Introductory Statistics Tutorial
Chapter 3 – Exploratory Tools for Relationships

Section A: Types of Variables

1. **(a)** **Quantitative** variables are _____ and counts.

(b) **Qualitative** variables describe _____ _____.

2. **(a)** To explore the relationship between two **quantitative** variables we use a _____ _____.

(b) To explore relationships between a **qualitative** variable and a **quantitative** variable we use _____ plots, _____ plots and _____ plots.

(c) To explore the relationship between two **qualitative** variables we use a _____ _____ of _____.

Section B: Two Variables

Questions 1 and 2 refer to the following information.

TVNZ News, 5 August 1997, reported that smoking is on the increase in the high socio-economic group in the USA. It was claimed that the advertising and fashion industries are responsible for this increase. The data shown in the table below is a subset of the data from a study on a large number of people. Each person has measurements made on variables that describe some aspect of their image.

ID	Gender	Weight (kg)	Socio-Ec Status	Smoking Status	Age	…
1	Female	50	High	Smoker	21-30	…
2	Male	75	Low	Smoker	31-40	…
3	Male	68	Middle	Non-smoker	51-60	…
4	Female	55	Middle	Non-smoker	11-20	…

Table 1: Data on People's Images

1. The most appropriate way to begin to explore the relationship between Socio-Economic Status and Smoking Status is to construct a:

(1) two-way table of counts with Socio-Economic Status for the row values and Smoking Status for the column values.
(2) dot plot of Socio-Economic Status for each level of Smoking Status, using the same scale for each plot.
(3) box plot of Socio-Economic Status for each level of Smoking Status, using the same scale for each plot.
(4) frequency table for each of these two variables.
(5) scatter plot of Socio-Economic Status against Smoking Status.

2. The most appropriate way to begin to explore the relationship between Weight and Smoking Status is to construct a:

(1) two-way table of counts with Weight for the row values and Smoking Status for the column values.
(2) dot plot of Weight for each level of Smoking Status, using the same scale for each plot.
(3) box plot of Weight for each level of Smoking Status, using the same scale for each plot.
(4) frequency table for each of these two variables.
(5) scatter plot of Weight against Smoking Status.

Questions 3 and 4 refer to the following information.

A record of quarterly sales revenues and the corresponding advertising costs from a large retail outlet is given below.

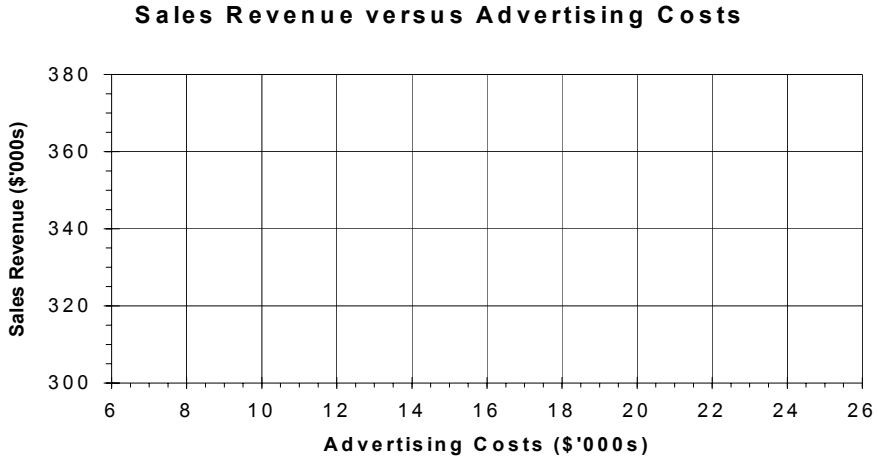
Quarter	1	2	3	4	5	6	7	8
Advertising Costs ($'000s)	10	12	8	20	11	15	10	25
Sales Revenue ($'000s)	342	347	318	350	351	346	345	367

Table 2: Quarterly Advertising Costs and Sales Revenues

3. If we want to investigate the relationship between the quarterly advertising costs and the quarterly sales revenues, then the most appropriate plot to look at is a:

(1) dot plot of the combined sales revenue data and advertising costs data.
(2) back-to-back stem-and-leaf plot of sales revenue and advertising costs.
(3) histogram of the combined sales revenue data and advertising costs data.
(4) dot plot of sales revenue and a dot plot of advertising costs (plotted on the same axes).
(5) scatter plot of sales versus advertising costs.

4. Draw a scatter plot of the above data, fit a trend curve by eye and describe anything interesting you see in the plot.



Interpretation:

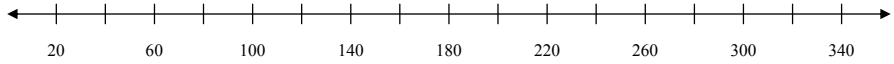
5. The following table gives the lengths (in kilometres) of the major rivers in the South Island.

Flowing into Pacific Ocean				**Flowing into Tasman Sea**			
Clutha	322	Selwyn	95	Buller	177	Hokitika	64
Taieri	288	Ashburton	90	Grey	121	Arahura	56
Clarence	209	Opihi	80	Motueka	108	Mokihinui	56
Waitaki	209	Shag	72	Karamea	80	Wanganui	56
Waiau	169	Kakanui	64	Taramakau	80	Whataroa	51
Waimakariri	161	Waihao	64	Hollyford	76	Waimea	48
Rakaia	145	Waipara	64	Aorere	72	Waitaha	40
Hurunui	138	Pareora	56	Takaka	72	Karangarua	37
Rangitata	121	Conway	48	Arawata	68	Heaphy	35
Ashley	97			Cascade	64	Cook	32
				Haast	64	Waiho	32

Table 3: Lengths of major rivers in the South Island (in kilometres)

Five-number summaries:
Pacific Ocean rivers: (48, 64, 97, 169, 322)
Tasman Sea rivers: (32, 48, 64, 76, 177)

(a) Draw a side-by-side box plot of the two sets of river lengths.



(b) Describe what you see in the plots.