Solving Multi-step Percentage Problems

Let's solve more problems about sales tax and discounts.

12.1 Which Three Go Together: Equations

Which three go together? Why do they go together?

A

$$1.08 \cdot 25 = 27$$

B

$$1.08 \cdot 25 = x$$

C

$$1.08x = 27$$

D

$$\left(1 + \frac{x}{100}\right) \cdot 25 = 27$$

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12.2 Info Gap: Sporting Goods

Your teacher will give you either a problem card or a data card. Do not show or read your card to your partner.

If your teacher gives you the problem card:

1. Silently read your card, and think about what information you need to answer the question.
2. Ask your partner for the specific information that you need. "Can you tell me _____?"
3. Explain to your partner how you are using the information to solve the problem. "I need to know _____ because . . . ."

   Continue to ask questions until you have enough information to solve the problem.
4. Once you have enough information, share the problem card with your partner, and solve the problem independently.
5. Read the data card, and discuss your reasoning.

If your teacher gives you the data card:

1. Silently read your card. Wait for your partner to ask for information.
2. Before telling your partner any information, ask, "Why do you need to know _____?"
3. Listen to your partner's reasoning and ask clarifying questions. Only give information that is on your card. Do not figure out anything for your partner!

   These steps may be repeated.
4. Once your partner says they have enough information to solve the problem, read the problem card, and solve the problem independently.
5. Share the data card, and discuss your reasoning.

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12.3 What Is the Percentage?

1. A salesperson sold a car for $18,250, and their commission is $693.50. What percentage of the sale price is their commission?

2. The bill for a meal was $33.75. The customer left $40.00. What percentage of the bill was the tip?

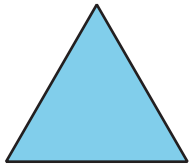
3. The original price of a bicycle was $375. Now it is on sale for $295. What percentage of the original price was the markdown?

Are you ready for more?

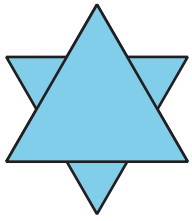
The Koch snowflake is a fractal—a special kind of repeating pattern. To make a Koch snowflake,

- Start with an equilateral triangle. This is Step 1.
- Divide each side into 3 equal pieces. Replace each middle third with a smaller equilateral triangle. This is Step 2.
- Repeat the process. This is Step 3.
- Keep repeating this process.

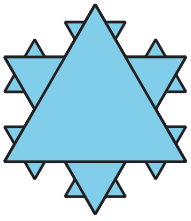
Step 1



Step 2



Step 3



By what percentage does the perimeter increase from step 1 to step 2? From step 2 to step 3? From step 9 to step 10?

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Lesson 12 Summary

To find a 30% increase over 50, we can find 130% of 50. $1.3 \cdot 50 = 65$

To find a 30% decrease from 50, we can find 70% of 50. $0.7 \cdot 50 = 35$

If we know the initial amount and the final amount, we can also find the percent increase or percent decrease. For example, a plant was 12 inches tall and grew to be 15 inches tall. What percent increase is this? Here are two ways to solve this problem:

The plant grew 3 inches, because $15 - 12 = 3$. We can divide this growth by the original height: $3 \div 12 = 0.25$. So the height of the plant increased by 25%.

The plant's new height is 125% of the original height, because $15 \div 12 = 1.25$. This means the height increased by 25%, because $125 - 100 = 25$.

Consider this new example: A rope was 2.4 meters long. Someone cut it down to 1.9 meters. What percent decrease is this? Here are two ways to solve the problem:

The rope is now $2.4 - 1.9$, or 0.5, meter shorter. We can divide this decrease by the original length: $0.5 \div 2.4 = 0.208\overline{3}$. So the length of the rope decreased by approximately 20.8%.

The rope's new length is about 79.2% of the original length, because $1.9 \div 2.4 = 0.791\overline{6}$. The length decreased by approximately 20.8%, because $100 - 79.2 = 20.8$.