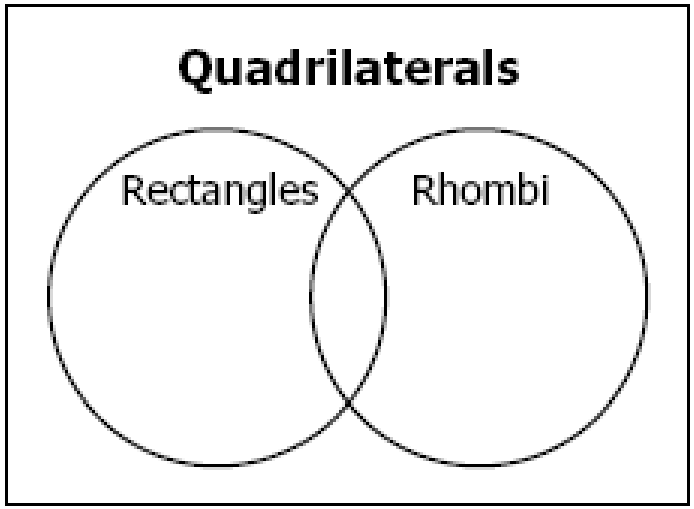
Modified and Animated By Chris Headlee
Nov 2011

CHAPTER 2 SOL PROBLEMS

SSM: Super Second-grader Methods

SOL Problems; not Dynamic Variable Problems



SSM:
- **intersection → both true**

Which of the following statements *must* be true about this Venn diagram?

F All rectangles are rhombi.

G Some rhombi are rectangles.

H Quadrilaterals are not rhombi or rectangles.

J All quadrilaterals are rhombi and rectangles.

Everything in rectangle are quadrilaterals → answer H is wrong
Trapezoids are a quadrilaterals → answer J is wrong
Since the two circles do not completely overlap → answer F is wrong

16 **Statement: *If lines are skew, then they are not coplanar.***

What is the contrapositive of the statement?

F If lines are not coplanar, then they are skew.

G If lines are not skew, then they are coplanar.

H If lines are coplanar, then they are not skew.

J If lines are skew, then they are coplanar.

SSM:
- **no help**

Contrapositive is a flip and a negate
flip changes order of statements and negate adds a not to both
(remember a double negative is a positive!)

18 Let $p =$ *An equation is of the form* $y = mx + b$.

Let $q =$ *Its graph is a line.*

Argument: *If an equation is of the form* $y = mx + b$, *then its graph is a line.*
The graph is not a line.
Therefore, the equation is not of the form $y = mx + b$.

Which of the following is the symbolic representation of the given argument?

F
$$\begin{array}{l} p \rightarrow q \\ \sim q \\ \therefore \sim p \end{array}$$

H
$$\begin{array}{l} p \rightarrow q \\ \sim p \\ \therefore \sim q \end{array}$$

G
$$\begin{array}{l} p \rightarrow q \\ q \\ \therefore p \end{array}$$

J
$$\begin{array}{l} p \rightarrow q \\ p \\ \therefore q \end{array}$$

SSM:
- **find the nots (~) and see which answer fits**
- **G and J have no nots; eliminate**

If an equation is of the form y = mx + b, then its graph is a line.
p → q
The graph is not a line
~q
Therefore, the equation is not of the form y = mx + b
∴ ~p

15 **Consider the following statement.**

If $4x = 8$, then $x = 2$.

Which is the inverse of the statement?

A If $x = 2$, then $4x = 8$.

B If $x \neq 2$, then $4x \neq 8$.

C If $x = 2$, then $4x \neq 8$.

D If $4x \neq 8$, then $x \neq 2$.

SSM:

- **need to memorize the vocabulary**

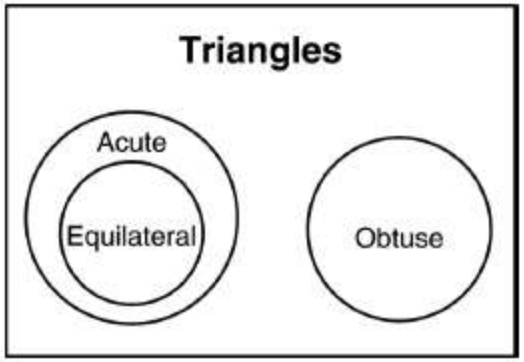
converse: **flip**
inverse: **negates**
contrapositive: **flips and negates**

20 Which Venn diagram represents all the following set of statements?

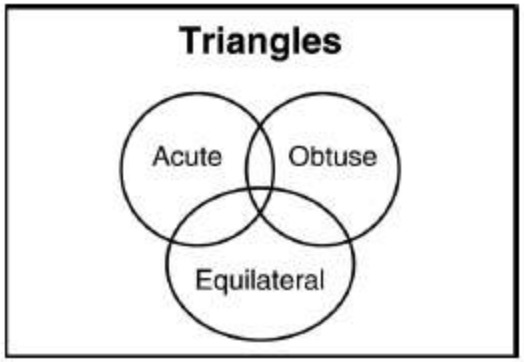
- Some triangles are acute.
- Some triangles are obtuse.
- No triangle is both acute and obtuse.
- Some acute triangles are equilateral.

statement 1 and 2 have no overlap
statement 1 and 4 overlap

F



H



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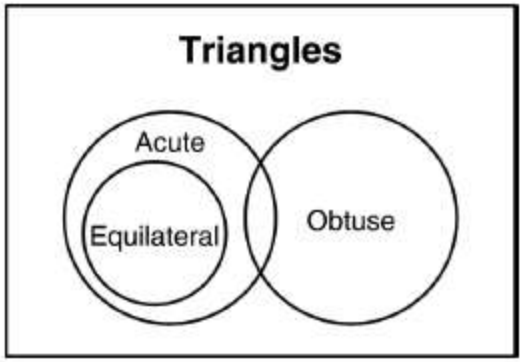
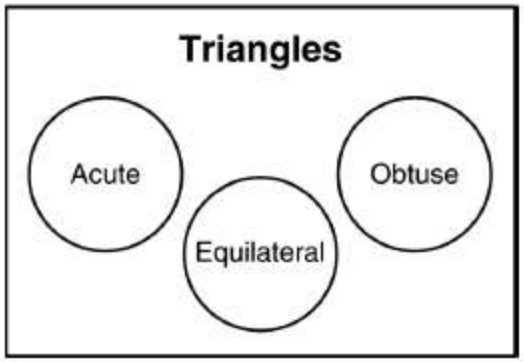


J



SSM:
• no help

12 What is the *converse* of the following statement?

If Joe goes fishing, then he needs bait.

F If he needs bait, then Joe goes fishing.
G If Joe does not go fishing, then he does not need bait.
H If he does not need bait, then Joe does not go fishing.
J If Joe goes fishing, then he does not need bait.

SSM:
- **J does not fit the patterns**

converse → flip
inverse → negates
contrapostive → flips and negates

flip the phrases

13 In which group of statements is the conclusion *not* justified by the previous pair of statements?

A All cooks work in the kitchen.
Mary is a cook.
Mary works in the kitchen.

B All dinosaurs are extinct.
A triceratops is a dinosaur.
All triceratops are extinct.

C All squares are rectangles.
All rectangles are parallelograms.
All squares are parallelograms.

D All fish live in the water.
Some snakes live in the water.
Some snakes are fish.

SSM:

- **Check to see which answers make sense when you read them**
- **D does not fit the pattern**

Just because some snakes live in the water does not mean that they are fish

14 Let p represent

$x^2 = 21$,

and let q represent

x is not a whole number.

Which is a representation of the statement below?

If x is a whole number, then $x^2 \neq 21$.

F $\sim p \rightarrow \sim q$

G $\sim p \rightarrow q$

H $p \rightarrow \sim q$

J $\sim q \rightarrow \sim p$

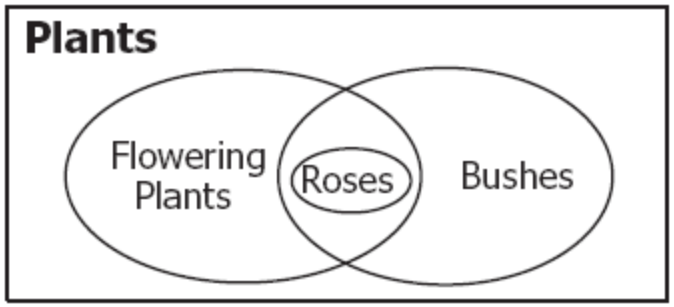
SSM:

- label each statement as told
- label the statement in question
- pick the answer

first phrase is the negation of q and the second phrase is the negative of p

only answer J has not p in the second spot

20



According to the diagram, which is true?

F No bushes are flowering plants.
G No roses are bushes.
H Some roses are not flowering plants.
J Some flowering plants are bushes.

SSM:
- **no help**

Roses are both bushes and flowering plants

12 If $p \rightarrow q$, and $q \rightarrow r$, then —

F $r \rightarrow p$

G $p \rightarrow r$

H $\sim r \rightarrow p$

J $r \rightarrow \sim p$

SSM:

- **Think transitive property of equality: p = q and q = r so p = r**

Law of Syllogism: p must imply r

13 If the conditional statement

"If you have a laptop, then you have a computer"

is represented by $p \rightarrow q$, what is the symbolic representation of

"If you have a computer, then you do not have a laptop"?

A $q \rightarrow \sim p$

B $\sim q \rightarrow p$

C $p \rightarrow \sim q$

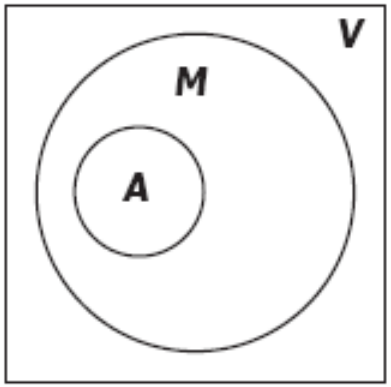
D $\sim q \rightarrow \sim p$

SSM:

- q is second statement
- only one answer has q first

First part represents q and second part represents ~p

14 **In the Venn diagram below, *V* represents the set of all vehicles, *M* represents the set of all motorized vehicles, and *A* represents the set of all automobiles.**



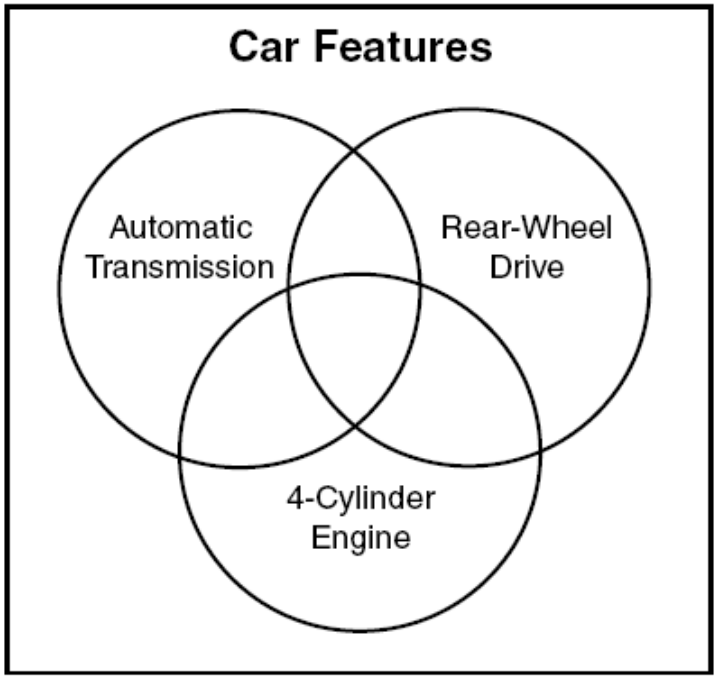
Based on the diagram, which is a valid conclusion?

F All automobiles are motorized vehicles.
G All motorized vehicles are automobiles.
H Some automobiles are not motorized vehicles.
J No automobiles are motorized vehicles.

SSM:
- **not much help**

Since all of set A is inside of set M, then all A are M

12



According to the Venn diagram above, which is true?

F All cars have automatic transmissions and rear-wheel drive.

G No cars have 4 cylinders and rear-wheel drive.

H All cars have rear-wheel drive.

J Some cars have automatic transmissions and 4 cylinders.

SSM:

- **no much help**

All three intersection, so some have all three characteristics

or only two of the three characteristics

13 Which set of statements represents an *invalid* argument?

A If I work, then I will make money.
If I make money, then I will buy clothes.
If I work, then I will buy clothes.

B If we pass Geometry, then we will play sports.
If we play sports, then we will get a trophy.
If we do not get a trophy, then we did not pass Geometry.

C If Mark goes camping, then he will go fishing.
If Mark goes fishing, then he will buy bait.
If Mark does not buy bait, then he will go camping.

D If it is your birthday, then you will get ice cream.
If you get ice cream, then you will get cake.
If it is your birthday, then you will get cake.

SSM:

- **read carefully and see which one makes sense**

invalid

so 3 are valid and one is not

A, B, D are all Law of Syllogism and are valid

15 Which is the contrapositive of the statement below?

If you do your homework, then you will be prepared for the test.

A If you are prepared for the test, then you did your homework.

B If you are not prepared for the test, then you did not do your homework.

C If you do your homework, then you will be prepared for the test.

D If you do not do your homework, then you will not be prepared for the test.

SSM:

- **not much help**

contrapositive → flip and negate

13 Let p represent

$$\sqrt{11} = z\ ,$$

and let q represent

z is a rational number.

Which is a representation of the statement below?

If $\sqrt{11} = z$, then z is not a rational number.

A $\sim p \rightarrow \sim q$

B $p \rightarrow q$

C $p \rightarrow \sim q$

D $\sim q \rightarrow \sim p$

SSM:

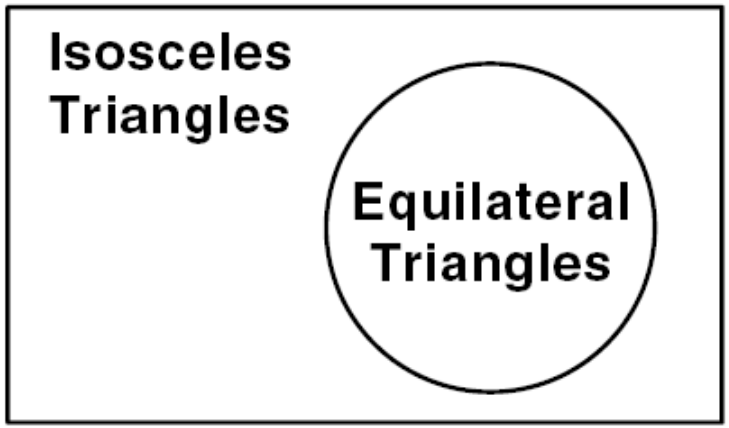
- put the words into the answers and see which work

A "not" is in the second statement so it eliminates only answer B

statement ~q is the second statement

statement p is the first statement

14



SSM:
- **not much help**

According to the Venn diagram, which statement is true?

F All isosceles triangles are also equilateral triangles.

G All equilateral triangles are also isosceles triangles.

H Some equilateral triangles are also isosceles triangles.

J No isosceles triangles are equilateral triangles.

Since equilateral triangles circle is all inside isosceles triangles, then all these are also isosceles triangles

15 Which of the following statements represents a valid argument?

A If $a > b$ and $a > c$, then $b > c$.

B If $a > b$ and $b > c$, then $a > c$.

C If $a < b$ and $a < c$, then $c < b$.

D If $a > b$ and $a > c$, then $a > b + c$.

SSM:

- **put numbers in for a, b and c**
- **See which answer makes sense**

Similar to transitive property of equality

12 **Consider the following arguments. If the first two statements are true, in which argument is the 3rd statement an *incorrect* conclusion?**

SSM:
- **Check to see which answers make sense when you read them**
- **F does not fit the pattern**

F

1 If John studies, then he will pass the test.
2 If John passes the test, then he will not be grounded.
3 If John is grounded, then he will study.

H

1 If we win the game, then we will win the championship.
2 If we win the championship, then we will get a trophy.
3 If we do not get a trophy, then we did not win the game.

G

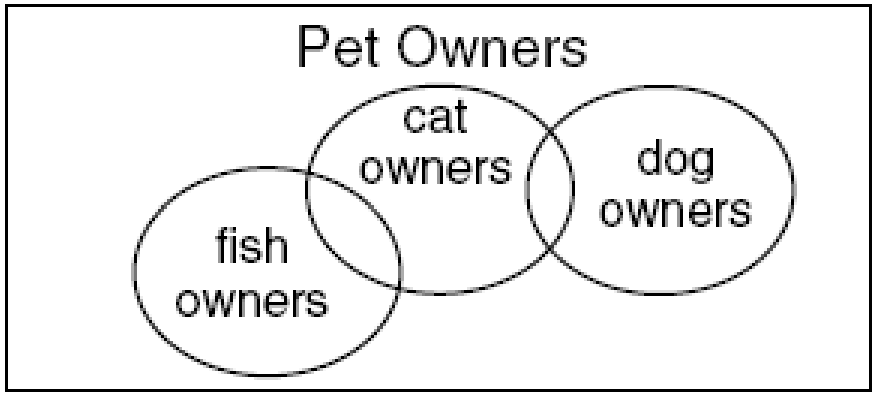
1 If it rains, then we will stay inside.
2 If we stay inside, then we will play games.
3 If it rains, then we will play games.

J

1 If Susan eats her broccoli, then she will get ice cream.
2 If Susan gets ice cream, then she will stay up late.
3 If Susan eats her broccoli, then she will stay up late.

If John is grounded then he failed the test (and will not need to study for it)

13



Based strictly on this diagram, which is a valid conclusion?

A No cat owners also own dogs.

B No dog owners also own fish.

C No fish owners also own cats.

D No pet owner owns more than one pet.

SSM:

- **Check to see which answers make sense when you read them**
- **A, C, D all don't fit because of the overlap of the circles**

Since the dog circle and the fish circle do not overlap, then no one owns both

14 Consider the following statements.

p: The sum of two angles is 90°.
q: The two angles are complements.

Which of the following is a symbolic representation of the statement:

If two angles are not complements, then the sum of the two angles is not 90°?

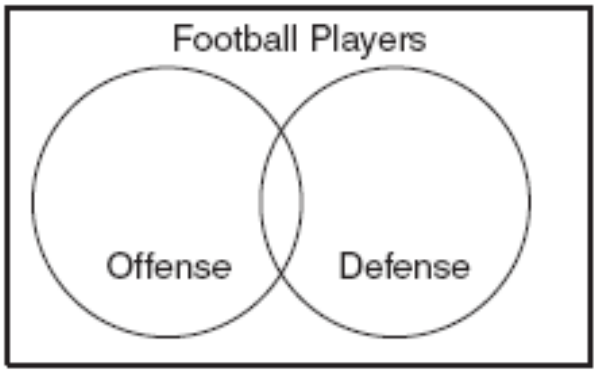
F $\sim q \rightarrow \sim p$
G $\sim p \rightarrow \sim q$
H $q \rightarrow p$
J $p \rightarrow q$

SSM:
- **Sub the words in for the symbols**
- **Check to see which answers make sense when you read them**
- **H and J do not fit the pattern**

q is first and p is second
both have not's in them

so F is correct

12



According to the Venn diagram, which is true?

F All football players play offense or defense.

G No football players play offense and defense.

H All football players play defense.

J Some football players play offense and defense.

SSM:

- **examine each statement and see which makes sense**

- **F → some on bench or injured**
- **G → no game or circles**
- **H → same as F**
- **J → circles overlap**

16 **Assuming these statements are true,**

Some musicians are happy people.
All happy people like music.

which of the following is a valid conclusion?

F All happy people are musicians.
G All musicians like music.
H Some happy people do not like music.
J Some musicians like music.

SSM:
- **examine each statement and see which makes sense**

Law of Syllogism: a → b, b → c, so a → c

12 **Which of the following groups of statements represents a valid argument?**

F Given: All quadrilaterals have four sides. / All squares have four sides.
Conclusion: All quadrilaterals are squares.

G Given: All squares have congruent sides. / All rhombuses have congruent sides.
Conclusion: All rhombuses are squares.

H Given: All four sided figures are quadrilaterals. / All parallelograms have four sides.
Conclusion: All parallelograms are quadrilaterals.

J Given: All rectangles have angles. / All squares have angles.
Conclusion: All rectangles are squares.

SSM:

- **examine each statement and see which makes sense**

- **F → rectangle is a quadrilateral**
- **G → all squares are rhombi**
- **H → Yes!**
- **J → all squares are rectangles**

13 **Which is the *contrapositive* of the statement, "If I am in Richmond, then I am in Virginia"?**

A If I am in Virginia, then I am in Richmond.

B If I am not in Richmond, then I am not in Virginia.

C If I am not in Virginia, then I am not in Richmond.

D If I am not in Virginia, then I am in Richmond.

SSM:

- **Read the statements and see which makes sense**

converse: flips statements
inverse: negates statements
contrapositive: flips and negates statements

12 Which conclusion logically follows the true statements?

"If negotiations fail, the baseball strike will not end."

"If the baseball strike does not end, the World Series will not be played."

F If the baseball strike ends, the World Series will be played.

G If negotiations do not fail, the baseball strike will not end.

H If negotiations fail, the World Series will not be played.

J If negotiations fail, the World Series will be played.

SSM:

- **Read the statements and see which makes sense**
- **H does not fit the patterns**

Law of Syllogism: a → b, b → c, so a → c

13 Let a represent "x is an odd number."
Let b represent "x is a multiple of 3."

When x is 7, which of the following is true?

A $a \wedge b$

B $a \wedge \sim b$

C $\sim a \wedge b$

D $\sim a \wedge \sim b$

SSM:

- Plug in 7 for x and see which statements make sense

7 is an odd number so a is true

7 is not a multiple of 3, so not (~) b is true

12 Which is the inverse of the sentence, "If Sam leaves, then I will stay."?

F If I stay, then Sam will leave.

G If Sam does not leave, then I will not stay.

H If Sam leaves, then I will not stay.

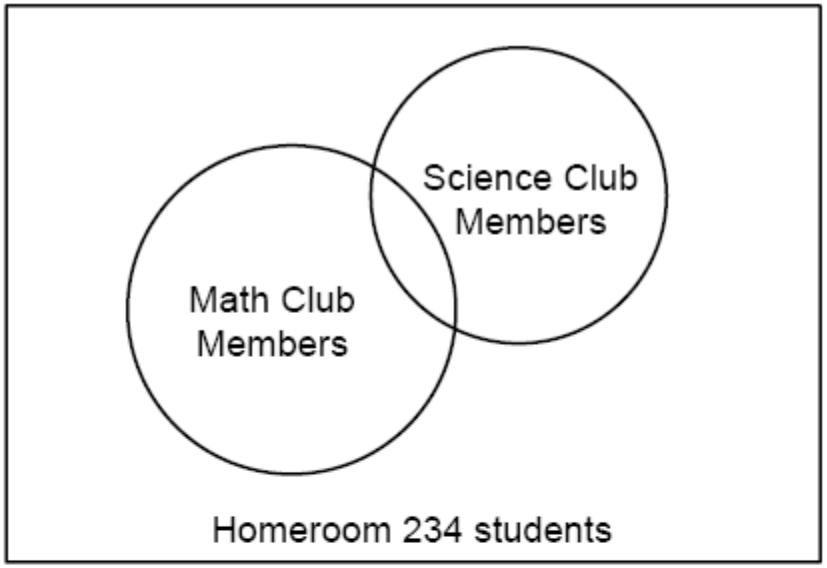
J If I do not stay, then Sam will not leave.

SSM:
- **not much help**
- **H does not fit the patterns**

converse → flip
inverse → negates
contrapostive → flips and negates

negate the phrases

13



According to the diagram, which of the following is true?

A All students in homeroom 234 belong to either the Math Club or the Science Club.

B All students in homeroom 234 belong to both the Math Club and the Science Club.

C No student in homeroom 234 belongs to both the Math Club and the Science Club.

D Some students in homeroom 234 belong to both the Math Club and the Science Club.

SSM:
- **not much help**

Some fits the overlap