GRADE 7 · UNIT 10 · LESSON 8

Solving Real-World Problems With Two-Step Equations

MA.7.AR.2.2

I can write a two-step equation for a real-world situation, say what my variable stands for, and tell which number is the rate and which is the starting amount.

Warm-Up

1. Solve: $3(x - 2.5) = 12$
2. Pens cost $1.50 each. What is the most Ava can buy with $10?
3. Write an expression: $12, plus $4 for each hour h.
4. Write and solve: a number decreased by 7 is 15.

Warm-Up

1. Solve: $3(x - 2.5) = 12$ $x = 6.5$
2. Pens cost $1.50 each. What is the most Ava can buy with $10?

   6 pens
3. Write an expression: $12, plus $4 for each hour h. $4h + 12$
4. Write and solve: a number decreased by 7 is 15.

   $n - 7 = 15$, so $n = 22$

Vocabulary

rate

an amount for each one: $2.50 a mile — in a rate-and-start equation it multiplies the variable

starting amount

an amount that comes once, whatever the variable is: a $3 fare to start — the constant

define the variable

say what the letter stands for, with its unit: m = the number of miles

Notes

I. Rate and start: the rate is the coefficient

A taxi costs $3 to start plus $2.50 a mile, and the ride costs $18.

Let m be the number of miles. 2.50 a mile multiplies m; the 3 is paid once.

$2.50m + 3 = 18$, so $2.50m = 15$ and $m = 6$: a 6-mile ride.

Notes

II. Groups: the same pair, bought again and again

Four friends each buy a $6 ticket and a snack, and they spend $38.

Let s be the price of one snack. Each friend's pair costs $s + 6$.

$4(s + 6) = 38$, so $s + 6 = 9.5$ and $s = 3.5$: a snack is $3.50.

Notes

III. Going down: the rate is subtracted

A 50-liter tank drains 2.5 liters a minute, down to 20 liters.

Let t be the number of minutes: $50 - 2.5t = 20$

Read it back: 50 liters, less 2.5 for each minute, leaves 20.

Subtract 50: $-2.5t = -30$, so $t = 12$ minutes.

Example 1

An electrician charges $55 to come out plus $40 an hour, and the bill is $175.

Write an equation for the hours. Then solve it.

Example 1

Let h be the number of hours. 40 an hour multiplies h; the 55 is paid once.

$$40h + 55 = 175$$

Subtract 55: $40h = 120$. Divide by 40: $h = 3$.

The electrician worked 3 hours.

Answer: $40h + 55 = 175$; 3 hours

Your Turn

A bike rental costs $12 plus $6.50 an hour, and Kai paid $44.50.

Write an equation for the hours. Then solve it.

Your Turn

A bike rental costs $12 plus $6.50 an hour, and Kai paid $44.50.

Write an equation for the hours. Then solve it.

Let h be the hours: $6.50h + 12 = 44.50$

Subtract 12, then divide by 6.50: $32.50 \div 6.50 = 5$, so $h = 5$

Answer: $6.50h + 12 = 44.50$; 5 hours

Example 2

Three friends each buy a $7.25 lunch and a drink, and they spend $27.75.

Write an equation for the price of a drink. Then solve it.

Example 2

Let d be the price of one drink. Each friend's pair costs d + 7.25.

$$3(d + 7.25) = 27.75$$

Divide by 3: d + 7.25 = 9.25. Subtract 7.25: d = 2.

A drink costs 2 dollars.

Answer: 3(d + 7.25) = 27.75; a drink is $2

Your Turn

Four friends each buy a $5.50 sandwich and a snack, and they spend $31.

Write an equation for the price of a snack. Then solve it.

Your Turn

Four friends each buy a $5.50 sandwich and a snack, and they spend $31.

Write an equation for the price of a snack. Then solve it.

Let s be a snack's price: $4(s + 5.50) = 31$

Divide by 4: $31 \div 4 = 7.75$, so $s + 5.50 = 7.75$ and $s = 2.25$

Answer: $4(s + 5.50) = 31$; a snack is $2.25

Whiteboards · Question 1 of 9

A gym charges $30 to join plus $18 a month, and Ben has paid $192.

Which equation can be used to find m, the number of months?

A. $18(m + 30) = 192$

B. $30m + 18 = 192$

C. $18m - 30 = 192$

D. $18m + 30 = 192$

Answer it.

Whiteboards · Question 1 of 9

A gym charges $30 to join plus $18 a month, and Ben has paid $192.

Which equation can be used to find m, the number of months?

18 a month is the rate: it multiplies m

The 30 is paid once, so it is added: $18m + 30 = 192$

Answer: D — 18m + 30 = 192

Whiteboards · Question 2 of 9

$18m + 30 = 192$

Solve it. How many months has Ben paid?

Answer it.

Whiteboards · Question 2 of 9

$18m + 30 = 192$

Solve it. How many months has Ben paid?

Subtract 30: $192 - 30 = 162$, so $18m = 162$

Divide by 18: $162 \div 18 = 9$, so $m = 9$

Answer: 9 months

Whiteboards · Question 3 of 9

A 24 cm candle burns 1.5 cm an hour and is now 15 cm tall.

Write an equation for the hours. Then solve it.

Answer it.

Whiteboards · Question 3 of 9

A 24 cm candle burns 1.5 cm an hour and is now 15 cm tall.

Write an equation for the hours. Then solve it.

Going down from 24: $24 - 1.5h = 15$

Subtract 24: $-1.5h = -9$, so $h = -9 \div (-1.5) = 6$

Answer: $24 - 1.5h = 15$; 6 hours

Whiteboards · Question 4 of 9

Six friends each buy a $12 shirt and a hat, and they spend $114.

Which equation can be used to find h, the price of a hat?

A. $12(h + 6) = 114$

B. $6(h - 12) = 114$

C. $6(h + 12) = 114$

D. $6h + 12 = 114$

Answer it.

Whiteboards · Question 4 of 9

Six friends each buy a $12 shirt and a hat, and they spend $114.

Which equation can be used to find h, the price of a hat?

Each friend buys the pair, a hat and a 12 shirt: $h + 12$

Six of the pair: $6(h + 12) = 114$

Answer: C — 6(h + 12) = 114

Whiteboards · Question 5 of 9

$6(h + 12) = 114$

Solve it. What does a hat cost?

Answer it.

Whiteboards · Question 5 of 9

$6(h + 12) = 114$

Solve it. What does a hat cost?

Divide by 6: $114 \div 6 = 19$, so $h + 12 = 19$

Subtract 12: $19 - 12 = 7$, so $h = 7$

Answer: $7

Whiteboards · Question 6 of 9

A necklace is a \$2 cord and beads at \$0.75 each: $0.75b + 2 = 8$.

What does b stand for? Find it.

Answer it.

Whiteboards · Question 6 of 9

A necklace is a \$2 cord and beads at \$0.75 each: $0.75b + 2 = 8$.

What does b stand for? Find it.

0.75 is the price of each bead, so b counts the beads

$8 - 2 = 6$, and $6 \div 0.75 = 8$, so $b = 8$

Answer: b is the number of beads: 8 beads

Whiteboards · Question 7 of 9

Each batch of cookies takes 3/4 cup of sugar, plus 1/2 cup for the topping. Lin uses 5 cups in all.

How many batches does she make?

Answer it.

Whiteboards · Question 7 of 9

Each batch of cookies takes 3/4 cup of sugar, plus 1/2 cup for the topping. Lin uses 5 cups in all.

How many batches does she make?

Batches use 3/4 cup each, plus the 1/2 cup of topping: $\frac{3}{4}b + \frac{1}{2} = 5$

Subtract $\frac{1}{2}$, then multiply by $\frac{4}{3}$: $\frac{9}{2} \times \frac{4}{3} = 6$, so $b = 6$

Answer: 6 batches

Whiteboards · Question 8 of 9

A scooter costs $1 to unlock plus $0.39 a minute, and Jay paid $8.80 to ride 3 miles.

How many minutes did he ride?

Answer it.

Whiteboards · Question 8 of 9

A scooter costs $1 to unlock plus $0.39 a minute, and Jay paid $8.80 to ride 3 miles.

How many minutes did he ride?

The rate, 0.39 a minute, multiplies m: $0.39m + 1 = 8.80$

Subtract 1, then divide by 0.39: $7.80 \div 0.39 = 20$, so $m = 20$

Answer: 20 minutes

Whiteboards · Question 9 of 9

Tia wrote $5m + 40 = 165$ for a \$5 fee plus \$40 a month, \$165 in all.

What is Tia's mistake? Write the right equation and solve it.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Tia wrote $5m + 40 = 165$ for a \$5 fee plus \$40 a month, \$165 in all.

What is Tia's mistake? Write the right equation and solve it.

The rate is 40 a month, so 40 multiplies m: $40m + 5 = 165$

Subtract 5, divide by 40: $160 \div 40 = 4$, so $m = 4$

Answer: Swapped: 40m + 5 = 165, so 4 months

Independent Practice

1. A club costs $15 to join plus $8 a meeting; Ana has paid $71. Write and solve: how many meetings?
2. A club costs $8 to join plus $15 a meeting; Ana has paid $83. Write and solve: how many meetings?
3. A 2,000-gallon pool drains 150 gallons an hour, down to 800. Write and solve: how many hours?
4. An equilateral triangle has a perimeter of 19.5 inches, and each of its sides is $x + 1.5$ inches long. Write and solve: what is x?
5. A garage charges $2 plus $1.25 an hour; Sam paid $9.50. Write and solve: how many hours?
6. $12.50t + 20 = 95$ is t tickets and a $20 parking fee. Name the rate and the starting amount. Solve it.

Before You Go

Say what the variable stands for.

The rate multiplies the variable; the one-time amount is the constant.

Tomorrow: percents and fractions in stories.

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

Choose two-step equations: word problems (8NH)