GRADE 7 · UNIT 10 · LESSON 9–10

Writing and Solving Two-Step Equations From Real-World Contexts

MA.7.AR.2.2

I can write and solve a two-step equation for a real-world problem with fractions, decimals or percents, and say what the solution means.

Warm-Up

1. A $4 fare plus $2 a mile is $16. How many miles?
2. Solve: $\frac{1}{4}n - 3 = 2$
3. Solve: $11 - t \geq 9$
4. Find 8% of 250.

Warm-Up

1. A $4 fare plus $2 a mile is $16. How many miles? **6 miles**
2. Solve: $\frac{1}{4}n - 3 = 2$ $n = 20$
3. Solve: $11 - t \geq 9$ **$t \leq 2$**
4. Find 8% of 250. **20**

Vocabulary

percent off

a part taken off the price: 20% off leaves 80% of the price, 0.80p

commission

pay that is a percent of sales: 5% of sales s is 0.05s

interpret

say what the solution means in the story, with its unit

Notes

I. Four moves for a story

1. Name the variable, with its unit. 2. Write the equation.

3. Solve it. 4. Answer in a sentence with the unit, and check that it fits.

A pool has 1,800 gallons and fills at 150 gallons a minute to 4,050. Let m be the minutes.

$150m + 1{,}800 = 4{,}050$, so $150m = 2{,}250$ and $m = 15$: it is full in 15 minutes.

Notes

II. Percents in a story

$300 a week plus 5% of sales s, and $420 earned:

$0.05s + 300 = 420$, so $0.05s = 120$ and $s = 2{,}400$: $2,400 of sales.

20% off, then a $5 coupon, and $35 paid: 20% off leaves 80% of the price p.

$0.80p - 5 = 35$, so $0.80p = 40$ and $p = 50$: the price was $50.

Notes

III. Does the answer fit?

A count is a whole number: $v \geq 4.6$ means 5 vans — the least whole number that works.

Money is in cents: \$12.17 is a price; \$12.1666… is not.

Check the answer in the story, not only in the equation.

Example 1

Six friends each buy a smoothie and a $2.35 bagel, and they spend $41.70.

Write and solve an equation for the price of a smoothie.

Example 1

Let s be the price of a smoothie, in dollars. Each pair costs s + 2.35.

$$6(s + 2.35) = 41.70$$

Divide by 6: s + 2.35 = 6.95. Subtract 2.35: s = 4.60.

A smoothie costs 4 dollars and 60 cents.

Answer: 6(s + 2.35) = 41.70; a smoothie is $4.60

Your Turn

Five friends each buy a sandwich and a $1.85 drink, and they spend $39.

Write and solve an equation for the price of a sandwich.

Your Turn

Five friends each buy a sandwich and a $1.85 drink, and they spend $39.

Write and solve an equation for the price of a sandwich.

Let s be a sandwich's price: $5(s + 1.85) = 39$

Divide by 5: $39 \div 5 = 7.80$, so $s + 1.85 = 7.80$ and $s = 5.95$

Answer: $5(s + 1.85) = 39$; a sandwich is $5.95

Example 2

A jacket is 25% off, and then a $6 coupon comes off; Mo pays $39.

Write and solve an equation for the original price.

Example 2

Let p be the original price. 25% off leaves 75% of it: 0.75p.

$$0.75p - 6 = 39$$

Add 6: 0.75p = 45. Divide by 0.75: p = 60.

The jacket was 60 dollars. Check: 75% of 60 is 45, and 45 – 6 = 39.

Answer: 0.75p – 6 = 39; the jacket was $60

Your Turn

Shoes are 10% off, and then a $4 coupon comes off; Zoe pays $59.

Write and solve an equation for the original price.

Your Turn

Shoes are 10% off, and then a $4 coupon comes off; Zoe pays $59.

Write and solve an equation for the original price.

10% off leaves 90%: $0.90p - 4 = 59$

Add 4, then divide by 0.90: $63 \div 0.90 = 70$, so $p = 70$

Answer: $0.90p - 4 = 59$; the shoes were $70

Whiteboards · Question 1 of 9

A tutor charges $25 to start plus $18.50 an hour, and the bill is $117.50.

Write the equation, and find the hours.

Answer it.

Whiteboards · Question 1 of 9

A tutor charges $25 to start plus $18.50 an hour, and the bill is $117.50.

Write the equation, and find the hours.

Let h be the hours: $18.50h + 25 = 117.50$

Subtract 25, then divide by 18.50: $92.50 \div 18.50 = 5$, so $h = 5$

Answer: $18.50h + 25 = 117.50$; 5 hours

Whiteboards · Question 2 of 9

A landscaper charges $65 an hour, and a $20 coupon comes off; the bill is $240.

Write the equation, and find the hours.

Answer it.

Whiteboards · Question 2 of 9

A landscaper charges $65 an hour, and a $20 coupon comes off; the bill is $240.

Write the equation, and find the hours.

The coupon comes off: $65h - 20 = 240$

Add 20, then divide by 65: $260 \div 65 = 4$, so $h = 4$

Answer: $65h - 20 = 240$; 4 hours

Whiteboards · Question 3 of 9

Socks are $4 off each pair, and Jen pays $16.50 for 3 pairs.

What was the original price of a pair?

A. $5.50

B. $1.50

C. $9.50

D. $6.83

Answer it.

Whiteboards · Question 3 of 9

Socks are $4 off each pair, and Jen pays $16.50 for 3 pairs.

What was the original price of a pair?

Each pair costs $p - 4$, three times: $3(p - 4) = 16.50$

Divide by 3: $16.50 \div 3 = 5.50$, so $p - 4 = 5.50$ and $p = 9.50$

Answer: C — $9.50

Whiteboards · Question 4 of 9

A plant is 4.5 cm tall and grows 1.2 cm a week.

Write the equation, and find when it will be 12.9 cm tall.

Answer it.

Whiteboards · Question 4 of 9

A plant is 4.5 cm tall and grows 1.2 cm a week.

Write the equation, and find when it will be 12.9 cm tall.

Let w be the weeks: $1.2w + 4.5 = 12.9$

Subtract 4.5, then divide by 1.2: $8.4 \div 1.2 = 7$, so $w = 7$

Answer: $1.2w + 4.5 = 12.9$; in 7 weeks

Whiteboards · Question 5 of 9

Each cupcake takes 2/3 cup of frosting, and the cake takes 1 cup. Ray uses 9 cups in all.

Write the equation, and find how many cupcakes he frosts.

Answer it.

Whiteboards · Question 5 of 9

Each cupcake takes 2/3 cup of frosting, and the cake takes 1 cup. Ray uses 9 cups in all.

Write the equation, and find how many cupcakes he frosts.

2/3 cup each, plus 1 cup for the cake: $\frac{2}{3}c + 1 = 9$

Subtract 1, then multiply by $\frac{3}{2}$: $8 \times \frac{3}{2} = 12$, so $c = 12$

Answer: (2/3)c + 1 = 9; 12 cupcakes

Whiteboards · Question 6 of 9

A salesperson earns $400 a week plus 8% of her sales, and she earned $560.

Write the equation, and find her sales.

Answer it.

Whiteboards · Question 6 of 9

A salesperson earns $400 a week plus 8% of her sales, and she earned $560.

Write the equation, and find her sales.

8% of sales s is $0.08s$: $0.08s + 400 = 560$

Subtract 400, then divide by 0.08: $160 \div 0.08 = 2{,}000$, so $s = 2{,}000$

Answer: $0.08s + 400 = 560$; $2,000 of sales

Whiteboards · Question 7 of 9

Ana has $100, buys video games at $12.50 each, and has $25 left.

How many games did she buy?

A. 6

B. 8

C. 10

D. 2

Answer it.

Whiteboards · Question 7 of 9

Ana has $100, buys video games at $12.50 each, and has $25 left.

How many games did she buy?

What she had, less 12.50 a game, leaves 25: $100 - 12.50g = 25$

Subtract 100: $-12.50g = -75$, so $g = -75 \div (-12.50) = 6$

Answer: A — 6 games

Whiteboards · Question 8 of 9

A van rental costs $45 plus $0.20 a mile, and the bill is $72 for a 3-hour trip.

How many miles was the trip?

Answer it.

Whiteboards · Question 8 of 9

A van rental costs $45 plus $0.20 a mile, and the bill is $72 for a 3-hour trip.

How many miles was the trip?

The rate, 0.20 a mile, multiplies m: $0.20m + 45 = 72$

Subtract 45, then divide by 0.20: $27 \div 0.20 = 135$, so $m = 135$

Answer: 135 miles

Whiteboards · Question 9 of 9

Pia wrote $0.15p - 12 = 39$ for 15% off and then $12 off, with $39 paid.

Fix Pia's equation, solve it, and say what the answer means.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Pia wrote $0.15p - 12 = 39$ for 15% off and then \$12 off, with \$39 paid.

Fix Pia's equation, solve it, and say what the answer means.

15% off leaves 85%: $0.85p - 12 = 39$

Add 12, then divide by 0.85: $51 \div 0.85 = 60$, so $p = 60$

Answer: $0.85p - 12 = 39$: the original price was \$60

Independent Practice

1. A music school costs $40 to join plus $22.50 a lesson; Eli has paid $175. How many lessons?

2. A phone battery at 92% charge loses 6 percentage points an hour. When will it be at 47%?

3. Four friends each buy a ticket and a $3.75 drink for $56 in all. What is a ticket?

4. Each bag of trail mix takes 3/4 cup of nuts, plus 1 cup for a bowl on the table. Kim uses 7 cups in all. How many bags does she fill?

5. A server earns $120 a day plus 15% of her sales, and she earned $195. What were her sales?

6. A lamp is 30% off, and then a $5 coupon comes off; Raj pays $51. What was the original price?

Before You Go

Name it, write it, solve it, say it.

A percent off leaves the rest.

Tomorrow: the review. Thursday and Friday: the 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 10 test.

Today's skills — all required

Solve two-step equations: word problems (D2Y)