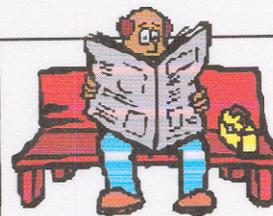# Percent Benchmarks

Institute Notes

Concept: Construct and compare percent benchmarks.

TEKS Focus: **6.1A-—**The student is expected to generate equivalent forms of rational numbers including whole numbers, fractions, and decimals;

7.1B-—The student is expected to convert between fractions, decimals, whole numbers, and percents mentally, on paper, or with a calculator.

8.1B-—The student is expected to select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships.

Overview: Participants will develop an understanding of percent by constructing percent benchmarks for comparison using strips of paper.

Materials: Copies of the percent bars, Scissors, Rulers

Procedure:
1. Discuss ways percents are used in everyday life. Relate to examples from "Why Do We Need This Stuff Anyway?" Discuss what percent means.

2. Hand out the activity pages. Have participants cut out three strips each.

3. Participants should work through the problems folding their strips, changing the fractions to percents, and labeling the bar on their activity page.

4. Have participants share their processes for folding the percent bars.

5. After completing Activity 2, add the percent benchmarks to the number line from "Order on Line." See cards after the institute notes.

Extensions: Investigate how you would construct benchmarks for percents greater than 100, i.e., 125%, 150%, etc.

Percent Benchmarks

Make a list of ways these are used in real-world applications.

Assessment: Name 5 everyday examples where these percent benchmarks might appear.

Notes:

10%	20%	30%
50%	60%	70%
90%	100%	80%
$33\frac{1}{3}$%	75%	40%
$66\frac{2}{3}$%	25%	25%

Percent Benchmarks

Percent Benchmarks

Percent Benchmarks
Activity 1

1. Cut out three bars.

2. Fold one bar in half lengthwise. What percent of the bar is represented by the fold that you just created? Fold the bar into fourths. What percent of the bar is represented by the fold you just created? Label the percent marks on your bar and the model below. Then change the fractions to percents.

$$\frac{1}{2} = \frac{1 \bullet}{2 \bullet} \underline{\hspace{1cm}} = \frac{\underline{\hspace{0.5cm}}}{100} = \underline{\hspace{0.5cm}}\%$$

$$\frac{1}{4} = \underline{\hspace{1.5cm}} = \frac{\underline{\hspace{0.5cm}}}{100} = \underline{\hspace{0.5cm}}\%$$

$$\frac{3}{4} = \underline{\hspace{1.5cm}} = \frac{\underline{\hspace{0.5cm}}}{100} = \underline{\hspace{0.5cm}}\%$$

0% ├────────┼────────┼────────┼────────┤ 100%
0   1

3. Fold a different bar into thirds. What percent of the bar is represented by the fold you just created? Label the percent marks on your bar and the model below. Then change the fractions to percents.

$$\frac{1}{3} = \underline{\hspace{1.5cm}} = \frac{\underline{\hspace{0.5cm}}}{100} = \underline{\hspace{0.5cm}}\%$$

$$\frac{2}{3} = \underline{\hspace{1.5cm}} = \frac{\underline{\hspace{0.5cm}}}{100} = \underline{\hspace{0.5cm}}\%$$

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TEXTEAMS Rethinking Middle School Mathematics: Numerical Reasoning
Summer 2001   Activity-42

Reason and Communicate:
· Why are benchmarks important?

· How could we use the benchmarks for estimation?

· Why is the concept of equivalence important in the construction of benchmarks?

Answers:

$$\frac{1}{2} = \frac{1 \bullet 50}{2 \bullet 50} = \frac{50}{100} = 50\%$$

$$\frac{1}{4} = \frac{1 \bullet 25}{4 \bullet 25} = \frac{25}{100} = 25\%$$

$$\frac{3}{4} = \frac{3 \bullet 25}{4 \bullet 25} = \frac{75}{100} = 75\%$$

$$\frac{1}{3} = \frac{1 \bullet 33\frac{1}{3}}{3 \bullet 33\frac{1}{3}} = \frac{33\frac{1}{3}}{100} = 33\frac{1}{3}\%$$

$$\frac{2}{3} = \frac{2 \bullet 33\frac{1}{3}}{3 \bullet 33\frac{1}{3}} = \frac{66\frac{2}{3}}{100} = 66\frac{2}{3}\%$$

Math Notes

The rule for creating equivalence is largely not known. Most people think of it as multiplying by 1. But the idea is *multiplying the numerator and denominator by the same number results in an equivalent fraction*. We are really using this to construct the benchmarks. As another example, to find

n in $\frac{23}{25} = \frac{n}{100}$ simply multiply by 4 or $\frac{23 \bullet 4}{25 \bullet 4} = \frac{92}{100}, n = 92$. In this

example, the 4 is a scale factor. There is a proportional relationship between the numbers and the percents on a percent bar. As the number increases along the bar, the percent of the number increases proportionally. This relationship makes it possible to have percent benchmarks.

Note the use of the distributive property in constructing the thirds to aid in understanding:

$$3(33) = 99 \ and \ 3\left(\frac{1}{3}\right) = 1,$$

so

$$3\left(33 + \frac{1}{3}\right) = 99 + 1 = 100$$

TEXTEAMS Rethinking Middle School Mathematics: Numerical Reasoning   39
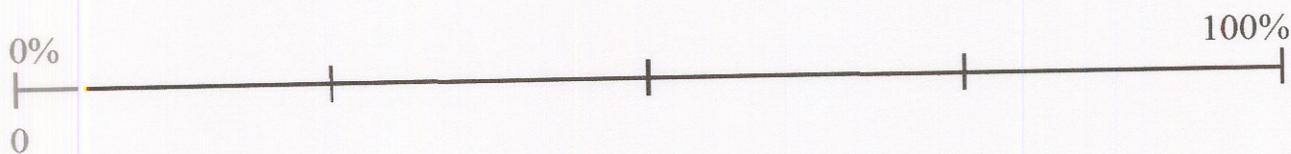
Percent Benchmarks

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$$\frac{3}{4} = \underline{\hspace{2cm}} = \frac{}{100} = \underline{\hspace{1cm}}\%$$

0%   100%

0

3. Fold a different bar into thirds. What percent of the bar is represented by the fold you just created? Label the percent marks on your bar and the model below. Then change the fractions to percents.

$$\frac{1}{3} = \underline{\hspace{2cm}} = \frac{}{100} = \underline{\hspace{1cm}}\%$$

$$\frac{2}{3} = \underline{\hspace{2cm}} = \frac{}{100} = \underline{\hspace{1cm}}\%$$

0%   100%
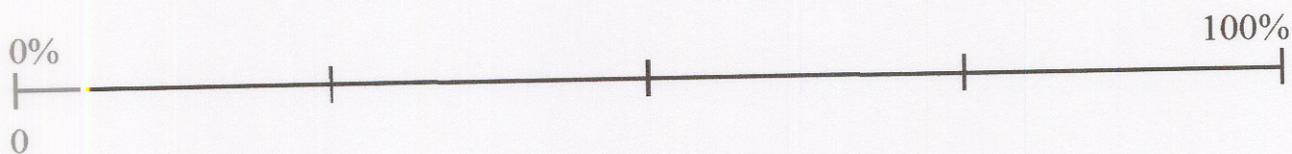
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Percent Benchmarks
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0%   100%

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0%   100%

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Percent Benchmarks

Percent Benchmarks

Activity 2

Using another bar, fold it into tenths. It is helpful to measure the bar in centimeters and then mark off ten equal parts. Label the percent marks you created on your bar and the model below. Then change the percents to fractions.

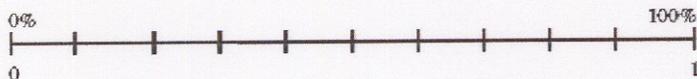$10\% = \dfrac{10}{100} =$

$20\% =$

$30\% =$

$40\% =$

$50\% =$

$60\% =$

$70\% =$

$80\% =$

$90\% =$

$100\% =$

0%   100%
├──┼──┼──┼──┼──┼──┼──┼──┼──┼──┤
0   1

Reason and Communicate:

· How can we use our tenths to construct fifths as benchmarks?

· How can we use tenths to compare with other benchmarks, i.e. thirds, fourths, and halves?

Answers:

1. $20\% = \dfrac{20}{100} = \dfrac{2}{10}$

2. $30\% = \dfrac{30}{100} = \dfrac{3}{10}$

3. $40\% = \dfrac{40}{100} = \dfrac{4}{10}$

4. $50\% = \dfrac{50}{100} = \dfrac{5}{10}$

5. $60\% = \dfrac{60}{100} = \dfrac{6}{10}$

6. $70\% = \dfrac{70}{100} = \dfrac{7}{10}$

7. $80\% = \dfrac{80}{100} = \dfrac{8}{10}$

8. $90\% = \dfrac{90}{100} = \dfrac{9}{10}$

9. $100\% = \dfrac{100}{100} = 1$

Using another bar, fold it into tenths. It is helpful to measure the bar in centimeters and then mark off ten equal parts. Label the percent marks you created on your bar and the model below. Then change the percents to fractions.

$10\% = \dfrac{10}{100} =$

$20\% =$

$30\% =$

$40\% =$

$50\% =$

$60\% =$

$70\% =$

$80\% =$

$90\% =$

$100\% =$

0%   100%

0