



Topic: Associations between categorical variables

Time: 45 mins

Marks: /45 marks

Calculator Assumed

Question One: [3, 1, 1, 1, 2: 8 marks]

A survey of 72 people was conducted about which type of smartphone they have used out of Samsung and Apple. 58 people said they had used an Apple phone. 12 people said they had only ever used a Samsung and 25 people said they had used both.

- a) Construct a two-way table to displaying the relative frequencies for the various smartphones.

What percentage of people in this sample:

- b) have used a Samsung phone?
- c) have used neither a Samsung or an Apple phone?
- d) have used either a Samsung or an Apple phone?
- e) have used a Samsung phone given that they did not use an Apple phone?

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Question Two: [5, 1, 2: 8 marks]

A survey of 200 people is conducted about whether they have used the Uber service or a taxi service in the past 12 months. A partial two-way table showing some of people's responses is shown below.

	Used Uber	Not Used Uber	Total
Used Taxi	20		
Not Used Taxi			
Total			

Of those who used a taxi it is known that half as many also used an uber compared with those who did not. There were three times as many uber users than non-uber users.

- Complete the two-way table above.
- What percentage of people used neither service?
- Of those who did not use an uber, what percentage used a taxi?

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Question Three: [3, 2, 2, 2, 2, 3: 14 marks]

Goluxy is a major nation-wide shopping centre franchise. In order to improve their services they spent 24 months collecting data about it's customers. This provides a snapshot of the shopping habits of those who took part in the survey. The table below presents information from their 2014 - 2015 survey.

Table A: Number and percentage of people by age and gender who participated in the 2014 – 2015 survey

Number of People				
Age group	Female	Male	Total	% of total
6 – 12 years	320	A	B	2.46
13 – 16 years	599	413	1 012	4.36
17 – 19 years	1 900	1 116	3 016	12.98
20 – 25 years	2 001	1 489	3 490	15.02
26 – 30 years	2 900	1 081	3 981	17.13
30 – 40 years	3 000	770	3 770	16.23
40 – 50 years	2 100	880	2 980	12.83
50 – 60 years	1 919	602	2 521	10.85
60 – 70 years	801	236	1 037	4.46
70 +	500	357	857	3.69
Total	16 040	7 195	23 235	C

Table B: Most visited shop in the Goluxy shopping centre by age group, 2014 – 2015 Survey

Shop	16 or below	17 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 +
Myer	8.9	11.0	2.3	19.1	15.5	12.9	2.1	2.0
David Jones	6.5	2.3	1.1	17.5	14.2	5.0	3.5	1.5
Target	14.2	18.2	5.6	9.9	18.6	4.0	2.5	1.6
Kmart	19.3	25.1	15.9	10.1	9.2	3.5	0.9	1.0
Big W	21.1	13.8	6.0	8.9	8.7	8.5	3.3	0.7
Coles	8.0	5.2	32.0	12.8	15.9	35.9	45.3	59.2
Woolworths	6.1	6.1	28.2	12.0	16.9	29.9	39.9	30.8
Other	15.9	18.3	8.9	0.8	1.0	0.3	2.5	3.2

* The figures represent the percentages of the total number of people in each age group who participated in the 2014 - 2015 survey.

By referring to Table 1 and Table 2, answer the following questions.

- a) Calculate the values of A, B and C from Table 1.
- b) Which age group had the lowest participation rate in this survey?
- c) Calculate the proportion of males who took part in the survey. (You do not need to simplify your answer.)

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- d) Order outlets from most popular to least popular for people under 21 years of age.
- e) How do the results for those under 21 years old compare with the 70 + age group?
- f) “Does the popularity of specific outlets appear to change across the different ages?”
Comment, giving reasoning to support your statements.

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Question Four: [2, 3, 2, 1, 2: 8 marks]

Consider the following table from the Australian Bureau of Statistics analysing data relating to the Consumer Price Index (CPI).

JUNE KEY FIGURES

Weighted average of eight capital cities	Mar Qtr 2015 to Jun Qtr 2015 % Change	Jun Qtr 2014 to June Qtr 2015 % Change
All groups CPI	0.7	1.5
Food and non-alcoholic beverages	-0.2	1.3
Alcohol and tobacco	1.2	4.8
Clothing and footwear	1.3	-0.9
Housing	0.7	2.5
Furnishing, household equipment and services	1.0	1.4
Health	2.7	4.3
Transport	3.4	-2.4
Communication	-0.6	-3.0
Recreation and culture	-1.4	0.9
Education	0.0	5.4
Insurance and financial services	0.3	2.1
CPI analytical series		
All groups CPI, seasonally adjusted	0.8	1.5
Trimmed mean	0.6	2.2
Weighted mean	0.5	2.4

- a) Explain what the two figures for transport means and why these figures are different.
- b) Which groups' consumer price index failed to increase in the March – June quarter for 2015?
- c) Which group's CPI rose the most from June 2014 to June 2015?
- d) If the index number for Food and Non-Alcoholic Beverages was 7.8 in June 2014, what was the index number by June 2015?

Question Five: [2, 3, 2: 7 marks]

A group of teenagers were asked who their favourite music artist is currently. Results for the top 8 responses are shown below.

Popular Artists	Males	Females	Total
Taylor Swift	212	351	563
The Weekend	102	201	303
Fetty Wap	99	109	208
Ed Sheeran	75	269	344
Drake	209	109	318
Meghan Trainor	105	205	310
Walk the Moon	111	75	186
Mark Ronson	89	65	154
Total	1002	1384	2386

- a) How does the percentage of people surveyed who are male and like Taylor Swift compare to the total percentage of people who said Taylor Swift was their favourite?
- b) State the difference between the combined total percentage of the two most popular artists and the two least favourite artists.
- c) What percentage of males selected Walk the Moon or Meghan Trainor as their favourite artist?



Topic: SOLUTIONS

Time: 45 mins

Marks: /45 marks

Calculator Assumed

Question One: [3, 1, 1, 1, 2: 8 marks]

A survey of 72 people was conducted about which type of smartphone they have used out of Samsung and Apple. 58 people said they had used an Apple phone. 12 people said they had only ever used a Samsung and 25 people said they had used both.

- a) Construct as a two-way table to displaying the relative frequencies for the various smartphones.

	Samsung	Have Not Used Samsung	Total
Apple	25	33 ✓	58
Have Not Used Apple	12	2	14 ✓
Total	37	35	72

What percentage of people in this sample: ✓

- b) have used a Samsung phone?

$$\frac{37}{72} \times 100 = 51.38\% \text{ of people } \checkmark$$

- c) have used neither a Samsung or an Apple phone?

$$\frac{2}{72} \times 100 = 2.7\% \text{ of people } \checkmark$$

- d) have used either a Samsung or an Apple phone?

$$100\% - 2.7\% = 97.2\% \text{ of people } \checkmark$$

- e) have used a Samsung phone given that they did not use an Apple phone?

$$\checkmark \frac{12}{14} \times 100 = 85.71\% \text{ (2 dp) of people } \checkmark$$

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Question Two: [5, 1, 2: 8 marks]

A survey of 200 people is conducted about whether they have used the Uber service or a taxi service in the past 12 months. A partial two-way table showing some of people's responses is shown below.

	Used Uber	Not Used Uber	Total
Used Taxi	20	40 ✓	60 ✓
Not Used Taxi	130	10	140
Total	150 ✓	50 ✓	200 ✓

Of those who used a taxi it is known that half as many also used an uber compared with those who did not. There were three times as many uber users than non-uber users.

a) Complete the two-way table above.

b) What percentage of people used neither service?

$$\frac{10}{200} \times 100 = 5\% \text{ of people } \checkmark$$

c) Of those who did not use an uber, what percentage used a taxi?

$$\checkmark \frac{40}{50} \times 100 = 80\% \text{ of people}$$

✓

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Question Three: [3, 2, 2, 2, 2, 3: 14 marks]

Goluxy is a major nation-wide shopping centre franchise. In order to improve their services they spent 24 months collecting data about it's customers. This provides a snapshot of the shopping habits of those who took part in the survey. The table below presents information from their 2014 - 2015 survey.

Table A: Number and percentage of people by age and gender who participated in the 2014 – 2015 survey

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* The figures represent the percentages of the total number of people in each age group who participated in the 2014 - 2015 survey.

By referring to Table 1 and Table 2, answer the following questions.

a) Calculate the values of A, B and C from Table 1.

$$B = 571.581 = 572 \quad \checkmark$$

$$A = B - 320 = 252 \quad \checkmark$$

$$C = 100\% \quad \checkmark$$

b) Which age group had the lowest participation rate in this survey?

\checkmark Males have a much lower participation rate compared to females. The 6 – 12 year olds are the age group with the lowest participation rate. \checkmark

c) Calculate the proportion of males who took part in the survey. (You do not need to simplify your answer.)

$$\frac{7\,195}{23\,235} \quad \checkmark \quad \checkmark$$

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- d) Order outlets from most popular to least popular for people under 21 years of age.

Kmart, other Target, Big W Myer, Woolworths, Coles, David Jones.



- e) How do the results for those under 21 years old compare with the 70 + age group?

The least popular outlets are Big W and Kmart while the most popular is Coles and Woolworths. This is the complete opposite compared to the under 21 year olds. Both groups rate David Jones as an unpopular shop.



- f) “Does the popularity of specific outlets appear to change across the different ages?”
Comment, giving reasoning to support your statements.



As the age group becomes older the percentage of visitors to shops like Big W and Kmart decreases and the percentage of visitors to Coles and Woolworths increases.



Younger people may not be doing the household grocery shop but as they get older their shopping habits may change.



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Question Four: [2, 3, 1, 2: 8 marks]

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Weighted mean	0.5	2.4

- a) Explain what the two figures for transport means and why these figures are different.

3.4% is the % change in the Consumer Price Index from March – June 2015 whereas the -2.4% is the % change over 12 months from June 2014 – June 2015. Even though there was an increase in CPI over the March – June quarter the CPI dropped overall in the 12 months from June – June.

- b) Which groups' consumer price index failed to increase in the March – June quarter for 2015?

Food, Recreation and Culture and Communication

- c) Which group's CPI rose the most from June 2014 to June 2015?

Education

- d) If the index number for Food and Non-Alcoholic Beverages was 7.8 in June 2014, what was the index number by June 2015?

$$7.8 \times 1.015 = 7.9$$

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Question Five: [2, 3, 2: 7 marks]

A group of teenagers were asked who their favourite music artist is currently. Results for the top 8 responses are shown below.

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Drake	209	109	318
Meghan Trainor	105	205	310
Walk the Moon	111	75	186
Mark Ronson	89	65	154
Total	1002	1384	2386

- a) How does the percentage of people surveyed who are male and like Taylor Swift compare to the total percentage of people who said Taylor Swift was their favourite?

$$\frac{212}{2386} \times 100 = 8.9\% \text{ of people surveyed are males who like Taylor Swift. } \checkmark$$

$$\frac{563}{2386} \times 100 = 23.6\% \text{ of people surveyed like Taylor Swift. This indicated that more females like Taylor Swift than males. } \checkmark$$

- b) State the difference between the combined total percentage of the two most popular artists and the two least favourite artists.

$$\frac{563+344}{2386} \times 100 = 38.0\% \text{ of those surveyed voted for the two most popular artists. } \checkmark$$

$$\frac{154+186}{2386} \times 100 = 14.2\% \text{ of those surveyed voted for the two least popular artists. } \checkmark$$

23% difference between them. \checkmark

- c) What percentage of males selected Walk the Moon or Meghan Trainor as their favourite artist?

$$\checkmark \frac{105+111}{1002} \times 100 = 21.6\% \text{ of males. } \checkmark$$