

13 Analyzing Quantities

fraction
 $\frac{1}{4}$

percent
25%

decimal number
0.25

mixed number
 $2\frac{1}{3}$

reduce
 $\frac{6}{8}$
 $\frac{3}{4}$

point
3.97

Get ready!

- 1 Before you read the passage, talk about these questions.

- 1 What are some ways to express quantities that are smaller than one?
- 2 What is the difference between an improper fraction and a mixed number?

Reading

- 2 Read the textbook excerpt. Then, mark the following statements as true (T) or false (F).

- 1 A percent represents a part of a whole number.
- 2 A decimal number contains a point.
- 3 Reducing a mixed number produces an improper fraction.

2.2 Expressing Quantities in Engineering

Whole numbers are easy to express. But many calculations involve partial quantities. Engineers must understand how to express parts of a whole.

Some quantities appear as percents.

Example: The compound is 80 out of 100 parts lead. The compound is 80% lead.

These quantities are easy to convert into decimal numbers. The percent simply appears after a decimal point.

Example: The compound is 0.80 parts lead.

A fraction is another form.

Example: The compound is $\frac{1}{10}$ lead. Or, reduce the fraction to its lowest form: $\frac{1}{10}$.

NOTE: Some fractions represent quantities larger than one. An example is $\frac{3}{2}$. These **improper fractions** are often converted into **mixed numbers**: $2\frac{1}{2}$.

Vocabulary

- 3 Match the words or phrases (1-6) with the definitions (A-F).

- | | | | |
|---|---------------------------------|---|--|
| 1 | <input type="checkbox"/> point | 4 | <input type="checkbox"/> quantity |
| 2 | <input type="checkbox"/> reduce | 5 | <input type="checkbox"/> mixed number |
| 3 | <input type="checkbox"/> out of | 6 | <input type="checkbox"/> improper fraction |
- A any numerical value
B to change to a form with the lowest possible numbers
C an amount that is greater than one and expressed as a fraction
D an amount that is expressed as a whole number and a fraction
E describing the ratio between actual and potential amounts
F a dot that is placed after a whole unit in a decimal number

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- 4 Read the sentence pairs. Choose which word or phrase best fits each blank.

1 fraction / percent

- A The solution contains fifty _____ water, so it is half water.
B A _____ is expressed as one value over another value.

2 decimal number / whole number

- A A _____ always contains a point.
B If a quantity is less than one, it is not a _____.

- 5 Listen and read the textbook excerpt again. What are two other ways to express $1\frac{3}{4}$?

Listening

- 6 Listen to a conversation between two mechanical engineers. Choose the correct answers.

- What is the conversation mostly about?
A a calculation error in the woman's design
B how to convert test results into fractions
C which form of expression is most appropriate for a quantity
D the number of successful prototypes in a test set
- What does the woman predict?
A The cost of the new product will be nine tenths the current cost.
B Every prototype will function correctly in the next test.
C The next set of belt drives will operate eight times faster.
D A new design will make the belt drives smaller.

- 7 Listen again and complete the conversation.

Engineer 1: Do you have the belt-drive test reports ready?

Engineer 2: Yes. The prototypes are 1 _____ than we expected.

Engineer 1: That's great to hear! 2 _____ of the set is still running?

Engineer 2: Only one failed. That means 3 _____ are still functional.

Engineer 1: Wow. Nine tenths is 4 _____. Are they efficient?

Engineer 2: Yes, they are. They each generate 5 _____ more power than the previous ones.

Engineer 1: Well, the design is really 6 _____, then.

Speaking

- 8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

Do you have the report on ...?
Are they ...?
I think our next ...

Student A: You are an engineer.

Talk to Student B about:

- a report on a recent product test
- the results of the test

Student B: You are an engineer.

Talk to Student A about the results of a recent product test and predictions about the next test.

Writing

- 9 Use the textbook excerpt and the conversation from Task 8 to fill out the progress report.

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Progress Report

Test: #119b

Please indicate changes since the last progress report.

Functionality: The _____ are more functional than the last group. Only _____ out of _____ failed. That means _____ are still functioning.

Cost: The new models are _____ as expensive as the previous models.

Expectations: I predict _____