

MYSTERY PICTURE



DEDUCTIVE REASONING: DETACHMENT AND SYLLOGISM

Does It Follow? Detachment and Syllogism

25 squares · 5 rows of given sentences · follows or not

FREE

Row 1. Given: If two angles are vertical angles, then they are congruent. If two angles are congruent, then they have equal measures. $\angle 1$ and $\angle 2$ are vertical angles.	¹ If two angles are congruent, then they are vertical angles.	² If two angles are right angles, then they are congruent.	³ $\angle 1$ and $\angle 2$ are congruent.	⁴ $\angle 1$ and $\angle 2$ have equal measures.	⁵ If two angles are vertical angles, then they have equal measures.
Row 2. Given: If a number is a multiple of 4, then it is even. If a number is a multiple of 8, then it is a multiple of 4. Kai's number is a multiple of 8.	⁶ If a number is even, then it is a multiple of 8.	⁷ If a number is a multiple of 4, then it is a multiple of 8.	⁸ Kai's number is a multiple of 2.	⁹ Kai's number is even.	¹⁰ If a number is a multiple of 8, then it is even.
Row 3. Given: If it rains on Saturday, then the game is canceled. If the game is canceled, then Mia stays home. It rains on Saturday.	¹¹ If Mia stays home, then it rains on Saturday.	¹² If the game is not canceled, then Mia does not stay home.	¹³ The game is canceled.	¹⁴ If it rains on Saturday, then the grass is wet.	¹⁵ If it rains on Saturday, then Mia stays home.
Row 4. Given: If a figure is a square, then it is a rectangle. If a figure is a rectangle, then it is a parallelogram. Figure K is a parallelogram.	¹⁶ Figure K is a rectangle.	¹⁷ If a figure is a square, then it is a parallelogram.	¹⁸ Figure K is a square.	¹⁹ If a figure is a parallelogram, then it is a square.	²⁰ Figure K is a quadrilateral.
Row 5. Given: If an animal is a dog, then it is a mammal. Rex is a dog.	²¹ Rex is a mammal.	²² If an animal is a mammal, then it is a dog.	²³ Rex has four legs.	²⁴ If an animal is not a dog, then it is not a mammal.	²⁵ Rex is not a cat.

Mystery Picture — how to run it

25–35 minutes

1. **Hand out page 3, one per student.** Nothing else is needed.
2. **Say this once:** *“Use only the given sentences in the row. A sentence can be true and still not follow.”*
3. **Check the picture on page 4.** A correct sheet shows an up-right arrow, with 9 squares filled.

Student sheet page 3, one per student.

Answers page 4: the picture, and why each square follows or not.

Each row gives its sentences once and then asks about five new sentences. Students write nothing. They only decide whether each sentence follows. The two laws are printed at the top of the sheet.

The white squares show the common mistakes. In 3 of them, the sentence turns a given rule around (the converse). In 2, it names the if part of a rule when the row gives its then part. In 2, it puts not in both parts of a rule (the inverse). In 3, it reads a chain backwards. In 6, it uses words that are not in the row at all.

A true sentence does not always follow. Of the white squares, 6 are true in real life. For example, “Kai’s number is a multiple of 2” is true, but the row says “even.” Two sentences join only when the words are the same. A student who fills every sentence that is true in real life gets 6 squares wrong.

One row gives two rules in the wrong order. The rules still join. Many students answer “Nothing follows” there, and that is wrong.

Guessing does not draw the arrow. Every simple guessing rule, such as filling every if-then sentence, gets at least 6 squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.

chooseyourlesson.com — 135 free geometry lessons.

Mystery Picture

Does it follow?

Name _____

Period _____

Date _____

Each row starts with its given sentences, at the left. Read each square. Does its sentence follow from the given sentences of its row? If yes, fill the square with slanted lines. If no, leave it white. Use only the given sentences. A sentence can be true and still not follow. When you finish, a picture appears. If part of it looks wrong, check that square again.

Law of Detachment

If p, then q. ($p \rightarrow q$)
p is true.
So q is true.

Law of Syllogism

If p, then q. ($p \rightarrow q$)
If q, then r. ($q \rightarrow r$)
So: if p, then r.

Nothing follows

From "If p, then q" and "q is true."
From "If p, then q" and "p is not true."
The arrow goes one way only.

To join two rules, the middle part must be the same words. Similar words are not enough.

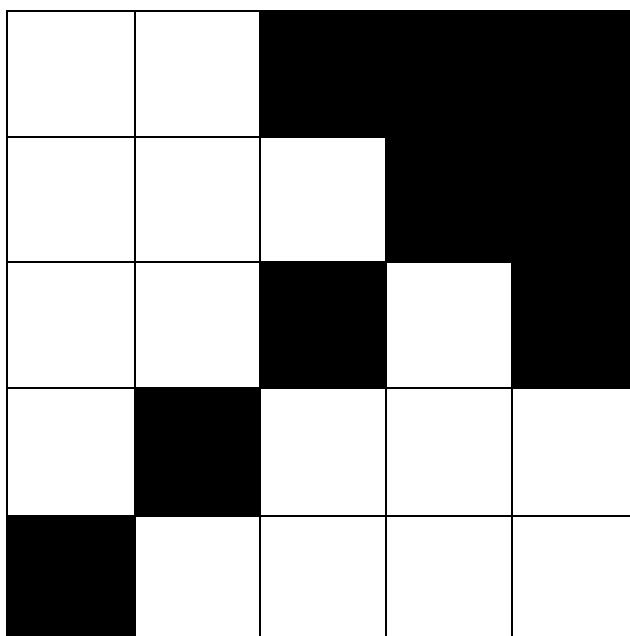
Row 1. Given: If two angles are vertical angles, then they are congruent. If two angles are congruent, then they have equal measures. $\angle 1$ and $\angle 2$ are vertical angles.	¹ If two angles are congruent, then they are vertical angles.	² If two angles are right angles, then they are congruent.	³ $\angle 1$ and $\angle 2$ are congruent.	⁴ $\angle 1$ and $\angle 2$ have equal measures.	⁵ If two angles are vertical angles, then they have equal measures.
Row 2. Given: If a number is a multiple of 4, then it is even. If a number is a multiple of 8, then it is a multiple of 4. Kai's number is a multiple of 8.	⁶ If a number is even, then it is a multiple of 8.	⁷ If a number is a multiple of 4, then it is a multiple of 8.	⁸ Kai's number is a multiple of 2.	⁹ Kai's number is even.	¹⁰ If a number is a multiple of 8, then it is even.
Row 3. Given: If it rains on Saturday, then the game is canceled. If the game is canceled, then Mia stays home. It rains on Saturday.	¹¹ If Mia stays home, then it rains on Saturday.	¹² If the game is not canceled, then Mia does not stay home.	¹³ The game is canceled.	¹⁴ If it rains on Saturday, then the grass is wet.	¹⁵ If it rains on Saturday, then Mia stays home.
Row 4. Given: If a figure is a square, then it is a rectangle. If a figure is a rectangle, then it is a parallelogram. Figure K is a parallelogram.	¹⁶ Figure K is a rectangle.	¹⁷ If a figure is a square, then it is a parallelogram.	¹⁸ Figure K is a square.	¹⁹ If a figure is a parallelogram, then it is a square.	²⁰ Figure K is a quadrilateral.
Row 5. Given: If an animal is a dog, then it is a mammal. Rex is a dog.	²¹ Rex is a mammal.	²² If an animal is a mammal, then it is a dog.	²³ Rex has four legs.	²⁴ If an animal is not a dog, then it is not a mammal.	²⁵ Rex is not a cat.



135 free geometry lessons: worksheets, worked answers and lesson plans.
chooseyourlesson.com

Mystery Picture — answers

For the teacher



An up-right arrow: 9 squares filled.

1. Does not follow. Leave white. It turns a given rule around.	2. Does not follow. Leave white. It uses words that are not in the row.	3. Follows. Fill. Law of Detachment, from the fact and the first rule.	4. Follows. Fill. Law of Detachment twice: the fact with the first rule, then with the second rule.	5. Follows. Fill. Law of Syllogism: the then part of the first rule is the if part of the second rule.
6. Does not follow. Leave white. It reads a chain backwards.	7. Does not follow. Leave white. It turns a given rule around.	8. Does not follow. Leave white. It uses words that are not in the row.	9. Follows. Fill. Law of Detachment twice: the fact with the second rule, then with the first rule.	10. Follows. Fill. Law of Syllogism: the then part of the second rule is the if part of the first rule.
11. Does not follow. Leave white. It reads a chain backwards.	12. Does not follow. Leave white. It puts not in both parts of a rule.	13. Follows. Fill. Law of Detachment, from the fact and the first rule.	14. Does not follow. Leave white. It uses words that are not in the row.	15. Follows. Fill. Law of Syllogism: the then part of the first rule is the if part of the second rule.
16. Does not follow. Leave white. It names the if part when the row gives the then part.	17. Follows. Fill. Law of Syllogism: the then part of the first rule is the if part of the second rule.	18. Does not follow. Leave white. It names the if part when the row gives the then part.	19. Does not follow. Leave white. It reads a chain backwards.	20. Does not follow. Leave white. It uses words that are not in the row.
21. Follows. Fill. Law of Detachment, from the fact and the rule.	22. Does not follow. Leave white. It turns a given rule around.	23. Does not follow. Leave white. It uses words that are not in the row.	24. Does not follow. Leave white. It puts not in both parts of a rule.	25. Does not follow. Leave white. It uses words that are not in the row.