WARM-UP...

1. Grab a calculator. (you won't be able to do this one in your head)
2. Key in the first three digits of your phone number (NOT the area code)
3. Multiply by 80
4. Add 1
5. Multiply by 250
6. Add the last 4 digits of your phone number
7. Add the last 4 digits of your phone number again.
8. Subtract 250
9. Divide number by 2

Do you recognize the answer?

WHY??? Prove by deduction...

$$80(100a + 10b + c)$$

$$250(8000a + 800b + 80c + 1)$$

$$2000000a + 200000b + 20000c + 250 + 1000d + 100e + 10f + g$$

HOMEWORK... *Questions*

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

③ ⑦ 4 ⑨ 10
✱ ✱

$$x^2 - 9$$
$$(x + 3)(x - 3)$$

3. Mickey says he can prove that $2 = 0$. Here is his proof.
Let both a and b be equal to 1.

$a = b$	Transitive property ✓
$a^2 = b^2$	Squaring both sides ✓
$a^2 - b^2 = 0$	Subtracting b^2 from both sides ✓
$(a - b)(a + b) = 0$	Factoring a <u>difference of squares</u>
$\dfrac{(a - b)(a + b)}{(a - b)} = \dfrac{0}{(a - b)}$	Dividing both sides by $a - b$ ✗
$1(a + b) = 0$	Simplifying
$a + b = 0$	
$1 + 1 = 0$	Substitution
$2 = 0$	

$a - b = 0$

ERROR $\div 0$

7. According to this proof, $2 = 1$. Determine the error in reasoning.

Let $a = b$.

$$a^2 = ab \qquad \text{Multiply by } a.$$

← $a^2 - ab = 0$ ✓

$$a^2 + a^2 = a^2 + ab \qquad \text{Add } a^2. \checkmark$$

$$2a^2 = a^2 + ab \qquad \text{Simplify.} \checkmark$$

$$2a^2 - 2ab = a^2 + ab - 2ab \qquad \text{Subtract } 2ab. \checkmark$$

$$2a^2 - 2ab = a^2 - ab \qquad \text{Simplify.} \checkmark$$

$$2(a^2 - ab) = 1(a^2 - ab) \qquad \text{Factor.} \checkmark$$

$$2 = 1 \qquad \text{Divide by } (a^2 - ab). \; ✗$$

Dividing by 0

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?
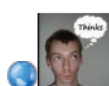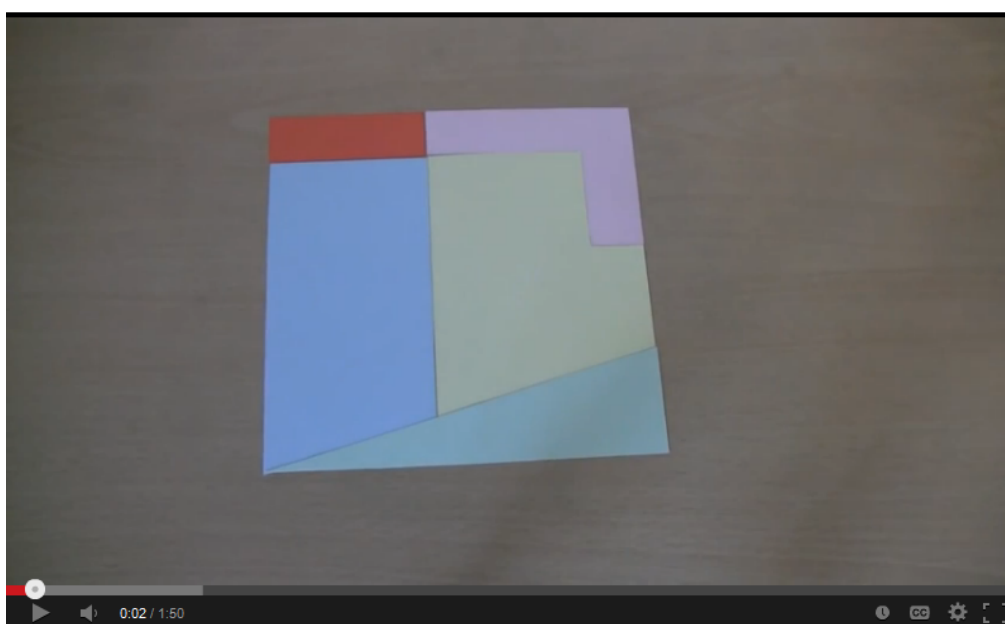
Paper is two sided
Mobius strip is 3D

4. Noreen claims she has proved that $32.5 = 31.5$.
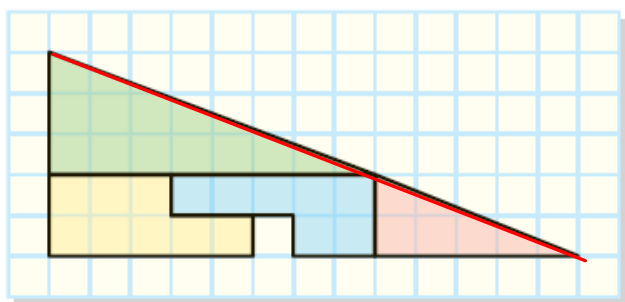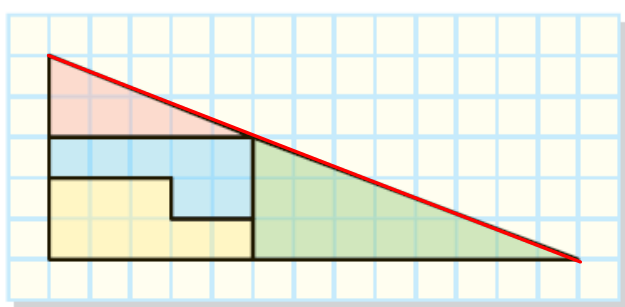
Is Noreen's proof valid? Explain.

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Mystery of the Missing Dollar Puzzle

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?

Match → Candle → Lantern
                              ↳ Stove

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.
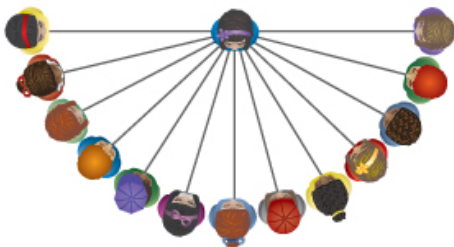
APPLY the Math

| EXAMPLE 1 | Using reasoning to solve a problem |

p.46

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?

Kim's Solution

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.

13 handshakes

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 handshakes

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

$$\frac{14 \times 13}{2}$$

**EXAMPLE 2**   Using reasoning to solve a problem

P. 47

Sue signed up for games at her school's fun night. Seven other people were assigned to her group, making up four pairs of partners. The other members of her group were Dave, Angie, Josh, Tanya, Joy, Stu, and Linus. When the games started, Dave and his partner were to the left of Stu. Across from Dave was Sue, who was to the right of Josh. Dave's brother's partner, Tanya, was across from Stu. Joy was not on Stu's right.

Name the four pairs of partners.

[handwritten annotations: Dave / Joy / Stu / Josh / Tanya / Linus / Sue / Angie]
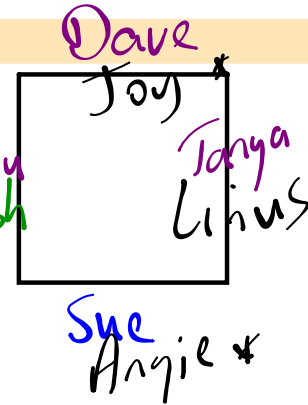
Vicky's Solution

Dave
Angie
Josh
Tanya
Joy
Stu
Linus
Sue
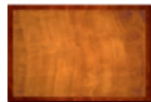
I drew a rectangle to represent a table. I made a list of the students' names so I could cross them off as I put them in place.

~~Dave~~
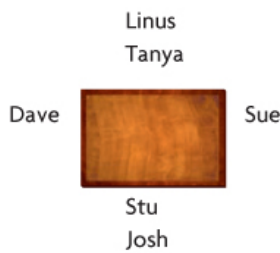Angie
Josh
Tanya
Joy
~~Stu~~
Linus
Sue

Dave

Stu

The first names I wrote in were Dave and Stu, since they were the first two mentioned. It didn't matter where I started, as long as I kept the relationships of left, right, and across the table. I crossed Dave and Stu off my list.

~~Dave~~
Angie
~~Josh~~
Tanya
Joy
~~Stu~~
Linus
~~Sue~~

Dave   Sue

Stu
Josh

I knew that Sue was across from Dave and to the right of Josh. I crossed Sue and Josh off my list.

~~Dave~~
Angie
~~Josh~~
~~Tanya~~
Joy
~~Stu~~
~~Linus~~
~~Sue~~

Linus
Tanya

Dave   Sue

Stu
Josh

The next clue mentioned that Dave's brother and his partner Tanya were across from Stu. The only male name left was Linus, so Linus and Tanya were partners. I crossed their names off my list.

~~Dave~~
~~Angie~~
~~Josh~~
~~Tanya~~
~~Joy~~
~~Stu~~
~~Linus~~
~~Sue~~

Linus
Tanya

Dave   Sue
Joy   Angie

Stu
Josh

If Joy was not on Stu's right, then she must have been on his left. Therefore, she must have been Dave's partner. So, the last person to match was Angie with Sue.

The four pairs of partners were Linus and Tanya, Dave and Joy, Sue and Angie, and Stu and Josh.

The partners sat together, on the same side of the table.

10

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)