

Unit 5

Methods of Collecting Data Vocabulary 8dc1

Survey: a method of collecting information by asking questions

- **Questionnaire:** a set of written questions with a choice of answers
- **Interview:** a conversation in which one person (the interviewer) asks another (the interviewee) questions

Experiment: a repeatable process, such as rolling a dice

Observation: Primary data collected by recording things that are seen

Examples: How would you collect the data to answer these questions?

a) What is the favorite food and drink of the students in your class?

Survey-Interview

b) How many cars pass your school in one hour?

Observation

c) How many times will a dice show a 6 when it is rolled 100 times?

experiment

Population/Sample

Population: The total set of people, things or events being investigated

Sample: A selection from a large population, when a population is large the sample consist of 10%

Example: There are 452 people living in a town. Emily wants to know the ages of the people living in the town. She decides to ask a sample of the population. How many people should there be in her sample?

Refer to Find quantity of percent notes

Step 1: Convert to decimal or fraction

$$10\% \text{ OR } \frac{10}{100} = \frac{1}{10} \rightarrow \frac{1}{10}$$

Step 2: Multiply by quantity

$$452 \times \frac{1}{10} = 45.2$$

$$\frac{1}{10} \times 452 = \frac{452}{10}$$

Trick:
Move decimal
two to the left

Example #2: There are 30 students in Carlos' class. He wants to know their favorite color. Should he ask the whole class or ask a sample of the class?

The whole class, 30 is already a small population. The sample would be way too small at 3 people.

$$30 \times .10 \\ \underline{\quad} \\ 300$$

Degree of Accuracy

Degree of accuracy: level of accuracy in any rounding

Example: If you are recording the height of the students in your class would you measure it in centimeters or meters?

CW Page 63 # 1-3

Types of Data 8dc2

8dc2 know the difference between discrete and continues data

Discrete Data:

Data that can only have exact values. Usually whole numbers but can include fractions.

Examples:
Number of goals scores
Number of people at the game

Continues Data:

Any data that can take any value in a range. All data that is measured is continuous data. If you round the measurement to the nearest whole number, the data is still continues.

Examples:
Heights of Trees
Masses of babies

VS

Practice:

Write down whether the data is discrete or continuous.

- a) The number of cars in a car park - discrete
- b) The height of a flower at the park - continuous
- c) The time it takes to run 100m - continuous

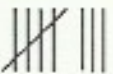
HW P.65 #1

Frequency Tables 8dc3

8DC3 construct and use:-frequency tables with given equal class intervals to gather continuous data-two way tables to record discrete data

Frequency Table: a table that lists the number of times a specific value or item occurs in a set of data

It has three columns:

<p>Column One: Lists the class intervals (<u>Equal class intervals</u>: class intervals, in grouped data, that are all the same size)</p> <p>Represented with inequality symbols $<$, $>$, \leq, and \geq.</p>	<p>Column Two: Records the tally marks (when recording with tallies, make columns wide enough)</p> <p>Example: </p>	<p>Column Three: List the frequency, with a digit</p> <p>Example: 20, 18, or 5</p>
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Example #1: Create an interval table for the following information.

The masses of 20 teachers, measured to the nearest kilogram, are listed below:

	74	83	79	88	62	76	90	88	91	70	72	77	85	71	95	81	91	66	80	74
$60 \leq m < 70$											2									
$70 \leq m < 80$											8									
$80 \leq m < 90$											6									
$90 \leq m < 100$											4									
equal class intervals	tallys										Frequency									

Example #2 Exercise 6.2 #1-2

Two-Way Table

Two-way table: a table displaying data, with rows and columns usually showing different variables

Present it in a way that makes it easy to read the information

Example #1:

The two-way table shows the result of the games played by a hockey team.

	— Win	— Draw	— Lose	Total
— Home Games	7	3	2	$7+3+2=12$
— Away Games	3	4	5	$3+4+5=12$
— Total	$7+3=10$	$3+4=7$	$2+5=7$	$12+12=24$

- How many home games did the hockey team lose? 2
- How many away games did the hockey team win? 3
- How many games did the hockey team draw altogether? 7

Processing and Presenting Data 8DP1

8dp1 calculate statistics for sets discrete and continuous data recognized when to use the range, mean, median, and mode and for grouped data, the modal class

Statistics: study and use of data; values calculated from a set of data

- **Average:** a representative value includes mean, median, and mode
- **Range:** the difference between the largest and smallest number in a set, describes how spread the data is (*it is not an average*)

Calculating statistics from discrete data

*To calculate the statistics of discrete data we use average and range

If the data set is given:

Example #1: This set of data is the ages of a group of 20 people.

12 11 15 12 13 11 13 14 12 14 11 14 11 14 12 14 14 11 14 14

Display in a frequency table:

Ages	11	12	13	14	15
Frequency	= 5	= 4	= 2	= 8	= 1

- a) Find the **mode** (most common value) 14 (has an 8 person frequency)
- b) Find the **median** (middle value, when the values are put in order)

||||||| 12 12 12 12 13 13 14 14 14 14 14 14 14 14 15
| | | | | | | | | | | | | | | |

- c) Find the **mean** (sum of all values ÷ total number of values)

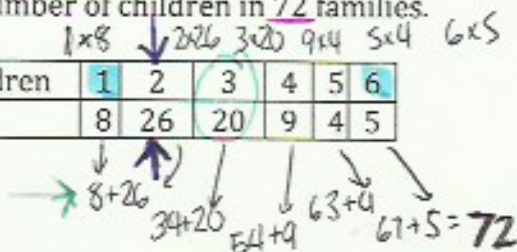
$$\begin{array}{cccccc} 11 \times 5 & 12 \times 4 & 13 \times 2 & 14 \times 8 & 15 \times 1 & \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \\ 55 & + 48 & + 26 & + 112 & + 15 & = 256 \end{array}$$

- d) Find the **range** (largest value - smallest value)

$$15 - 11 = 4$$

Example #1: The table shows the number of children in 72 families.

Number of children	1	2	3	4	5	6
Frequency	8	26	20	9	4	5



a) Find the mode.

- Look for the largest frequency. Mode is 2, largest frequency with 26

b) Find the median.

- Find the term in the middle by dividing

Numerator: Total number in the sample plus one $\frac{72}{2} = 36$

Denominator: 2

→ Start adding each frequency until you get to the term in step one

median in 3

c) Find the mean.

- Multiply each number by its frequency and add them $8 + 52 + 60 + 36 + 20 + 30 = 206$

- Find the mean by dividing

Numerator: sum of all the values

Denominator: total number of values

$$\frac{206}{72} = 2.861 \approx 2.3$$

d) Find the range (largest value - smallest value)

$$6 - 1 = 5 \text{ range}$$

Calculating statistics from grouped or continues data

*Sets of data with lots of values (large samples) or continues data is written in grouped frequency tables

*The data is set in classes (a group in a set of continuous data)

***Mean, median and range can only be **estimates!**

***Mode cannot be found but you find modal class (class with highest frequency)

Example #1: Use the data below to answer the following questions

Mass (kg)	(16-20)	(21-25)	(26-30)	(31-35)	(36-40)	(41-45)
Frequency	12	14	20	30	17	7

$12 + 14 = 26$ $26 + 20 = 46$ $46 + 30 = 76$ $76 + 17 = 93$ $93 + 7 = 100$

a) Find the modal class? (Highest frequency)

31-35

b) Find the median (estimate).

- Find the term in the middle by dividing

Numerator: Total number in the sample plus one

$$\frac{100+1}{2} = 50.5$$

Denominator: 2

- Start adding each frequency until you get to the term in step one

31-35, around 32

c) Find the mean (estimate)

- Find the midpoint of each class

- Multiply midpoint by the frequency

- Find the mean by dividing

Numerator: sum of all the midpoint values

$$12 \times 18 + 14 \times 23 + 20 \times 28 + 30 \times 33 + 17 \times 38 + 7 \times 43$$

$$18 + 23 + 28 + 33 + 38 + 43$$

Denominator: total number of frequencies

100

d) Find the range (largest value- smallest value)

- Find largest range

45

- Find smallest range

-16

$$\frac{216 + 414 + 560 + 990 + 646 + 301}{100} = 31.2$$

e) Find the midpoint in class one 18

16 17 18 19 20

Frequency	5	18	15	18	29	11	14
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- a) Find the average for both
- b) Find the range for both
- c) What can we draw from the results?

Example #2 this table shows the rainfall in a town in May and November, over a period of 25 years.

Rainfall (cm)		0-	5-	10-	15-	20-	25-
Number of years	May	7	11	4	2	1	0
	November	0	3	4	7	7	4

Practice ↓

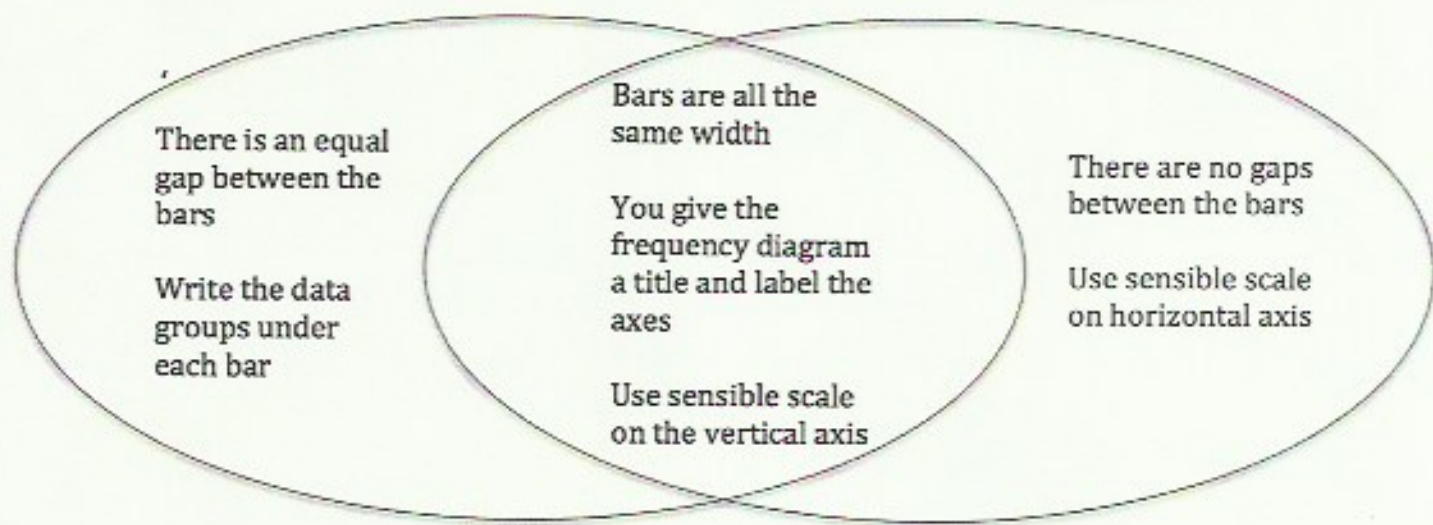
Interpreting and drawing frequency diagrams- Bar Graph

Frequency diagrams show how often particular values occur in a set of data,
Example: **Bar Graph**

Discrete Data

Both

Continuous Data



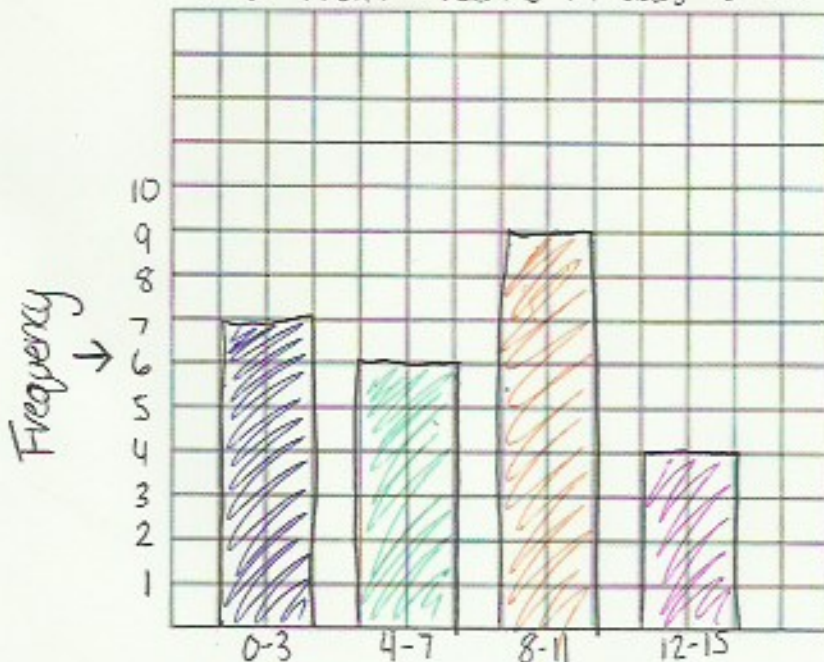
Example 1: Discrete Grouped

The frequency table shows how many pieces of fruit the students in class 8T ate in one week.

# of fruits	0-3	4-7	8-11	12-15
Frequency	7	6	9	4

a. Create a bar graph to represent the data (Cut a 15x15)

of Fruits students in class 8T ate in one week



- Gap between each bar
- Over all title
- X and Y axis titles

b. How many students ate 4-7 pieces of fruit? 6

c. How many more students ate 8-11 pieces of fruit than 12-15 pieces?

$$8-11 \quad 12-15 \\ 9 - 4 = 5$$

d. How many students are there in class 8T? $7+6+9+4=26$

Example #2: (Continuous)

The frequency table shows the masses of 20 teachers, measured to nearest kilogram, Draw a frequency diagram to show the data.

Mass, m , (kg)	Frequency
$60 < m \leq 70$	3
$70 < m \leq 80$	8
$80 < m \leq 90$	6
$90 < m \leq 100$	4

• no gap



Example: Pie Chart

Pie Chart: used to display data to show how an amount is divided or shared. The angles on all the sectors add up to 360° . The sectors and angles must be accurate.

Example #1:

90 people were asked what type of holiday they had last year. The table shows the results of the survey.

Type of holiday	Number of people
Activity	32
Beach	27
City break	24
Other	7

$\times 4 = 128$
 $\times 4 = 108$
 $\times 4 = 96$
 $\times 4 = 28$

A. Draw a pie chart to represent the data.

Total 360

Step one: Find the ratio of degrees per person.

$$\frac{\text{Degrees of a circle}}{\text{Total people in Sample}} = \frac{360}{90} \div \frac{90}{90} = \frac{4}{1} \rightarrow 4^\circ \text{ per person}$$

Simplify

Step two: Find the degrees of the rest of the numbers by multiplying

Step three: Add the sectors, they should equal 360° .

★ Step Four: Use a protractor to measure the degrees per sector and label

B. What percentage of the people went on the beach holiday?

$\frac{27}{90}$ people who went to the beach
90 total people in survey
↓ simplify → factor by 9

$$\frac{27 \div 9}{90 \div 9} = \frac{3}{10} \text{ convert to \% by } \times \text{ by } 10$$

↓

$$\frac{3}{10} \times \frac{10}{10} = \frac{30}{100} \rightarrow 30\%$$

Example #2:

The table shows the favorite flavors of ice cream of the 30 students in class 8A.

Favorite Flavor	Vanilla	Strawberry	Raspberry	Chocolate	Caramel
Number of Students	6 × 12	9 × 12	5 × 12	8 × 12	2 × 12
	72	108	60	96	24

a. Draw a pie chart to represent the data

Step one: Find the ratio of degrees per person.

$$\frac{\text{Degrees of a circle}}{\text{Total people in Sample}} = \frac{360}{30} \rightarrow \div \frac{30}{30} \rightarrow \frac{12}{1} \rightarrow 12^\circ \text{ per person}$$

Simplify

Step two: Find the degrees of the rest of the numbers by multiplying

Step three: Add the sectors, they should equal 360° .

Step Four: Use a protractor to measure the degrees per sector and label.

b. What percentage of the students chose a vanilla flavor?

$$\frac{6 \text{ students chose vanilla}}{30 \text{ total students}}$$

Class Practice!



simplify by = by common factor "6"

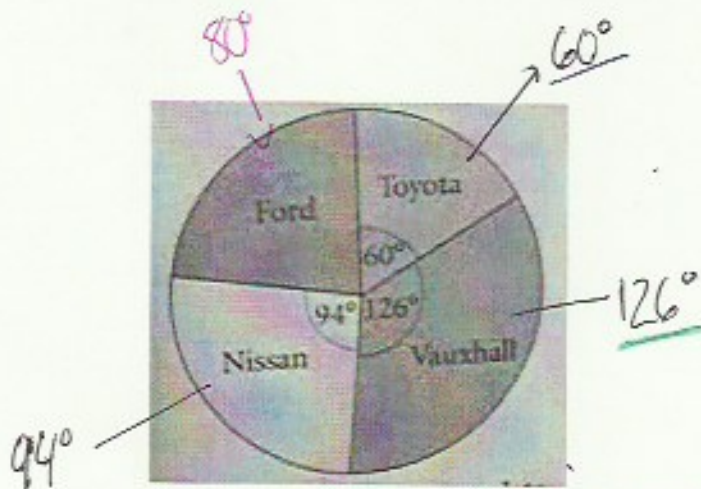
$$\frac{6 \div 6}{30 \div 6} \rightarrow \frac{1}{5}$$

↓ convert to % by turning denominator to 100

$$\frac{1}{5} \xrightarrow{\times 20} \frac{20}{100} \rightarrow 20\%$$

Example #4:

The pie chart shows the four makes of car sold by a garage in June. Altogether they sold 180 cars in June.



a. Which make of car was the most popular? Find the missing degrees.

b. What fractions of the cars sold were Toyota?

Toyota $\rightarrow \frac{60}{360}$ simplify $\frac{60 \div 60}{360 \div 60} \rightarrow \frac{1}{6}$

c. What percentage of the cars sold were Vauxhall?

Vauxhall $\frac{126}{360} \times 100$ simplify by 6 $\frac{126 \div 6}{360 \div 6} \rightarrow \frac{21 \div 3}{60 \div 3} \rightarrow \frac{7}{20} \times \frac{5}{5} = \frac{35}{100} \rightarrow 35\%$
convert by converting to 100

d. How many cars were sold ford?

$X = \text{Ford} \rightarrow \frac{X}{180} = \frac{80}{360}$
 Ford degrees
 total cars
 Degrees in a circle

cross multiply
 $180(80) = 360(X)$
 $\frac{14400}{360} = \frac{360X}{360} \rightarrow \frac{1440}{36} = X \rightarrow 40$
 simp.

- 360
- 60 Toyota
- 126 Vauxhall
- 94 Nissan
- 80 Ford

Example: **Line Graph**

Line Graph: series of points that are joined by straight lines, they show trends

Trends: Tells you how data changes over a period of time

Characteristics

- Time goes in the horizontal axis
- Use an appropriate scale on the vertical axis
- Plot each point accurately
- Join the points with a straight line
- Give the line graph a title and label the axes

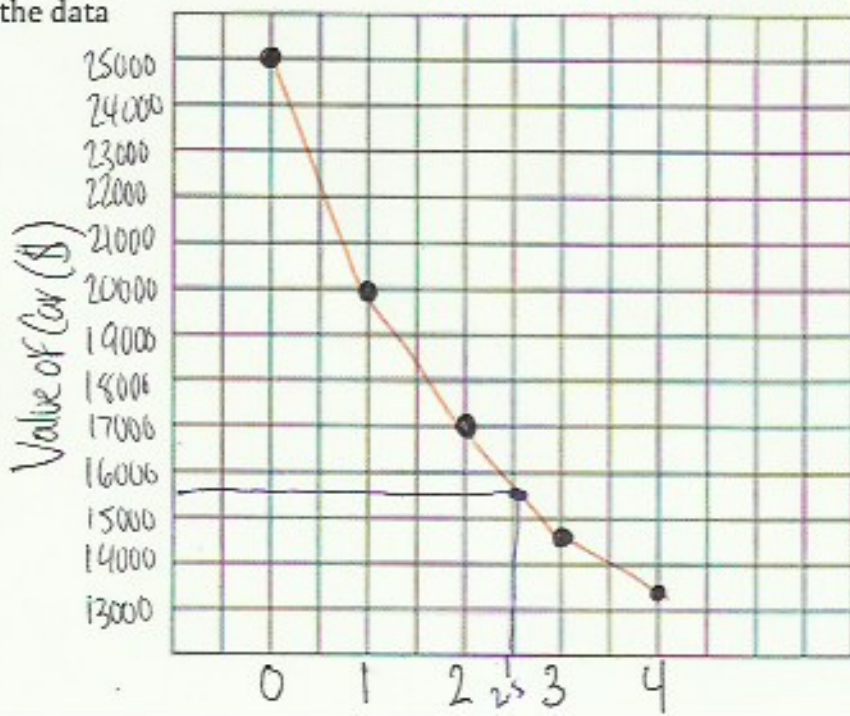
Example #1: The table shows the value of a car over a period of five years.

Age of Car (years)	0	1	2	3	4
Value of Car (\$)	25,000	20,000	17,000	14,900	13,400

5,000 3,000 2,100 1,500

a) Draw a line graph to show the data

graph to



Connect w/ straight lines!

line on X-axis!

Age of Car (yrs)

- b) During which year did the car lose the most value? Find difference between each year.
Year 0-1 with 5,000 loss
- c) Describe the trend in the value of the car
continues to decrease, smaller decrease each time
- d) Use the graph to estimate the value of the car after 2.5 years.
Start @ 2.5 and go to y-axis. about 15,500

Example: Stem-and-leaf Diagrams

- Write the numbers in order of size from smallest to largest
- Write a key to explain the numbers
- Keep all the numbers in a line vertically and horizontally

Example #1

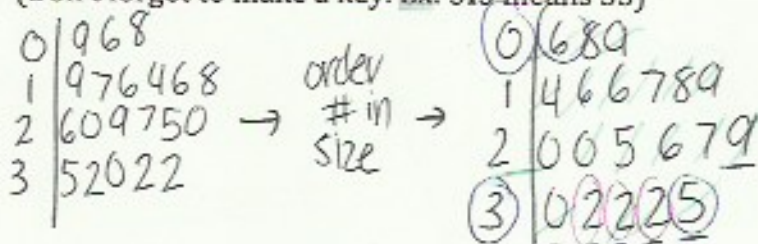
Here are the temperatures in C, recorded in 20 cities on one day.

9	19	26	35	6	17	32	20	30	16
14	16	18	29	27	8	25	32	20	32

- a. Draw an ordered stem-and-leaf diagram to show this data (You can make one unordered, and then order the leaf) (Don't forget to make a key. Ex: 315 means 35)

Make key first!

Key: 1|9 means 19



- b. How many cities had a temperature over 28?

go to 2, count after 8 \rightarrow 6 cities

- c. Use the stem-and-leaf to figure out the mode, median, and range

most common
32

middle #
20

big# - small#
 $35 - 06 = \underline{29}$