GRADE 7 · UNIT 7 · LESSON 10

Calculating Percent Error

MA.7.AR.3.1

I can find the percent error of an estimate or a measurement: how far off it is, as a percent of the actual value, and I can go between a ratio and a percent.

Warm-Up

1. Percent of change, 250 to 325? (final – initial) ÷ initial · 100
2. A $55 jacket is 40% off. What is the sale price?
3. A map's scale is 1 cm : 5 km. Towns 7 cm apart are how far?
4. Evaluate: $|12 - 15|$

Warm-Up

1. Percent of change, 250 to 325? (final – initial) ÷ initial · 100

   30%

2. A $55 jacket is 40% off. What is the sale price? **$33**

3. A map's scale is 1 cm : 5 km. Towns 7 cm apart are how far?

   35 km

4. Evaluate: $|12 - 15|$ **3**

Vocabulary

estimate

a value that is guessed or measured, close to the real one

actual value

the true value: what the thing really is

error

how far the estimate is from the actual value: |estimate – actual|

Vocabulary

percent error

the error as a percent of the actual value: percent error = |estimate − actual| ÷ actual · 100

absolute value

a number's distance from 0, so never negative: |−5| = 5

ratio

a comparison of two amounts; today, two parts of one whole (boys : girls)

Notes

I. How far off, over the actual value

percent error = |estimate − actual| ÷ actual · 100

Ella estimates 45 people are in a line. There are actually 50.

$$|45 - 50| \div 50 \cdot 100 = 5 \div 50 \cdot 100 = 10$$

Her percent error is 10%. Divide by the actual value, never the estimate.

Notes

II. Over or under, the error is positive

Estimate	Actual	Error	Percent error
45	50	$\lvert 45 - 50 \rvert = 5$	10%
55	50	$\lvert 55 - 50 \rvert = 5$	10%

Under by 5 or over by 5: the error is 5 either way.

The absolute value makes the error a distance, so it is never negative.

Notes

III. The same miss, a different percent error

A 10 cm pencil measured 2 cm off: $2 \div 10 \cdot 100 = 20$, so 20%

A 200 cm door measured 2 cm off: $2 \div 200 \cdot 100 = 1$, so 1%

The same 2 cm miss is a big error on the pencil and a small one on the door.

The percent error compares the miss with the actual value.

Notes

IV. Ratios and percents

A ratio can compare part to part. A percent can compare a part to the whole.

Ratio to percent: in a club, boys : girls = 3 : 2; the whole is 3 + 2 = 5 parts.

$$3 \div 5 \cdot 100 = 0.6 \cdot 100 = 60$$

Boys are 3 of every 5: 60% of the club.

Percent to ratio: 45% of a class walk, so 100 – 45 = 55 of every 100 do not.

walk : do not = 45 : 55 = 9 : 11 (divide both by 5)

Example 1

$$\text{percent error} = |\text{estimate} - \text{actual}| \div \text{actual} \cdot 100$$

Ana estimated a watermelon weighs 12 pounds. It actually weighs 16 pounds.

Find the percent error of her estimate.

Example 1

$$|12 - 16| = 4$$

$$4 \div 16 \cdot 100 = 25$$

Answer: The percent error is 25%.

Your Turn

$$\text{percent error} = |\text{estimate} - \text{actual}| \div \text{actual} \cdot 100$$

Ben estimated his puppy at 13 pounds. It actually weighs 20 pounds.

Find the percent error of his estimate.

Your Turn

$$\text{percent error} = |\text{estimate} - \text{actual}| \div \text{actual} \cdot 100$$

Ben estimated his puppy at 13 pounds. It actually weighs 20 pounds.

Find the percent error of his estimate.

Error: $|13 - 20| = 7$

Percent error: $7 \div 20 \cdot 100 = 35$

Answer: 35%

Example 2

$$\text{percent error} = |\text{estimate} - \text{actual}| \div \text{actual} \cdot 100$$

Kai estimated his bus ride at 39 minutes. It actually takes 30 minutes.

Find the percent error of his estimate.

Example 2

Which number do you divide by?

$$|39 - 30| = 9$$

$$9 \div 30 \cdot 100 = 30$$

Divide by the actual value, 30, not the estimate, 39.

Answer: The percent error is 30%.

Your Turn

$$\text{percent error} = |\text{estimate} - \text{actual}| \div \text{actual} \cdot 100$$

Mia estimated a drive takes 58 minutes. It actually takes 40 minutes.

Find the percent error of her estimate.

Your Turn

$$\text{percent error} = |\text{estimate} - \text{actual}| \div \text{actual} \cdot 100$$

Mia estimated a drive takes 58 minutes. It actually takes 40 minutes.

Find the percent error of her estimate.

Error: $|58 - 40| = 18$

Percent error: $18 \div 40 \cdot 100 = 45$

Answer: 45%

Whiteboards · Question 1 of 9

percent error = |estimate – actual| ÷ actual · 100

Lena guessed 1,180 people were at a game; 1,250 people came.

What is the error of her guess, in people?

Answer it.

Whiteboards · Question 1 of 9

percent error = |estimate − actual| ÷ actual · 100

Lena guessed 1,180 people were at a game; 1,250 people came.

What is the error of her guess, in people?

Error: $|1{,}180 - 1{,}250| = |-70| = 70$

Answer: 70 people

Whiteboards · Question 2 of 9

percent error = |estimate – actual| ÷ actual · 100

Sam estimated a fish was 33 cm long. It measured 40 cm.

What is the percent error of his estimate?

Answer it.

Whiteboards · Question 2 of 9

percent error = |estimate – actual| ÷ actual · 100

Sam estimated a fish was 33 cm long. It measured 40 cm.

What is the percent error of his estimate?

Error: $|33 - 40| = 7$

Percent error: $7 \div 40 \cdot 100 = 17.5$

Answer: 17.5%

Whiteboards · Question 3 of 9

percent error = |estimate – actual| ÷ actual · 100

Leo guessed a jar holds 290 marbles. It holds 250.

What is the percent error of his guess?

Answer it.

Whiteboards · Question 3 of 9

percent error = |estimate – actual| ÷ actual · 100

Leo guessed a jar holds 290 marbles. It holds 250.

What is the percent error of his guess?

Error: $|290 - 250| = 40$

Percent error: $40 \div 250 \cdot 100 = 16$

Answer: 16%

Whiteboards · Question 4 of 9

percent error = |estimate – actual| ÷ actual · 100

Jada guessed her trip would take 48 minutes. It took 60 minutes.

What is the percent error of her guess?

A. –20%

B. 12%

C. 25%

D. 20%

Answer it.

Whiteboards · Question 4 of 9

percent error = |estimate – actual| ÷ actual · 100

Jada guessed her trip would take 48 minutes. It took 60 minutes.

What is the percent error of her guess?

Error: $|48 - 60| = 12$

Percent error: $12 \div 60 \cdot 100 = 20$

Answer: D — 20%

Whiteboards · Question 5 of 9

percent error = |estimate – actual| ÷ actual · 100

Ava's guess for a 20-minute walk was 3 minutes off.

Ben's guess for an 80-minute drive was 6 minutes off.

Whose guess had the smaller percent error?

Answer it.

Whiteboards · Question 5 of 9

percent error = |estimate – actual| ÷ actual · 100

Ava's guess for a 20-minute walk was 3 minutes off.

Ben's guess for an 80-minute drive was 6 minutes off.

Whose guess had the smaller percent error?

Ava: $3 \div 20 \cdot 100 = 15$

Ben: $6 \div 80 \cdot 100 = 7.5$

7.5% is less than 15%.

Answer: Ben's: 7.5% against Ava's 15%

Whiteboards · Question 6 of 9

A shelter has only cats and dogs. The ratio of cats to dogs is 3 : 5.

What percent of the animals are cats?

A. 60%

B. 37.5%

C. 62.5%

D. 0.375%

Answer it.

Whiteboards · Question 6 of 9

A shelter has only cats and dogs. The ratio of cats to dogs is 3 : 5.

What percent of the animals are cats?

The whole: $3 + 5 = 8$ parts

Cats: $3 \div 8 = 0.375$

$0.375 \cdot 100 = 37.5$

Answer: B — 37.5%

Whiteboards · Question 7 of 9

In a park, 15% of the trees are oaks.

What is the ratio of oaks to the other trees?

Answer it.

Whiteboards · Question 7 of 9

In a park, 15% of the trees are oaks.

What is the ratio of oaks to the other trees?

Of every 100 trees, 15 are oaks.

The others: $100 - 15 = 85$

oaks : others = 15 : 85 = 3 : 17 (divide both by 5)

Answer: 15 : 85, or 3 : 17

Whiteboards · Question 8 of 9

percent error = |estimate – actual| ÷ actual · 100

A reporter estimated 4,500 people at a parade that lasted 3 hours, but 4,000 people came.

What was the percent error of the estimate?

Answer it.

Whiteboards · Question 8 of 9

percent error = |estimate – actual| ÷ actual · 100

A reporter estimated 4,500 people at a parade that lasted 3 hours, but 4,000 people came.

What was the percent error of the estimate?

Error: $|4{,}500 - 4{,}000| = 500$

Percent error: $500 \div 4{,}000 \cdot 100 = 12.5$

Answer: 12.5%

Whiteboards · Question 9 of 9

percent error = |estimate – actual| ÷ actual · 100

Mia's estimate was 57 and the actual value 60. She wrote:

$(57 - 60) \div 60 \cdot 100 = -5$

What did Mia leave out? What is the percent error?

Write your answer in sentences.

Whiteboards · Question 9 of 9

percent error = |estimate – actual| ÷ actual · 100

Mia's estimate was 57 and the actual value 60. She wrote:

$(57 - 60) \div 60 \cdot 100 = -5$

What did Mia leave out? What is the percent error?

The bars: $|57 - 60| = 3$, and $3 \div 60 \cdot 100 = 5$

Answer: She left out the absolute value: 5%

Independent Practice

1. A bag holds only red and blue beads. The ratio of red to blue is 7 : 3. What percent of the beads are blue?

2. 65% of the seats on a bus are taken. What is the ratio of taken seats to empty seats?

3. For questions 3–6, percent error = |estimate − actual| ÷ actual · 100. Pumpkin: estimate 22 lb, actual 25 lb. Find the percent error.

4. Hike: estimate 98 min, actual 80 min. Find the percent error.

5. Pencil: measured 7.2 cm, actual 7.5 cm. Find the percent error.

6. Crowd: actual 3,200, estimate 3,680. Find the percent error.

Before You Go

Percent error: how far off, out of the actual value.

Divide by the actual value; the error is never negative.

In a part-to-part ratio, the whole is the sum of the parts.

The practice test goes home today. Monday: review. Tuesday and Wednesday: the unit test.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 7 test.

Today's skills — all required

Percent error: word problems (6UY)