INDUCTIVE REASONING AND CONJECTURE, AND LOGIC

INDUCTIVE REASONING

- Reasoning that uses examples to come to a conclusion; think patterns
- A concluding statement based on inductive reasoning is called a conjecture; think educated guess
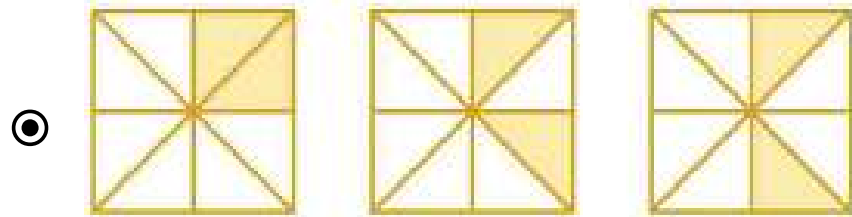
EXAMPLES

- The sum of two even numbers

- The relationship between AB and EF if AB = CD and CD = EF

COUNTEREXAMPLES

- A false example; it can be a number, a drawing, or a statement.

- Ex. – $2x > x$; false if $x < 0$

EXAMPLES

- 3, 3, 6, 9, 15,... what is the next number?

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- What is next in the sequence?

- If in ΔABC, $(AB)^2 + (BC)^2 = (AC)^2$, then ΔABC is a right triangle

LOGIC

- Statement is a sentence that is either true or false.

- Truth value of a statement is either true (T) or false (F)

- Negation of a statement has the opposite meaning and truth value; written p, read n

Negation	
p	~*p*
T	F
F	T

LOGIC

- A compound statement using the word *and* is called a conjunction; written $p \wedge q$, read p and q
- Conjunctions are only true when both statements are true

Conjunction		
P	q	p∧q
T	T	T
T	F	F
F	T	F
F	F	F

LOGIC

- A compound statement using the word *or* is called a disjunction; written $p \lor q$, read p or q
- Disjunctions are only false when both statements are false

Disjunction		
p	*q*	*p* ∨ *q*
T	T	T
T	F	T
F	T	T
F	F	F

TRUTH TABLE

- Truth tables organize the values of statements

- Start by making columns with heading that include each original statement, any negations of the statements, and the compound statements

- Next, determine all of the possible combinations of truth values... 2^x, where x is the number of original statements
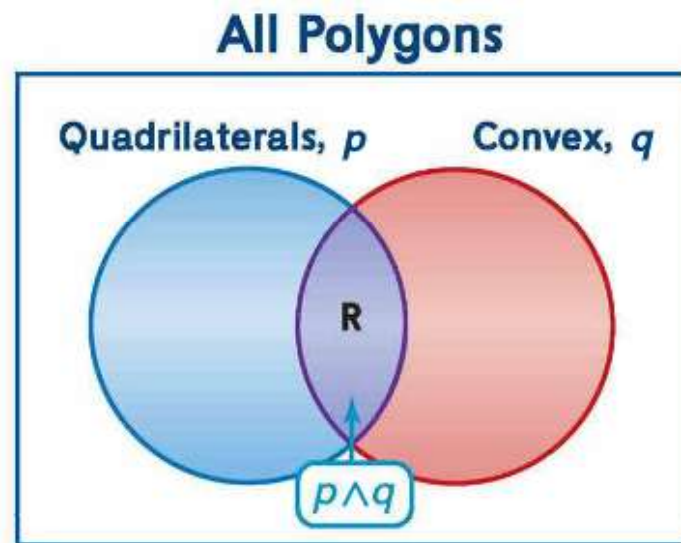
TRUTH TABLE

- Use the truth values to determine each part of the compound statement to determine the truth value of the statement.

| p	q	~q	p ∨ ~q
T	T	F	
T	F		
F	T		
F	F		

VENN DIAGRAMS

- Conjunctions and disjunctions can also be illustrated with Venn diagrams.

- Rectangles are located at the intersection of the set of quadrilaterals and the set of convex polygons

VENN DIAGRAMS

- A disjunction is represented by the union of the two sets; all polygons that are quadrilaterals, convex or both.

- The disjunction includes three regions: quadrilaterals that are not convex, convex polygons that are not quadrilaterals, and polygons that are both quadrilaterals and convex
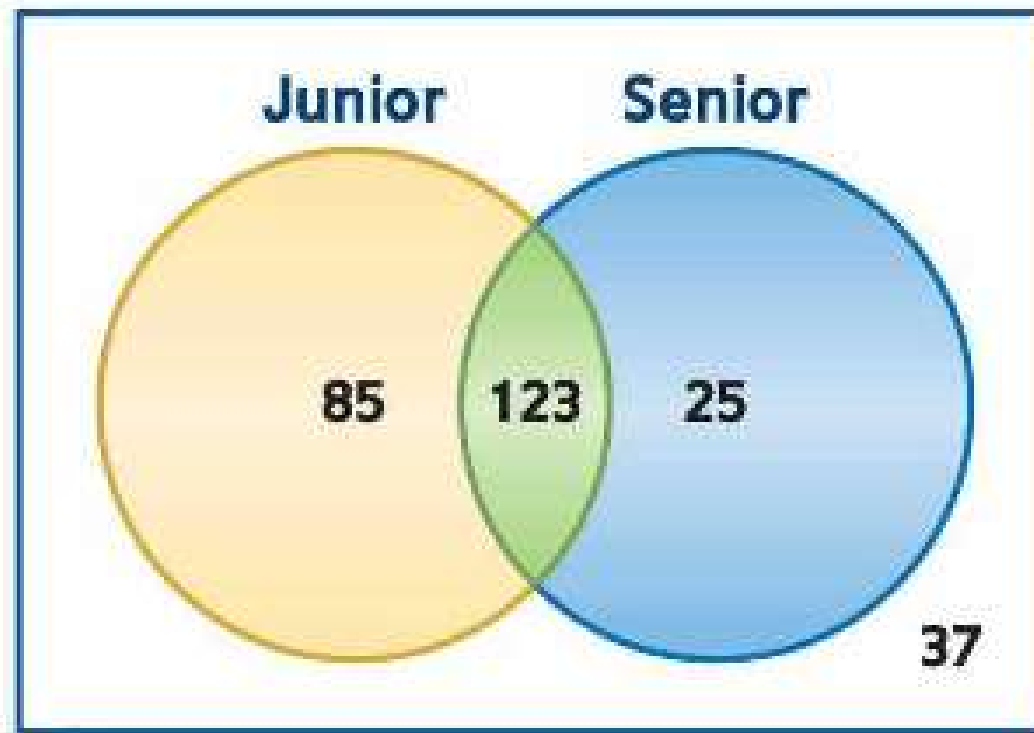
All Polygons

Quadrilaterals, p Convex, q

$p \wedge \sim q$ $p \wedge q$ $\sim p \wedge q$

$p \vee q$
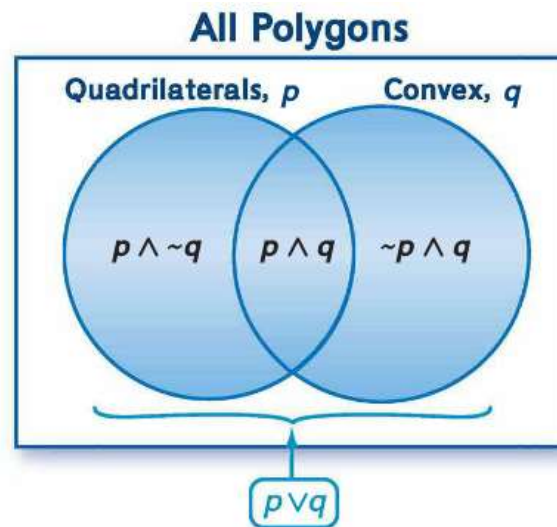
EXAMPLES

Spanish Club Meeting
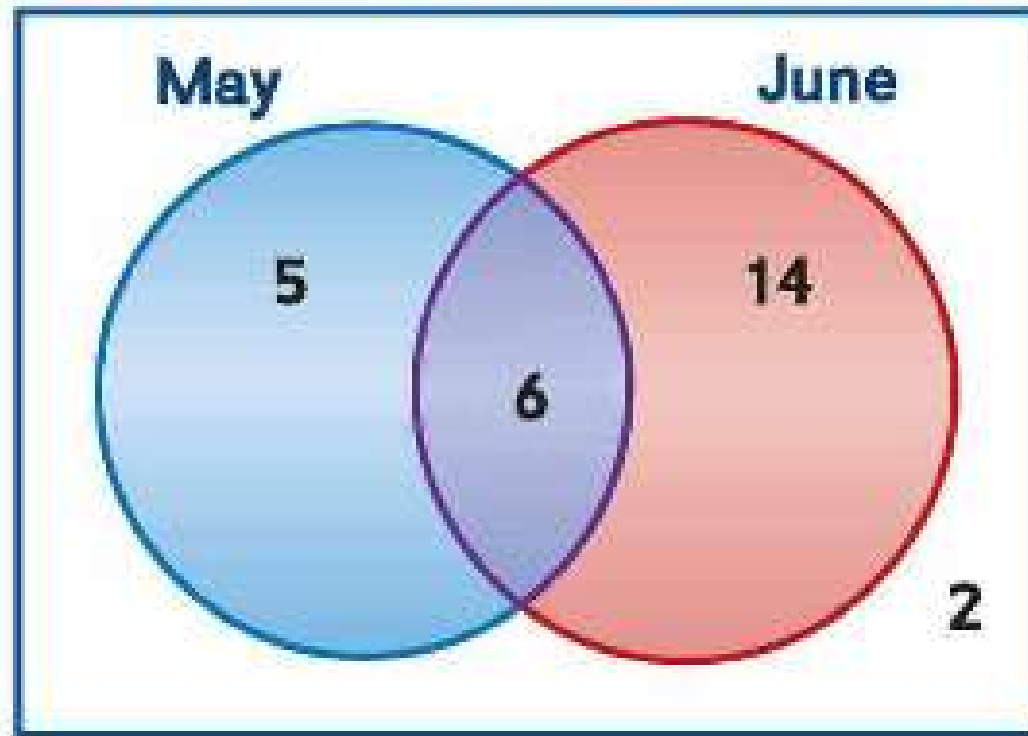
EXAMPLES

Prom Attendance

EXAMPLES

p: $\overrightarrow{DB}$ is the angle bisector of $\angle ADC$.

q: Points C, D, and B are collinear.

r: $\overline{AD} \cong \overline{DC}$

QUESTIONS

- How are truth tables useful in the real world?
- How can you as a student use Venn diagrams in your life?