



ASSIGNMENT (ANSWER SCHEME)

Course: STATISTICS & PROBABILITY

Course Code: DUM2413

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QUESTION 1																																																																																																																							
Answer									Remarks																																																																																																														
(i) Variable : The total area of the grid Type of variable : Qualitative/Continuous Level of measurement : Ratio-level scale Tangible. (ii) <table><tr><th>Number (Grid)</th><th>Areas</th><th>Number (Grid)</th><th>Areas</th><th>Number (Grid)</th><th>Areas</th><th>Number (Grid)</th><th>Areas</th><th>Number (Grid)</th><th>Areas</th></tr><tr><td>1</td><td>0.5</td><td>14</td><td>2.0</td><td>34</td><td>6.0</td><td>57</td><td>9.0</td><td>87</td><td>4.0</td></tr><tr><td>2</td><td>0.5</td><td>15</td><td>4.5</td><td>35</td><td>2.0</td><td>58</td><td>2.0</td><td>88</td><td>2.0</td></tr><tr><td>3</td><td>0.5</td><td>17</td><td>4.5</td><td>48</td><td>3.0</td><td>59</td><td>4.0</td><td>90</td><td>8.0</td></tr><tr><td>4</td><td>0.5</td><td>18</td><td>2.0</td><td>49</td><td>5.0</td><td>60</td><td>4.0</td><td>93</td><td>8.0</td></tr><tr><td>5</td><td>0.5</td><td>19</td><td>8.0</td><td>50</td><td>0.5</td><td>61</td><td>4.0</td><td>94</td><td>1.5</td></tr><tr><td>6</td><td>2.5</td><td>22</td><td>2.0</td><td>52</td><td>6.0</td><td>78</td><td>2.0</td><td>95</td><td>3.0</td></tr><tr><td>10</td><td>0.5</td><td>30</td><td>2.0</td><td>53</td><td>3.0</td><td>79</td><td>4.0</td><td>96</td><td>9.0</td></tr><tr><td>11</td><td>0.5</td><td>31</td><td>8.0</td><td>54</td><td>1.5</td><td>80</td><td>1.0</td><td>97</td><td>2.0</td></tr><tr><td>12</td><td>4.0</td><td>32</td><td>2.5</td><td>55</td><td>8.0</td><td>81</td><td>7.5</td><td>98</td><td>3.0</td></tr><tr><td>13</td><td>7.0</td><td>33</td><td>6.0</td><td>56</td><td>2.0</td><td>82</td><td>3.0</td><td>99</td><td>4.5</td></tr></table> *Note: The numbers of grids sampled by each group is different.									Number (Grid)	Areas	Number (Grid)	Areas	Number (Grid)	Areas	Number (Grid)	Areas	Number (Grid)	Areas	1	0.5	14	2.0	34	6.0	57	9.0	87	4.0	2	0.5	15	4.5	35	2.0	58	2.0	88	2.0	3	0.5	17	4.5	48	3.0	59	4.0	90	8.0	4	0.5	18	2.0	49	5.0	60	4.0	93	8.0	5	0.5	19	8.0	50	0.5	61	4.0	94	1.5	6	2.5	22	2.0	52	6.0	78	2.0	95	3.0	10	0.5	30	2.0	53	3.0	79	4.0	96	9.0	11	0.5	31	8.0	54	1.5	80	1.0	97	2.0	12	4.0	32	2.5	55	8.0	81	7.5	98	3.0	13	7.0	33	6.0	56	2.0	82	3.0	99	4.5	
Number (Grid)	Areas	Number (Grid)	Areas	Number (Grid)	Areas	Number (Grid)	Areas	Number (Grid)	Areas																																																																																																														
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5	0.5	19	8.0	50	0.5	61	4.0	94	1.5																																																																																																														
6	2.5	22	2.0	52	6.0	78	2.0	95	3.0																																																																																																														
10	0.5	30	2.0	53	3.0	79	4.0	96	9.0																																																																																																														
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(iii)

Number (Grid)	Area	Number (Grid)	Area	Number (Grid)	Area	Number (Grid)	Area	Number (Grid)	Area
0	6.0	19	8.0	34	6.0	51	4.0	66	5.0
2	0.5	20	0.5	36	2.0	53	3.0	67	2.0
3	0.5	23	5.0	37	5.0	54	1.5	68	6.0
5	0.5	25	9.0	38	4.5	55	8.0	69	2.0
8	0.5	27	2.0	39	6.0	56	2.0	72	0.5
9	0.5	28	2.5	41	8.0	57	9.0	73	8.0
10	0.5	30	2.0	43	2.0	58	2.0	74	5.0
14	2.0	31	8.0	45	5.0	61	4.0	75	4.0
16	0.5	32	2.5	46	1.5	62	1.5	77	1.5
17	4.5	33	6.0	49	5.0	65	2.5	79	4.0

*Note: The numbers of grids sampled by each group is different.

(iv)

Question	(ii)	(iii)
Sampling Technique	Judgment sampling	Simple random sampling
Type of Sampling Technique	Nonprobability	Probability

(v)

Areas(Judgment)		Areas(SRS)	
Mean	3.6200	Mean	3.6400
Standard Error	0.3652	Standard Error	0.3665
Median	3.0000	Median	2.7500
Mode	2.0000	Mode	0.5000
Standard Deviation	2.5824	Standard Deviation	2.5913
Sample Variance	6.6690	Sample Variance	6.7147
Kurtosis	-0.6550	Kurtosis	-0.8068
Skewness	0.6758	Skewness	0.5405
Range	8.5000	Range	8.5000
Minimum	0.5000	Minimum	0.5000
Maximum	9.0000	Maximum	9.0000
Sum	181.0000	Sum	182.0000
Count	50	Count	50

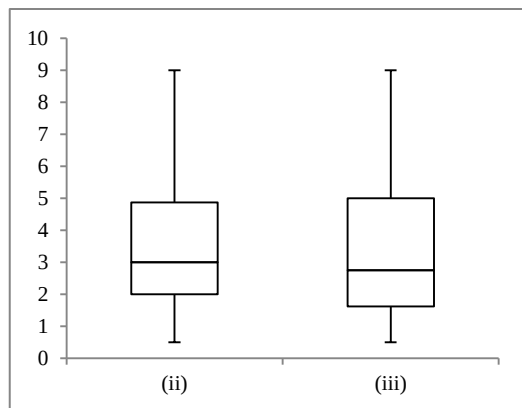
*Note: The values of the output dependent of the sample data in (ii) and (iii).

Comparison:

Question	(ii)	(iii)
Shape	$(\text{Mode} = 2) < (\text{Median} = 3) < (\text{Mean} = 3.62)$ Right-skewed distribution.	$(\text{Mode} = 2) < (\text{Median} = 3) < (\text{Mean} = 3.62)$ Right-skewed distribution.
Center	Since $(\bar{x}_{\text{judgment}} = 3.62) < (\bar{x}_{\text{SRS}} = 3.64)$, therefore the data sampled using simple random sampling technique has higher average compare to judgment sampling technique.	
Spread	Since $(s_{\text{judgment}} = 2.5824) < (\bar{x}_{\text{SRS}} = 2.5913)$, therefore the data sampled using simple random sampling technique is more spread compare to judgment sampling technique.	

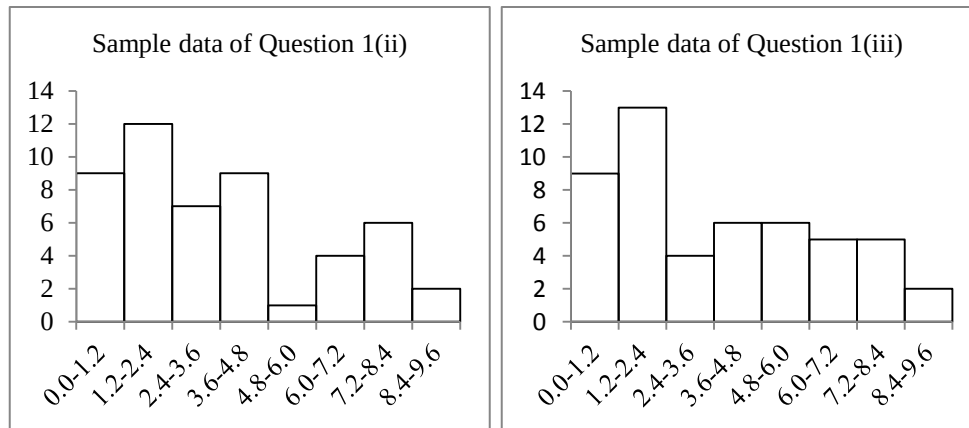
(vi)

Question	(ii)	(iii)
5-number summary		
Minimum	0.5000	0.5000
Q1	2.0000	1.6250
Q2	3.0000	2.7500
Q3	4.8750	5.0000
Maximum	9.0000	9.0000
IQR	2.8750	3.3750
Outlier		
Lower Limit	-2.3125	-3.4375
Upper Limit	9.1875	10.0625
Outlier	No	No
Box		
Hidden	2.0000	1.6250
Lower	1.0000	1.1250
Upper	1.8750	2.2500
Whisker		
Bottom	1.5000	1.1250
Top	4.1250	4.0000



(vii)

Question	(ii)	(iii)
Sturge's Formula, k	$k = 1 + 3.322 \log_{10}(50) = 6.6440$ $k \approx 7$	$k = 1 + 3.322 \log_{10}(50) = 6.6440$ $k \approx 7$
Class width, w	$w = \frac{\text{range}}{k} = \frac{8.5}{7} = 1.2143$ $w \approx 1$	$w = \frac{\text{range}}{k} = \frac{8.5}{7} = 1.2143$ $w \approx 1$



No, both sample data sampled using judgment and simple random sampling techniques are non-normal distributed. This is due to the histogram showed the sample data sampled using judgment sampling technique is bimodal distribution, while the sample data sampled using simple random sampling is right skewed distribution.

(viii)

$$\mu = \frac{\sum f_i x_i}{\sum f_i} = 3.64$$

Since the $(|\bar{x}_{\text{Judgment}} - \mu| = 0.02) > (|\bar{x}_{\text{SRS}} - \mu| = 0.02)$, therefore the simple random sampling technique produces a more accurate estimation compare to judgment sampling technique.

QUESTION 2

Answer					Remarks
(i)					
Game	Replicate 1	Replicate 2	Replicate 3	Replicate 4	
1	4 (even)	4 (even)	2 (even)	1 (odd)	
2	3 (odd)	3 (odd)	4 (even)	6 (even)	
3	1 (odd)	1 (odd)	3 (odd)	1 (odd)	
4	1 (odd)	6 (even)	6 (even)	2 (even)	
5	1 (odd)	4 (even)	6 (even)	1 (odd)	
6	6 (even)	4 (even)	1 (odd)	6 (even)	
7	1 (odd)	4 (even)	5 (odd)	3 (odd)	
8	1 (odd)	6 (even)	6 (even)	5 (odd)	
9	2 (even)	5 (odd)	3 (odd)	6 (even)	
10	2 (even)	4 (even)	1 (odd)	2 (even)	
11	3 (odd)	2 (even)	2 (even)	1 (odd)	
12	1 (odd)	4 (even)	5 (odd)	6 (even)	
13	3 (odd)	5 (odd)	6 (even)	4 (even)	
14	3 (odd)	6 (even)	1 (odd)	3 (odd)	
15	6 (even)	2 (even)	4 (even)	6 (even)	
16	4 (even)	2 (even)	6 (even)	3 (odd)	
*Note: The numbers generated by each group is different.					
			START		
TALLY					
I	II	IIII II	IIII	I	
(ii)					
Position	Frequency	Probability			
1	1	0.0625			
2	-	-			
3	2	0.1250			
4	-	-			
5	7	0.4375			
6	-	-			
7	5	0.3125			
8	-	-			
9	1	0.0625			
*Note: The position 2, 4, 6 and 8 are for confusing.					
The empirical probability approach has been used in finding probability.					

(iii)

$$p = \frac{3}{6} = 0.5$$

Since $X \sim b(x; 4, 0.5)$, therefore $P(X = x) = \binom{4}{x} (0.5)^x (0.5)^{(4-x)}$

Position	X	Probability, $P(X = x)$
1	4	0.0625
2	-	-
3	3	0.2500
4	-	-
5	2	0.3750
6	-	-
7	1	0.2500
8	-	-
9	0	0.0625

*Note: The position 2, 4, 6 and 8 are for confusing.

(iv)

No, the approach has been used in (ii) and (iii) to find the probability is different. The approach has been used in (iii) is classical probability approach.

