Chapter 2
Reasoning and Proof

2.3 Apply Deductive Reasoning

2.7 Prove Angle Pair Relationships

2.6 Prove Statements About Segments and Angles

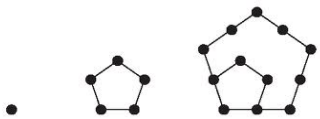
2.2 Analyze Conditional Statements

2.4 Use Postulates and Diagrams

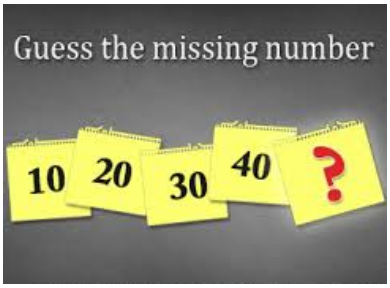
2.5 Reason Using Properties From Algebra

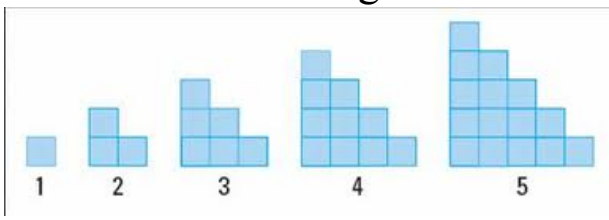
2.1 Use Inductive Reasoning

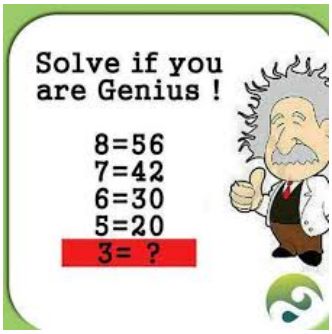
2.1 Use Inductive Reasoning

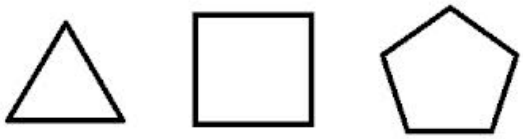


Goal: Describe patterns and use inductive reasoning.



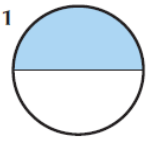
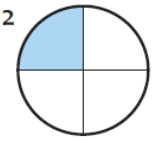
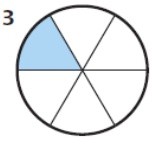


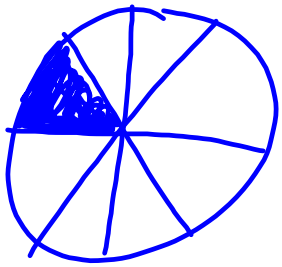




Describe a visual pattern

Describe how to sketch the fourth figure in the pattern. Then sketch the fourth figure.

Figure 1  Figure 2  Figure 3 



Describe a number pattern

Describe the pattern in the numbers −7, −21, −63, −189, . . . and write the next three numbers in the pattern.

Notice that each number in the pattern is three times the previous number.

−7, $\xrightarrow{\times 3}$ −21, $\xrightarrow{\times 3}$ −63, $\xrightarrow{\times 3}$ −189, . . . $\xrightarrow{\times 3}$ −567, −1701, −5103

×3 ×3

Conjecture - an unproven statement that is based on observation

Inductive Reasoning - a process that includes looking for patterns and making conjectures

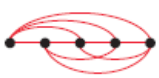
- the process of reasoning that a rule or statement is true because specific cases are true

Make a conjecture

Given five collinear points, make a conjecture about the number of ways to connect different pairs of the points.

Solution

Make a table and look for a pattern. Notice the pattern in how the number of connections increases. You can use the pattern to make a conjecture.

Number of points	1	2	3	4	5
Picture	•	•—•			
Number of connections	0	1	3	6	10

+1 +2 +3 +4

6 15 5

Make and test a conjecture

multiply

Make and test a conjecture about the sign of the product of any three negative integers.

STEP 1 **Find** a pattern using a few groups of small numbers.

$-1 \cdot -2 \cdot -3$

$2 \cdot -3$

-6

STEP 2 **Test** your conjecture using other numbers.

$-4 \cdot -5 \cdot -6$

$20 \cdot -6$

-120

Counterexample - a specific case for which the conjecture is false

- an example that proves that a conjecture or statement is false

* only one counterexample is needed to prove a statement false *

Find a counterexample

A student makes the following conjecture about the sum of two numbers. Find a counterexample to disprove the student's conjecture.

Conjecture The sum of two numbers is always greater than the larger number.

To find a counterexample, you need to find a sum that is less than the larger number.

$4+5>5$
$9>5$

$55+900>900$
$955>900$

$-3+10>10$
$7 \not> 10$

Find a counterexample to show that the following conjecture is false.

Conjecture The value of x^2 is always greater than the value of x.

$(1)^2>1$
$1 \not> 1$

$0^2>0$
$0 \not> 0$

$(-1)^2>-1$
$1>-1$

$\left(\frac{1}{2}\right)^2>\frac{1}{2}$
$\frac{1}{4} \not> \frac{1}{2}$

HW: Pg 67 #'s 3-15, 17, 32