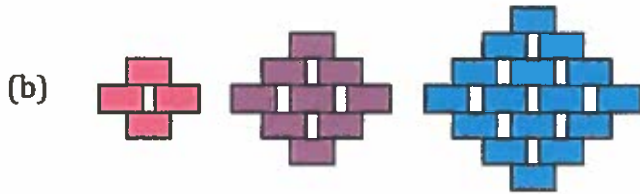


- 1) Find the next item in each pattern  
 (a) January, March, May, ...

(a) July



(c) 4, 7, 12, 19, 28, ...

(c) 39

- 2) Write a conjecture about the product of an even number and an odd number

$2 \times 3 = 6$   
 $4 \times 5 = 20$

The product of an even number and an odd number is always even.

- 3) Provide a counterexample to show that each statement is false.

- (a) If a number is divisible by 5, then it is divisible by 10.  $\sqrt{\frac{25}{5}}$  but  $\frac{25}{10} \times \boxed{25}$   
 (b) For every integer  $n$ ,  $n^3$  is positive. if  $n = -1$   $(-1)^3 = -1$   
 (c) For any number  $n$ ,  $2n > n$ . if  $n = -1$   $-2 > -1$  is false

- 4) Use deductive reasoning to prove the following statement:

"The sum of any three consecutive even numbers is divisible by three."

3 consecutive even numbers

$$\begin{array}{r} 2n \\ 2n+2 \\ 2n+4 \\ \hline 6n+6 \end{array}$$

$6n+6$  can be divisible by 3.

$3(2n+2)$

So the conjecture is valid.

- 5) Use inductive reasoning to make a conjecture for the magic trick shown below. Then use deductive reasoning to prove your conjecture.

- Step 1: Choose a number  
 Step 2: Add 3  
 Step 3: Multiply by 2  
 Step 4: Add 4  
 Step 5: Divide by 2  
 Step 6: Subtract the number you started with

Inductive  
 5  
 $5+3=8$   
 $8 \times 2 = 16$   
 $16+4=20$   
 $\frac{20}{2} = 10$   
 $10-5=5$

Deductive  
 $x$   
 $x+3$   
 $2(x+3) = 2x+6$   
 $2x+6+4 = 2x+10$   
 $\frac{2x+10}{2} = x+5$   
 $x+5-5 = x$

Conjecture: Start and end with the same number.

Proven  $\uparrow$

- 6) Dan is a high school student. All high school students like soccer. Therefore, Dan likes soccer. Where is the error in the reasoning?

There is a false assumption that all high school students like soccer.

- 7) Shelby was trying to prove the following number trick: Choose any number. Double your number. Add 20. Divide by 2. Subtract the original number. Each time Shelby tries the trick, she ends up with 10. Her proof, however, does not give the same result.

- $n$  Choose any number  
 $2n$  Double your number  
 $2n+20$  Add 20  
 $n+20$  Divide by 2  
 $n+20-n$  Subtract the original number  
 $20$

mistake

Where did Shelby make a mistake?

when  $2n+20$  is divided by 2

correctly it's  $\frac{2n+20}{2} = n+10$