### QUESTION 1

1.1 Mean  
\[
\text{Mean} = \frac{3.2 + 3.2 + 3.2 + 4.2 + 4.5 + 4.9 + 8.3 + 9.5 + 11.7 + 12.2 + 12.5}{11}
\]
\[
= 7.74
\]
\[
= 7.03
\]
Median = 4.9  
Mode = 2,3  

(3)  

1.2 Mode  
This is the lowest value and will indicate that the increases are very poor.  

(2)  

1.3 Mean.  
This is the highest value and can be used to indicate that increases are good.  

(2)  

### QUESTION 2

2.1  
\[
\sigma = \frac{90 - 65}{2} = 12.5
\]

(2)  

2.2 University A:  
\[
78 - 65 = 13
\]
Her result lies just over 1 standard deviation from the mean.  

University B:  
\[
\bar{x} + \sigma = 54
\]
\[
\bar{x} + 2\sigma = 59
\]
Her result lies just over 2 standard deviations from the mean.  

Her result for University B is better.  

(3)  

5
QUESTION 3

3.1

\[
\begin{align*}
\text{Rain} &\quad 63\% \\
\quad &\quad 36\% \quad \text{Fall} \\
\quad &\quad 64\% \quad \text{(Rain & Fall)} \\
\text{No Rain} &\quad 37\% \\
\quad &\quad 12\% \quad \text{Fall} \\
\quad &\quad 88\% \quad \text{(No Rain & Fall)} \\
\text{Not Fall} &\quad 36\% \\
\quad &\quad 64\% \quad \text{(Rain & Not Fall)} \\
\quad &\quad 37\% \quad \text{No Rain} \\
\quad &\quad 88\% \quad \text{(No Rain & Not Fall)}
\end{align*}
\]

\checkmark \checkmark \text{structure of the tree diagram}
\checkmark 63\% \text{ Rain}
\checkmark 36\% \text{ Fall}
\checkmark 64\% \text{ Not fall}
\checkmark 88\% \text{ Not Fall} \quad (6)

3.2

\[
P(\text{Not Fall}) = \left( \frac{37}{100} \times \frac{88}{100} \right) + \left( \frac{63}{100} \times \frac{64}{100} \right)
\]

\[
= \frac{407}{1250} + \frac{252}{625}
\]

\[
= \frac{911}{1250}
\]

\[
= 0.7288
\]

\checkmark \frac{37}{100} \times \frac{88}{100}
\checkmark \frac{63}{100} \times \frac{64}{100}
\checkmark \text{answer} \quad (3)

3.3

\[
P(\text{Dry & Fall}) = \frac{37}{100} \times \frac{12}{100}
\]

\[
= \frac{111}{2500}
\]

\[
= 0.0444
\]

\checkmark \frac{37}{100} \times \frac{12}{100}
\checkmark \text{answer} \quad (2) \quad [11]
QUESTION 4

<table>
<thead>
<tr>
<th>Average of trial examination</th>
<th>80</th>
<th>68</th>
<th>94</th>
<th>72</th>
<th>74</th>
<th>83</th>
<th>56</th>
<th>68</th>
<th>65</th>
<th>75</th>
<th>88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final examination mark</td>
<td>72</td>
<td>71</td>
<td>96</td>
<td>77</td>
<td>82</td>
<td>72</td>
<td>58</td>
<td>83</td>
<td>78</td>
<td>80</td>
<td>92</td>
</tr>
</tbody>
</table>

4.1

Scatter Plot showing the trial examination mark vs final examination mark

3 marks: All points plotted correctly.
2 marks: 7 – 10 points plotted correctly
1 mark: 3 – 6 points plotted correctly

4.2

\[ a = 25,38 \quad (25,38342009\ldots) \]
\[ b = 0,71 \quad (0,7069044703\ldots) \]
\[ \hat{y} = a + bx \]
\[ \hat{y} = 25.38 + 0,71x \]

\( \checkmark a \)
\( \checkmark b \)
\( \checkmark \) answer

4.3

Scatter plot showing the trial examination mark vs final examination mark

\( \checkmark \) slope
\( \checkmark \) accurate drawing

(2)
4.4 \( r = 0,74 \) (0, 7391817008…) ✓✓ answer (2)

4.5 \( \hat{y} = 25,38 + 0,71x \)
\( \hat{y} = 25,38 + 0,71(75) \)
\( = 78,63 \% \)

If the original values of \( a \) and \( b \) then \( \hat{y} = 78,401 \) ✓ substitution ✓ answer (2) [13]

QUESTION 5

<table>
<thead>
<tr>
<th>Broken a limb</th>
<th>Not broken a limb</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>463</td>
<td>( b )</td>
</tr>
<tr>
<td>Female</td>
<td>( a )</td>
<td>( c )</td>
</tr>
<tr>
<td>TOTAL</td>
<td>913</td>
<td>617</td>
</tr>
</tbody>
</table>

5.1 \( a = 450 \)
\( b = 319 \)
\( c = 298 \)
\( d = 748 \) ✓ answer for \( a \)
✓ answer for \( b \)
✓ answer for \( c \)
✓ answer for \( d \) (4)

5.2 \( P(\text{Female who has not broken a limb}) \)
\( \frac{298}{1530} \)
\( = \frac{149}{765} \)
\( P(\text{Female}) \times P(\text{Broken a limb}) \)
\( \frac{450}{1530} \times \frac{5}{17} \)
\( = 0,2941176471… \)
\( = 0,29 \)
\( P(\text{Female}) \times P(\text{Broken a limb}) \)
\( \frac{748}{1530} \times \frac{913}{1530} \)
\( = 0,29 \)

The events of being female and having broken a limb are independent. ✓ independent (4) [10]

If a candidate answers not independent due to the fact that the answers are not accurate to more than 2 decimal places, award full marks.
### QUESTION 6

| 6.1 | Number of different ways the shirts and trousers can be arranged  
= \((7 + 4)!\)  
= \(11!\)  
= \(39 \, 916 \, 800\) |
|---|---|
| ✓ | 11  
✓ | 11! |
| 6.2 | Number of ways so that the shirts are together and trousers are together  
= \(7! \cdot 4! \cdot 2\)  
= \(241 \, 920\) |
| ✓ | 7!  
✓ | 4!  
✓ | \(\times 2\) |
| 6.3 | \(P(\text{Shirt at beginning and trouser at the end})\)  
\(= \frac{9! \times 4 \times 7}{11!}\)  
\(= \frac{14}{55}\) |
| ✓ | \(\times 4 \times 7\)  
✓ | 9!  
✓ | 11!  
✓ | answer |

### QUESTION 7

| 7.1 | \(|7| \quad 4 \quad -5 \quad -32 \quad -113 \quad -356\)  
\(-113; -356\) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>answers</td>
</tr>
</tbody>
</table>
| 7.2 | \(T_{k+1} = T_k - (3)^k\)  
\(T_1 = 7\)  
\(k \geq 1\)  

**OR**

\(T_{k+1} = T_k - 3(3)^{k-1}; \quad T_1 = 7; \quad k \geq 1\)

**OR**

\(T_k = T_{k-1} - (3)^{k-1}; \quad T_1 = 7; \quad k \geq 2\)
QUESTION 8

8. \(\text{AO} = \text{OB}\) (radii)
\(\text{AO} = \text{BC}\) (given)
\(\text{OB} = \text{BC}\)
\(\hat{O}_1 = 22^\circ\) (\(\angle\)s opp = radii)
\(\hat{B}_2 = 44^\circ\) (ext \(\angle\) = sum int opp)
\(\hat{A} = 44^\circ\) (\(\angle\)s opp = radii)
\(\hat{AOD} = 66^\circ\) (ext \(\angle\) = sum int opp)

\(\checkmark\) S
\(\checkmark\) S
\(\checkmark\) S/R
\(\checkmark\) S
\(\checkmark\) S
\(\checkmark\) answer

[5]

QUESTION 9

9.1 Join PO and OS
Let \(\hat{O}_1 = 2x\)
\(\hat{T} = x\) (\(\angle\) at circ centre = 2 \(\angle\) at circumference)
\(\hat{O}_2 = 360^\circ - 2x\) (\(\angle\)s round a point)
\(\hat{R} = 180^\circ - x\) (\(\angle\) at circ centre = 2 \(\angle\) at circumference)
\(\hat{T} + \hat{R} = x + 180^\circ - x = 180^\circ\)

\(\checkmark\) construction
\(\checkmark\) S/R
\(\checkmark\) S
\(\checkmark\) S/R
\(\checkmark\) S

(5)
9.2.1(a) \[ \hat{D}_4 = \hat{C} \quad (\angle \text{opp} = \text{sides}) \]
\[ \hat{C} = x \quad (\angle \text{sum } \Delta) \]
\[ \hat{D}E\hat{B} = 180^\circ - x \quad (\text{opp } \angle \text{cyclic quad supp}) \]

9.2.1(b) \[ \hat{A} = 180^\circ - 2x \quad (\text{ext } \angle \text{cyclic quad} = \text{int opp } \angle) \]

9.2.2 \[ \hat{D}_1 + \hat{A} = \hat{E}_1 \quad (\text{ext } \angle \Delta = \text{sum int opp}) \]
\[ \hat{D}_1 = x \]
\[ \hat{C} = x \quad (\angle \text{sum } \Delta) \text{ OR proved above} \]
\[ \hat{D}_1 = \hat{C} = x \]
\[ \text{DE } \parallel \text{CB} \quad (\text{corres } \angle s =) \]

| 9.2.1(a) | \( \hat{D}_4 = \hat{C} \) | \( (\angle \text{opp} = \text{sides}) \) | ✓ S/R | ✓ S | ✓ S/R |
| 9.2.1(b) | \( \hat{A} = 180^\circ - 2x \) | \( (\text{ext } \angle \text{cyclic quad} = \text{int opp } \angle) \) | ✓ S | ✓ R |
| 9.2.2 | \( \hat{D}_1 + \hat{A} = \hat{E}_1 \) | \( (\text{ext } \angle \Delta = \text{sum int opp}) \) | ✓ S/R | ✓ statement | ✓ Reason | (3) [13] |
QUESTION 10

10.1 \[ \frac{EG}{48} = \frac{24}{36} \quad (DE \parallel FG) \]

\[ EG = \frac{48 \times 24}{36} \]

\[ EG = 32 \text{ cm} \]

\[ \text{S/R} \]

\[ \text{answer} \]

10.2 \[ \frac{BC}{DE} = \frac{AC}{AE} \]

\[ BC = \frac{120 \times 40}{48} \]

\[ BC = 100 \text{ cm} \]

\[ \text{statement} \]

\[ \checkmark \]

\[ \text{substitution} \]

\[ \text{answer} \]

\[ \text{(4)} \]

OR

\[ \frac{AB}{AD} = \frac{AC}{AE} \]

\[ AB = \frac{120 \times 36}{48} \]

\[ AB = 90 \text{ cm} \]

\[ \Delta ABC \parallel \Delta ADE \quad (\angle \angle \angle) \]

\[ \frac{BC}{DE} = \frac{AB}{AD} \quad (\text{sides in proportion}) \]

\[ BC = \frac{90 \times 40}{36} \]

\[ BC = 100 \text{ cm} \]

\[ \text{S} \]

\[ \text{S} \]

\[ 90 \]

\[ \text{answer} \]

\[ \text{(4)} \]

OR

\[ \Delta ABC \parallel \Delta ADE \quad (\angle \angle \angle) \]

\[ \frac{BC}{DE} = \frac{AC}{AE} \quad (\text{sides in proportion}) \]

\[ BC = \frac{120 \times 40}{36} \]

\[ BC = 100 \text{ cm} \]

\[ \text{S} \]

\[ \text{S} \]

\[ \text{substitution} \]

\[ \text{answer} \]

\[ \text{(4)} \]

\[ \text{[6]} \]
QUESTION 11

11.1 Let $\hat{A}_1 = x$

In $\triangle ABC$ and $\triangle ADT$
1. $\hat{A}_1 = \hat{B}_2 = x$ (tan ch th)
   $\hat{B}_2 = \hat{A}_3 = x$ (AC || BD alt $\angle$s)
   $\hat{A}_1 = \hat{A}_3$
2. $\hat{T}_3 = B\hat{C}A$ (ext $\angle$ cyclic quad)
3. $\hat{B}_1 = \hat{D}_1$ (3rd $\angle$ on triangle)
   $\triangle ABC || \triangle ADT$ ($\angle\angle\angle$)

11.2 $\hat{A}_1 = \hat{C}_2 = x$ (tan ch th)

$\hat{T}_1 = \hat{C}_2 = x$ (AC || BD; alt $\angle$s)
$\therefore \hat{T}_1 = \hat{A}_1 = x$
$\hat{T}_4 = x$ (vert opp angles)
$\hat{T}_4 = \hat{A}_1$ ($= x$)
PT is a tangent (conv tan ch th)

OR
$\hat{A}_1 = \hat{B}_2 = \hat{A}_3 = x$ (AC || BT)
$\hat{A}_1 = \hat{T}_1 = \hat{T}_4 = x$ ($\angle$s in same segment)
$\hat{A}_1 = \hat{T}_4 = x$
PT is a tangent (conv tan ch th)

OR
$\hat{B}_1 = \hat{T}_2$ ($\angle$s in same seg)
$\hat{B}_1 = \hat{D}_1$ (|| $\Delta$s)
$\hat{D}_1 = \hat{T}_2$
PT is a tangent (conv tan ch th)

11.3 In $\triangle APT$ and $\triangle TPD$
1. $\hat{P}$ is common.
2. $\hat{T}_4 = \hat{A}_1$ (proven)
3. $\hat{A}\hat{TP} = \hat{D}_3$ (3rd $\angle$ on triangle)
   $\triangle APT || \triangle TPD$ ($\angle\angle\angle$)

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| 11.4 | \[ \frac{AP}{PT} = \frac{PT}{PD} \quad (\Delta APT \parallel \Delta TPD) \] | ✓ statement  
✓ reason  

\[ AP \cdot PD = PT \cdot PT \]  

 ✓ DP = \( \frac{1}{3} \) AP  
✓ substitution  

\[ AP \cdot \frac{1}{3} AP = PT^2 \]  

\[ AP^2 = 3PT^2 \]  

| 16 | [4] | [16] | [16] | [16] |

**TOTAL: 150**