7.1 Choosing an Appropriate Graph

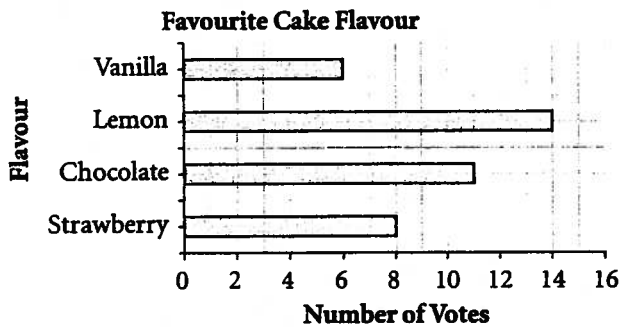
Quick Review

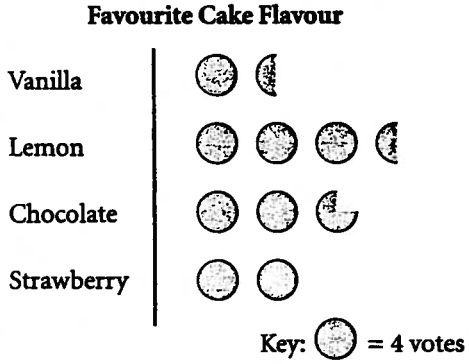
➤ Different types of graphs have different characteristics. It is important to choose an appropriate graph that best represents a set of data.

This table shows the strengths and limitations of five common types of graphs.

Type of Graph	Strengths	Limitations
Circle Graph	• Shows parts of a whole • Shows percents of the total • Sizes of sectors compare parts of the whole	• Does not show data values and the total • Difficult to draw accurately
Bar Graph	• Lengths of bars compare data values • Scale can be used to find the total • Easy to draw	• May be difficult to read depending on scale used • Does not show percents of the total for comparison
Line Graph	• Easy to draw and to read • Shows data changes over time • Can be used to estimate values between or beyond data points	• Does not show parts of a whole • Zig-zag pattern can be difficult to interpret
Pictograph	• Lengths of rows of symbols compare data values • Graph is visually appealing • Key can be used to find the total	• Large number of symbols make it difficult to read • Does not show parts of a whole • Difficult to draw
Double Bar Graph	• Directly compares two sets of data • Lengths of bars compare data values • Scale can be used to find the total of each data set • Easy to draw	• Can only be used to show discrete data • May be difficult to read depending on scale used • Two sets of data in one graph can be confusing

1. Rebecca's family hosted a party to gather opinions on the choice of flavour for her sister's wedding cakes. The guests' votes are displayed in these two graphs.





a) Which flavour is the most popular? _____ the least popular? _____

b) How many people voted at the party? 6 + 14 + _____ + _____ = _____

c) From which graph is it easier to gather the information? Explain.

_____

_____

2. This table shows the favourite types of music of the students in a Grade 8 class.

Favourite Music

Genre	Number
Rock	10
Rap	25
Country	7
Classical	2

a) Use a bar graph to display the data.

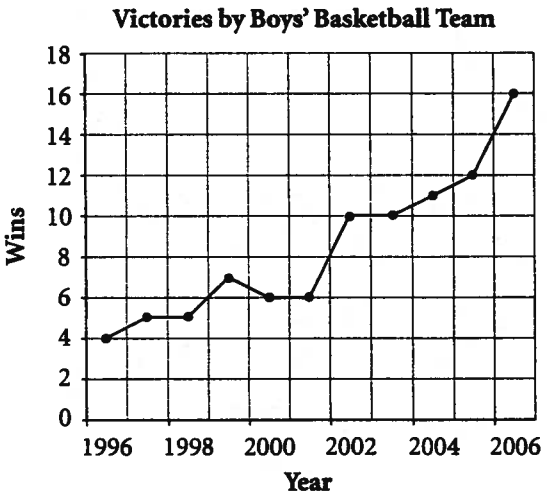
b) Use a pictograph to display the data.

c) Which graph was easier to draw? Justify your choice.

_____

_____

3. The graph shows the number of wins for the Boys' Basketball Team.



a) In what year did the team have the most wins? _____

b) In what year did the team have the least wins? _____

c) How well do you predict the team will do in the next year? Explain.

_____

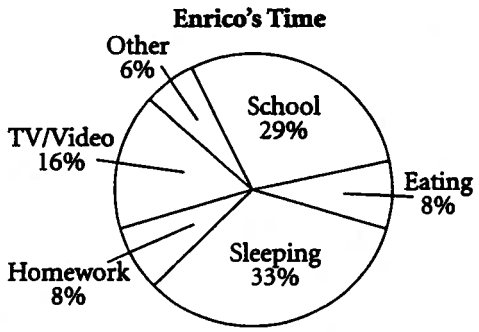
_____

d) Could you use a circle graph to display these data? Justify your answer.

_____

_____

4. The circle graph shows the percents of time Enrico spends on different activities during an average day.



a) Why is a circle graph used?

_____

_____

_____

b) What percent of Enrico's time is spent at school and on sleeping?

_____

c) Could a bar graph be used to display the data? Would it more appropriate? Explain.

_____

_____

5. Match the most appropriate graph with the data.

Graph	Data
a) Circle graph	i. Change in your height over time
b) Line graph	ii. Number of shots by each starting player of the girls' and boys' basketball teams
c) Double bar graph	iii. Percent of each math topic on the final exam
d) Pictograph	iv. Number of students in a Grade 8 class from 5 different areas of origin
e) Bar graph	v. Number of food items donated by 4 Grade 8 classes

6. Suyama surveyed the clothes in her closet and counted these items:

Blue jeans:	6
Pants (not jeans):	2
Shorts:	5
Skirts:	4
Dresses:	3

a) List two graph types in question 5 you can use to display these data. Explain your choice.

_____

_____

b) List two graph types that may not be good choices. Justify your answer.

_____

_____

c) Pick one of your choices in part a) and draw the graph.

Quick Review

At Home / At School

➤ Graphs are a visual way of representing data. However, they can create false impressions by the way they are drawn.

There are many different ways in which graphs can be drawn to **misrepresent data.** Misinterpretation of the data may lead to incorrect conclusions or assumptions.

A wise consumer needs to become aware of the ways in which graphs can be misleading.

This table shows Tamara's math marks in the 4 report cards she has received for this year.

Report Card Marks

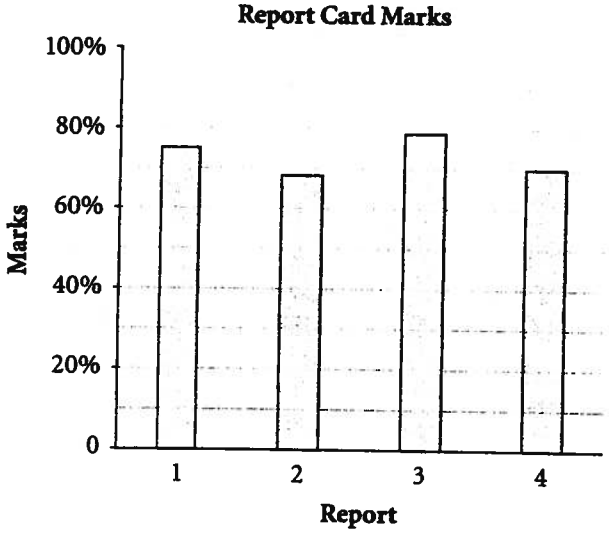
Report	Marks
1	75%
2	67%
3	78%
4	70%

Tamara's brother wants to show that Tamara's performance in math is not steady.

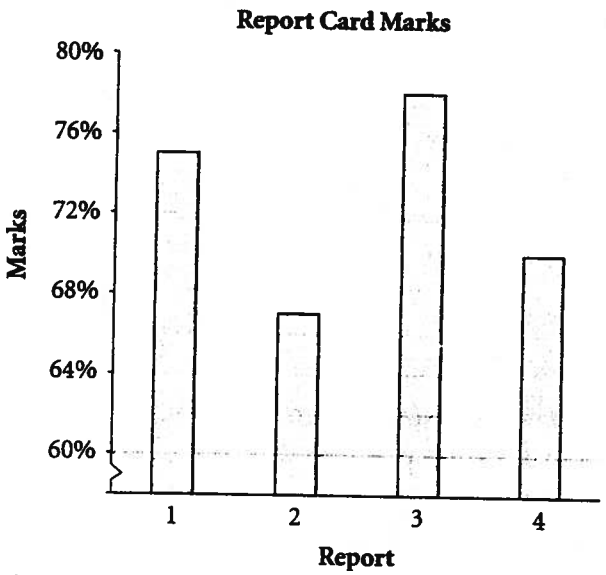
Tamara wants to show that this is not true.

They drew these graphs.

Tamara's Graph



Tamara's Brother's Graph

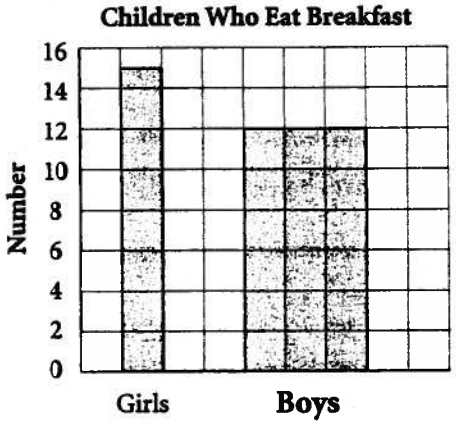


➤ These are some ways in which a graph can be drawn to misrepresent data.

- Start the scale on the vertical axis of a bar graph at a number other than 0, as in Tamara's brother's graph.
- Use different size symbols in a pictograph or bars of different widths in a bar graph to make one piece of data appear greater than another.
- Treat a part of a graph differently to draw people's attention to that piece of data.

1. This bar graph is drawn in a way to misrepresent the data.

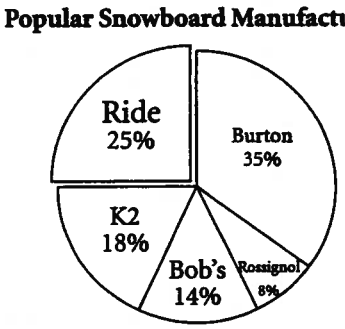
a) Which part of the graph draws your attention most? Why?



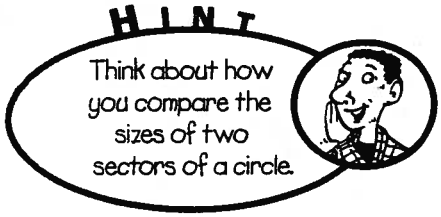
b) What changes can you make to the graph to eliminate the false impression?

2. This circle graph is drawn in a way to misrepresent the data.

a) Which part of the graph draws your attention most? Why?

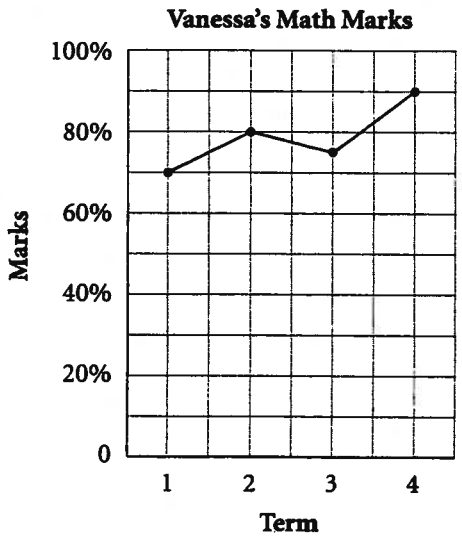


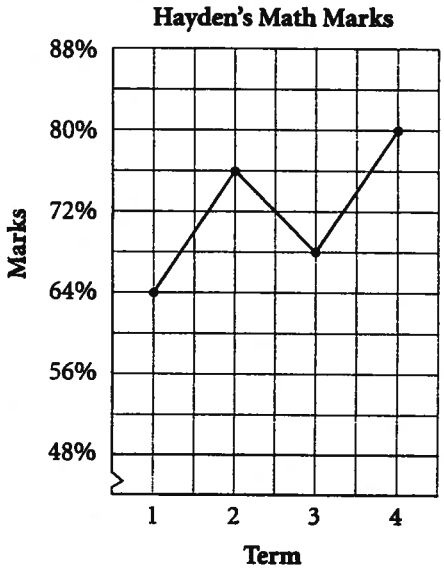
b) What changes can you make to the graph to eliminate the false impression?



c) Which snowboard manufacturer is the most popular? How do you know?

3. These line graphs display the math marks over 4 terms for 2 students, Vanessa and Hayden.





a) Which line graph appears to show a greater increase in marks from Term 3 to Term 4?

_____

b) Read the marks represented by the points on the line graph for Term 3 and Term 4. What is the actual increase in marks for each student?

Vanessa: _____ Hayden: _____

c) How are the graphs misleading?

_____

_____

d) How can you change the graphs so that they do not misrepresent the data?

_____

_____

e) If an award were to be given to the student with the most consistent marks over time, who would win the award? Explain your answer.

_____

_____

4. Refer to the 2 graphs in question 3.

a) Which graph would you choose to show the most dramatic improvement? Explain.

_____

_____

b) What is the overall increase in marks for each student for the 4 terms?

Vanessa: _____ Hayden: _____

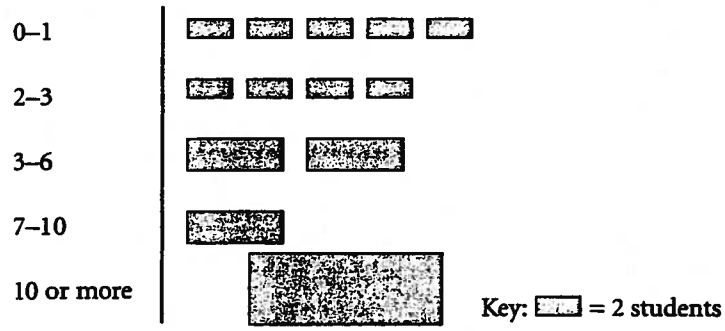
c) Does the result in part b) agree with the choice you made in part a)? Explain.

_____

_____

5. The graph shows the number of cities visited by students surveyed.

Cities Visited by Students



a) What is the number of cities visited by the most students? _____

b) Jean-Pierre estimates from the pictograph that about 8 students visited 10 or more cities. Why do you think Jean-Pierre made this estimate?

_____

_____

c) Marie says that only 2 students visited 10 or more cities. Explain who you agree with.

_____

_____

d) How could the pictograph be changed to represent the data more accurately?

_____

_____

7.3 Probability of Independent Events

Quick Review

At Home / At School

➤ Two events are independent events when one event does not affect the other event.
A coin is tossed and a regular die labelled 1 to 6 is rolled.

The table shows the possible outcomes.

		Die					
		1	2	3	4	5	6
Coin	H	H/1	H/2	H/3	H/4	H/5	H/6
	T	T/1	T/2	T/3	T/4	T/5	T/6

Whether the coin lands heads or tails has no effect on the outcome of rolling the die. So, the two events are independent.

➤ There are 12 possible outcomes.

Half of the outcomes have heads. The probability of tossing heads is $\frac{1}{2}$.

Two outcomes have a 4. The probability of rolling a 4 is $\frac{1}{6}$.

Only one outcome is H/4. The probability of tossing heads and rolling a 4 is $\frac{1}{12}$.

Note that $\frac{1}{12} = \frac{1}{2} \times \frac{1}{6}$

The above example illustrates the probability rule for two independent events:
P(A) and P(B) are the individual probabilities of the two events A and B.
P(A and B) is the probability of both A and B occurring.
If A and B are two independent events, P(A and B) = P(A) × P(B)

1. A quarter and a dime are both tossed. The table shows the possible outcomes.

		Quarter	
		H	T
Dime	H	HH	HT
	T	TH	TT

a) For a quarter, P(heads) = _____

b) For a dime, P(heads) = _____

c) How many outcomes in the table have 2 heads? _____

Write the probability of tossing 2 heads. P(2 heads) = _____

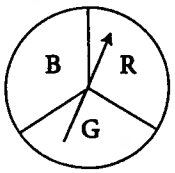
d) Find the product of the answers from parts a) and b). _____ × _____ = _____

e) Why do parts c) and d) have the same answer?

_____

_____

2. The pointer of a spinner with 3 congruent sectors is spun once and a tetrahedron labelled 1 to 4 is rolled.



The table shows the possible outcomes.

		Tetrahedron			
		1	2	3	4
Spinner	R	R/1	R/2	R/3	R/4
	G	G/1	G/2	G/3	G/4
	B	B/1	B/2	B/3	B/4

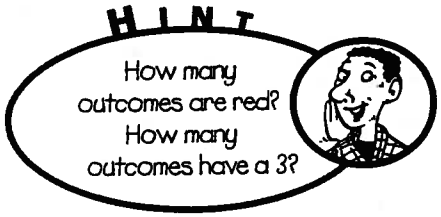
Find the probability of each event:

a) the pointer landing on red

$P(\text{red}) = \frac{\square}{12} =$ _____

b) rolling a 3

$P(3) = \frac{\square}{12} =$ _____



c) red and a 3

P(R/3) = _____

Compare the probability in part c) with the product of the probabilities in parts a) and b). What do you notice?

_____

3. The pointer of the spinner in question 2 is spun and a regular die labelled 1 to 6 is rolled.

Find the probability of each event:

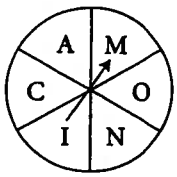
a) the pointer landing on green: _____

b) rolling a 1 _____

c) green and a 1

P(green and 1) = _____ × _____ = _____

4. Monica writes each letter of her name on one of the equal sectors of this spinner.



She spins the pointer of the spinner and rolls the tetrahedron in question 2.

Find the probability of each event:

a) rolling an odd number _____

b) an I and a 4 _____

c) a vowel and a 2 _____

5. Consider an experiment of rolling a red and a white regular die labelled 1 to 6.

a) What is the probability of rolling a 4 on the red die and a 5 on the white die?

_____

b) What is the probability of rolling a 5 on the red die and an even number on the white die?

_____

c) What is the probability of rolling a 3 on both dice?

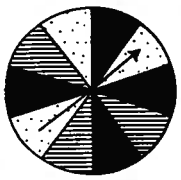
_____

d) What is the probability of rolling a square number on the red die and a non-square number on the white die?

_____

_____

6. The pointer of this spinner with 10 equal sectors is spun twice.



Find the probability of each event:

a) The pointer lands on a dotted sector and then a solid sector.

b) The pointer lands on a solid sector each time.

c) The pointer does not land on a solid sector each time.

7. A bag contains 5 yellow balls, 3 red balls, and 2 green balls. A ball is removed from the bag without looking, the colour recorded, and then returned the bag. A second ball is drawn and its colour is also recorded.

a) What is the probability of a red ball followed by a green ball?

b) What is the probability of both balls being yellow?

c) What would be the outcome of the 2 balls if it has a probability of $\frac{1}{10}$?

7.4 Solving Problems Involving Independent Events

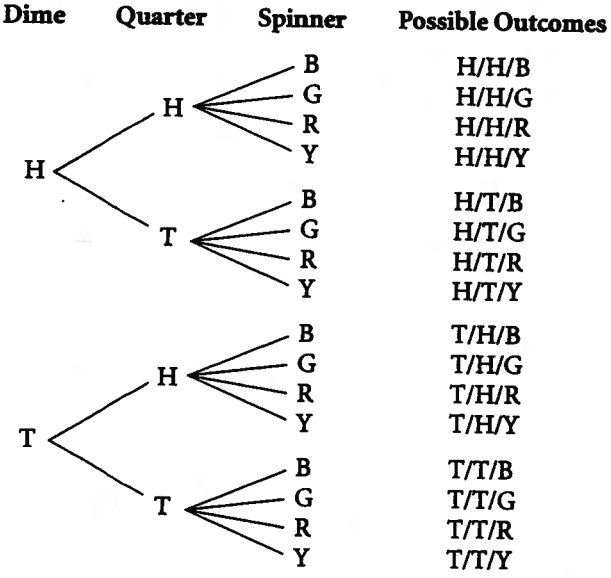
Quick Review

At Home / At School

➤ The rule for the probability of two independent events can be extended to three or more independent events.

Consider a case where there are more than two events.
You toss a dime and a quarter, and spin the pointer of a spinner with 4 equal sectors coloured blue, green, red, and yellow.

This tree diagram shows all possible outcomes:



There are 16 outcomes. One outcome is H/T/R.
So, the probability of tossing a head on the dime, tossing a tail on the quarter, and the pointer landing on red is $\frac{1}{16}$.

The probability of tossing a head on a dime is $\frac{1}{2}$ and tossing a tail on a quarter is $\frac{1}{2}$.

The probability of the pointer landing on red is $\frac{1}{4}$.

Note that $\frac{1}{16} = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{4}$

The rule for the probabilities of independent events can be extended to:
The probability of 3 events A, B, and C occurring is P(A and B and C).
If A, B, and C are two independent events, P(A and B and C) = P(A) × P(B) × P(C)

1. Use the experiment in Quick Review.

   a) Find the probability of each event:

   i) a head on the dime _____ ii) a head on the quarter _____

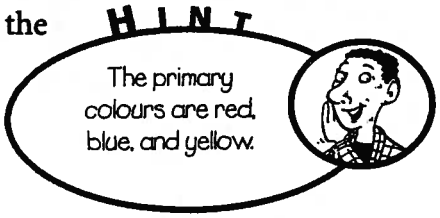
   iii) the spinner landing on blue _____

   b) How many outcomes have 2 heads and a blue? _____

   c) The probability of 2 heads and a blue is:

   P(H/H/B) = _____ × _____ × _____ = _____

   d) How many outcomes have a head on the dime, a tail on the quarter, and a primary colour? _____

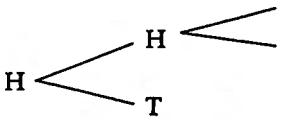


   e) Use the extended rule for the probabilities of independent events. Find the probability of a head on the dime, a tail on the quarter, and a primary colour.

_____

2. Three coins—a penny, a dime, and a quarter—are tossed. Draw a tree diagram to show the possible outcomes.

Penny	Dime	Quarter	Possible Outcomes



   a) How many outcomes have 3 heads?

   _____

   What is the probability of 3 heads?

   _____

   _____

   b) Use the individual probabilities for each coin and the probability of independent events.

   What is the probability of all 3 coins showing heads?

_____

3. Diane, Claud, and Norma are playing a memory game.
They lay out 12 cards numbered 2 to 13 face down on a table.
Each player turns over a card and puts it back to its original position face down.
Find the probability of each event:

a) Each draws a prime. _____

b) Each draws a square number. _____

c) Diane turns over a prime, Claud turns over a square number, and Norma turns over a number that is a factor of 17.

_____

_____

4. Robert has 25 songs in his MP3 player.
Ten of them are classic rock, 12 are country, and 3 are classical.
Robert sets the MP3 player to play the songs randomly.
Find the probability of each event:

a) The first song is classical, the second is country, and the third is classic rock.

_____

_____

b) The first 2 songs are classic rock and the third is country.

_____

5. To start a game of cards, each of 3 players cuts a card from a standard deck of 52 playing cards. Each time, the card is returned to the deck before the next player cuts.
Find the probability of each event:

a) Player 1 cuts a red card, player 2 cuts a jack, and player 3 cuts a spade.

_____

b) Player 1 cuts a red ace, player 2 cuts a black card, and player 3 cuts the ace of clubs.

_____

c) Player 1 cuts an ace, player 2 cuts a heart, and player 3 cuts a card that is not a diamond.

_____

_____

Tip
What are the suits that are not diamonds?

In Your Words unit 7

Here are some of the important mathematical words of this unit.
Build your own glossary by recording definitions and examples here. The first one is done for you.

appropriate graph graph with certain features that enables questions to be answered or information to be drawn easily from the displayed data For example, a circle graph shows the parts of a whole better than a line graph does.

misrepresentation of data

discrete data

possible outcomes

probability of an event

independent events

List other mathematical words you need to know.

Unit Review

LESSON

7.1 **1.** Each year, the Grade 8 classes collect food items for a charity. The table shows the number of items the classes collected for 6 years.

Nicolas wants to display the data on a line graph. Martina wants to use a circle graph, and Nicole is pushing for a bar graph.

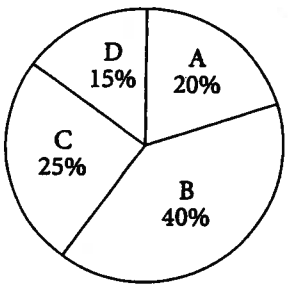
Which graph do you think is a good choice? Explain your answer.

Food Drive Collection

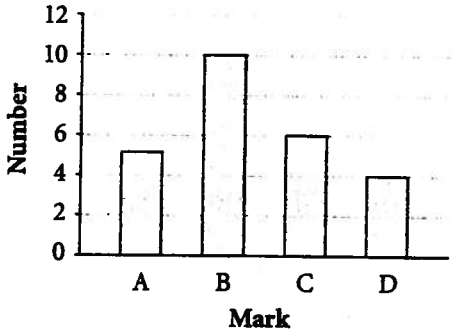
Year	Number of Items
2003	120
2004	155
2005	161
2006	180
2007	196
2008	210

2. These 2 graphs show the marks of students in Ms. Papas's class.

Marks in Ms. Papas's Class



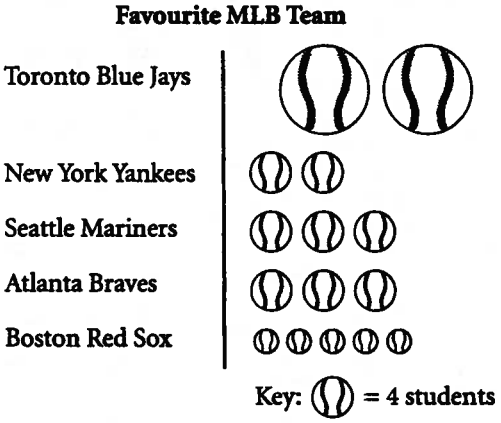
Marks in Ms. Papas's Class



a) The principal asks Ms. Papas: "What fraction of your class got an A?" Which graph is easier to use to respond to this question? Explain.

b) "How many students got a D?" Which graph can provide the answer? Explain.

3. Some Grade 8 students were asked to name their favourite major league baseball team. The graph shows the results.



a) How many students named the Toronto Blue Jays? _____

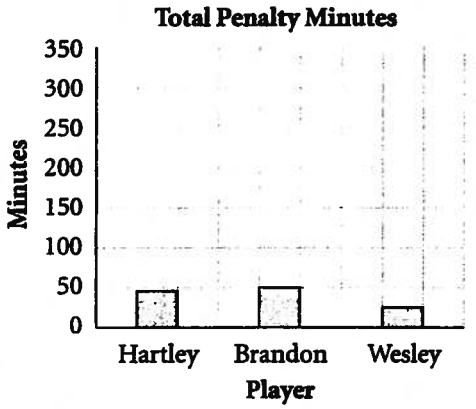
b) How many students named the Boston Red Sox? _____

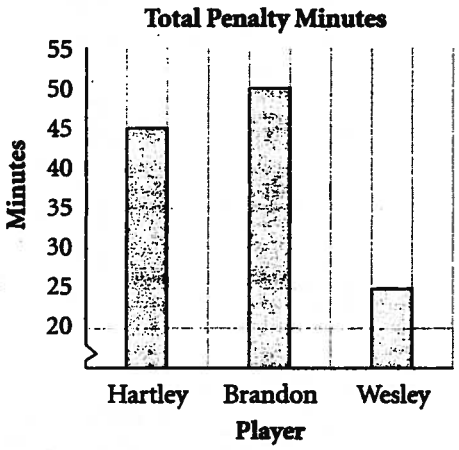
c) What aspect of the graph is misleading? Explain.

_____

_____

4. These graphs show the penalty minutes in hockey for three players.





a) In the first graph, how do the total penalty minutes of the 3 players compare?

_____

b) In the second graph, how do the total penalty minutes of the three players compare?

_____

_____

c) The data in the two graphs are the same. What features of the graphs create the dramatic difference in their appearance?

_____

_____

5. The table shows the average salary of employees of a company over 8 years.

The employees are asking for a raise in salary for the next year.

The manager wants to show that the raise should be lower. The employees want to show that the raise should be higher.

Construct two appropriate graphs for the manager and the employees.

Average Employee Salary

Year	Salary
2002	$26 000
2003	$26 500
2004	$27 500
2005	$28 500
2006	$30 000
2007	$30 500
2008	$32 000

7.3 **6.** Identify which pair of events is a pair that are not independent. Explain your answer.

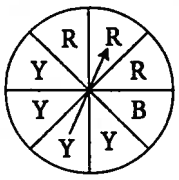
a) Roll two regular 6-sided dice.

b) Toss a penny and a nickel one after the other.

c) Remove 1 card from a standard deck of 52 cards and then remove a second card.

LESSON

7. The pointer on the spinner with 8 congruent sectors is spun twice.



Find the probability of each event:

a) a red and then a blue

_____

b) a yellow and then a red

_____

c) a blue on both spins

_____

8. A regular die labelled 1 to 6 is rolled and a quarter is tossed.
Find the probability of each event:

a) an odd number and a tail _____

b) a number greater than 4 and a head _____

7.4

9. **a)** A quarter, a penny, and a dime are tossed. Find the probability of each event:

i) heads on the quarter and the penny and a tail on the dime

_____

ii) all 3 tails _____

b) Explain why the probability of "all 3 tails" is the same as that of "all 3 heads."

_____

_____

10. A box contains 26 cards, each with a letter of the alphabet on it. Stephanie draws a card from the box and puts it back in the box. She repeats this procedure 2 more times for a total of 3 draws.

Tip

Consider Y to be a consonant for this experiment.

Find the probability of each event:

a) an A, then an F, then a G _____

b) a vowel, then 2 consonants _____

c) all vowels _____