

WARM UP PROBLEM: Need 4 gallons using only a 3 and 5 gallon jugs???



SOLUTIONS...

Mr. H

Step 1. Fill 5 gallon jug
 Step 2. Pour 5 gallon jug into 3 gallon jug, leaving 2 remaining gallons in 5 gallon jug.
 Step 3. Empty 3 gallon jug.
 Step 4. Pour 2 gallons from 5 gallon jug into 3 gallon jug, leaving 1 gallon of empty space.
 Step 5. Refill 5 gallon jug.
 Step 6. Pour water from 5 gallon jug into 3 gallon jug, which already has 2 gallons in it, and only 1 gallon of empty space, leaving exactly 4 gallons in the 5 gallon jug.

there is an alternate way to solve this:

1. fill the 3 gallon jug
2. pour that 3 gallons into the 5 gallon jug
3. refill the 3 gallon jug
4. fill the 5 gallon jug to the top, leaving 1 gallon in the 3 gallon jug
5. empty the 5 gallon jug
6. pour the 1 gallon from the 3 gallon jug into the 5 gallon jug
7. refill the 3 gallon jug
8. pour that 3 gallons into the 5 gallon jug which already has 1 gallon in it for a total of 4 gallons.

Die Hard

In Summary

Key Idea

- A single error in reasoning will break down the logical argument of a deductive proof. This will result in an invalid conclusion, or a conclusion that is not supported by the proof.

Need to Know

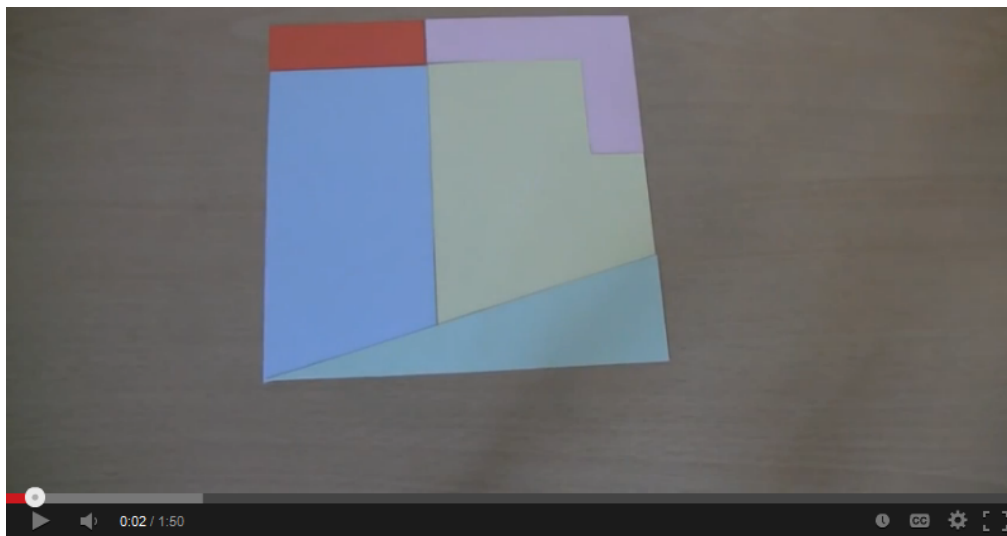
- Division by zero always creates an error in a proof, leading to an invalid conclusion.
- Circular reasoning must be avoided. Be careful not to assume a result that follows from what you are trying to prove.
- The reason you are writing a proof is so that others can read and understand it. After you write a proof, have someone else who has not seen your proof read it. If this person gets confused, your proof may need to be clarified.

HOMEWORK...

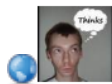
p. 42: #1 - 10
(omit #8)

* # 4

* # 10



A Maths Puzzle: The Missing Square Solution



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The image shows a YouTube video player interface. The video content is a blackboard with white chalk-like text that reads "THE MYSTERY OF THE VANISHING DOLLAR". Below the video player, the title "Mystery of the Missing Dollar Puzzle" is displayed. The channel name "AmazingMathGuy" is shown with a profile picture and the text "14 videos". A red "Subscribe" button is visible next to a comment count of "206". On the right side, the view count is "3,015", with "14" likes and "1" dislike indicated below it. The video player controls at the bottom of the video frame show a progress bar at 0:02 / 4:30, along with icons for volume, closed captions, settings, and full screen.

The 'Missing Dollar' Riddle...

[is a famous riddle that involves an informal fallacy]

Three guests check into a hotel room. The clerk says the bill is \$30, so each guest pays \$10. Later the clerk realizes the bill should only be \$25. To rectify this, he gives the bellhop \$5 to return to the guests. On the way to the room, the bellhop realizes that he cannot divide the money equally. As the guests didn't know the total of the revised bill, the bellhop decides to just give each guest \$1 and keep \$2 for himself. Each guest got \$1 back: so now each guest only paid \$9; bringing the total paid to \$27. The bellhop has \$2. And $\$27 + \$2 = \$29$ so, if the guests originally handed over \$30, what happened to the remaining \$1?

Solution:

Start with the money that the clerk has...\$25

Now add the change given to each person... 3 x \$1

Finally add the bellhop tip...\$2

TOTAL = \$30 (there was NO missing dollar!)

OR 9 x \$3 **SUBTRACT** \$2 = \$25

HW Questions

6. Connie tried this number trick:

- Write down the number of your street address.
- Multiply by 2.
- Add the number of days in a week.
- Multiply by 50.
- Add your age.
- Subtract the number of days in a year.
- Add 15.

Connie's result was a number in which the tens and ones digits were her age and the rest of the digits were the number from her street address. She tried to prove why this works, but her final expression did not make sense.

- ✓ Let n represent any house number.
- ✓ $2n$ Multiply by 2.
- ✓ $2n + 7$ Add the number of days in a week.
- ✓ $100n + 350$ Multiply by 50.
- ✓ Let a represent any age.
- ✓ $100n + 350 + a$ Add your age.
- ✓ $100n + 350 + a - 360$ Subtract the number of days in a year.
- ✓ $100n + a + 15$ Add 15.

- a) Try this number trick to see if you get the same result as Connie.
- b) Determine the errors in her proof, and then correct them.
- c) Explain why your final algebraic expression describes the result of this number trick.

$100n + a$

↑
hundreds position

↓
Tens

9. Brittney said she could prove that a strip of paper has only one side. She took a strip of paper, twisted it once, and taped the ends together. Then she handed her friend Amber a pencil, and asked Amber to start at any point and draw a line along the centre of the paper without lifting the pencil. Does a strip of paper have only one side? Why or why not?



∞ infinity

1.6

Reasoning to Solve Problems

GOAL

Solve problems using inductive or deductive reasoning.

EXPLORE...

- Suppose that you are lost in the woods for hours and come upon a cabin. In the cabin, you find a lantern, a candle, a wood stove with wood in it, and a match. What do you light first?

**SAMPLE ANSWER**

I would light the match first. If I didn't, I couldn't light any of the other items. I would light the candle next, since it would stay lit for longer than the match and would allow me to light the other two items. Also, it's less likely that I would make an error or fail when lighting the candle. The lantern and the stove would be more difficult to light.

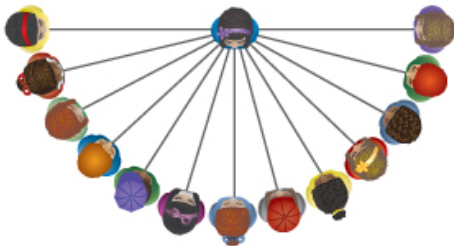
APPLY the Math

EXAMPLE 1 Using reasoning to solve a problem

The members of a recently selected varsity basketball team met each other at their first team meeting. Each person shook the hand of every other person. The team had 12 players and 2 coaches. How many handshakes were exchanged?

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Kim's Solution



13 handshakes

I decided to think about how many times each person shook hands. There were 14 people in total, so person 1 shook hands with each of the other 13 people.



Person 2 had already shaken hands with person 1. Person 2 shook hands with each of the remaining 12 people.

13 + 12 handshakes

$$13 + 12 + 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 91 \text{ handshakes}$$

This pattern of handshakes continued until there were two people left when the last handshake happened.

In Summary

Key Idea

- Inductive and deductive reasoning are useful in problem solving.

Need to Know

- Inductive reasoning involves solving a simpler problem, observing patterns, and drawing a logical conclusion from your observations to solve the original problem.
- Deductive reasoning involves using known facts or assumptions to develop an argument, which is then used to draw a logical conclusion and solve the problem.

HOMEWORK...

**p. 48: #1 - 13
(OMIT #5, 8, 10, 11)**