angle \text{opp} = \text{radii}) \]
\[ \hat{A}_1 = 90^\circ - x \quad (\text{rad} \perp \text{tan}) \]
\[ \angle AOC = 180^\circ - 2x \quad (\angle \text{sum} \Delta) \]
\[ \angle ABC = 90^\circ - x \quad (\angle \text{circ cent} = 2 \angle \text{circumference}) \]
\[ ABC = \hat{A}_1 \quad (= 90^\circ - x) \]

NOTE:
If there is no construction: 0 / 5 marks

If candidate changes lettering and states “Similarly”: full marks

OR

Draw QA extend to P. Draw tangent CP at C.
PC = PA \quad (\text{tan from comm pt})
\[ \hat{C}_2 = \hat{A}_1 \quad (\angle \text{opp} = \text{sides}) \]
\[ \angle C\hat{O}\hat{A} = 2\hat{A}BC \]
(\angle \text{circ cent} = 2\angle \text{circumf})
\[ \hat{A}_1 + \hat{A}_2 = 90^\circ \quad (\text{tan} \perp \text{radius}) \]
\[ C\hat{O}\hat{A} = 180^\circ - (90^\circ - \hat{A}_1 + 90^\circ - \hat{C}_2) \]
\[ = \hat{A}_1 + \hat{C}_2 \]
\[ = \hat{A}_1 + \hat{A}_1 \]
\[ = 2\hat{A}_1 \]
\[ \hat{A}_1 = \frac{1}{2} \angle C\hat{O}\hat{A} \]
\[ = \angle C\hat{B}\hat{A} \]

OR

\[ \checkmark \text{construction} \]
\[ \checkmark \text{S/R} \]
\[ \checkmark \hat{B}_1 + \hat{B}_2 = 90^\circ \]
\[ \checkmark \angle \text{s in a semi circle} \]
\[ \checkmark \text{S/R} \]

\[ \checkmark \text{construction} \]
\[ \checkmark \hat{A}_1 = 90^\circ - x \]
\[ \checkmark \text{rad} \perp \text{tan} \]
\[ \checkmark \text{S/R} \]
\[ \checkmark \text{S/R} \]

\[ \checkmark \hat{A}_1 + \hat{A}_2 = 90^\circ \]
\[ \checkmark \text{tan} \perp \text{radius} \]
Draw diameter AM and Join M and C
\[ \hat{MCA} = 90^\circ \quad (\angle \text{s in semi circle}) \]
\[ \hat{AMC} + \hat{A}_2 = 90^\circ \quad (\angle \text{sum } \Delta) \]
\[ \hat{A}_1 + \hat{A}_2 = 90^\circ \quad (\text{rad } \perp \text{ tangent}) \]
\[ \hat{AMC} = \hat{A}_1 \]
\[ \hat{AMC} = \hat{B} \quad (\angle \text{s in same seg}) \]
\[ \hat{A}_1 = \hat{B} \]

\[ \hat{W} = 90^\circ \quad (\tan \perp \text{ radius}) \]

<table>
<thead>
<tr>
<th>8.2.1</th>
<th>[ \hat{WRS} = 90^\circ ] (tan \perp radius)</th>
<th>✓ statement</th>
</tr>
</thead>
</table>

8.2.2
\[ \hat{RST} = 50^\circ \quad (\text{tan ch th}) \]
\[ \hat{W} = 40^\circ \quad (\angle \text{sum } \Delta) \]

\textbf{OR}
\[ \hat{T}_1 = 90^\circ \quad (\angle \text{s in semi circle}) \]
\[ \hat{W} + \hat{R}_1 = \hat{T}_1 \quad (\text{ext } \angle \Delta) \]
\[ \hat{W} = 40^\circ \]

\[ \hat{R}_2 = 40^\circ \quad (\tan \perp \text{ radius}) \]
\[ \hat{P}_1 = 40^\circ \quad (\angle \text{s in same seg}) \]

| ✓ S/R |
| ✓ \(\hat{W} = 40^\circ\) |

| ✓ \(\hat{W} + \hat{R}_1 = \hat{T}_1\) |
| ✓ \(\hat{W} = 40^\circ\) |

| ✓ \(\hat{R}_2 = 40^\circ\) |
| ✓ \(\hat{P}_1 = 40^\circ\) |
| ✓ \(\angle \text{s in same seg}\) |
**8.2.4**

<table>
<thead>
<tr>
<th>Mathematics/P3</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
<td>NSC –</td>
</tr>
<tr>
<td>( \hat{P}_1 = \hat{W} ) ((= 40^\circ))</td>
<td>( \checkmark \hat{P}_1 = \hat{W} )</td>
</tr>
<tr>
<td>WVPT is a cyclic quadrilateral ( (\text{ext } \angle = \text{int opp}) )</td>
<td>( \checkmark \text{WVPT is a cyclic quadrilateral} )</td>
</tr>
<tr>
<td>( \hat{V}_1 = \hat{P}\hat{T}\hat{S} ) ((\text{ext } \angle \text{ cyclic quad}))</td>
<td>( \checkmark \text{ext } \angle = \text{in opp} )</td>
</tr>
<tr>
<td>OR</td>
<td>( \checkmark \text{ext } \angle \text{ cyclic quad} )</td>
</tr>
<tr>
<td>( \hat{T}_1 = 90^\circ ) ((\angle \text{s in semi circle}))</td>
<td>( \checkmark ) ( \angle \text{s in semi circle} )</td>
</tr>
<tr>
<td>( \hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2 )</td>
<td>( \checkmark \hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2 )</td>
</tr>
<tr>
<td>( \hat{T}_2 = \hat{S}_1 ) ((\angle \text{s in same seg}))</td>
<td>( \checkmark \hat{T}_2 = \hat{S}_1 )</td>
</tr>
<tr>
<td>( \hat{P}\hat{T}\hat{S} = 90^\circ + \hat{S}_1 )</td>
<td>( \checkmark \text{( \angle \text{s in same seg} )} )</td>
</tr>
<tr>
<td>( \hat{V}_1 = 90^\circ + \hat{S}_1 ) ((\text{ext } \angle \Delta))</td>
<td>( \checkmark \hat{V}_1 = 90^\circ + \hat{S}_1 )</td>
</tr>
<tr>
<td>( \hat{V}_1 = \hat{P}\hat{T}\hat{S} ) ((\text{ext } \angle \text{ cyclic quad}))</td>
<td>( \checkmark \text{ext } \angle \text{ cyclic quad} )</td>
</tr>
<tr>
<td>OR</td>
<td>( \text{(4)} )</td>
</tr>
<tr>
<td>( \hat{P}_2 = 140^\circ ) ((\angle \text{s on str line}))</td>
<td>( \checkmark \hat{W} + \hat{P}_2 = 180^\circ )</td>
</tr>
<tr>
<td>WVPT is cyclic quad ((\text{opp } \angle \text{s suppl}))</td>
<td>( \checkmark \text{WVPT is a cyclic quadrilateral} )</td>
</tr>
<tr>
<td>( \hat{V}_1 = \hat{P}\hat{T}\hat{S} ) ((\text{ext } \angle \text{ cyclic quad}))</td>
<td>( \checkmark \text{opp } \angle \text{ suppl} )</td>
</tr>
<tr>
<td>OR</td>
<td>( \checkmark \text{ext } \angle \text{ cyclic quad} )</td>
</tr>
<tr>
<td>( \hat{V}_1 = \hat{R}_1 + \hat{R}_2 + \hat{S}_1 ) ((\text{ext } \angle \Delta))</td>
<td>( \checkmark \hat{V}_1 = 90^\circ + \hat{S}_1 )</td>
</tr>
<tr>
<td>( \hat{V}_1 = 90^\circ + \hat{S}_1 )</td>
<td>( \checkmark \hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2 )</td>
</tr>
<tr>
<td>( \hat{T}_2 = \hat{S}_1 ) ((\angle \text{s in same seg}))</td>
<td>( \checkmark \hat{T}_2 = \hat{S}_1 )</td>
</tr>
<tr>
<td>( \hat{V}_1 = \hat{P}\hat{T}\hat{S} )</td>
<td>( \checkmark \text{( \angle \text{s in same seg} )} )</td>
</tr>
<tr>
<td>OR</td>
<td>( \text{(4)} )</td>
</tr>
<tr>
<td>In ( \triangle \hat{P}\hat{T}\hat{S} \text{ and } \triangle \hat{W}\hat{V}\hat{S} )</td>
<td>( \checkmark \text{identification of triangles} )</td>
</tr>
<tr>
<td>( \hat{P}_1 = \hat{W} ) ((= 40^\circ))</td>
<td>( \checkmark \hat{P}_1 = \hat{W} )</td>
</tr>
<tr>
<td>( \hat{S}_2 ) is common</td>
<td>( \checkmark \hat{S}_2 ) is common</td>
</tr>
<tr>
<td>( \hat{V}_1 = \hat{P}\hat{T}\hat{S} ) ((\angle \text{ sum } \Delta))</td>
<td>( \checkmark \angle \text{ sum } \Delta )</td>
</tr>
</tbody>
</table>

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**QUESTION 9**

9. \( \hat{C} = 90^\circ \)  
   (\( \angle s \) in semi circle)  
   O\( \hat{E} \)A = 90°  
   (corres \( \angle s \); OD \( \parallel \) BC)  
   AE = 8 cm  
   (line from circ cent \( \perp \) ch bis ch)  
   OE = 6 cm  
   (Pythagoras)  
   ED = 10 - 6  
   = 4 cm

**OR**

\( \hat{C} = 90^\circ \)  
(\( \angle s \) in semi circle)  
O\( \hat{E} \)A = 90°  
(corres \( \angle s \); OD \( \parallel \) BC)  
OE \( \parallel \) BC  
(given)  
OA = OB  
(radii)  
AE = EC = 8 cm  
(midpoint theorem)  
OE = 6 cm  
(Pythagoras)  
ED = 10 - 6  
= 4 cm

**OR**

\( \hat{C} = 90^\circ \)  
(\( \angle s \) in semi circle)  
\( BC^2 = (20)^2 - (16)^2 \)  
BC = 12  
OE = \( \frac{1}{2} BC \)  
(midpoint theorem)  
OE = 6 cm  
OD = 10 cm  
ED = 10 - 6  
= 4 cm

**OR**

\( \hat{C} = 90^\circ \)  
(\( \angle s \) in semi circle)  
\( BC^2 = (20)^2 - (16)^2 \)  
BC = 12  
OE = \( \frac{1}{2} BC \)  
(midpoint theorem)  
OE = 6 cm  
ED = 4 cm

---

[5]

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### QUESTION 10

#### 10.1
\[ \hat{A} = \hat{D}_4 = x \quad (\text{tan ch th}) \]
\[ \hat{E}_2 = x \quad (\text{tan ch th}) \textbf{ OR } (\angle s \text{ in same seg}) \]
\[ \hat{D}_2 = \hat{A} = x \quad (\text{alt } \angle s; \text{ CA } \parallel \text{ DF}) \]

#### 10.2
In \( \triangle BHD \) and \( \triangle FED \)
1. \[ \hat{B}_2 = \hat{F} \quad (\angle s \text{ in same seg}) \]
2. \[ \hat{D}_3 = \hat{D}_1 \quad (= \text{ chs subt } = \angle s) \]
\( \triangle BHD \parallel \triangle FED \ (\angle \angle \angle) \)

#### 10.3
\[
\begin{align*}
\frac{FE}{FD} &= \frac{BD}{BH} \quad (\parallel \Delta s) \\
\text{But } FE &= AB \quad (\text{given}) \\
\frac{AB}{BD} &= \frac{FD}{BH} \\
AB.BD &= FD.BH
\end{align*}
\]

---

[13]
### QUESTION 11

**Diagram:**

![Diagram of a parallelogram with points A, B, C, D, E, F, P, and Q connected by lines and arrows indicating parallel and proportional relationships.]

#### 11.1
- \( AF = FC \) (diags of parallelogram bisect)
- \( FE \parallel CD \)
- \( AE = ED \) (Prop Th; FE \parallel CD) **OR** (Midpoint Theorem)

| \[\frac{AC}{CP} = \frac{1}{2}\] | (given) |
| \[\frac{AD}{DQ} = \frac{1}{2}\] | (given) |
| \[\frac{AC}{CP} = \frac{AD}{DQ}\] | (converse proportionality theorem) |
| \( CD \parallel PQ \) | (given) |
| \( CD \parallel FE \) | \( \therefore PQ \parallel FE \) |

**Reason:**
- \( AF = FC \)
- \( reason \)

**Marks:** (2)

#### 11.2

| \[\frac{AC}{AP} = \frac{1}{3}\] | (given) |
| \[\frac{AD}{AQ} = \frac{1}{3}\] | (given) |
| \[\frac{AC}{AP} = \frac{AD}{AQ}\] | (converse proportionality theorem) |
| \( CD \parallel PQ \) | (given) |
| \( CD \parallel FE \) | \( \therefore PQ \parallel FE \) |

**Reason:**
- \( ratios \ equal \)
- \( CD \parallel PQ \)
- \( reason: \ converse \ prop \ th \ and \ conclusion \)

**Marks:** (3)

**OR**

| \[\frac{AF}{AP} = \frac{1}{6}\] | (given) |
| \[\frac{AE}{AQ} = \frac{1}{6}\] | (given) |
| \[\frac{AF}{AE} = \frac{AP}{AQ}\] | (converse proportionality theorem) |
| \( \therefore PQ \parallel FE \) | \( conv \ prop \ theorem \)

**Reason:**
- \( \frac{AF}{AP} = \frac{1}{6} \)
- \( \frac{AF}{AE} = \frac{AP}{AQ} \)
- \( conv \ prop \ theorem \)

**Marks:** (3)
11.3 In $\triangle AEF$ and $\triangle APQ$
1. $\hat{A}$ is common
2. $\angle A\hat{E}F = \angle A\hat{Q}P$ (corres $\angle$s; $FE \parallel PQ$)
3. $\angle A\hat{F}E = \angle A\hat{P}Q$ (corres $\angle$s; $FE \parallel PQ$)

$\therefore \triangle AEF \parallel \triangle AQP (\angle \angle \angle)$

$\frac{FE}{AF} = \frac{AP}{PQ} \quad (\parallel \Delta s)$

$\frac{FE}{60} = \frac{1}{6}$

$FE = 10 \text{ cm}$

**OR**

In $\triangle ADC$ and $\triangle APQ$
1. $\hat{A}$ is common
2. $\angle AD\hat{C} = \angle A\hat{Q}P$ (corres $\angle$s; $CD \parallel PQ$)
3. $\angle A\hat{C}D = \angle A\hat{P}Q$ (corres $\angle$s; $CD \parallel PQ$)

$\therefore \triangle ADC \parallel \triangle AQP (\angle \angle \angle)$

$\frac{AC}{AP} = \frac{AD}{AQ} = \frac{1}{3} \quad (\parallel \Delta s)$

$\frac{CD}{3} = \frac{1}{PQ}$

$CD = 20 \text{ cm}$

But $AF = FC$

$AE = ED$ (Midpoint Theorem)

$FE = \frac{1}{2} CD$

$FE = 10 \text{ cm}$

**NOTE:** If the similarity has not been proven, then max 3/5 marks

$\checkmark$ first pair of angles equal with reason

$\checkmark$ second pair of angles equal with reason

$\frac{AF}{AP} = \frac{1}{6}$

$\frac{FE}{PQ} = \frac{AF}{AP}$

$\checkmark$ answer

$\checkmark$ first pair of angles equal with reason

$\checkmark$ second pair of angles equal with reason

$\frac{CD}{3} = \frac{1}{PQ}$

$\checkmark$ $FE = \frac{1}{2} CD$

$\checkmark$ answer

**TOTAL:** 100