AWM 11 – UNIT 1 – WORKING WITH GRAPHS

Assignment	Title	Work to complete	Complete
1	*Introduction to Statistics*	Read the introduction – no written assignment	
2	*Bar Graphs*	Bar Graphs	
3	*Double Bar Graphs*	Double Bar Graphs	
4	*Broken Line Graphs*	Broken Line Graphs	
	Quiz 1		
5	*Histograms*	Interpreting Histograms	
6	*Histograms*	Creating Histograms	
7	*Circle Graphs*	Interpreting Circle Graphs	
8	*Circle Graphs*	Drawing Angles	
9	*Circle Graphs*	Creating Circle Graphs	
10	*Misleading Graphs*	Misleading Graphs	
	Quiz 2		
Practice Test	**Practice Test** How are you doing?	Get this page from your teacher	
Math Journal	**Math Journal**	Journal entry based on criteria on handout and question jointly chosen.	
Self-Assessment	**Self-Assessment**	On the next page, complete the self-assessment assignment.	
Unit Test	**Unit Test** Show me your stuff!		

Self Assessment

In the following chart, show how confident you feel about each statement by drawing one of the following: ☺, ☺, or ☹. Then discuss this with your teacher **_BEFORE_** you write the test!

Statement After completing this chapter;	☺ ☺ ☹
• I can determine the types of graphs that can be used to represent given data	
• I can explain the advantages and disadvantages of different types of graphs	
• I can create a bar graph, a broken line graph, a histogram, and a circle graph	
• I can interpret bar graphs, broken line graphs, histograms, and circle graphs in order to answer questions about the data	
• I can discuss the trends a graph represents for a given set of data	
• I can explain how different graphs of the same data can be used to be misleading	

Vocabulary: Unit 1
angle
bar graph
broken line graph
circle graph
histogram
statistics
trend

INTRODUCTION TO STATISTICS

Statistics is the branch of mathematics that works with data. It involves collecting data, organizing the data in some way, and interpreting it. This section will focus on organizing data.

There are many different ways to organize or present data: tables, charts, graphs, etc. Data is often presented visually in the form of **graphs**. In this unit you will learn about different types of graphs and their uses. These include bar graphs, broken line graphs, histograms, and circle (pie) graphs.
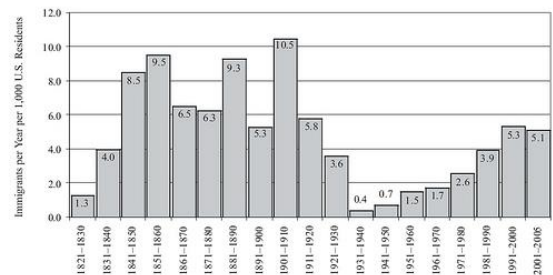
Finally, you will also discuss how graphs can be misleading.
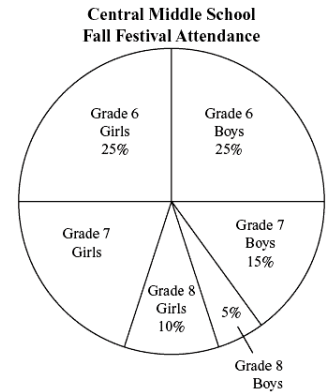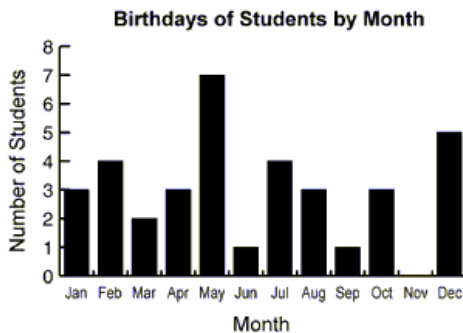
Graphs

Although there are many types of graphs, there are similarities between many graphs. All graphs must have labels to allow the viewer to know what they are reading. Without that, a graph is just another pretty picture rather than being a visual representation of data. And all graphs must have a title.

On most graphs, there are two axes (plural of axis), one axis goes horizontally (↔) and the other goes vertically (↕). Each axis needs a label describing what it is showing (months, cost, number of something, etc.) and a scale if it is a number quantity. When assigning the scale, it is important to remember that each line of the grid paper **MUST** represent the same amount on that graph, and all graphs must start at zero if they represent a numerical property. And remember to label lines, not spaces.
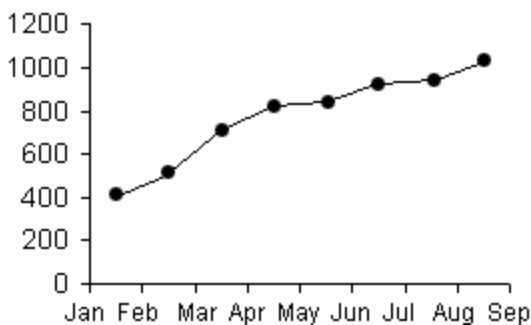
All bar graphs, broken line graphs and histograms **MUST** be constructed on grid paper. Circle graphs will be done on a circle graph blank using a protractor. **NO EXCEPTIONS**. As well, all graphs need a title summarizing what they are showing

BAR GRAPHS

A **bar graph** is *a visual representation used to show comparison*. On a bar graph, the bars can be horizontal or vertical as shown on the right. Most bar graphs are drawn with vertical bars. The values plotted are discrete, meaning they have a distinct or exact value. There is always the same amount of space between the bars and the bars are always the same thickness.
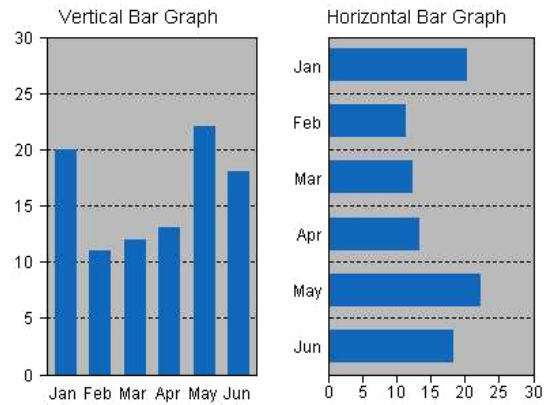
When drawing a bar graph with vertical bars, the horizontal axis does not have a scale: it just the names of each bar. The vertical axis will need a scale. For this Math course, each vertical scale must start at **zero**, and end it just above the highest data value unless otherwise specified (negative temperatures). For example, if your data consisted of the information below, you would start your vertical axis at zero and the top value might be 55 if increments go up by 5, or 56 if increments go up by 2.

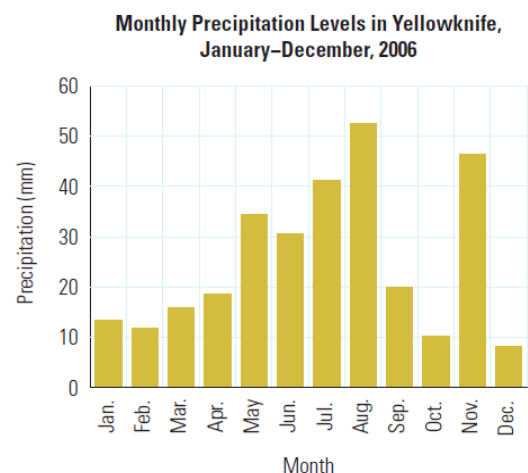| Colour	Number
Blue	50
Green	45
Red	54
Orange	49
Yellow	52

For this course, the bars in the graph should not be coloured with individual colours, but all one colour. A highlighter is fine, or they can be simply shaded with a pencil.

Example 1: Use the bar graph below to answer the following questions.
a) What is the title of this graph?
b) What is the precipitation that fell in October?
c) Which months have precipitation greater than or equal to 30 mm?
d) Which season would you say is the rainy season in Yellowknife?

Solution: Use the information on the graph to answer the questions.

a) The title is "Monthly Precipitation Levels in Yellowknife, January – December, 2006"
b) About 10 mm of precipitation fell in October
c) May, June, July, August, November
d) Summer is the rainy season.

Example 2: Create a vertical bar graph using the data in the table below.

Favourite Colour of Grade 3 Students						
Colour	Blue	Green	Yellow	Red	Orange	Purple
Number of Students	16	5	3	18	11	8

Solution: Draw and label the axes, set a scale, and plot the data accordingly.
The horizontal axis is labelled "Colour" while the vertical axis is labelled "Number of Students." The scale must go up from 0 and a good top value would be 20 with the increment of 2 for each line. The data is plotted as shown below.

**Favourite Colour of Grade 3 Students**
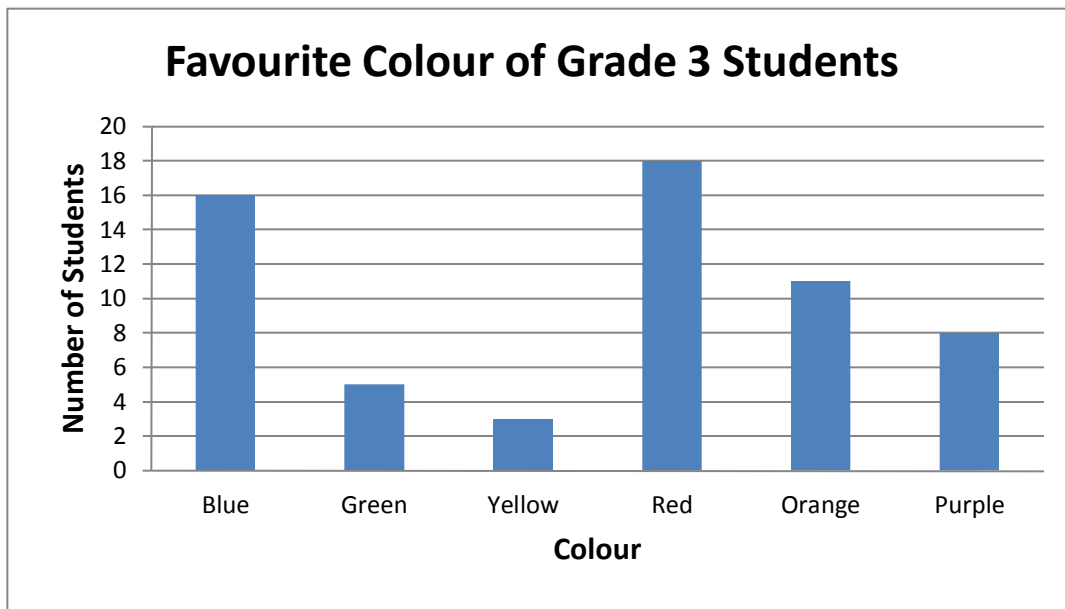
Note that this graph was produced using a software program so it might look slightly different when done with pencil and paper. There are other acceptable values that could be used on the vertical axis; this is not the only answer.

Example 3: The following data is shown in both a vertical and horizontal bar graph. Which graph is a clearer representation of the data and why?

| Population of Anywhere City, BC, 1980 – 2005						
Year	1980	1985	1990	1995	2000	2005
Population (in thousands)	33.5	34.3	33.4	32.8	32.0	32.0

The graphs are plotted below.

Population of Anywhere City BC, 1980 – 2005
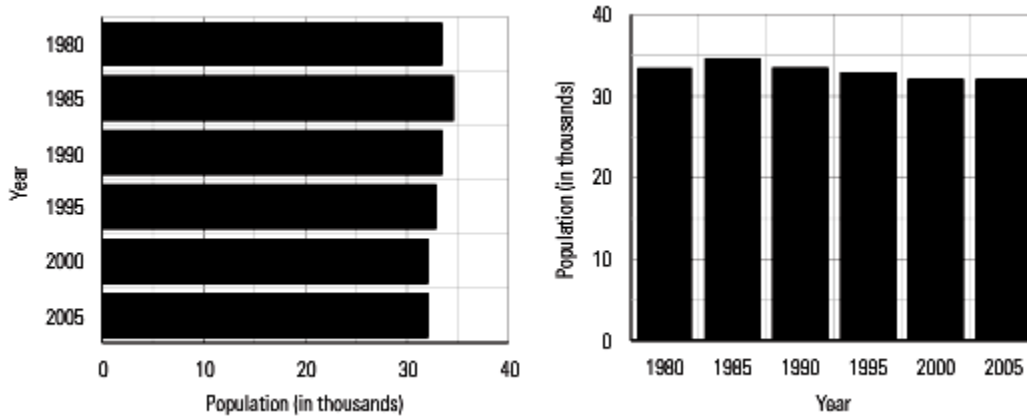
The vertical bar graph on the right seems to have the clearer representation as it is easier to see that the population is dropping from 1995 to 2005. *Using the graph to assess this statistic is called determining the* **trend** *of the data.* In this case, the trend is a slight decrease in population over the time covered by the graph.

ASSIGNMENT 2 – BAR GRAPHS

1) Use this bar graph to answer the following questions.

DVDs Sales
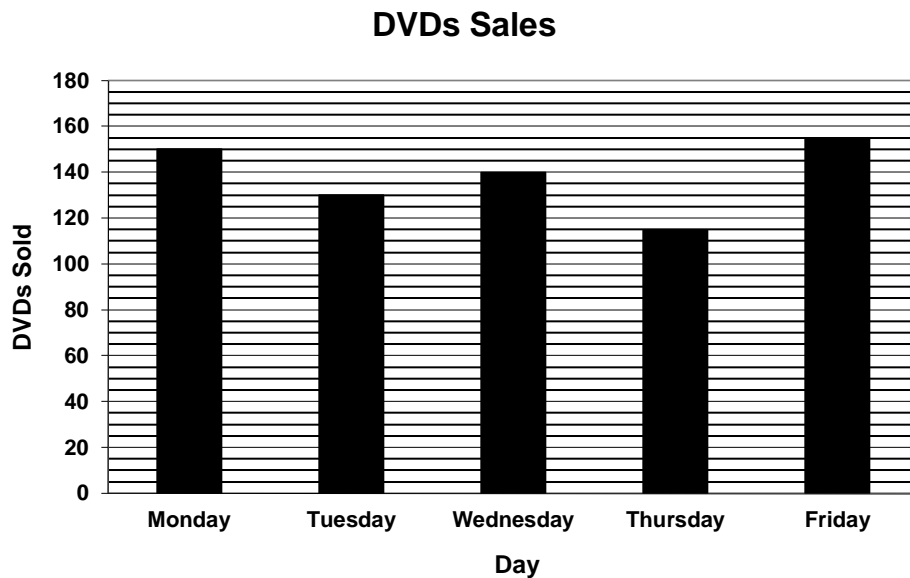
How many DVDs were sold on:

   a) Monday? _____

   b) Tuesday? _____

   c) Wednesday? _____

   d) Thursday? _____

   e) Friday? _____

On which days were:

   f) More than 130 DVDs sold? _____

   g) 120 or more DVDs sold? _____

   h) Fewer than 130 DVDs sold? _____

   i) 150 or fewer DVDs sold? _____
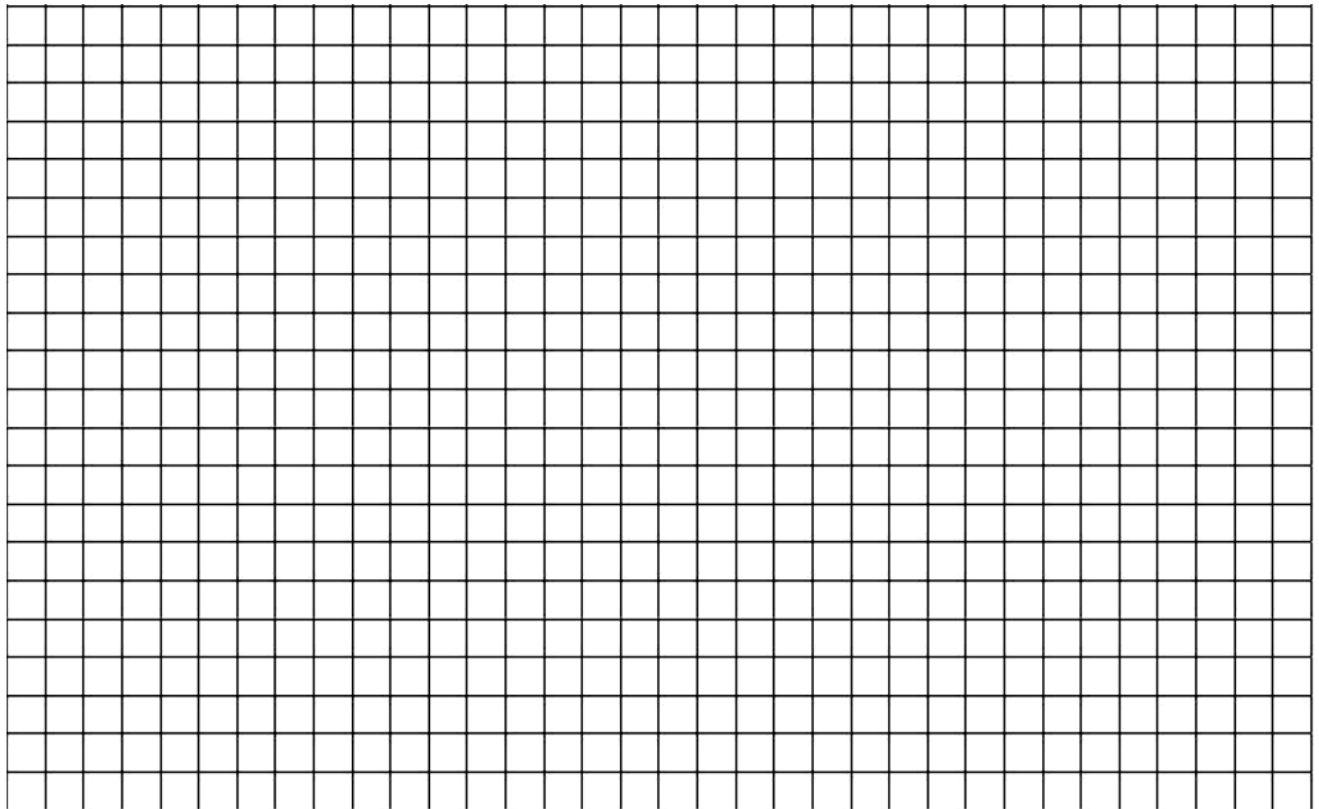
Were more DVDs sold on:

   j) Monday or Wednesday? _____

   k) Tuesday or Thursday? _____

   l) Wednesday or Friday? _____

2) Create a bar graph for each of the following sets of data. Use the graph paper given below the chart of data. Plan your graph carefully so it fits on the graph paper and is not too small.
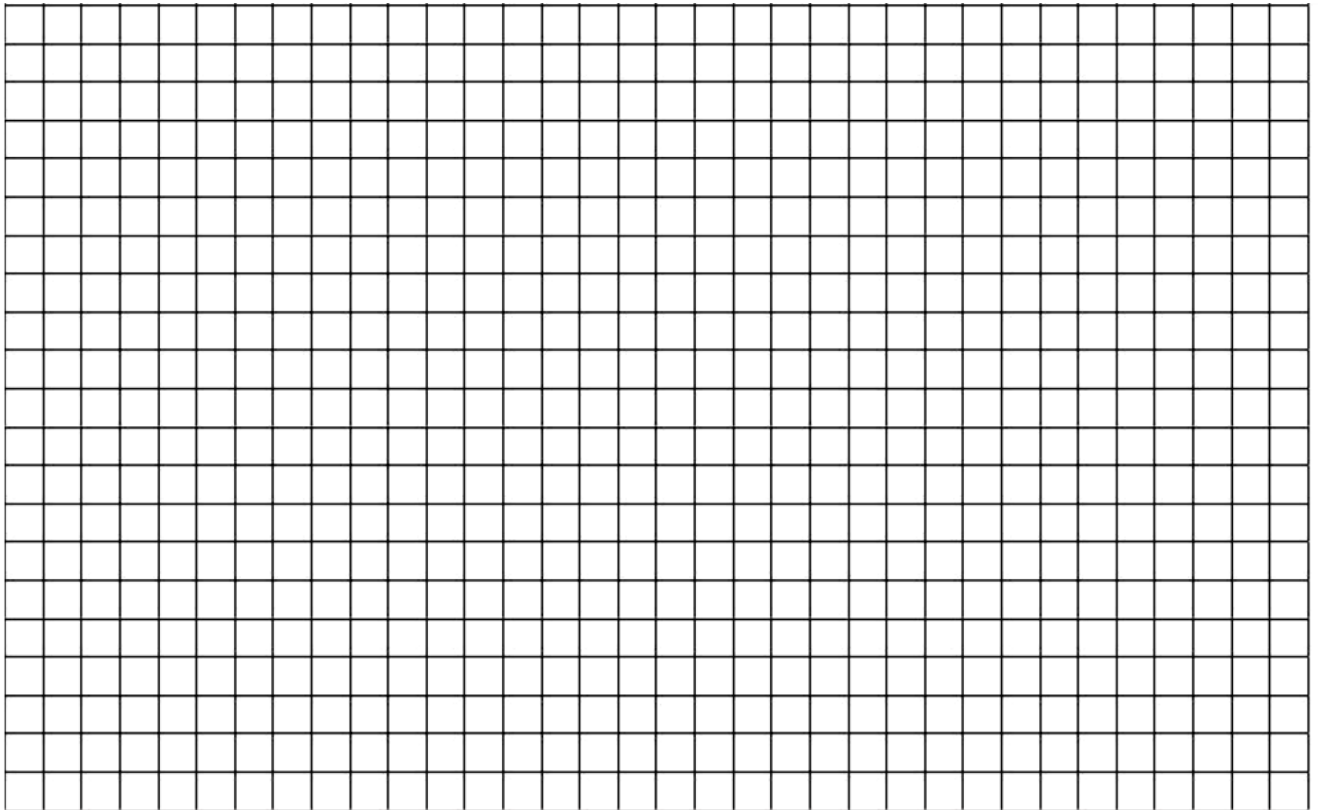
<u>Favourite Sport</u>

Sport	Number
Tennis	40
Hockey	36
Soccer	34
Baseball	44
Football	46

0

Math Test Scores

Test Score	Number of Students
60	15
65	10
70	20
75	30
80	50
85	25
90	5
95	15

NOTE: The "Test Score" goes on the horizontal axis (⟷) while the "Number of Students" goes on the vertical axis.

0

Double Bar Graphs

Double bar graphs are used to compare two things and show the trends between both at the same time. Double bars graphs have everything the same as single bar graphs except they have two bars at each spot on the horizontal axis comparing some entity. Drawing double bars graphs follows the same set of rules as for single bar graphs. Examples of double bar graphs could be fuel consumption for different vehicles comparing highway and city driving or housing prices for new and resale homes, or the graph to the right.

This example of a double bar graph shows several key features; the pair of bars is the same width and touching each other. There is the regular space between sets of bars. There needs to be some form of a legend to indicate what different colours or patterns represents. And like ALL graphs, the axes are labelled, the vertical axis has a scale on it, and the graph has a title.

Time Spent Watching Television and Doing Homework
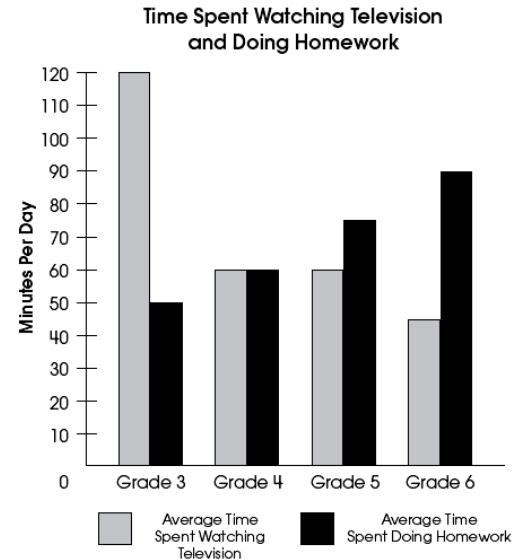
Example: Use the double bar graph to answer the following questions.
- a) What are the two company names?
- b) Which company is represented by the darker bar?
- c) How many computers does each company sell?
- d) How many working spaces does each company have?
- e) Why would one company have more computers than working spaces?

Solution:
- a) Competitor's company and Ginger's company
- b) Competitor's company
- c) Competitor's company - 8
  Ginger's company - 5
- d) Competitor's company - 7
  Ginger's company - 8
- e) Some computers may be laptops and not used in a workspace.

Company Expenses
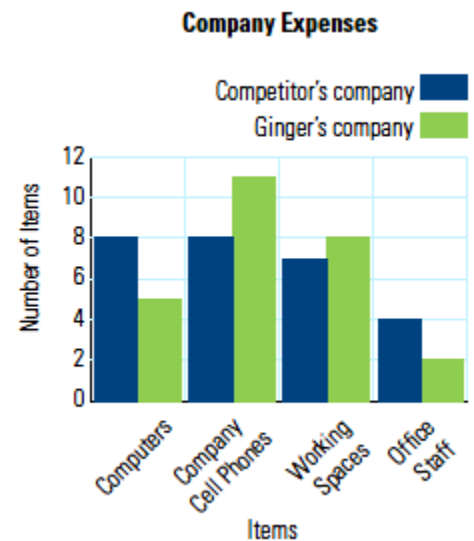
ASSIGNMENT 3 – DOUBLE BAR GRAPHS

1) George did a survey at his school to find out what each student's favourite sport was to watch on TV. The results are in the chart. Draw a double bar graph to represent this data on the graph paper below.

| Favourite Sport to Watch on TV					
Sport	Hockey	Soccer	Football	Baseball	Golf
Boys	243	101	135	79	18
Girls	265	75	121	15	2
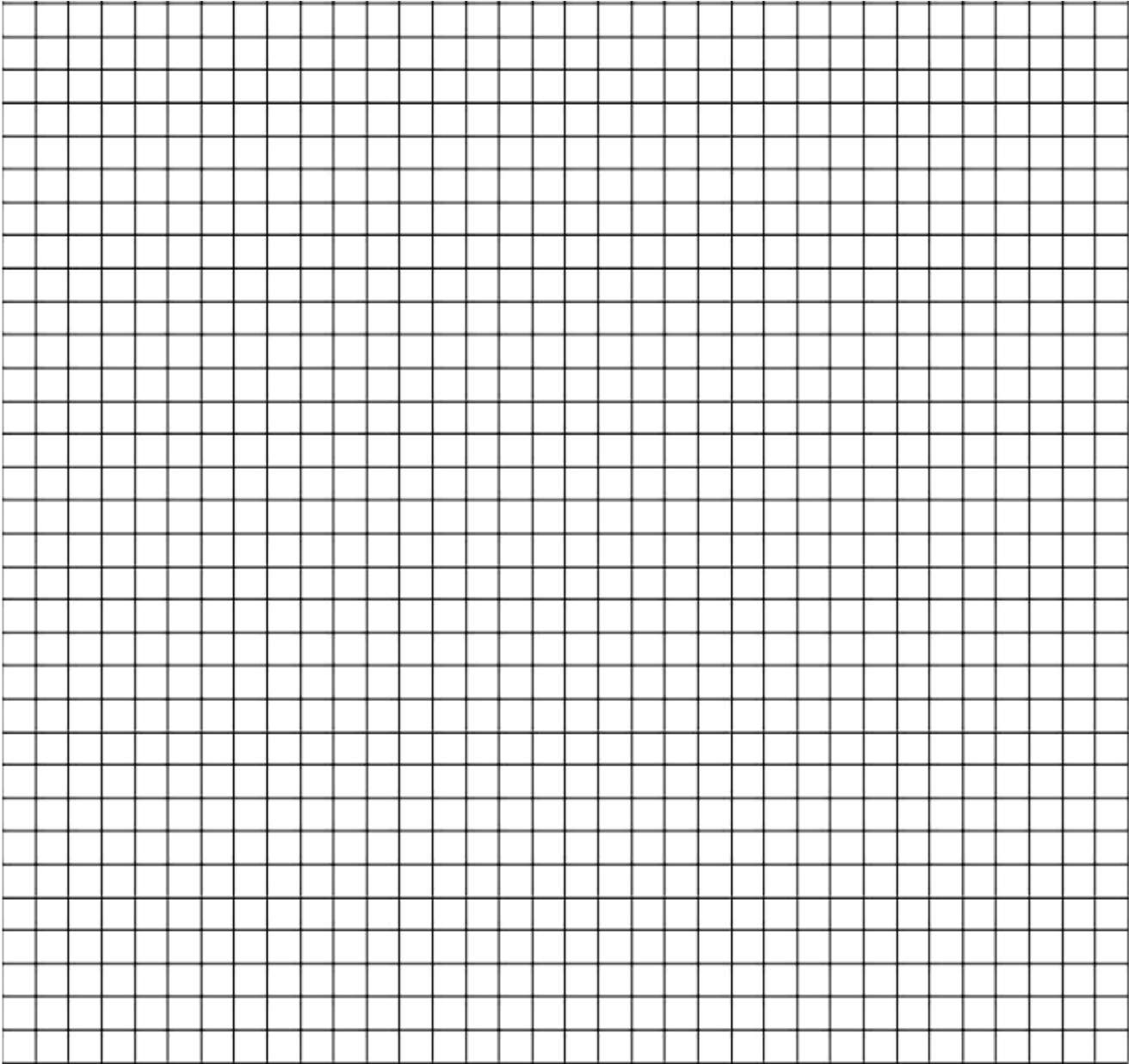
0

BROKEN LINE GRAPHS

A **broken-line** graph displays information by using a scale. It is similar to a bar graph, but it has points at the top of where the bars would be. These points are joined in individual line segments creating a "broken" line. It shows continuous change over a period of time. Just as with a bar graph, a broken line graph needs labels on the axes and a title.

Broken line graphs *are used to show trends over time*. By looking at just the line on a broken line graph rather than a set of bars on a bar graph, it is easier to discover the changes in the data over time. As with double bar graphs, broken line graphs can have more than one broken line on a graph.

Net Income by Month for One Year

If you see a symbol like the one shown in the diagram to the right on an axis, it means that some amount of the axis has been omitted. If it is a scale, it is indicating that while the graph starts at zero, it really leaves out a large chunk of the values on the axis. DO NOT USE THIS TYPE OF SYMBOL OR METHOD. It produces inaccurate and misleading graphs which will be discussed later in this unit.
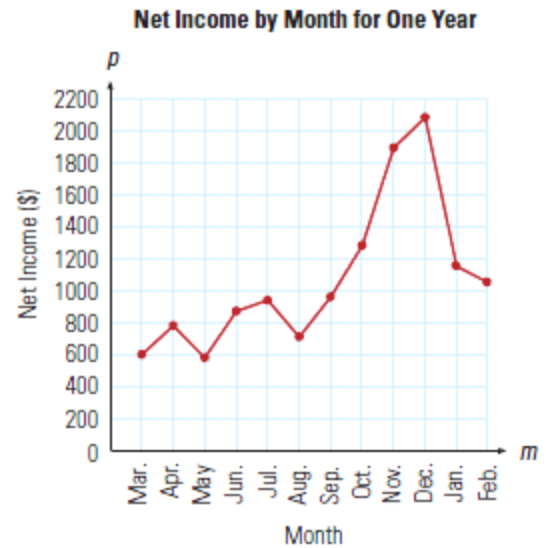
To construct a broken-line graph, complete the following steps.

1) Plan, draw and label the vertical scale to show the range of values. The label contains the words stating what the numbers are like metres, income, number if hours, etc. Remember to start at zero and to go just above the highest value. Each line MUST represent the same amount on your scale. If it is 5, your lines will go up like this: 0, 5, 10, 15, 20, 25, etc. It is not necessary to label every line with a number as it may get cluttered and hard to read.

2) Next plan, draw and label the horizontal scale. The spacing between each vertical line that you choose to label where you will plot a point MUST be consistent. For example, don't leave two lines for the first 5 points and then only one line at the right side between points because you are running out of room! Plan your graph carefully!

3) Next, plot the points of data. To do this, find the values on each axis and where they meet, draw a **small** point.

4) When all the points are plotted, connect them **WITH A RULER**. Do not try to make the line one straight line. It is a series of line segments between each dot.

5) Finally, write a title for the graph that describes what the graph is illustrating.

ASSIGNMENT 4 – BROKEN LINE GRAPHS

1) Use the broken-line graph above to answer the following questions.

Length of First Day Each Month
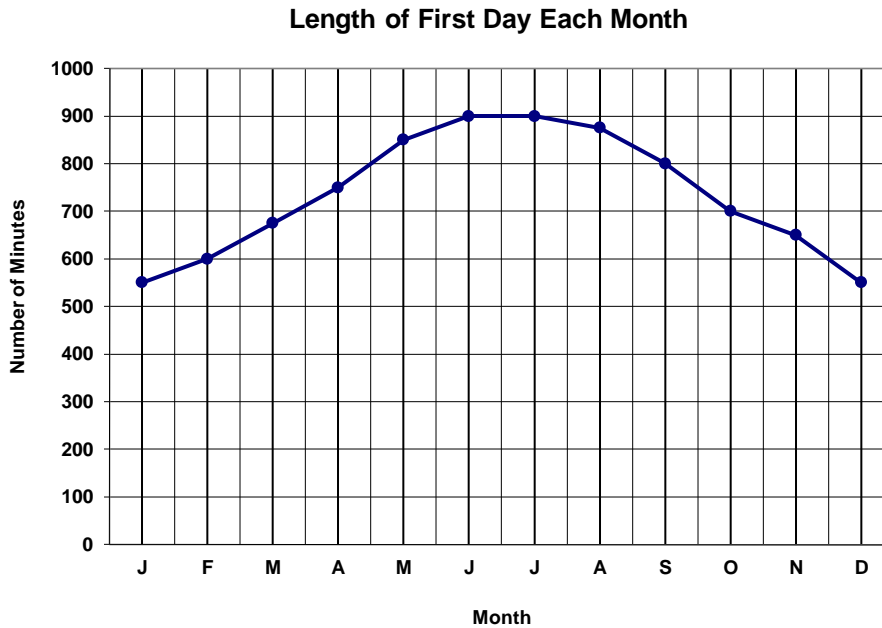
During which months does the graph show the first day to be:

    a) 800 minutes or more minutes? _____

    b) 750 or fewer minutes? _____

    c) Shorter than 600 minutes? _____

    d) Longer than 850 minutes? _____

    e) 700 or more minutes? _____

Was the first day longer in:

    f) March or September? _____

    g) May or September? _____

    h) April or October? _____

    i) June or August? _____

    j) February or November? _____

2) Jacob runs his own Fix-It company. He plotted his company's recent profits in a graph shown below. Use the graph to answer the next questions.

Fix-It - Net Profit, 2000-2009
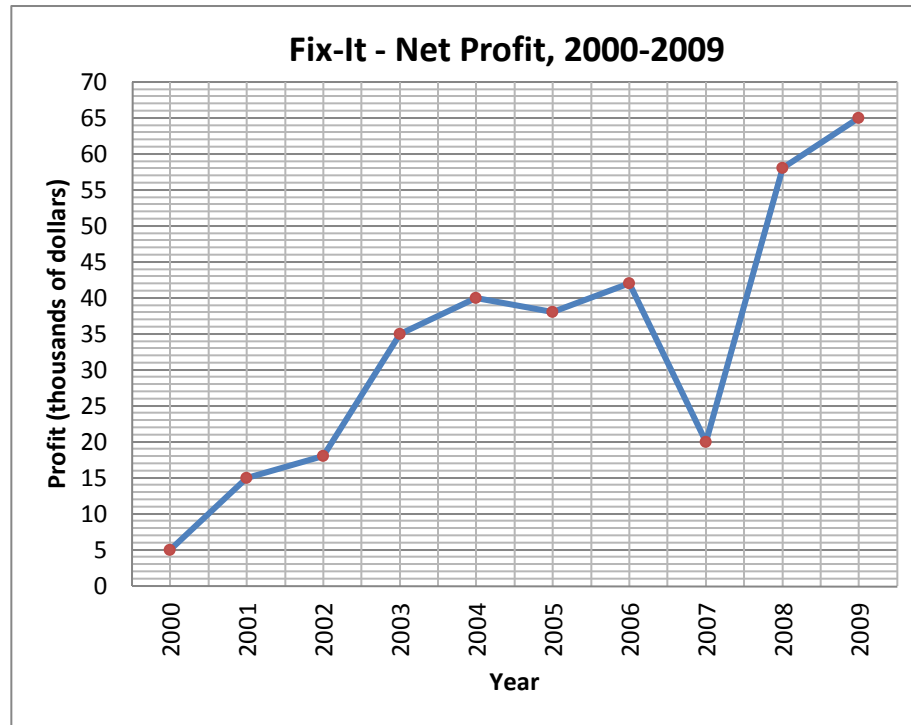
a) What does the graph display?

b) Describe the <u>general trend</u> in company's profits over the timeframe that the graph displays.
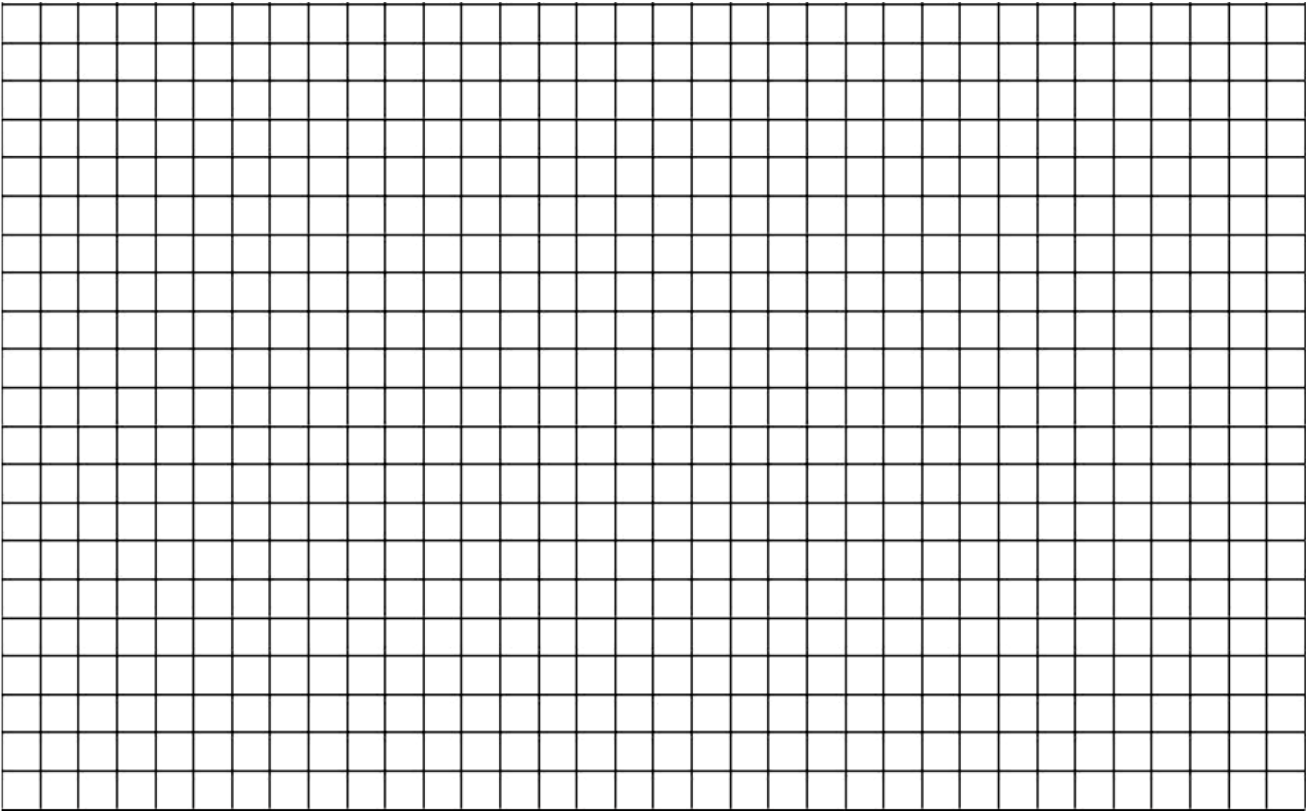
c) Are there any exceptions to the overall trend in the company's profits? Explain.

3) Create a broken-line graph for the following set of data. Plan your graph carefully so it fits on the graph paper but is not too small.
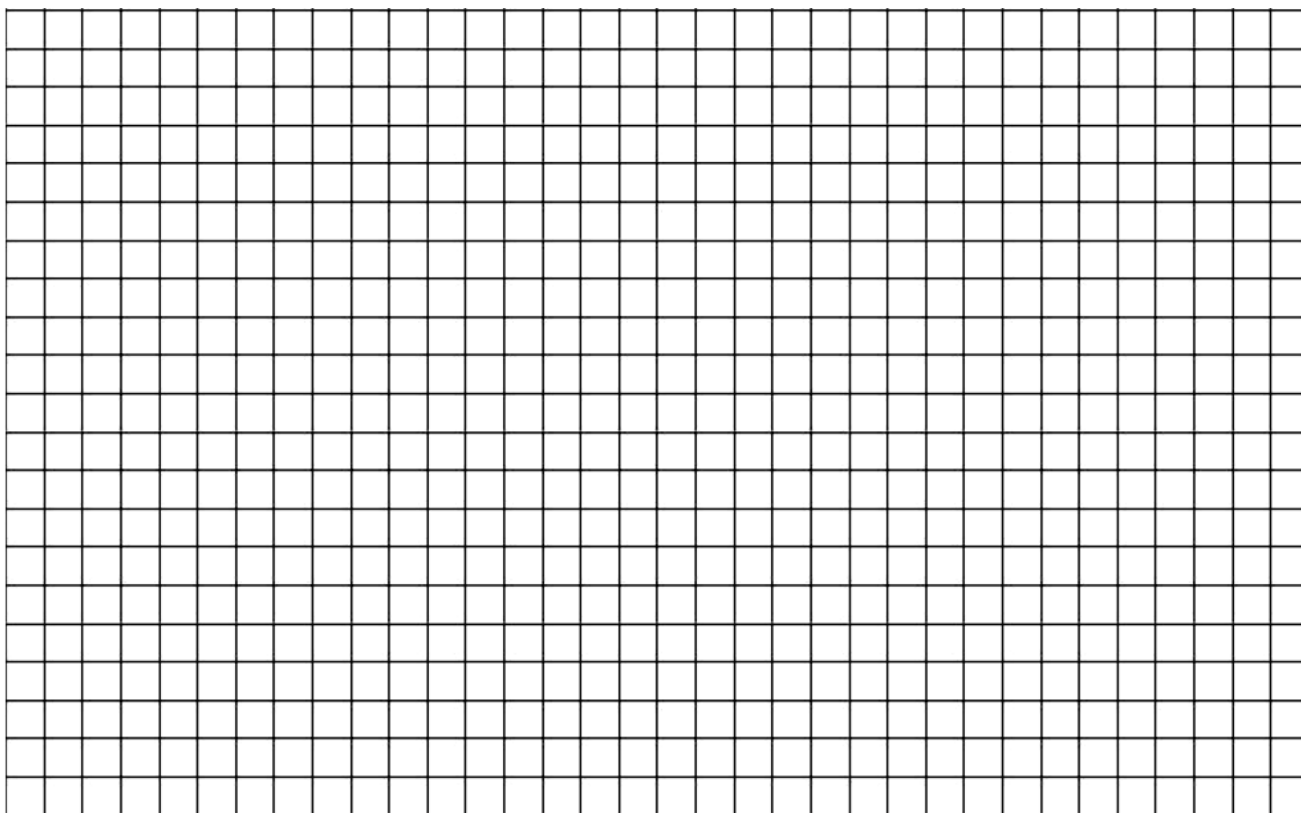
Math Test Scores

Test Score	Number of Students
60	15
65	10
70	20
75	30
80	50
85	25
90	5
95	15

NOTE: The "Test Score" goes on the horizontal axis while the "Number of Students" goes on the vertical axis.

0

4) Create a broken-line graph for the following set of data. Plan your graph carefully so it fits on the graph paper but is not too small.

Monthly Precipitation in Banff, Alberta												
Month	J	F	M	A	M	J	J	A	S	O	N	D
Precipitation (mm)	28	22	23	32	60	82	54	60	42	29	27	28

0

ASK YOUR TEACHER FOR QUIZ 1

HISTOGRAMS

A **histogram** is a special type of bar graph. It shows a range of continuous data on the horizontal axis grouped into what are called classes. *There is **no space** between the bars of a histogram because the data is continuous, and the width of each bar that represents the classes is the same.*

Price of Cards

Height of Students in Class
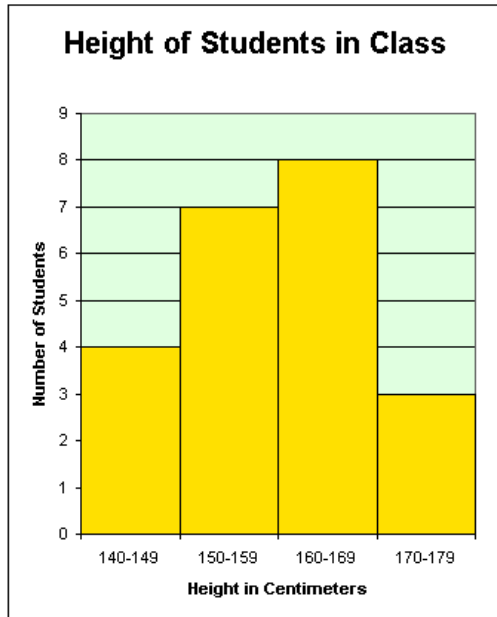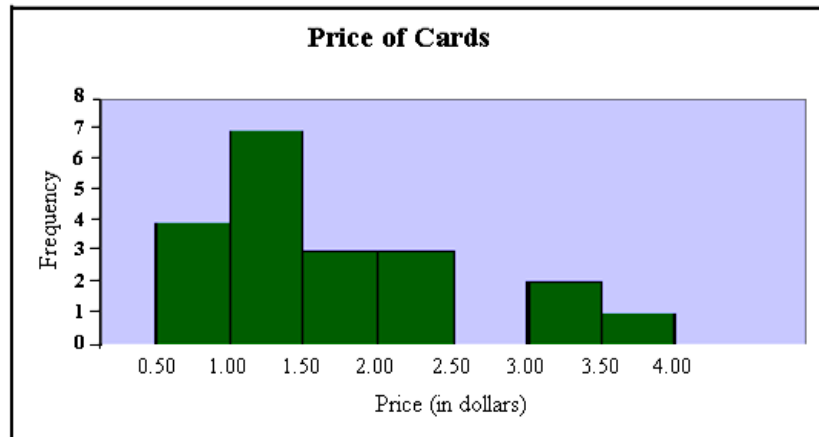
On the graph above, the label on the vertical axis is "Frequency". This simply tells us how often the item on the horizontal axis occurred. The vertical axis could also have a more descriptive title. In this case, it might say "Number of Cards".

On the graph to the left, the label on the vertical axis is more descriptive, saying "Number of Students" rather than frequency. This is the preferred way to label the axis.
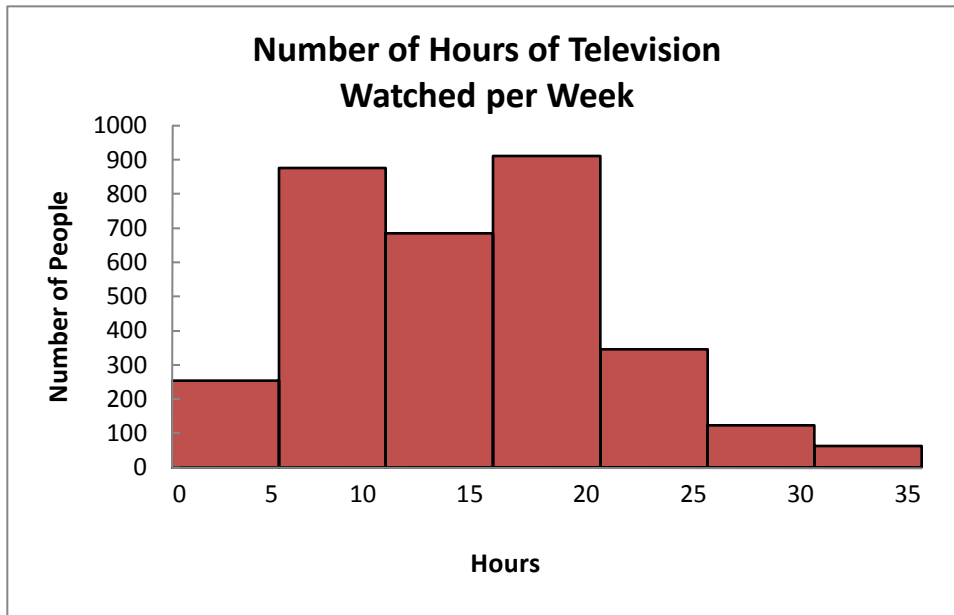
Also notice that the range of values horizontal axis in each graph is shown differently. Both show a range, but the graph above shows labels at the ends of each bar on the histogram while the graph to the left shows the entire range written under the bar. The preferred way to show the range is the graph at the top of the page.

The data used to plot a histogram comes from a tally chart or a frequency table. A tally chart lists the classes to be plotted and has tally marks for each time there is a piece of data in that class. A frequency table summarizes the tally marks into number data. Sometimes, both types of data are combined in the same table as seen here.

Marks on Math Quiz

Mark	Tally	Frequency
2	I	1
3	II	2
4	III	3
5	III	3
6	IIII	5
7	IIII I	6
8	IIII II	7
9	II	2
10	I	1

17

Example 1: Use the attached histogram to answer the following questions.

Number of Hours of Television Watched per Week

a) What are the intervals or classes shown on this histogram?

b) In which interval did the most people watch TV?

c) Which interval time had the least number of people watching TV?

Solution:

a) The classes or intervals are:
   0 – 5 hours, 5 – 10 hours, 10 – 15 hours, 15 – 20 hours, 20 – 25 hours, 25 – 30 hours, and 30 – 35 hours

b) The most people watched 15 to 20 hours of TV

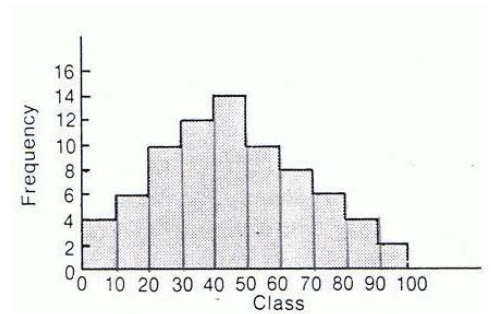c) The least people watched 30 -35 hours of TV per week.

ASSIGNMENT 5 – INTERPRETING HISTOGRAMS

Use the data in the following histograms to answer the questions.

1. What are the classes in this histogram? List them.

_____

2. In which class (or interval) does the most data occur?

_____

3. In which class (or interval) does the least data occur?

_____

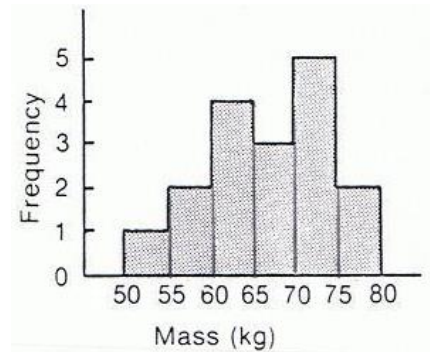4. How many students have a mass between 55 and 60 kg?

_____

5. How many students have a mass between 70 and 75 kg?

_____

6. How many students have a mass of less than 70 kg?

_____

7. How many students have a mass of 70 kg or more?

_____

8. How many students are on the football team?

_____

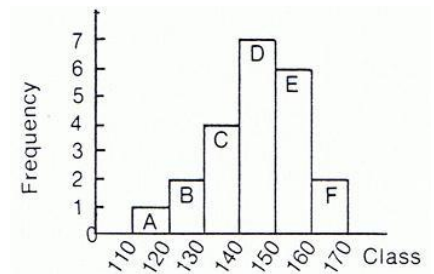Masses of Players on
School Football Team

9. How many classes are there in this histogram?

_____

10. What are the classes?

_____

11. In which class does the greatest frequency occur?

_____

12. Which 2 classes have the same frequency?

_____

CREATING HISTOGRAMS

Most of the histograms you will be drawing already have the first 3 steps completed and the frequency chart drawn. In case you are presented with raw data, you need to understand how the frequency chart is created.

1. Gather the data you are interested in.
   The example data here represents the heights of students in Grade 11 in centimetres.

152	161	189	158	177	167	182	155	171	163	185	173	183
166	177	172	157	168	181	167	188	158	168	162	159	153
171	186	152	167	173	175	159	184	189	187	162	151	179
163	185	183	177	176	152	174	179	182	158	172	186	171
185	157	173	188	152	176	187	157	172	179			

2. Look at the data and determine the categories or intervals you will use to organize the data. Sometimes the classes will be given to you. Other times you must determine them from the data. The tally chart here shows the results of a survey about height of students in Grade 11.

Height Classes	Tally
150 - 160 cm	卌 卌 卌
160 - 170 cm	卌 卌 I
170 - 180 cm	卌 卌 卌 IIII
180 - 190 cm	卌 卌 卌 II

3. Construct a frequency table for your data. The frequency corresponds to the number of times each value is observed. Using this example, the frequency table might look like this.

   THIS IS WHERE MOST OF THE DATA YOU WILL BE WORKING WITH WILL START – WITH A PREMADE FREQUENCY TABLE.

4. To create the histogram, draw a horizontal and a vertical axis. The horizontal axis (X) shows the data categories (such as time, or a measurement, like weight). In this case, it would be **Height**. The vertical axis (Y) represents the frequency of the observations (the number of observations for each category). In this case it would be **Number of Students**.

Height (cm)	Number of Students
150 – 160	15
160 – 170	11
170 – 180	19
180 – 190	17

5. For each category of data, draw a rectangle (without space between the rectangles). The width of the rectangle represents the interval between two groups, and the height represents the observed frequency.

The histogram for this data is found on the next page.

Height of Grade 11 Students
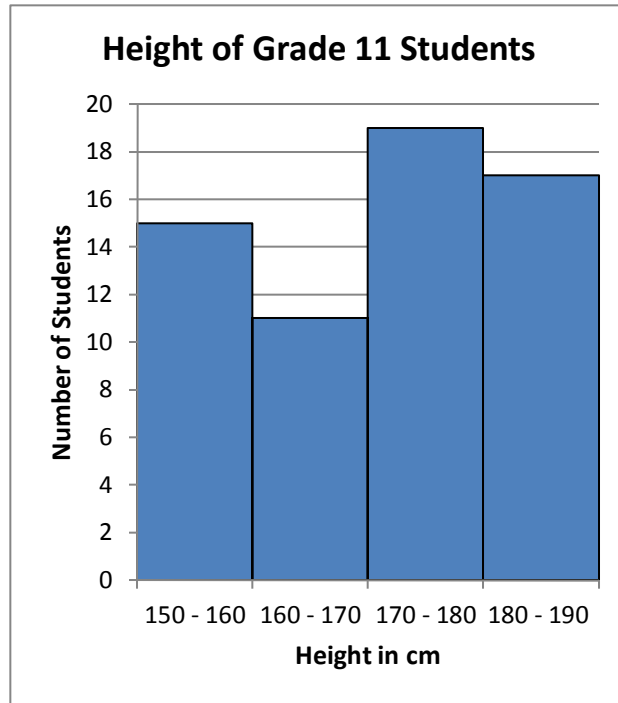
## ASSIGNMENT 6 – CREATING HISTOGRAMS

1) The table below gives data on the distribution of the age of teachers at a large high school. Use this data to draw a histogram on the grid paper on the next page.

| Age of Teachers at Central High School						
Age	Less than 25	25 – 34	35 – 44	45 – 54	55 – 64	65 and older
Number	3	18	30	22	17	2

2) The table below shows the Average Daily Temperatures in Yellowknife, NWT in July. Use this data to draw a histogram on the second grid paper on the next page.

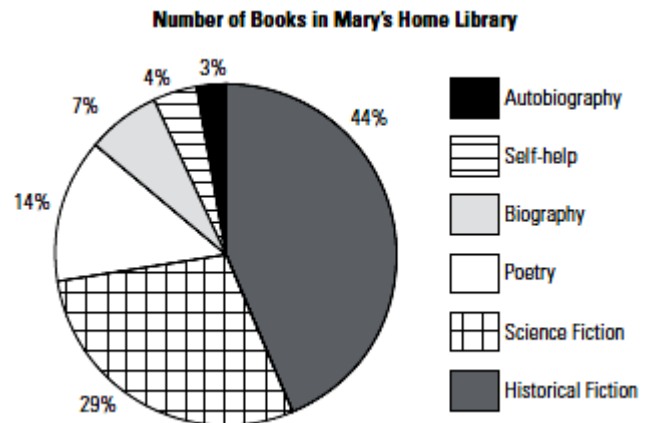| Average Daily July Temperatures, Yellowknife, NWT					
Temperature (^0C)	10 – 13	13 – 16	16 – 19	19 – 22	22 – 25
Number of Days	2	8	7	13	1

0
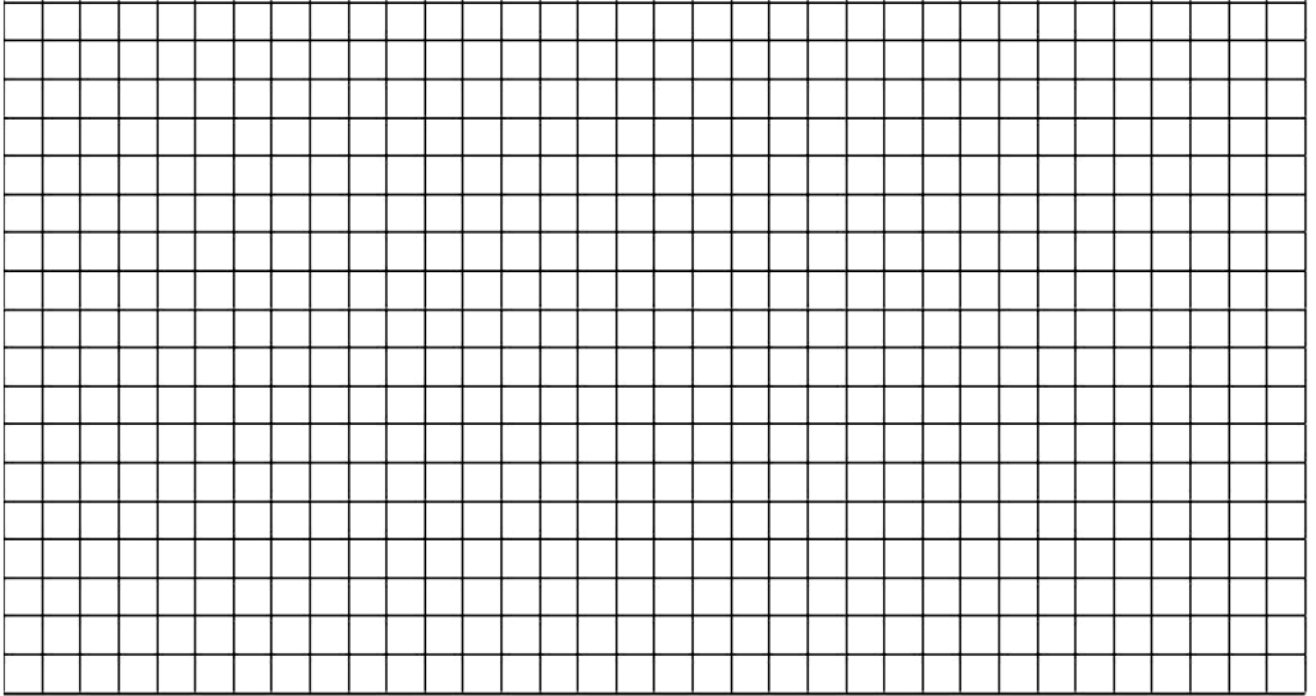
0
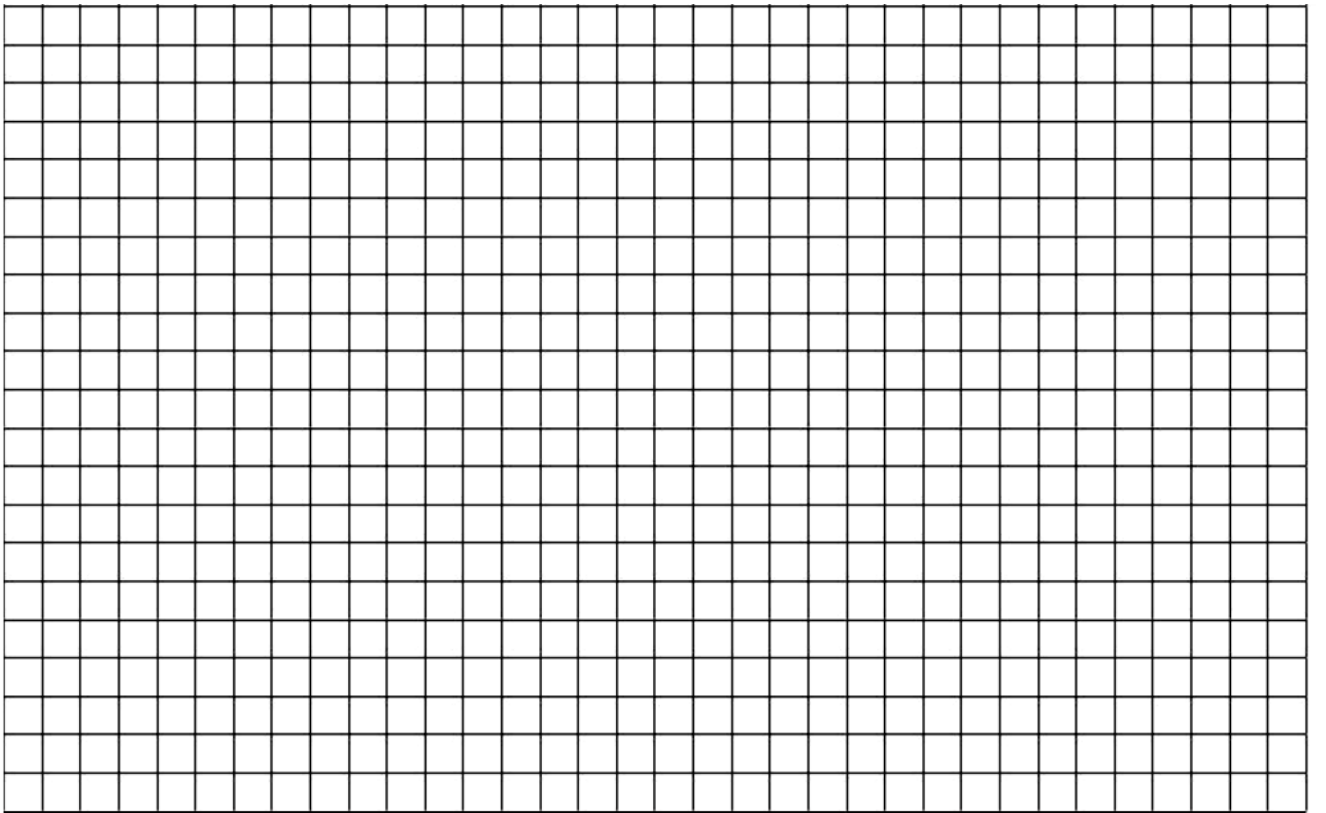
CIRCLE GRAPHS

A **circle graph** (or pie chart) is used when we want to show comparisons about parts that make up the whole amount. It could be something as simple as the distribution of blood types from data from the Canadian Red Cross blood donors as shown in this circle graph. Circle graphs can also show very complicated data, with many sectors.
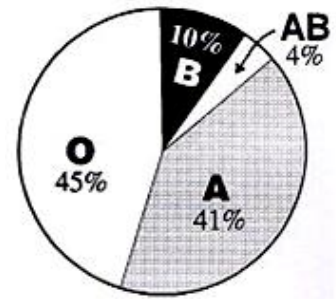
Blood Types

Example: The following circle graph shows the distribution of books in Mary's home library. Use the graph to answer the questions.

a) What percentage of Mary's books are Science Fiction?

b) Which category of books does Mary have the fewest of?

c) If Mary has 72 books in her library, how many are Biographies?

Number of Books in Mary's Home Library

Autobiography
Self-help
Biography
Poetry
Science Fiction
Historical Fiction

Solution:

a) From the graph, 29% of Mary's books are Science Fiction.

b) Mary has the fewest books in the Autobiography category.

c) Mary has said that 7% of her books are Biographies. To find how many books this represents, set up a proportion and calculate as follow:

$$\frac{part}{whole} \quad \frac{7}{100} = \frac{x}{72}$$
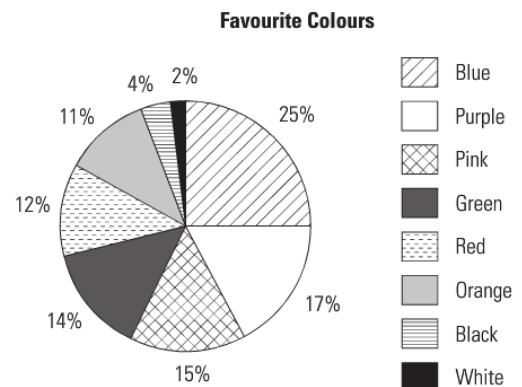
Cross multiply and divide as follows:

$$x = 7 \times 72 \div 100 = 5.04$$

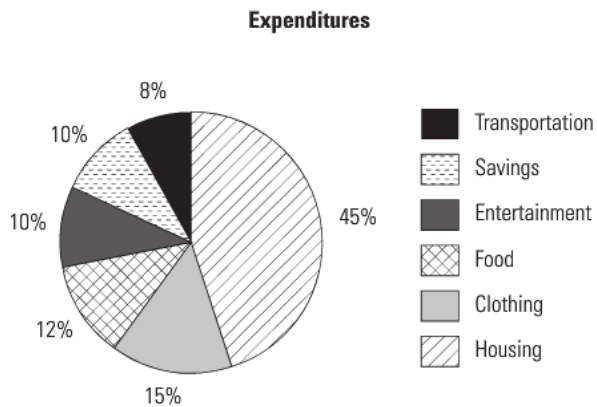Mary has 5 books that are Biographies.

ASSIGNMENT 7 – INTERPRETING CIRCLE GRAPHS

1) The circle graph of Favourite Colours was created after several students surveyed their grade. There were 175 students surveyed.

Favourite Colours

4% 2% 25% — Blue
11% — Purple
12% — Pink
14% — Green
15% — Red
17% — Orange
Black
White

a) What colour did most students respond was their favourite?

b) What was the least favourite colour?

c) How *many* students responded that red was their favourite colour?

2) Grace's expenses are shown in this circle graph.

Expenditures

8%
10%
10%
12%
15%
45%

- Transportation
- Savings
- Entertainment
- Food
- Clothing
- Housing

a) What two expenses did she spend the same amount on?

b) Which expense does she spend the most on?

c) What is her combined percentage spent on clothing and food?

d) If she saves $275.00 each month, how much does she earn?

DRAWING ANGLES

In order to draw a circle graph accurately, angles must be constructed using a protractor that correspond to the size that each "slice" of the pie represents.

To construct an angle, do the following:

i.   Draw a straight line about 5 – 10 cm long. On one end, mark a "tick" as shown below.

ii. Place the protractor on the line with the tick directly under the perpendicular line going up to 90^0 and the line you drew directly under one of the horizontal sides out to zero.

iii. Mark the location of the degrees of the angle you wish to draw. In this example, 53^0 is plotted. ***Be careful to follow the correct scale***. This means that if you start on the right side at zero, follow the **INSIDE** scale around until you reach the angle measure you require.

iv. Draw a line from the tick to the mark you made for the angle measure. This now forms the angle you were required to construct.
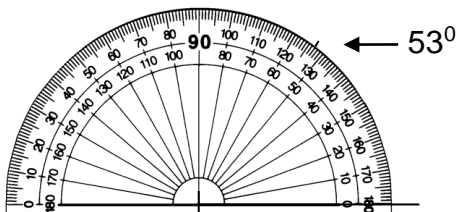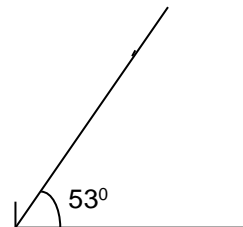
i.

ii)

iii)

   ← 53^0

iv)

53^0
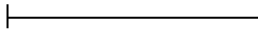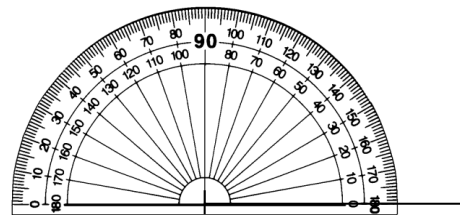
When constructing angles, always do it on plain or unlined paper.

ASSIGNMENT 8 – DRAWING ANGLES

Construct the following angles in the space below.

1) 65^0 2) 158^0

3) 125^0 4) 90^0

5) 11^0 6) 131^0

7) 112^0 8) 42^0

CREATING CIRCLE GRAPHS

To plot a circle graph, the amount or percentage given must first be converted to degrees and then the appropriate angles are plotted. Every circle has a degree measure of 360^0 and half of that is shown on a standard protractor. You will always be given a circle base to plot you graphs in. Make sure you use it!

Example 1: Construct a circle graph to show what amount of a college student's budget is spent in each category.

| Expenditure	Percentage
Travel	5 %
Personal	16%
Food	14%
Housing	10%
Books	3%
Tuition	52%

Solution: In order to plot this data accurately, each percentage in the table to the right must be converted into a degree measurement. To do this, divide each percent by 100 to get as a non-percentage number, and multiply by 360^0. Round each angle to the closet whole degree. This is an example of the calculations, but the calculation part does not need to be written on the circle graph blanks provided for this task.

Expenditure	Percentage	Calculation	Angle
Travel	5 %	$5 \div 100 \times 360 = 18^0$	18^0
Personal	16%	$16 \div 100 \times 360 = 57.8^0$	58^0
Food	14%	$14 \div 100 \times 360 = 50.4^0$	50^0
Housing	10%	$10 \div 100 \times 360 = 36^0$	36^0
Books	3%	$3 \div 100 \times 360 = 10.8^0$	11^0
Tuition	52%	$52 \div 100 \times 360 = 187.2^0$	187^0

In the circle blank provided, construct the first angle. When it is plotted, use its second line as the start for the next angle. When there are angles greater than 180^0, plot all the other angles and leave the big angle as the area leftover at the end.

For each graph, label the sections with what it represents. The percentages are not requires. Include a title. A legend is not required, nor is it necessary to colour the sectors. If the sectors are too small, a line pointing at the sector with the label can be used.

College Expenses
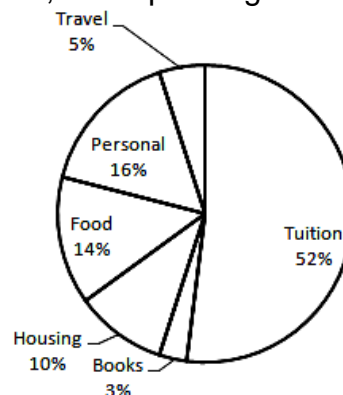
Often, the amounts given for each sector for a circle graph will not be expressed as a percent, but simply as a number. This type of data is handled slightly differently.

Example 2: Construct a circle graph to show the amounts of the nutritional make-up of a Protein Bar.

Ingredient	Mass (g)
Protein	34.0
Carbohydrates	33.0
Fat	6.0
Sodium and potassium	0.5
Other	11.5
Total	85.0

Solution: Notice that these ingredients are listed as parts of the 85 gram total. To use this data, we must find the percent of the whole before finding the angle.

Ingredient	Mass (g)	Percentage of Total Mass	Angle Calculation	Angle
Protein	34.0	$34 \div 85 \times 100 = 40$	$40 \div 100 \times 360 = 144^0$	144^0
Carbohydrates	33.0	$33 \div 85 \times 100 = 38.8$	$38.8 \div 100 \times 360 = 139.7^0$	140^0
Fat	6.0	$6 \div 85 \times 100 = 7.1$	$7.1 \div 100 \times 360 = 25.6^0$	26^0
Sodium and potassium	0.5	$0.5 \div 85 \times 100 = 0.6$	$0.6 \div 100 \times 360 = 2.2^0$	2^0
Other	11.5	$11.5 \div 85 \times 100 = 13.5$	$13.5 \div 100 \times 360 = 48.6^0$	49^0
Total	85.0	100%	360^0	360^0

The circle graph is plotted below.
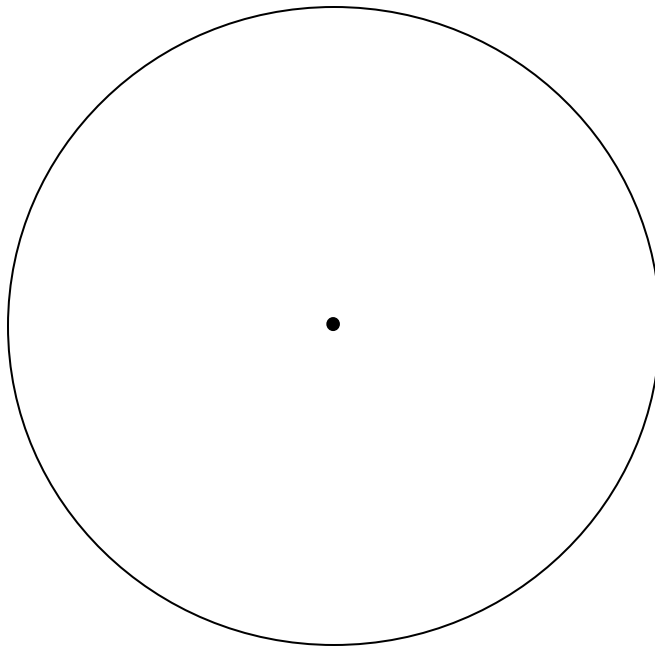
Protein Bar Nutritional Ingredients
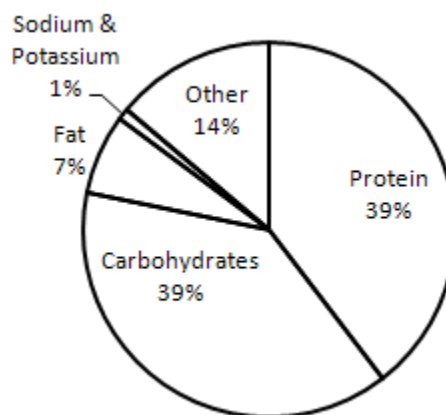
ASSIGNMENT 9 – CREATING CIRCLE GRAPHS

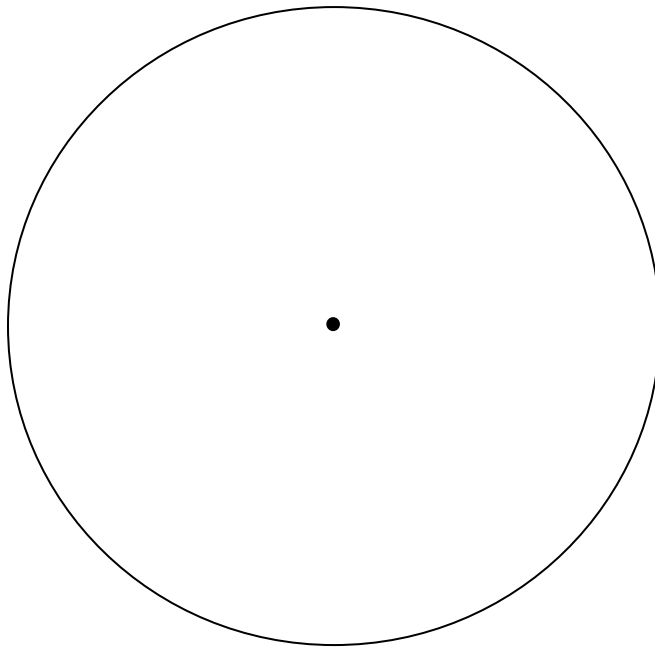Construct a circle graph to show each set of data.

1) Type of Pet

Pet	Percentage	Calculation	Angle
Cat	30		
Dog	34		
Mouse/Rat	4		
Gerbil	13		
No pet	19		
Total			

2) Transportation to School

Method of Travel	Number of People	Percentage of Total People	Angle Calculation	Angle
Drive	12			
Ride from parent	63			
Carpool	20			
Motorbike	5			
Bus	75			
Bicycle	10			
Walk	15			
Total		100%	360^0	360^0

3) Daily Activities

Sleep: 8 hrs   School: 4 hrs   Job: 5 hrs   Homework: 1 hr
Meals: 2 hrs   Relaxation: 2.5 hrs   Travel: 1.5 hrs

Total		100%	360^0	360^0
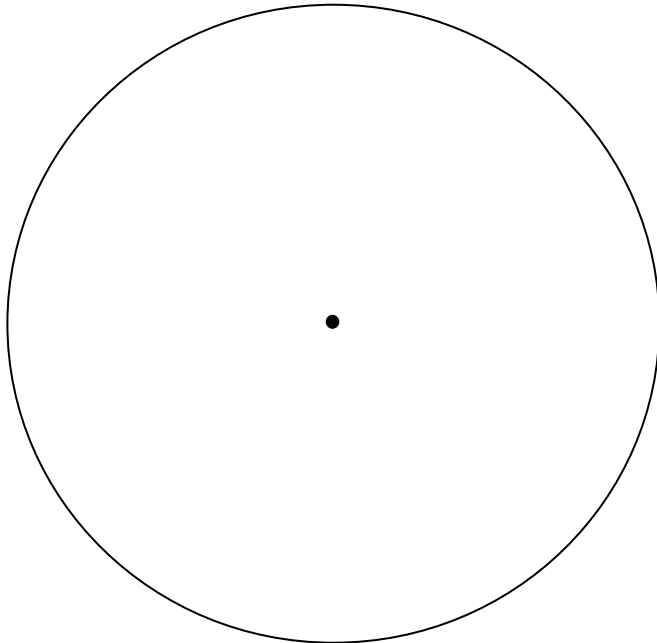
MISLEADING GRAPHS

Any graph can be made to seem misleading. By increasing or decreasing the scale, changing the starting point on an axis – especially not starting at zero – you can make the viewer see the data in a certain way. Distorting or skewing the data in this way makes the graph, or any other kind of statistic, misleading.

We have already touched on one way graphs can be misleading. If the vertical axis of a graph does not start at zero, a whole lot of the data is "missing." Look at the next graph.

When looking at this broken line graph, it appears that there has been a big increase between 1997 and 2008 in the average weekly earnings of Canadians.

But look a little more closely. The Earnings on the vertical axis starts at $600 and only goes up to $800. The increments on the axis are $40. This makes the increase seem large when it really isn't that big. This could be misleading to people who don't carefully look at the scale on the vertical axis.

Average Weekly Earnings of Canadians
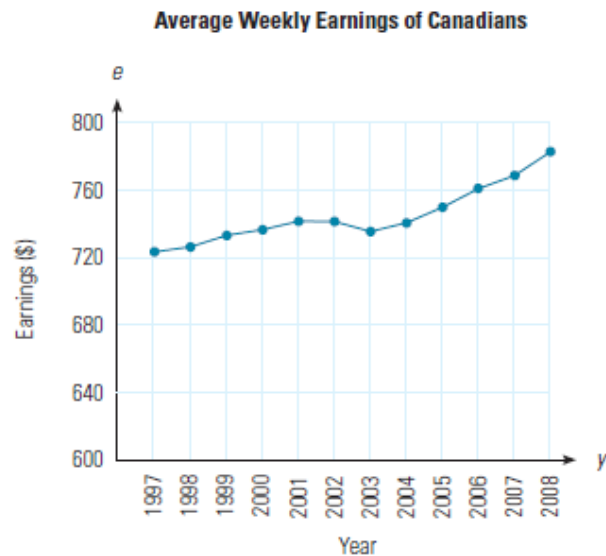
A graph that represents the data fairly and more accurately (not misleading) is illustrated here. See how the increase in earnings does not seem so large over the period of time? The vertical scale starts at zero rather than just showing a chunk of the graph.

Average Weekly Earnings of Canadians
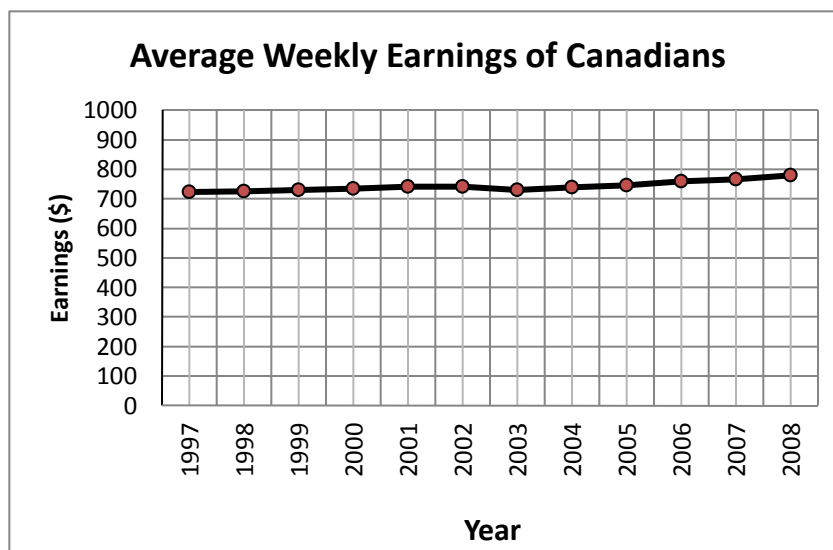
In the next graph, while the graph appears to start at zero, the first 60+ students have been cut from the bottom of the graph. This makes the bars look much shorter than they really are and thus does not represent the data fairly or accurately. All three Schools shown on this graph actually have bars that are more than double the size (length) of what is shown. It appears that the graduation rate for School B is almost double that of School A based on the size of the bars. In fact, they are much closer, differing by less than 10 students for both boys and girls.
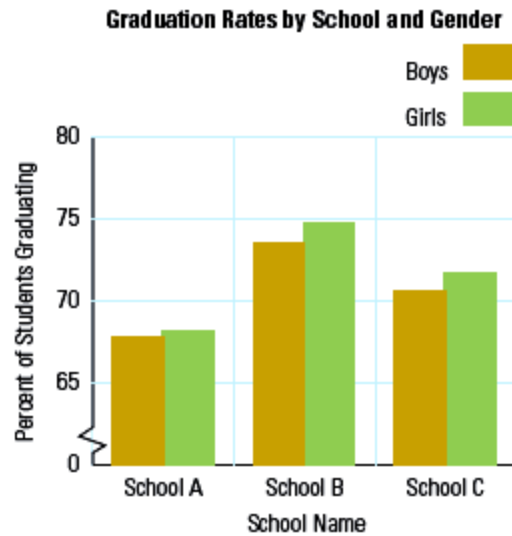

Graphs can also be misleading when the increments on the vertical axis are not consistent. Bar graphs as well as broken line graphs can be misleading. Histograms and circle graphs are less likely to be misleading unless they are drawn incorrectly.

Things to watch for to tell if graphs are misleading:
- **Does the vertical axis start at zero?**
- **Is there a gap between zero and the next value?**
- **Are the increments along the vertical axis the same? That means does each grid line represent the same amount on the scale.**
- **Are the bars on a bar graph all the same width?**
- **Is the space between bars on a bar graph the same?**
- **Is the scale on the horizontal axis on a broken line graph squished?**
- **Is the scale on the vertical axis on a broken line graph squished?**

ASSIGNMENT 10 – MISLEADING GRAPHS

1) Think about the two graphs below. They show the same data plotted in different ways.

Percentage of Alberta Population Living in Rural Areas, 1901–2001
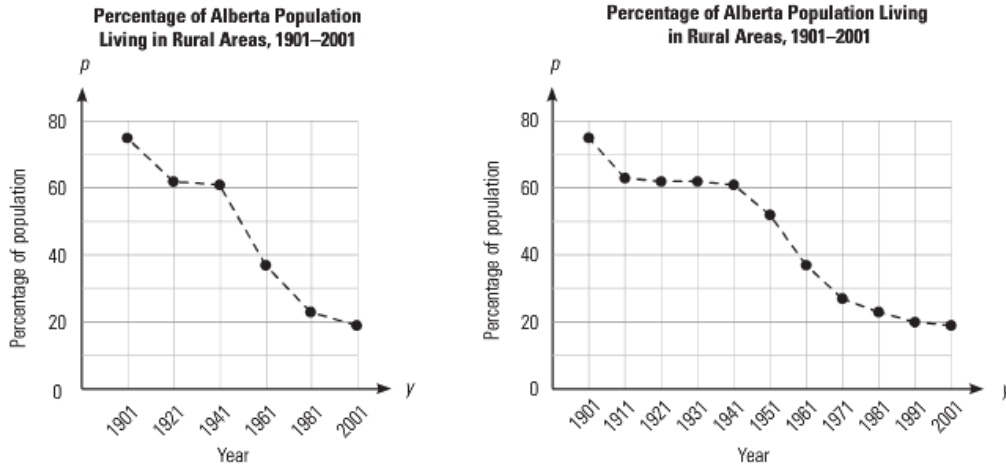
a) Which of the graphs makes appear that the drop in the population living in rural areas was faster? Why is this?
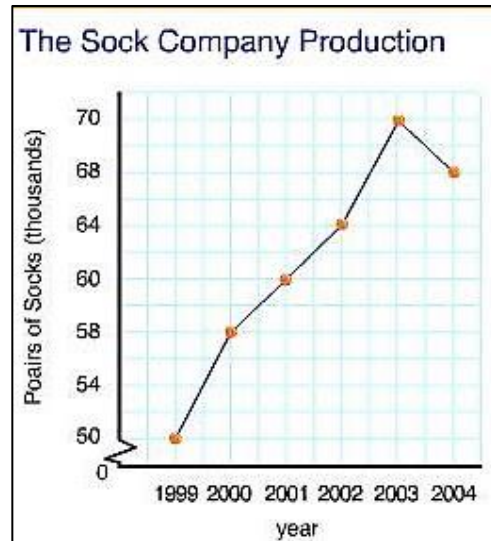
b) Which graph do you think is a better representation of the actual change in the rural population? Why is this?

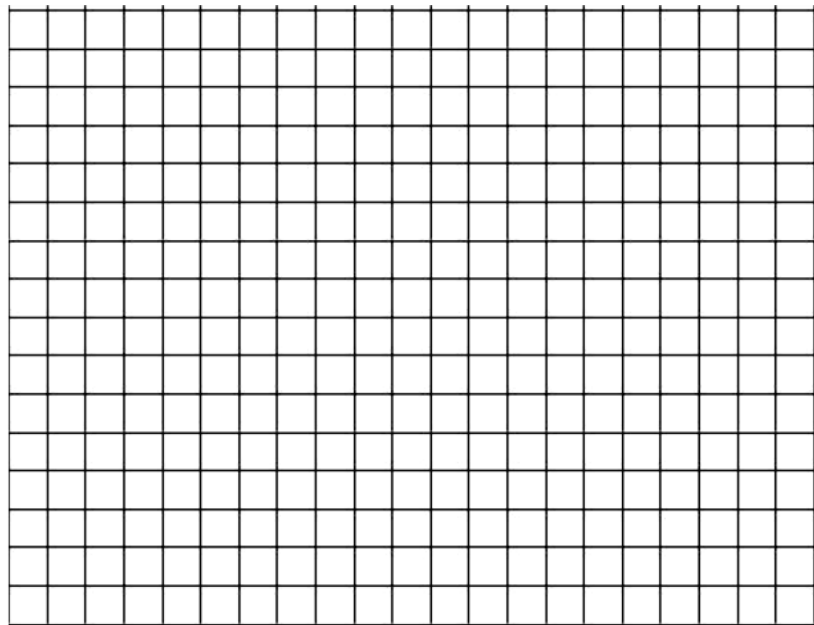c) In what year was the population half rural and half urban?

2) Is this graph misleading? Why or why not.

3) Is this graph misleading? Why or why not.

The Sock Company Production
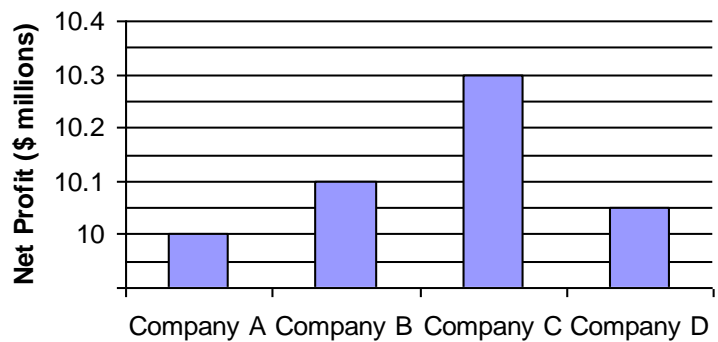
4) On the grid below, create a line graph that would represent the data more accurately and fairly.

ASK YOUR TEACHER FOR QUIZ 2