

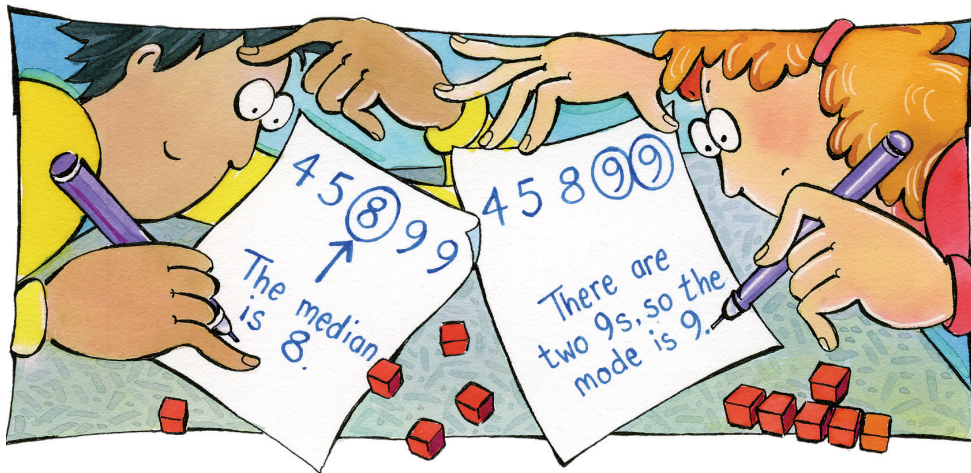
12.2

Mean

Focus on...

After this lesson, you will be able to...

- determine the mean for a set of data
- solve problems by finding the mean



Ms. Fermat was not satisfied with the way Amir and Melanie calculated their math midterm reports. She did not feel that the median and mode provided a correct view of their performances. Ms. Fermat asked the students to explore another way of representing the centre of the data.

Explore the Math

Materials

- 35 centimetre linking cubes

How do you calculate the mean of a set of data?

We need to find a value that the test scores are centred around.



Let's try levelling out the towers without adding any more blocks.

1. Build a tower that represents each score that Amir and Melanie received on their weekly math quizzes: 4, 5, 8, 9, 9. A tower 4 cubes high represents a score of 4 out of 10.
2. Sketch a picture of your towers for each of the five scores.
3. Move cubes from the taller towers to the shorter towers to create five identical towers with the same height. Use only the cubes that you used in #1.
 - a) What is the new height of each tower?
 - b) How does this value represent the centre of the data?

4. a) What is the sum of the five original scores?
- b) Divide the sum you found in part a) by the number of quizzes.
- c) How does your answer compare to the height of each tower in #3?

Reflect on Your Findings

5. The value you determined in #3 and #4 above is called the **mean**.
 - a) How does this value compare with the median and the mode?
 - b) Do you think the mean is the best measure of how Amir and Melanie are doing in math this term? Explain why.

mean

- a measure of central tendency
- the sum of a set of values divided by the number of values in the set
- for example,

$$\text{Mean} = \frac{6 + 8 + 4}{3} = 6$$

Example 1: Calculate the Mean

The daily sales at More Movies for the first week after the DVD release of *The Threat of the Brain Snatchers* are shown in the table.

Day	Number of Daily Sales
Monday	140
Tuesday	90
Wednesday	80
Thursday	90
Friday	110
Saturday	120

- a) What is the daily mean number of sales from Monday to Saturday?
- b) How many sales will be needed on Sunday if More Movies hopes to have a daily mean of 100 sales for the first week?

Solution

- a) Calculate the sum of the six numbers.
 $140 + 90 + 80 + 90 + 110 + 120 = 630$
 Divide the sum by the number of days, 6.
 $630 \div 6 = 105$
 The daily mean number of sales is 105 from Monday to Saturday.

Look for numbers that are easy to add.

$90 + 110 = 200$
 $80 + 120 = 200$
 So, $140 + 90 + 200 + 200 = 630$



- b) Calculate the total number of sales that will be necessary in order to have a daily mean number of sales of 100 for 7 days (one week). Since the mean needs to be 100, multiply 100 by 7.
 $100 \times 7 = 700$
 From part a), the sum of the sales for the first 6 days was 630. Subtract to calculate the number of sales needed on Sunday.
 $\text{Total Sales} = 700 - 630$
 $= 70$
 70 sales need to be made on Sunday.

Strategies

Work Backwards
 Refer to page xvi.

Show You Know

What is the mean of each set of values?

- a) 7, 8, 6, 9, 9, 5, 7, 7, 8, 4
- b) 300, 250, 400, 300, 250

Literacy Link

You often see the word "average" used instead of the word "mean."

Example 2: Use the Mean to Make Predictions

A scientist recorded the daily distance travelled by a spawning salmon for five days in a row.

Day	Distance Travelled (km)
Monday	44
Tuesday	52
Wednesday	51
Thursday	46
Friday	57



- What is the mean distance travelled by the salmon each day?
- How far would you expect the salmon to travel in the next ten days? Assume the salmon has not yet reached its spawning destination.
- A Chinook salmon may travel 8000 km from its feeding grounds in the North Pacific Ocean! How many days would you predict this journey to take based on the mean daily travel distance you calculated in part a)?


Solution

- a) Calculate the sum of the five distances.
 $44 + 52 + 51 + 46 + 57 = 250$
Divide the sum by the number of days.
 $250 \div 5 = 50$

$$\begin{array}{r} \boxed{C} \quad (\quad \boxed{44} \quad \boxed{+} \quad \boxed{52} \quad \boxed{+} \quad \boxed{51} \quad \boxed{+} \quad \boxed{46} \quad \boxed{+} \\ \boxed{57} \quad \boxed{) \div 5} \quad \boxed{=} \quad \boxed{50} \end{array}$$

The mean distance travelled each day is 50 km.

- b) The mean distance travelled each day is 50 km.
Multiply to calculate the expected distance travelled over the next ten days.
 $50 \times 10 = 500$
You would expect the salmon to travel about 500 km over the next ten days.
- c) The total distance travelled is 8000 km.
The mean distance travelled each day is 50 km.
Divide to find the length of time the total journey would take.
 $8000 \div 50 = 160$
The total journey would take about 160 days.

 **M E**
Add the tens.
 $40 + 50 + 50 + 40 + 50 = 230$
Add the ones.
 $4 + 2 + 1 + 6 + 7 = 20$
Add the subtotals.
 $230 + 20 = 250$

Did You Know?

Canada is about 5000 km from east to west, and also about 5000 km from north to south. The geographical centre of Canada is located just outside Baker Lake, Nunavut.

Key Ideas

- To calculate the mean, add all of the numbers in a set of data and then divide by the number of numbers.
- The mean does not have to be a number in the set of data.

$$\begin{aligned}\text{Mean} &= \frac{4 + 6 + 8 + 10 + 6 + 7 + 15}{7} \\ &= \frac{56}{7} \\ &= 8\end{aligned}$$

Communicate the Ideas

1. Describe to a classmate who missed the lesson how to calculate the mean of the following set of five numbers:
2, 6, 8, 9, 10
2. A toy store has six bins of stuffed animals. These bins contain 8, 7, 4, 5, 3, and 9 stuffed animals each.
 - a) What is the mean number of stuffed animals?
 - b) How could the vertical towers of linking cubes be levelled to determine the mean number of stuffed animals in a bin?



Practise

Round all answers to the nearest tenth where necessary.

For help with #3 to #6, refer to Example 1 on page 429.

3. What is the mean of each set of data?
 - a) 5, 4, 10, 5, 6
 - b) 2.2, 1.6, 1.9, 2.3, 2.1, 1.9
 - c) 30, 85, 50, 105, 100, 65, 20, 25
4. Determine the mean of each set of data.
 - a) 6, 7, 8, 9, 4, 11
 - b) 3.4, 2.2, 1.4, 4.6, 2.2, 1.4, 1.6, 1.6
 - c) 120, 72, 100, 110, 150, 75, 73
5. A store's sales of projection TVs on four Saturdays in February were 8, 7, 9, and 10. What was the mean number of Saturday sales in February?

6. Faith picked the following amounts of cranberries over seven days:
2 L, 1 L, 1.5 L, 3 L, 1 L, 0.5 L, 1.5 L
What is the mean volume of cranberries she picked?

For help with #7 and #8, refer to Example 2 on page 430.

7. Juanita scored the following points in her first six basketball games:
12, 10, 11, 12, 14, 13
 - a) What is the mean number of points scored?
 - b) How many points would she need to score in her next game to increase her mean by 1 point for the seven games?

8. The chart shows the growth of a seed planted indoors in January.

Month	Height (cm)
Jan	3
Feb	4
Mar	4
Apr	3
May	5
June	5

- What is the mean monthly growth?
- How much will the plant have to grow in July for the mean monthly growth to be 5 cm for the seven-month period?
- Predict the height of the plant after one year.

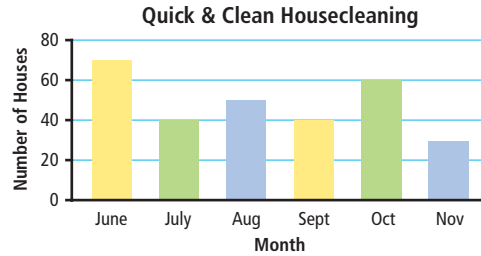
Apply

9. A survey company collected information about the amount of television teens watch each week.

Province	Television Viewing (hours per week)
British Columbia	12.4
Alberta	13.4
Saskatchewan	14.6
Manitoba	14.7

- What is the mean for the four provinces listed? Round your answer to the nearest tenth of an hour.
- The number of hours per week of television watched by teens for all of Canada was given as 14.0. How does the mean for the four provinces compare with the value given for all of Canada?
- Would you predict the mean for the provinces not listed to be more or less than 14.0? Explain your reasoning.
- How many hours of TV would you expect a typical Canadian teen to watch in one day?
- How many hours of TV would you expect a typical Canadian teen to watch in ten weeks?

10. The graph shows the number of homes cleaned by Quick & Clean Housecleaning. What is the mean number of homes cleaned for the months shown?



11. Here are Sasha's test scores in math this term:

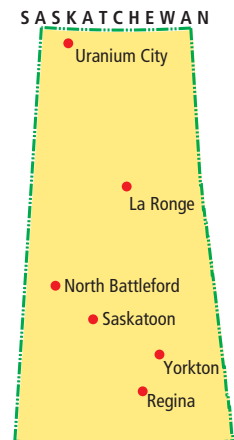
78%, 68.5%, 82%, 87%, 91%, 88%, 74.5%, 71%

- What is the mean of Sasha's test scores?
- Sasha wants to raise her mean mark by 1% after the next test. What mark does she need to get on the next test?

12. The table gives the maximum daytime temperatures for five cities in Saskatchewan during August.

City	Maximum Temperature (°C)
La Ronge	22
North Battleford	24
Regina	26
Uranium City	19
Yorkton	24

- What is the mean daytime temperature?
- Predict the maximum daily temperature for Saskatoon, SK, in August. Explain your reasoning.



13. Brennan recorded his test scores for his English course in a table.

Test	My Score	Out of (Total)
Grammar	6	10
Spelling	11	15
Novel Study	27	35
Poetry	31	40

- What is the sum of Brennan's four scores?
 - What is the total possible score Brennan could have received?
 - Calculate Brennan's overall mean score, to the nearest whole percent.
14. The table shows the percent of people who take their own bags shopping in order to minimize the waste of plastic and paper. What is the mean percent? Round your answer to the nearest tenth of a percent.

Province	People Who Bring Their Own Shopping Bags
Alberta	31%
British Columbia	31%
Manitoba	35%
Ontario	25%
Québec	18%
Saskatchewan	33%

Extend

15. The table gives the ticket prices and number of seats available at each seat location for a soccer stadium.

Seat Location	Ticket Price	Number of Seats
Lower Centre	\$12	500
Upper Centre	\$10	1000
End Zone	\$6	500

What is the mean ticket price for a sell-out?

16. During one month, major league baseball players Joe McEwing and Mike Lieberthal each had 45 hits in 132 attempts.
- Determine the *batting average* for each player by dividing the number of hits by the number of attempts. A *batting average* is always expressed as a decimal to 3 places.
 - Suppose these players played against each other. Joe hit .800 by hitting 4 times in 5 attempts. Mike hit 1.000 after successfully hitting 3 times in 3 attempts. Who do you think has the better updated *batting average* for the year? Explain your prediction.
 - Calculate each player's new *batting average*. Was your prediction correct?

MATH LINK

Leah interviewed ten friends about the number of cousins they have.

Name	Number of Cousins	Name	Number of Cousins
Danika	18	Kyle	20
Jerome	3	Nicole	8
Paula	9	Vishal	22
Sam	14	Michelle	6
Janice	12	Jonah	10

What is the mean number of cousins among Leah's friends? Round your answer to the nearest whole number.

