

MYSTERY PICTURE

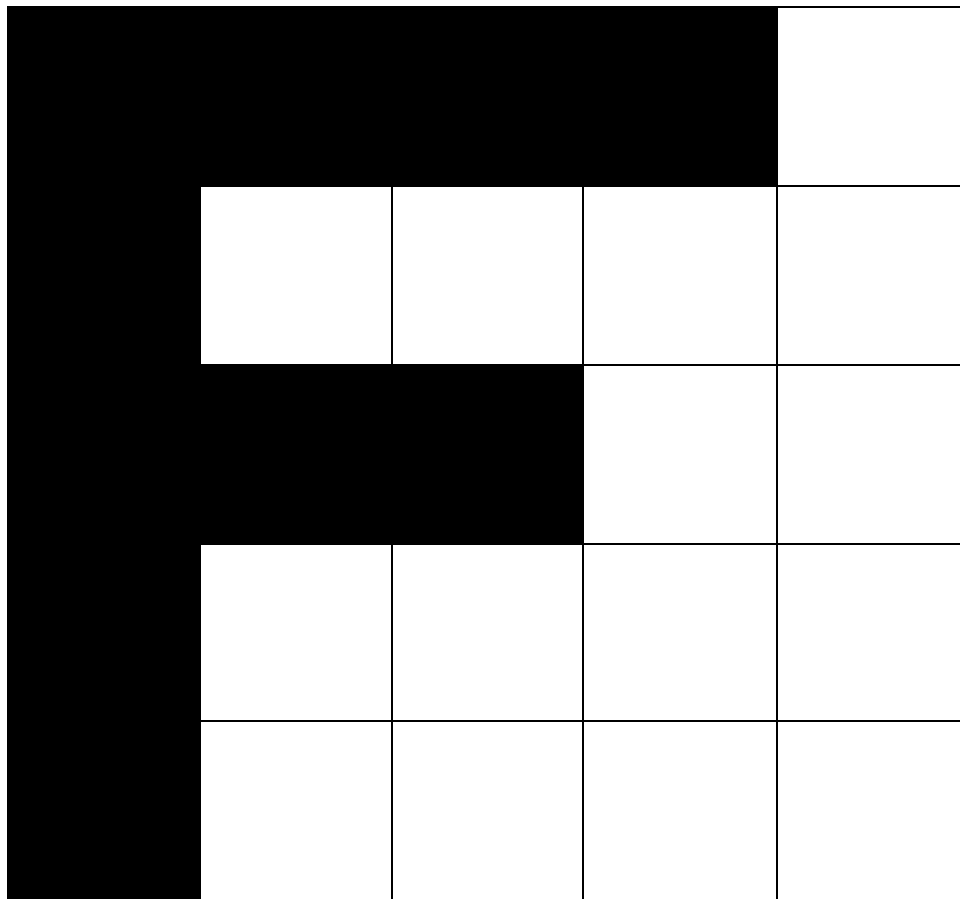


INDUCTIVE REASONING, CONJECTURE AND COUNTEREXAMPLE

Is It a Counterexample? Both Checks or Nothing

25 cases · 5 claims · the picture checks the answers

FREE



25 squares · 1 student sheet · answer key · 4 pages

Geometry · Grades 8–10 · chooseyourlesson.com

Mystery Picture — how to run it

25–35 minutes

1. **Hand out page 3.** Nothing else is needed.
2. **Say this once:** *“Check 1 first: does the case fit the if part? If it does not, the claim is not about it. Then check 2: is the then part false?”*
3. **Fill a square only when both checks say yes.** A letter appears. Ten of the 25 are filled.

Student sheet page 3, one per student. The five claims and the two checks are printed on it.
Answers page 4: the finished picture and the verdict for every square.

The white squares test the most common mistake. On seven white squares the then part is false, so the case looks like a counterexample. But it does not fit the if part (squares 5, 14, 15, 18, 20, 24, 25). This is the most common wrong counterexample. A student who skips check 1 fills all seven, and the letter gets extra squares.

Claims B and C look alike, but their if parts are different. Claim C is about any number, so 0 and 1 break it. Claim B is only about numbers greater than 1, so it is not about 0 or 1. Claim E is true: its squares are all white. Four of the five claims are false. You may tell the class that count, but not which claim is the true one.

No square needs a calculation. Where a claim is about $x \times x$, the square prints the values. The work is reading the claim.



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.
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Mystery Picture

Both checks, or it is not a counterexample

Name _____

Period _____

Date _____

A counterexample passes two checks. Check 1: the case fits the *if* part of the claim. **Check 2:** for this case, the *then* part is false. Both checks: it is a counterexample. If check 1 fails, the claim is not about this case.

One case can show that a claim is false. No number of cases can show that it is true.

Claim A. If a whole number is odd and greater than 1, then it is prime.

Claim B. If a number x is greater than 1, then $x \times x$ is greater than $x + 1$.

Claim C. If n is any number, then $n \times n$ is greater than n .

Claim D. If a shape is a triangle, then exactly one of its sides is the longest.

Claim E. If a whole number is a multiple of 6, then it is a multiple of 3.

Each square names a claim and a case. Is the case a counterexample to that claim? **If yes, fill the square with slanted lines. If no, leave it white.** A picture appears. If part of it is missing, or one square does not fit, check that square again.

1 Claim A Case: the number 9	2 Claim B Case: $x = 1.5$ $x \times x = 2.25$ $x + 1 = 2.5$	3 Claim C Case: $n = 0$ $n \times n = 0$	4 Claim D Case: a triangle with sides 7, 7 and 7	5 Claim A Case: the number 1
6 Claim A Case: the number 15	7 Claim B Case: $x = 3$ $x \times x = 9$ $x + 1 = 4$	8 Claim C Case: $n = 3$ $n \times n = 9$	9 Claim D Case: a triangle with sides 11, 9 and 6	10 Claim E Case: the number 12
11 Claim C Case: $n = \frac{1}{2}$ $n \times n = \frac{1}{4}$	12 Claim D Case: a triangle with sides 8, 8 and 5	13 Claim A Case: the number 25	14 Claim A Case: the number 4	15 Claim B Case: $x = 0$ $x \times x = 0$ $x + 1 = 1$
16 Claim C Case: $n = 1$ $n \times n = 1$	17 Claim C Case: $n = -1$ $n \times n = 1$	18 Claim D Case: a four-sided shape with sides 6, 4, 6 and 4	19 Claim E Case: the number 18	20 Claim B Case: $x = 1$ $x \times x = 1$ $x + 1 = 2$
21 Claim D Case: a triangle with sides 4, 9 and 9	22 Claim E Case: the number 9	23 Claim B Case: $x = -2$ $x \times x = 4$ $x + 1 = -1$	24 Claim E Case: the number 8	25 Claim E Case: the number 4

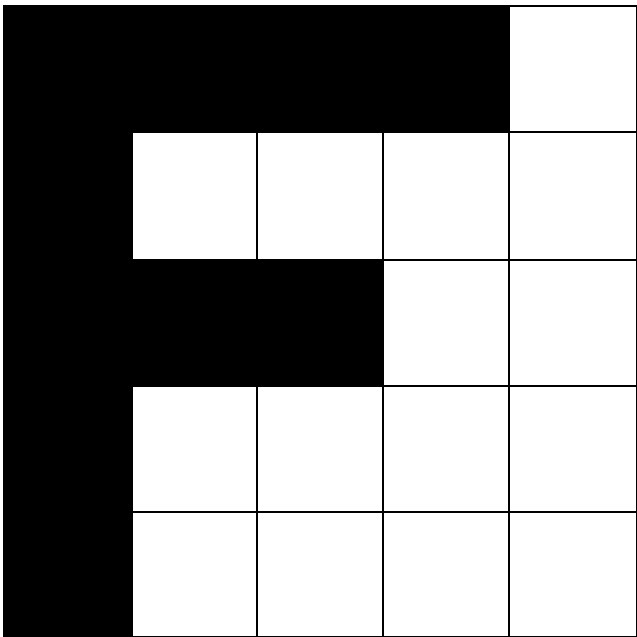


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Mystery Picture — answers

For the teacher

The finished picture is **the letter F**. Read the table left to right, as on the student's sheet. The squares are numbered there.



1–5	A: 9 FILL both checks	B: 1.5 FILL both checks	C: 0 FILL both checks	D: 7, 7, 7 FILL both checks	A: 1 white fails check 1
6–10	A: 15 FILL both checks	B: 3 white agrees with the claim	C: 3 white agrees with the claim	D: 11, 9, 6 white agrees with the claim	E: 12 white agrees with the claim
11–15	C: ½ FILL both checks	D: 8, 8, 5 FILL both checks	A: 25 FILL both checks	A: 4 white fails check 1	B: 0 white fails check 1
16–20	C: 1 FILL both checks	C: –1 white agrees with the claim	D: 6, 4, 6, 4 white fails check 1	E: 18 white agrees with the claim	B: 1 white fails check 1
21–25	D: 4, 9, 9 FILL both checks	E: 9 white fails check 1	B: –2 white fails check 1	E: 8 white fails check 1	E: 4 white fails check 1

Claim E is true, so no square of that claim is filled.