

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

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 $\frac{80}{100}$ lead. Or, **reduce** the fraction to its lowest form: $\frac{4}{5}$.

NOTE: Some fractions represent quantities larger than one. An example is $\frac{7}{3}$. These **improper fractions** are often converted into **mixed numbers**: $2\frac{1}{3}$.

Get ready!

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

- What are some ways to express quantities that are smaller than one?
- 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).

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

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 |

- 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 $\frac{13}{4}$?

Listening

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

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