12 DATA HANDLING

LEARNING OBJECTIVES

In this topic, we will learn to:

- construct and interpret
  - (i) tables
  - (ii) bar graphs
  - (iii) pictograms
  - (iv) line graphs
  - (v) pie charts

12.1 PICTOGRAMS

A pictogram uses pictures or symbols to represent data.

Advantages	Disadvantages	
• Easy to read • Visually appealing	• Hard to quantify a partial symbol • Degree of accuracy of figures is low	• Inconvenient to draw by hand • Not good for too many classes

WORKED EXAMPLE 1

A teddy bear manufacturer produces teddy bears in large quantities from February to June. The production is represented in the pictogram below.

Feb	
Mar	
Apr	
May	
Jun	

Key:  *represents 250 teddy bears produced*

Study the pictogram and answer the following questions.

(a) How many teddy bears were manufactured in the month of May?

(b) What was the total number of teddy bears produced?

(c) What was the fraction of April's production to the total production?

(d) What was the ratio of the number of teddy bears produced in March to the number of teddy bears produced in June?

Worked Solution:

(a) Teddy bears manufactured in May $= 8.5 \times 250$
$= \mathbf{2125}$

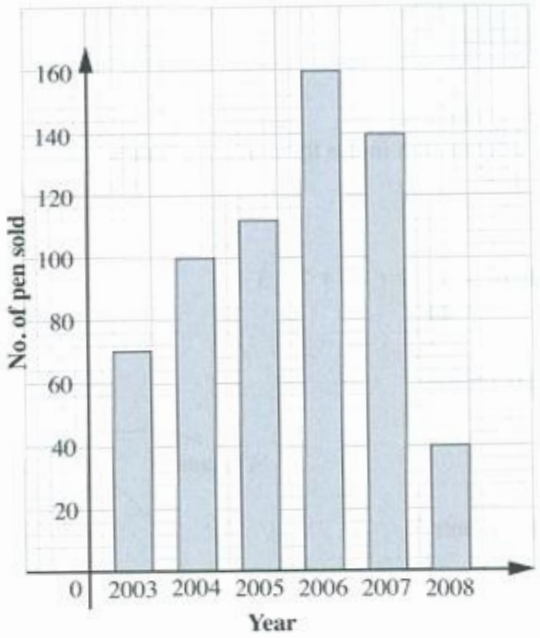
(b) Total number of teddy bears produced $= 37 \times 250$
$= \mathbf{9250}$

(c) April's production $= 10 \times 250 = 2500$
Fraction of April's production $= \frac{2500}{9250}$
$= \mathbf{\frac{10}{37}}$

(d) March's production $= 5.5 \times 250 = 1375$
June's production $= 5 \times 250 = 1250$
Ratio $= 1375 : 1250$
$= \mathbf{11 : 10}$

12.2 BAR GRAPHS

Bar graphs are used to represent discontinuous data. The data measured fits into categories and they have exact values.



Advantages	Disadvantages
• Easy to read • Easy to compare differences between classes • Can show subgroups of each class	• Cannot show the percentage of each class

12.3 PIE CHARTS

Advantages	Disadvantages
• Visually appealing • Can compare a part to the whole	• Cannot read the frequency of each class unless specified • Cannot read the difference between two classes • Not good for too many classes • Need to calculate the proportions before drawing • Can only provide an estimate for each proportion

WORKED EXAMPLE 2

Some students were asked how many countries they have been to. The table below illustrates the results of the survey.

Number of countries	0	1	2	3	4	5
Number of students	8	9	12	7	3	1

(a) Find the total number of students.
(b) Represent the above information in the form of a pie chart.

Worked Solution:

(a) Total number of students = 8 + 9 + 12 + 7 + 3 + 1
= **40**

(b) Students who visited 0 country
$= \frac{8}{40} \times 360°$
$= 72°$

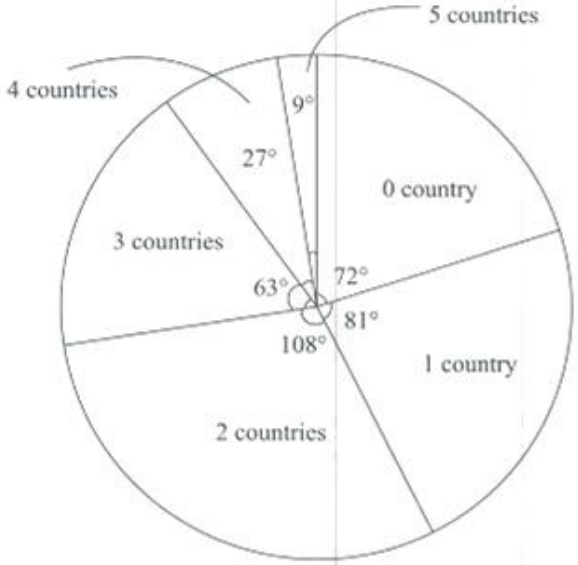
Students who visited 1 country
$= \frac{9}{40} \times 360°$
$= 81°$

Students who visited 2 countries
$= \frac{12}{40} \times 360°$
$= 108°$

Students who visited 3 countries
$= \frac{7}{40} \times 360°$
$= 63°$

Students who visited 4 countries
$= \frac{3}{40} \times 360°$
$= 27°$

Students who visited 5 countries
$= \frac{1}{40} \times 360°$
$= 9°$

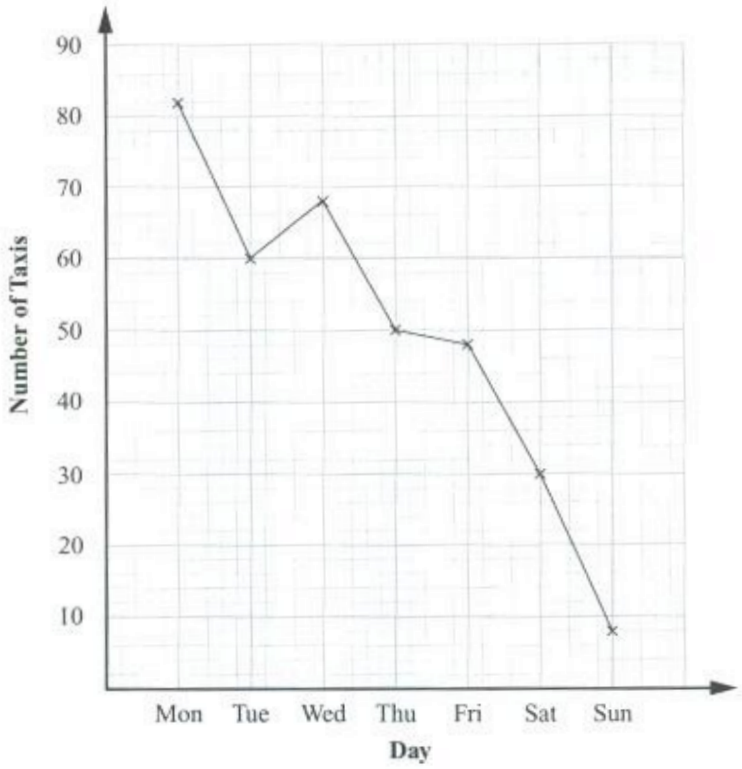


12.4 LINE GRAPHS

Advantages	Disadvantages
• Easy to draw and read • Can show the trend of the data • Can be used for prediction	• Only applicable to time-related data

WORKED EXAMPLE 3

The number of taxis that entered the Central Business District during the morning peak hours over a week was recorded. The results are represented in the line graph as shown.



(a) Find the total number of taxis that entered the Central Business District.
(b) What is the percentage decrease in the number of taxis between Monday and Tuesday?
(c) What fraction of the total is the number of taxis entering the Central Business District on Friday?
(d) Give a reason why Sunday has the least number of taxis entering the Central Business District.

Worked Solution:

(a) Total number of taxis = 82 + 60 + 68 + 50 + 48 + 30 + 8
= **346**

(b) Percentage decrease = $\frac{82 - 60}{82} \times 100\%$
= **26.8%** (3 sig.fig.)

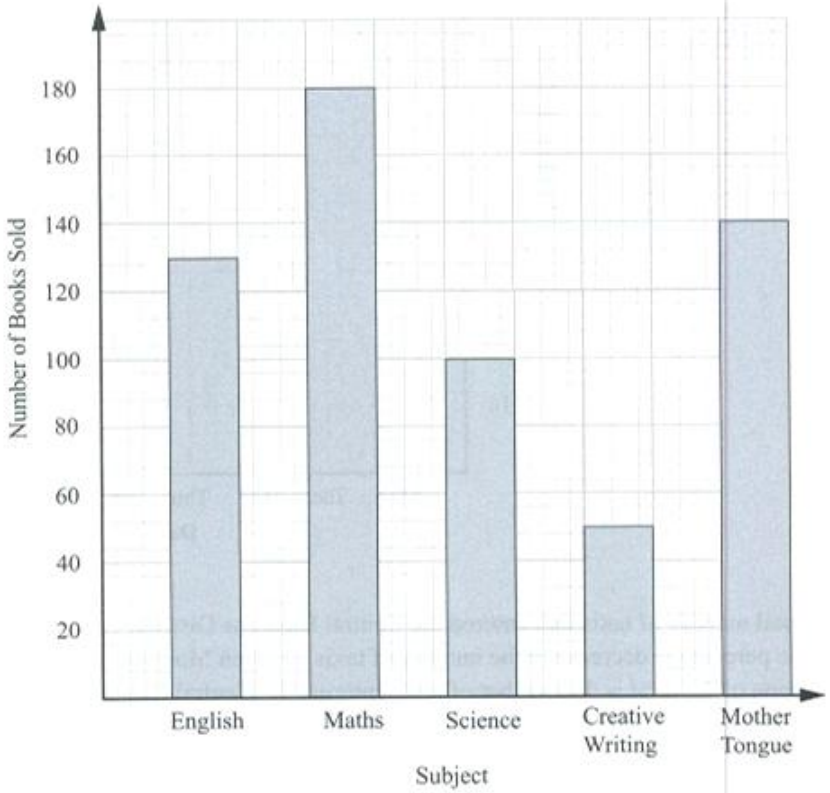
(c) Fraction $= \frac{48}{346}$

$= \frac{\mathbf{24}}{\mathbf{173}}$

(d) It is a Sunday and most of the commercial buildings or offices in the Central Business District are closed.

PRACTICE QUESTIONS

1. The bar graph below represents the different types of assessment books sold in one day.



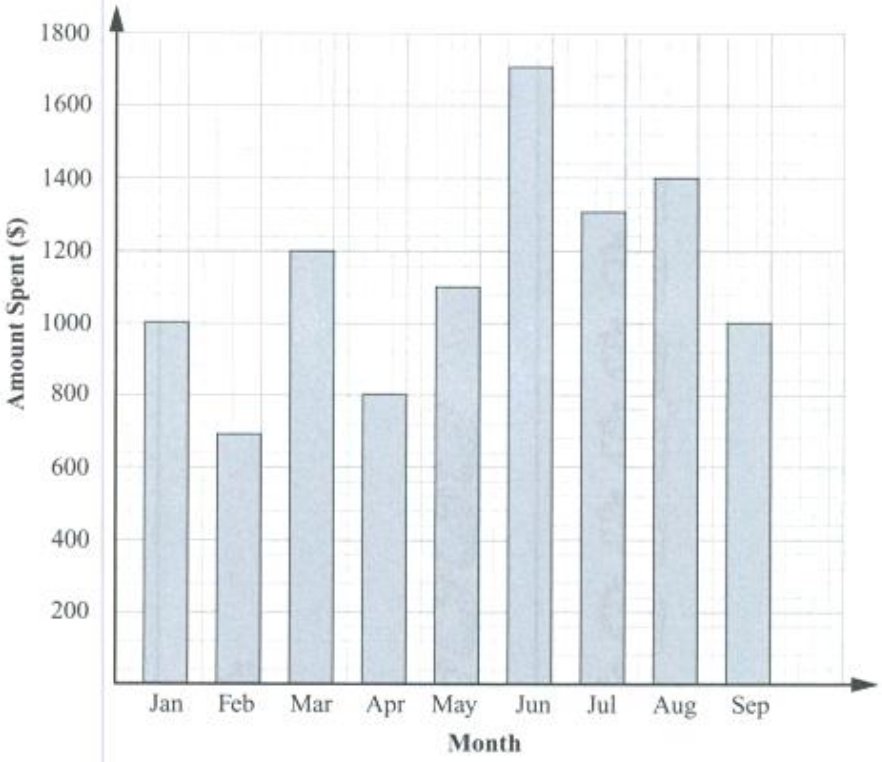
(a) Which type of assessment book has the most sales?
(b) What is the difference between the number of English assessment books sold and the number of Creative Writing assessment books sold?
(c) What is the total number of assessment books sold?
(d) What percentage of the assessment books sold is Science?

2. The table below represents the number of office workers reporting to work in a particular week. There is a total of 200 office workers.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Number of office workers	198	186	192	190	180

(a) Which day has the highest number of absentees from work?
(b) What is the total number of office workers reporting to work in the last week?
(c) What is the daily average of the number of workers reporting to work from Monday to Friday?

3.



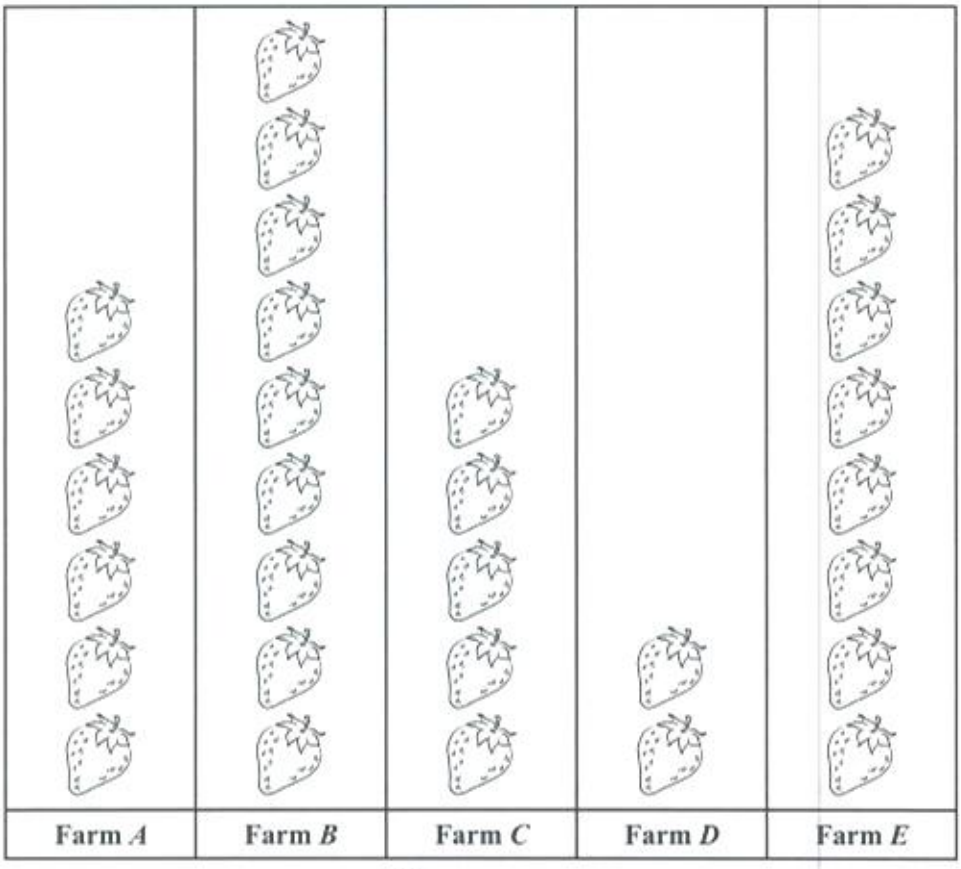
The monthly expenditure of a household in the first nine months of the year is represented on the bar graph above.

(a) Which two months have the same expenses?
(b) What is the difference in amount between the month with the highest expenditure and the month with the lowest expenditure?
(c) What is the total expenditure in the first three months of the year?
(d) Which are the months that have expenditure exceeding $1000?
(e) Find the average monthly expenditure in the nine months.
(f) Peter said that it is more appropriate to represent the data by a line graph. Do you agree with him? Explain your answer.

4. 120 students were asked the type of movies they like to watch. Each student can only choose one type of movie and their responses are represented in the pie chart as shown. Using the pie chart, find

(a) the number of students who like horror movies,
(b) the number of students who like comedy movies,
(c) the total number of students who like watching animation, thriller and romance movies, and
(d) the value of x, if the number of students who like romance, thriller and animation are the same.

5. The monthly harvesting of strawberries in five different farms is represented in the pictogram below.



Key:  *represents 100 kg of strawberries harvested*

Study the pictogram carefully and answer the following questions.

(a) Which farm has the poorest harvest?
(b) Find the total harvest of strawberries for the five farms in kilograms.
(c) Find the percentage of the strawberries harvested in Farm B.
(d) Find the fraction of the strawberries harvested in Farm C.

6. Some students took a memory test and their scores are recorded as follows:

Marks	4	5	6	7	8	9	10
Number of students	3	5	7	3	4	2	1

(a) How many students took the memory test?
(b) Find the percentage of the students who scored more than 8 marks.
(c) Find the fraction of the students who scored 6 marks and below.

7. The diameters of some ball bearings are measured using a vernier calliper and their measurements (in centimetres) are recorded as shown in the table below.

Diameter	6.0	6.1	6.2	6.3	6.4	6.5
Number of ball bearings	4	5	12	9	10	10

(a) How many ball bearings are measured?
(b) Find the percentage of the ball bearings that are 6.3 cm.
(c) Find the fraction of the ball bearings that are 6.4 cm and more.
(d) Find the ratio of the ball bearings that are 6.1 cm and below to the ball bearings that are 6.2 cm.

8. The age groups of toddlers in a childcare centre are recorded and presented in the table as shown below.

Age, x	$0 < x \leq 1$	$1 < x \leq 2$	$2 < x \leq 3$	$3 < x \leq 4$	$4 < x \leq 5$	$5 < x \leq 6$
Number of toddlers	3	5	7	3	4	2

(a) How many toddlers are there in the childcare centre?
(b) What fraction of the toddlers belong to the $4 < x \leq 5$ age group?
(c) How many toddlers are above 3 years old?
(d) Find the percentage of the toddlers who are 2 years old and below.

9. The sales of mountain bikes in the past one year in six different retail shops are represented in the pictogram.

Shop A	
Shop B	
Shop C	
Shop D	
Shop E	
Shop F	

Key:  *represents 10 mountain bikes sold*

Study the pictogram above and answer the questions carefully.

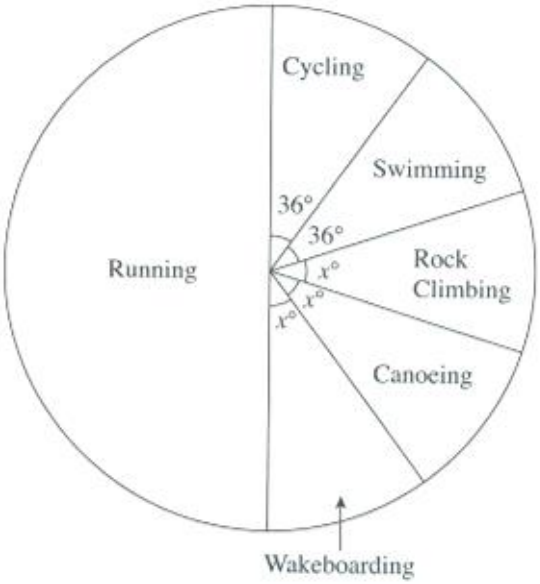
(a) Which shop has the most sales?

(b) Which shop has the least sales?

(c) What percentage of the total number of mountain bikes was sold in Shop B?

(d) What is the ratio of the sales of mountain bikes of Shop D to the sales of mountain bikes of Shop F?

10. Jeremy enjoys various kinds of sports, including cycling, swimming, running, rock climbing, wakeboarding and canoeing. The pie chart shows the number of hours he spent on different kinds of sports.



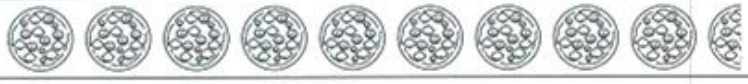
In a week, he spends a total of 80 hours doing different kinds of sports.

(a) What is the number of hours he spends on cycling?

(b) What is the value of x?

(c) Wakeboarding and rock climbing takes up y% of his time. Find the value of y.

11. A pizza chain has 7 outlets in a big city. Over a weekend, the number of pizzas delivered by the different outlets are represented in the pictogram below.

Mountain Vie	
Blue Shore	
Wooding	
Great Mall	
Yellow Wood City	
Fair Bay	
Sun-Ville	

Key:  *represents 20 pizzas delivered*

Study the above pictogram and answer the following questions:

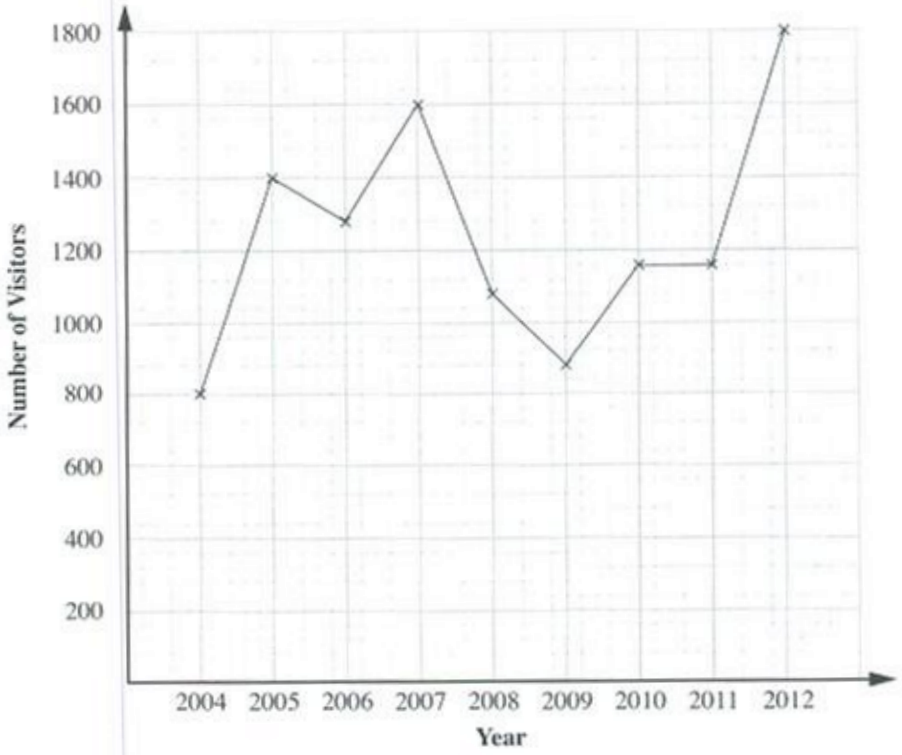
(a) What percentage of the total number of pizzas delivered was by the Yellow Wood City?

(b) Find the ratio of the pizzas that was delivered by Wooding to that by Great Mall.

(c) What was the difference in the number of pizzas delivered by Fair Bay and Mountain View?

(d) What fraction of the total number of pizzas was delivered by Great Mall?

12. The number of visitors to an orchid nursery from 2004 to 2012 are tabulated and plotted on the line graph as shown.



From the line graph, find

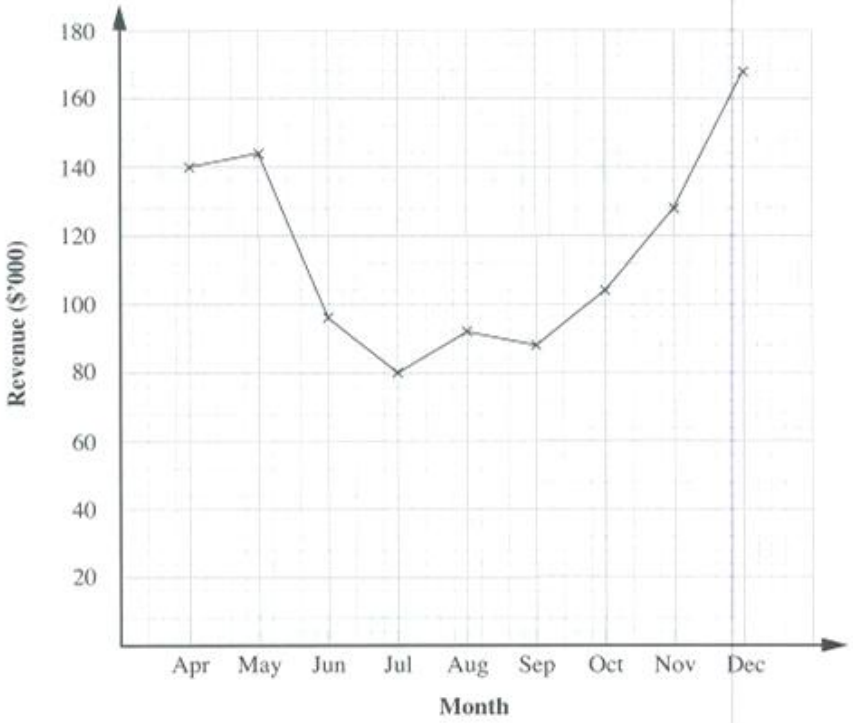
(a) which two years have the same number of visitors,

(b) the difference between the year with the highest number of visitors and the year with the lowest number of visitors,

(c) the percentage increase in visitors from 2011 to 2012, and

(d) the total number of visitors.

13. A fashion shop in the shopping district records its revenue from April to December. The revenue is plotted in the line graph as shown.



From the line graph,

(a) find the total revenue in the last three months of the year,

(b) find the difference between the month with the lowest revenue and the month with the highest revenue,

(c) find the ratio between May's revenue to June's revenue, and

(d) explain why the revenue in December is the highest.