

Unit 1

Basic Statistics and Calculator Use

Topic A: Average

- Mean and range
- Median and mode

Topic B: Graphs

- Bar or column graph
- Line graph
- Circle or pie graph
- Create a circle graph

Topic C: Using a calculator and estimating

- Scientific calculator
- Basic functions of a scientific calculator
- Estimating and rounding

Unit 1 Summary

Unit 1 Self-test

Topic A: Average

Mean and Range

Statistics: the mathematical branch that deals with data collection, organization, description, and analysis to draw conclusions.

Average: it refers to the statistical mean, median, mode, or range of a group of numbers or a set of data.

- **Mean** = average.
- **Median** = middle number.
- **Mode** = the number that occurs most often.
- **Range** = the difference between the largest and smallest values.

Mean (or arithmetic mean): the standard average value of a group of numbers or a set of data.

It is the most common expression for the average.

- **Determine the mean:** add up all the numbers in the group and divide by the number of values.

$$\text{Mean} = \frac{\text{Sum of numbers}}{\text{Number of values}}$$

- **Example:** Find the mean of 2, 3, 4, 0, 1.

$$\text{Mean} = \frac{2 + 3 + 4 + 0 + 1}{5} = \frac{10}{5} = 2$$

There are 5 numbers.

Range: the difference between the highest and lowest values in a group of numbers.

- **Determine the range:**

$$\text{Range} = \text{highest value} - \text{lowest value}$$

- **Example:** Find the range: 3, 5, 2, 9, 4, 8, 1

$$\text{Range} = 9 - 1 = 8$$

Median and Mode

Mode: the value(s) that occurs most frequently in a group of numbers.

Example: Find the mode:

2, 4, 5, 3, 7, 8, 4, 1 Mode = 4

The value that occurs most frequently is 4.

- If no value is repeated, the mode does not exist.

Example: 13, 27, 30, 49, 47 No mode.

No value is repeated.

- A bimodal has 2 modes in a group of numbers.

Example: 1, 3, 8, 17, 9, 8, 4, 6, 11, 3 Modes = 3 and 8

It has two modes.

- If more than one value occurs the same number of times, each value is a mode.

Median: the *middle* number of an ordered group of numbers.

Example: 1, 3, 5, 7, 9

- Determine the median: arrange the values in order (ascending or descending).
 - Ascending order: numbers are arranged from the smallest to the largest number.
 - Descending order: numbers are arranged from the largest to the smallest number.
- If the total number of terms in the group is *odd*, the median is the middle number.

Example: Find the median of 2, 8, 7, 1, 6, 5, 3, 4, 8, 1, 9

11 numbers (odd)

- Ascending order: 1, 1, 2, 3, 4, 5, 6, 7, 8, 8, 9

- Median = 5

5 is the middle number.

- If the total number of terms in the group is *even*, the median is the average of the two values in the middle (add two middle numbers and divide by 2):

$$\text{Median} = \frac{\text{Add two middle values}}{2}$$

Example: Find the median of 5, 4, 9, 0, 2, 6

6 numbers (even)

- Ascending order: 0, 2, 4, 5, 6, 9

- Median = $\frac{4+5}{2} = 4.5$

4 and 5 are the middle numbers.

- Or descending order: 9, 6, 5, 4, 2, 0

- Median = $\frac{5+4}{2} = 4.5$

Topic B: Graphs

Bar or Column Graph

Bar or column graph: a chart with rectangular bars whose heights or lengths display the values. (It used to compare information between different groups.)

A bar graph can be vertical (column graph) or horizontal (bar graph).

Create a bar (or column) graph:

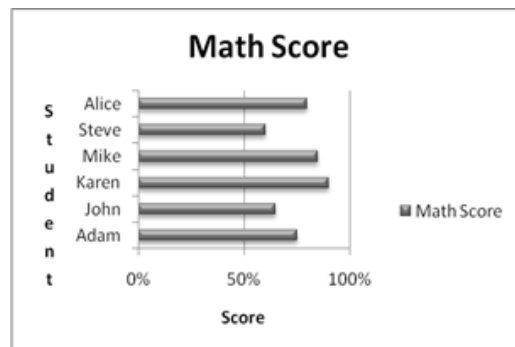
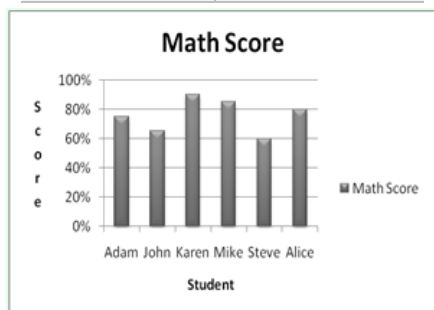
- Put data into tabular form (make a table).
- Label each axis and make up a title for the graph. Example { horizontal axis — student names
vertical axis — test scores
- Create a scale (number) for each axis starting from zero. Example { horizontal axis — Adam, John, Karen, Mike, Steve ...
vertical axis — 0%, 20%, 40%, 60%, 80% ...
- Draw bars or columns (use the data from the table). Example: Bar's height displays the student score.

Table: a group of numbers arranged in a condensed form of columns and rows. It is a more effective way to present information.

Interpolate and extrapolate from the information provided:

Example: Make a graph from the table and answer questions.

Student	Test score
Adam	75%
John	65%
Karen	90%
Mike	85%
Steve	60%
Alice	80%



- How many students earned 80% or greater?
- How many students earned 60%?
- How many more students earned between 59% and 81%?

3 students (80, 85, 90)

1 student (60)

4 students (60, 65, 75, 80)

Line Graph

Line graph: a chart that displays information by connecting lines between data points.

It is used to track changes over periods of time.

A line graph consists of a horizontal x -axis and a vertical y -axis.

- Horizontal x -axis: represents the independent variable (such as time).
- Vertical y -axis: represents the dependent variable (such as temperature, population, sales, rainfall, etc.).

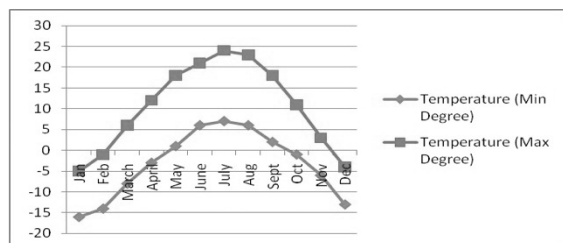
Create a line graph:

- Put data into tabular form (make a table).
- Label each axis and make up a title for the graph. Example { horizontal axis — months of the year
vertical axis — temperature
- Create a scale for each axis. Example { horizontal axis — Jan., Feb., Mar., April ...
vertical axis — 0°C , 5°C , 10°C , 15°C ...
- Plot the data points (use the data from the table).
- Draw a curve (or a line) that best fits the data points (connect the points).

Example of a line graph:

Average temperatures in Prince George

Month	Temperature $^{\circ}\text{C}$ (Low)	Temperature $^{\circ}\text{C}$ (High)
Jan	-16	-5
Feb	-14	-1
March	-8	6
April	-3	12
May	1	18
June	6	21
July	7	24
Aug	6	23
Sept	2	18
Oct	-1	11
Nov	-6	3
Dec	-13	-4



Average Temperatures in Prince George ($^{\circ}\text{C}$)

Circle or Pie Graph

Circle (or pie) graph: a chart made by dividing a circle into sections (parts) that each represent a percentage of the total.

It is used to compare parts of a whole.

- Entire pie: represents the total amount (360°).
- Sectors: represent percentages of the total.

Example { entire pie – the final grade of a class
sectors – percentage of students who get A, B, C ...

Create a circle graph:

- Put data into tabular form (make a table).
- Calculate the total amount.
- Determine the percentage of each sector or part.

$$\frac{\text{Part}}{\text{Whole}} = \frac{\text{Percent}}{100}$$

or

$$\text{Percent} = \frac{\text{Part}}{\text{Whole}} \cdot 100$$

- Determine the angle of each sector (convert the percent to a decimal first).

$$\text{Angle for each part} = (\text{Decimal}) (360^\circ)$$

- Draw a circle (use a compass) and a radius (r).

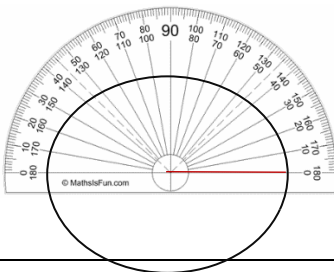


- Draw in the sectors of the circle (use a protractor), and add colors to the sectors (this will help to make them easier to distinguish).
- Label the sectors and make up a title for the graph.

How to use a protractor:

- Place the protractor on the circle so that the center mark of the protractor at the center of the circle.
- Ensure that the radius of the circle is lined up on the zero line at the end of the protractor.
- Draw the sector by using the calculated angle.

Each time you add a sector the radius changes to the line you just drew.



Create a Circle Graph

Example: Create a circle graph using the following table – final grades in a math class.

Final grades in a math class	Number of students
D	1
C	2
B	4
A	3
Total number of students:	10

- The total number of students: $1 + 2 + 4 + 3 = 10$ There are 10 students in the class.
- Determine the percentage of each sector (convert the percent to a decimal):

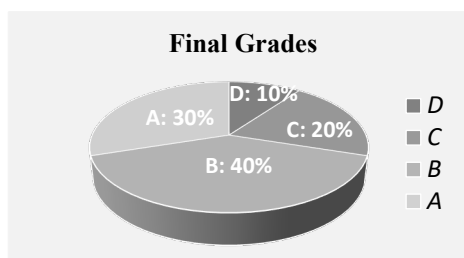
- First sector in the circle chart: $\frac{1}{10} = \frac{\text{Percent}}{100}$, $\% = \frac{1 \times 100}{10} = 10\% = 0.1$ $\frac{\text{Part}}{\text{Whole}} = \frac{\text{Percent}}{100}$
- Second sector in the circle chart: $\frac{2}{10} = \frac{\text{Percent}}{100}$, $\% = \frac{2 \times 100}{10} = 20\% = 0.2$
- Third sector in the circle chart: $\frac{4}{10} = \frac{\text{Percent}}{100}$, $\% = \frac{4 \times 100}{10} = 40\% = 0.4$
- Fourth sector in the circle chart: $\frac{3}{10} = \frac{\text{Percent}}{100}$, $\% = \frac{3 \times 100}{10} = 30\% = 0.3$

- Determine the angle of each sector: Angle for each part = (Decimal) (360°)
 - First sector in the circle chart: (Decimal) $(360^\circ) = (0.1) (360^\circ) = 36^\circ$
 - Second sector in the circle chart: (Decimal) $(360^\circ) = (0.2) (360^\circ) = 72^\circ$
 - Third sector in the circle chart: (Decimal) $(360^\circ) = (0.4) (360^\circ) = 144^\circ$
 - Fourth sector in the circle chart: (Decimal) $(360^\circ) = (0.3) (360^\circ) = 108^\circ$

Percent	Decimal	Angle
10%	(0.1)	36°
20%	(0.2)	72°
40%	(0.4)	144°
30%	(0.3)	108°
Total: 100%	(1)	Total: 360°

Check: The sum of the percentages = 100%. The sum of all the degrees should be = 360° .

- Draw the circle graph:



Topic C: Using a Calculator and Estimating

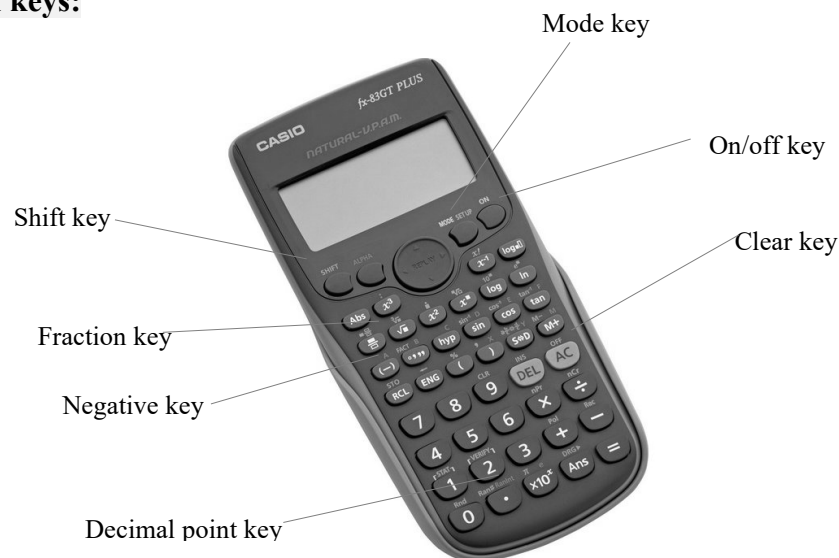
Scientific Calculator

Scientific calculator: a calculator with advanced functions that can solve mathematics, science, and engineering problems.

Basic functions of a scientific calculator

- Basic functions (+, −, ×, ÷)
- Parentheses
- Absolute values (abs)
- Order of operations
- Exponents or powers
- Pi problems ($\pi = 3.141592654\dots$)
- Fractions
- Scientific notation
- Trigonometry functions (sine, cosine, tangent)
- Etc.

Identify main keys:



Basic Functions of a Scientific Calculator

Basic features:

Operation	Function
+	Addition
−	Subtraction
×	Multiplication
÷	Division
(−) or neg	Negative number
x^2	Squaring
x^y or y^x or x	Exponent or power
$\sqrt{}$ or Sqrt	Square root
$\sqrt[3]{}$	Cube root
$\sqrt[x]{}$	nth root
()	Parentheses
π	Pi
Mode	Converting between degrees and radians
Shift or 2 nd F or INV	Converting between main and upper symbols
$\frac{a}{b}$ or d/c	Fraction
$a\frac{b}{c}$ or a b/c	Mixed number
Exp or $\times 10^x$	Scientific notation
sin, cos, tan	Trigonometry functions
\sin^{-1} , \cos^{-1} , \tan^{-1}	Inverse trigonometry functions

Determine what order you need to press the keys (it may vary with different calculators).

Examples:

1) $21 + 34 \times 5 = ?$

21 $\boxed{+}$ 34 $\boxed{\times}$ 5 $\boxed{=}$

Display: 191

2) $\frac{432}{6} + \pi = ?$

432 $\boxed{\div}$ 6 $\boxed{+}$ $\boxed{\pi}$ $\boxed{=}$

Display: 75.14159...

3) $27^2 + 38 \times 17 = ?$

27 $\boxed{x^2}$ $\boxed{+}$ 38 $\boxed{\times}$ 17 $\boxed{=}$

Display: 1375

4) $\sqrt[3]{27} + 2^3 = ?$

$\boxed{\text{Shift}}$ $\boxed{\sqrt[3]{}}$ 27 $\boxed{+}$ 2 $\boxed{x^y}$ 3 $\boxed{=}$

Display: 11

or $\boxed{2^{\text{nd}} \text{F}}$ 27 $\boxed{\sqrt[3]{}}$ $\boxed{+}$ 2 $\boxed{x^y}$ 3 $\boxed{=}$

Rounding and Estimating

Rounding whole numbers: choose an approximation for a whole number (making a number simpler).

The method of rounding:

- If the rounding digit (next digit) is ≥ 5 (greater than or equals to), round-up (add 1 to the left digit of the rounding digit and replace all the digits to the right of the rounding digit with 0).
- If the rounding digit is < 5 (less than), round down (do not change the left digit of the rounding digit, replace the rounding digit and all the digits to the right of it with 0).

Example:

		<u>Rounding digit (next digit)</u>
1) Round to the nearest largest place .	$3,459,567 \approx \boxed{3,000,000}$	4 $4 < 5$ round down
2) Round to the nearest ten .	$345 \approx \boxed{350}$	5 $5 \geq 5$ round-up
3) Round to the nearest hundred .	$3,429 \approx \boxed{3,400}$	2 $2 < 5$ round down
4) Round to the nearest thousand .	$27,656 \approx \boxed{28,000}$	6 $6 > 5$ round-up

Estimate: find a value that can be used to check if an answer is reasonable (approximating).

Method of estimating: round to the largest place value.

- If the next digit is ≥ 5 , round-up.
- If the next digit is < 5 , round down.

Example: Estimate the following.

$$\begin{array}{rcl} 1) & \begin{array}{r} 7656 \\ + 4358 \end{array} & \approx \begin{array}{r} 8000 \\ + 4000 \end{array} \\ & & \approx \boxed{12000} \end{array}$$

The next digit of 7 is 6 ($6 > 5$, round-up).
The next digit of 4 is 3 ($3 < 5$, round down).

$$\begin{array}{rcl} 2) & \begin{array}{r} 8756 \\ - 5432 \end{array} & \approx \begin{array}{r} 9000 \\ - 5000 \end{array} \\ & & \approx \boxed{4000} \end{array}$$

The next digit of 8 is 7 ($7 > 5$, round-up).
The next digit of 5 is 4 ($4 < 5$, round down).

$$3) \quad 5378 \times 367 \approx 5000 \times 400 = \boxed{2,000,000}$$

$$4) \quad 7576 \div 237 \approx 8000 \div 200 = \boxed{40}$$

Unit 1: Summary

Basic Statistics and Calculator Use

Graphs

- **Bar or column graph:** a chart with rectangular bars whose heights or lengths display the values. (It used to compare values between different groups.)
Construct a bar or column graph: page 23.
- **Line graph:** a chart that displays information by connecting lines between data points. (It is used to track changes over periods of time).
Construct a line graph: page 24.
- **Circle graph:** a chart made by dividing a circle into sections (parts) that each represent a percentage of the total. (It is used to compare parts of a whole.)
Construct a circle graph: page 25-26.
- **Average:**

Average/Range	Description / Formula
Mean	The "standard" average value of a group of numbers or a set of data. $\text{Mean} = \frac{\text{Sum of numbers}}{\text{Number of values}}$
Median	The middle number of an ordered group of numbers. <ul style="list-style-type: none">- Arrange the values in order.- If the total number of terms in the group is odd, the median is the middle number.- If the total number of terms in the sample is even: $\text{Median} = \frac{\text{Add two middle values}}{2}$
Mode	The value(s) that occurs most frequently in a group of numbers. <ul style="list-style-type: none">- If no value is repeated, the mode does not exist.- If more than one value occurs with the same frequency, each value is a mode.- A bimodal has 2 modes in a group of numbers.
Range	The difference between the highest and lowest values in a group of numbers. $\text{Range} = \text{highest value} - \text{lowest value}$

Scientific calculator

- **Scientific calculator:** a calculator with advanced functions that can solve mathematics, science, and engineering problems.

- **Basic functions of a scientific calculator:**

Operation	Function
+	Addition
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x^y or y^x	Exponent or power
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Exp or $\times 10^x$	Scientific notation
sin, cos, tan	Trigonometry functions
\sin^{-1} , \cos^{-1} , \tan^{-1}	Inverse trigonometry functions
...	...

Rounding

- **Rounding whole numbers:** choose an approximation for a number.
- **The method of rounding:**
 - If the rounding digit (next digit) is ≥ 5 , round-up.
 - If the rounding digit is < 5 (less than), round down.

Estimating

- **Estimate:** find a value that can be used to check if an answer is reasonable.
- **Method of estimating:** round to the largest place value.
 - If the next digit is ≥ 5 , round-up.
 - If the next digit is < 5 , round down.

Unit 1: Self-Test

Basic Statistics and Calculator Use

Topic A

1. Find the mean: 4, 0, 5, 10, 9, 2
2. Find the range: 11, 7, 2, 6, 9, 13, 3
3. Find the mode:
 - a) 12, 4, 7, 3, 9, 51, 6, 7
 - b) 21, 13, 4, 16, 54, 100
4. Find the median:
 - a) 4, 6, 7, 10, 9, 11, 3, 8, 5, 1, 14, 2, 23
 - b) 6, 14, 10, 11, 0, 19, 5, 4

Topic B

5. Create a column graph from the table and answer the following questions:

Student	Test score
Evan	85%
Jon	75%
Alice	90%
Tom	65%
Damon	95%
Steve	70%

- a) How many students earned 85% or greater?
 - b) How many students earned 75%?
 - c) How many more students earned between 64% and 91%?
6. Create a line graph from the table (average temperatures in Vancouver):

Month	Temperature °C (High)	Temperature °C (Low)
Jan	7	7
Feb	8	2
March	10	3
April	13	6
May	17	9
June	20	12
July	22	14
Aug	22	14
Sept	19	11
Oct	14	7
Nov	9	3
Dec	6	1

7. Create a circle graph from the table (Tom's monthly expenses):

Tom	Monthly Expenses
Rent	\$600
Food	\$300
Transportation	\$60
Utilities	\$80
Clothing	\$85
Entertainment	\$165
Miscellaneous	\$35

Topic C

8. Complete the following with your calculator:

a) $78 + 43 \times 11$

b) $\frac{2468}{8} + \pi$

c) $42^2 + 43 \times 25$

d) $4\frac{1}{6} + 3\frac{4}{7}$

e) $\sqrt[3]{125} + 3^5$

9. Rounding:

- a) Round to the nearest largest place. 6,345,789
- b) Round to the nearest *ten*. 567
- c) Round to the nearest *hundred*. 8, 649
- d) Round to the nearest *thousand*. 47,567

10. Estimate the following:

- a) $79,215 + 784$
- b) $11,345 - 372$
- c) $4,738 \times 624$
- d) $8,345 \div 382$