**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 as 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?

**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.

a) Complete the two-way table above.

b) What percentage of people used neither service?

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

**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.)

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.

**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 ti 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  4 |
| 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?

 of people

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

 of people

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

 of people

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

 of people

**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?

 of people

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

 of people



**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.

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**Table B: Most visited shop in the Goluxy shopping centre by age group, 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) Which age group had the lowest participation rate in this survey?

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

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

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.

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

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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?

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

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| **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?

of people surveyed are males who like Taylor Swift.

of people surveyed like Taylor Swift. This indicated that more females like Taylor Swift than males.

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

of those surveyed voted for the two most popular artists.

of those surveyed voted for the two least popular artists.

difference between them.

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

of males.