Name: _____

TOPIC TEST

Associations between variables

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (20 marks)
- Part B: 6 free-response questions (30 marks)
- Total: 50 marks

Part A

20 multiple-choice questions
1 mark each: 20 marks
Circle the correct answer.

1 What type of data has 2 variables and is collected in pairs?

A Univariate **B** Bivariate
C Categorical **D** Nominal

2 Which of the following is an example of continuous data?

A Hair colour
B Shoe size
C Weight
D Ice cream flavour preference

Use the table below to answer questions 3–5.
The two-way table below shows the results of a survey about transport methods students took to school.

	Walk	Bike	Bus	Car	Total
Boys		17		28	129
Girls	46		12		
Total		69	27	45	

3 How many students were surveyed?

A 129 **B** 115
C 127 **D** 256

4 How many girls rode their bike to school?

A 17 **B** 52
C 69 **D** 127

5 How many students walked to school?

A 115 **B** 69
C 46 **D** 129

6 Identify what the total is when calculating the percentage of car owners who favour SUVs.

A SUV owners **B** Males
C Car owners **D** SUV owners who are male

Use the table below to answer questions 7–9.
The two-way table below shows the preference of high school students for particular subjects.

	Maths	Science	English	Total
Boys	30			
Girls	26		40	100
Total		80	72	

7 What is the probability of a girl preferring science?

A 42.5%
B 34%
C 16.3%
D 38.5%

8 What is the probability of a science lover being a girl?

A 42.5%
B 34%
C 16.3%
D 38.5%

9 What is the probability of girl being a science lover?

A 42.5%
B 34%
C 16.3%
D 38.5%

10 The 'Rule of 5' states that:

A two-way tables must have 5 categories
B cell frequencies less than 5 are reliable
C cell frequencies less than 5 are unreliable
D cell frequencies more than 5 are unreliable

11 What is a true positive test result?

A A positive result that is correct
B A negative result that is wrong
C A negative result that is correct
D A positive result that is wrong

12 Which type of test result is the most serious error in pathological testing?

A True positive
B False positive
C True negative
D False negative

13 Which 2 results in pathological testing does the accuracy of the test determine?

A True positive and false positive
B True positive and true negative
C True negative and false negative
D False positive and false negative

Use the table below to answer questions 14–15.
The two-way table below shows the results of a study of the deaths of 20 000 women.

	Breast Cancer		
	Yes	No	
Hereditary	1460		5000
Non-hereditary			
		17 970	20 000

14 How many women died of breast cancer?

A 1460
B 15 000
C 2030
D 570

15 What is the risk of dying of breast cancer based on hereditary?

A 29.2%
B 71.9%
C 3.8%
D 28.1%

16 Which statement is *false* in regards to a positive association?

A Low values of the variable tend to be in the same pairs

B The graph of a positive association slopes upward from left to right

C High values of the variables tend to be in the same pairs

D As the value of one variable increases, the value of the second variable decreases

17 A non-linear association:

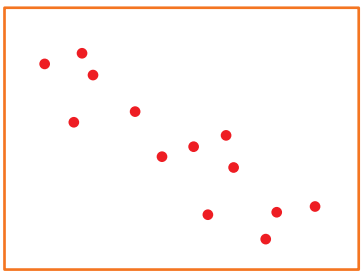
A is a straight-line

B is not a straight-line

C has a pattern but no clear line

D goes downwards from left to right

18 What type of association is shown in this scatterplot?



A Strong negative association

B Moderate positive association

C Weak negative association

D Moderate negative association

19 The covariance of x and y is 13.8 and their standard deviations are 4.3 and 6.9 respectively. What is the correlation coefficient?

A -0.47

B 22.14

C -22.14

D 0.47

20 The covariance of q and r is -6.6 and their standard deviations are 1.9 and 3.6 respectively.

Describe the apparent association.

A Moderate negative association

B Strong positive association

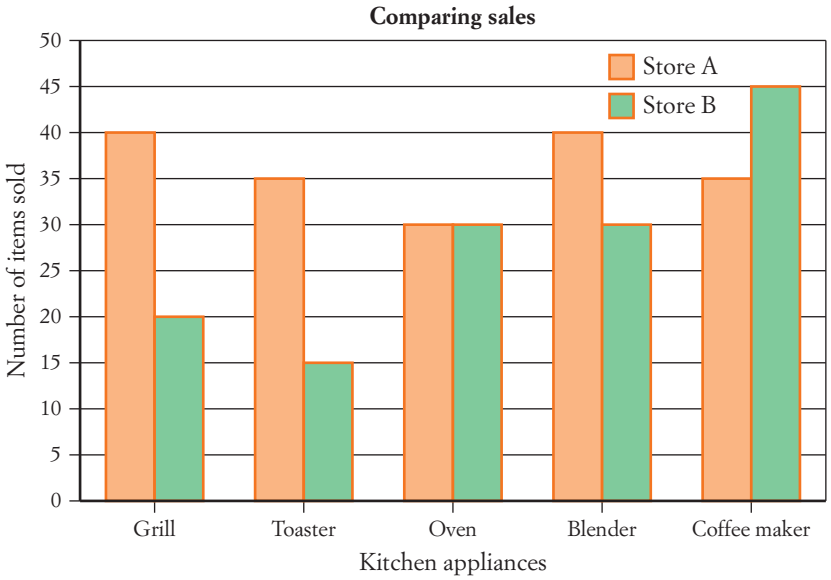
C Strong negative association

D Moderate positive association

Part B

6 free-response questions
30 marks
Show your working where appropriate.

21 This clustered bar graph shows the sales of appliances in 2 different stores.



a Use the information in the graph to construct a two-way table.

b How many blenders were sold in total?

c What is the probability that the next person to shop at Store A would purchase a coffee maker?

d Of the next 700 people to shop at Store B, how many would you expect to buy a toaster?

[6 marks]

22 The data below shows the amount of time in hours that Year 12 students spent studying maths each week and their overall achievement as a grade.

2, D	10, B	7, C	6, C	14, B
12, B	12, A	10, C	9, C	7, D
18, A	0, D	17, B	11, B	6, C
4, C	3, E	20, A	9, D	9, C
8, C	9, B	5, D	13, A	12, C

a Construct a two-way table of this information using suitable categories for the time.

b What percentage of the Year 12 students studied very little?

[4 marks]

23 Complete this table that shows the types of food preferred by a group of Year 12 students.

	Male	Female	Total
Mexican	38		66
Asian		34	61
Indian	31	24	
Total	96		

a Find the percentage of females who prefer Mexican.

b Find the percentage of students who prefer Mexican and are female.

c Find the percentage of Mexican food lovers who are female.

d Find the percentage of males who prefer Asian.

e Find the percentage of Asian food lovers who are male.

f From 350 students, how many would you expect to prefer Indian food?

[7 marks]

24 About 5% of the population suffers from the condition hypothyroidism and the pathology test for this condition is about 93% accurate.

a Set up a contingency table for test results and disease presence, assuming that test accuracy is not affected by the presence of the disease.

b Find the probability that a positive result is false.

c Find the probability that a negative result is false.

[7 marks]

25 Ohm's law is an important relationship in physics. It describes the association between current and voltage. Use the information in the table below to construct a scatterplot and hence describe the association between current and voltage in Ohm's law.

Current	1.0	2.1	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
Voltage	0.4	0.3	0.6	0.6	0.4	1.0	0.9	0.7	1.0	1.1	1.3	1.1	1.4	1.6

[3 marks]

26 The height and weight (to the nearest kg) of 10 friends is shown in the table below.

Height (cm)	170	166	134	185	149	175	156	163	180	140
Weight (kg)	82	50	47	89	82	74	54	59	94	65

Use a calculator to find the covariance and standard deviations of the data set and then describe the association between these data sets by calculating the correlation coefficient.

[3 marks]

This is the end of the test.
Use the rest of this page and the back for extra working space.

Answers

1 B	**2** C	**3** D	**4** B	**5** A
6 C	**7** B	**8** A	**9** C	**10** C
11 A	**12** D	**13** B	**14** C	**15** A
16 D	**17** B	**18** D	**19** D	**20** C

21 a

	Appliance					
	Grill	Toaster	Oven	Blender	Coffee maker	Total
Store A	40	35	30	40	35	180
Store B	20	15	30	30	45	140
Total	60	50	60	70	80	320

b 70

c $P(\text{store A coffee}) = \frac{35}{180} \times 100 = 19.4\%$

d $E(\text{store B toaster}) = \frac{15}{140} \times 700 = 75 \text{ people}$

22 a

	HOURS OF STUDY			
	Low (< 8 h)	Medium (8–12 h)	High (>12 h)	Total
A	0	1	3	4
B	0	4	2	6
C	4	5	0	9
D	4	1	0	5
E	1	0	0	1
Total	9	11	5	25

b $\frac{9}{25} \times 100 = 36\%$

23 a

	Male	Female	Total
Mexican	38	28	66
Asian	27	34	61
Indian	31	24	55
Total	96	86	182

b $P(\text{F, Mexican}) = \frac{28}{86} \times 100 = 32.6\%$

c $P(\text{S, Mexican}) = \frac{28}{182} \times 100 = 15.4\%$

d $P(\text{Mexican, F}) = \frac{28}{66} \times 100 = 42.4\%$

e $P(\text{M, Asian}) = \frac{27}{96} \times 100 = 28.1\%$

f $P(\text{Asian, M}) = \frac{27}{61} \times 100 = 44.3\%$

$E(\text{S, Indian}) = \frac{55}{182} \times 100 = 30.2\%$

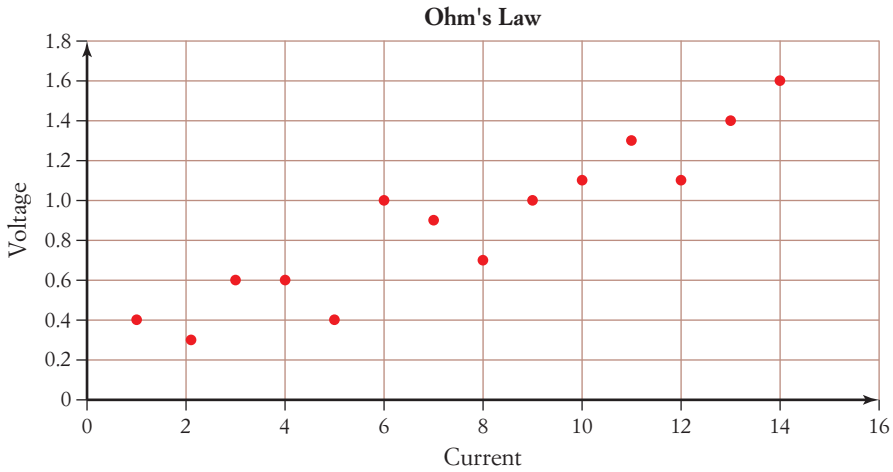
24 a

		Hypothyroidism		
		Yes	No	Total
Test Result	Positive	4.65%	6.65%	11.3%
	Negative	0.35%	88.35%	88.7%
	Total	5%	95%	100%

b $P(+, \text{F}) = \frac{6.65}{11.3} \times 100 = 58.8\%$

c $P(-, \text{F}) = \frac{0.35}{88.7} \times 100 = 0.4\%$

25 The points slope upwards as we move from left to right, therefore there is a moderate positive association between current and voltage.



25 $COV(h, w) = 179.91$ $StDev(h) = 16.92$ $StDev(w) = 16.9$

$r = \frac{COV(h,w)}{SD(h) \times SD(w)}$

$r = \frac{179.91}{(16.92 \times 16.9)}$

$r = 0.63$

r is a positive number, therefore it is a positive association and r is below 0.7, therefore it is a moderate association.

The association between height and weight is a moderate positive association.