PROVE IT OR LOSE IT!

UNDERSTANDING THE ROLE OF MATHEMATICAL REASONING ACROSS GRADE LEVELS

With Dr. Keith and
Ms. Robinson

MS. ROBINSON

DR. KEITH

NOTES

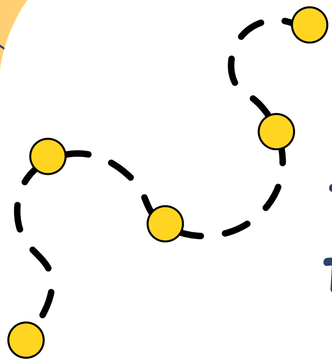
LET'S START WITH ONE TYPE OF PROOF

Given: $2x + 3 = 7$
Prove: $x = 2$

What are **three** different ways that you can prove that $x = 2$?

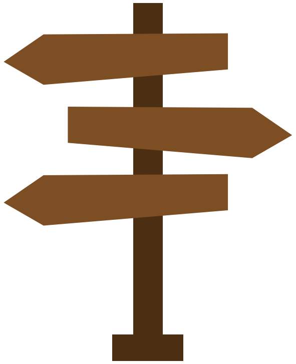
Discuss with a friend near you.

SO WHAT DO YOU THINK A PROOF IS?



A STEP-BY STEP EXPLANATION OF HOW THE GIVEN STATEMENT TRANSFORMS INTO THE PROVE STATEMENT

IT'S LIKE BEING A DETECTIVE IN MATH!



ALLOWS US TO EXPLORE DIFFERENT PATHWAYS TO THE PROVE STATEMENT

SHOWS WHY SOMETHING IS ALWAYS TRUE

LET'S PRACTICE

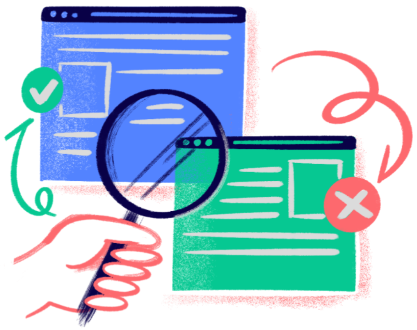
Statement:

All numbers that we multiply by 12 are whole numbers.

Discuss with a friend nearby.

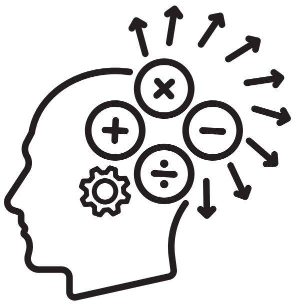
WHY ARE PROOFS IMPORTANT?

Proofs help us discover real mathematical truths.



Proofs help us to develop our ideas more clearly.

Proofs help us develop our critical thinking skills.



We use proofs in nearly every math class, but especially Algebra and Geometry.

LET'S PRACTICE

Statement: Every odd number is Prime.

Hint: What is the definition of a prime number?

DIFFERENT TYPES OF PROOFS

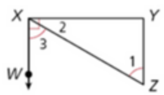
TWO COLUMN PROOFS
THE "CLASSIC"

Statement	Reasons
1. $\overline{AB}$ *is the* perpendicular bisector of $\overline{PQ}$	1. Given
2. $m < AMQ = 90°$	2. Definition of perpendicular
3. $m < AMP = 90°$	3. Definition of perpendicular
4. $m < AMQ = m < AMP$	4. Transitive Property

Image from: Study.com

PARAGRAPH PROOFS
THE "NARRATIVE"

Given: $\angle WXY$ is a right angle. $\angle 1 \cong \angle 3$
Prove: $\angle 1$ and $\angle 2$ are complementary.



Since $\angle WXY$ is a right angle, $\angle WXY = 90°$ by the definition of a right angle. By the Angle Addition Postulate, $\angle WXY = \angle 2 + \angle 3$. By substitution, $\angle 2 + \angle 3 = 90°$. Since $\angle 1 = \angle 3$, $\angle 1 = \angle 3$ by the definition of congruent angles. Using substitution, $\angle 2 + \angle 1 = 90°$. Thus by the definition of complementary angles, $\angle 1$ and $\angle 2$ are complementary.

Image from: tutorportland.com

COUNTEREXAMPLE PROOFS
THE "DISPROVER"

Every odd number is Prime
15 is a composite number because it has more than two factors (1, 3, 5, and 15).

VISUAL PROOFS
THE "PICTURE"

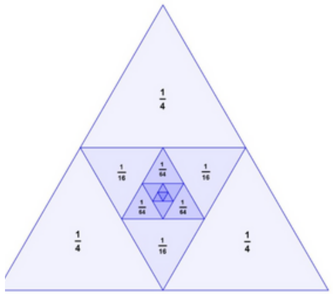


Image from: mrhonner.com

ACTIVITY #1: TWO COLUMN PROOFS

Around the room you currently have examples of two column proofs by Grade Level. There are two posters per grade level, so spread out!

Statement	Reasons
1. $\overline{AB}$ *is the* perpendicular bisector of $\overline{PQ}$	1. Given
2. $m < AMQ = 90°$	2. Definition of perpendicular
3. $m < AMP = 90°$	3. Definition of perpendicular
4. $m < AMQ = m < AMP$	4. Transitive Property

Image from: Study.com

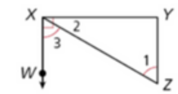
Work with others in your grade level to read the statement and confirm the proof statement.

You have 7 minutes for this two-column proof.

ACTIVITY #2: PARAGRAPH PROOF

Around the room you currently have examples of paragraph proofs by Grade Level. There are two posters per grade level, so spread out!

Given: $\angle WXY$ is a right angle. $\angle 1 \cong \angle 3$
Prove: $\angle 1$ and $\angle 2$ are complementary.



Since $\angle WXY$ is a right angle, $\angle WXY=90°$ by the definition of a right angle. By the Angle Addition Postulate, $\angle WXY=\angle 2+\angle 3$. By substitution, $\angle 2+\angle 3=90°$. Since $\angle 1 \cong \angle 3$, $\angle 1=\angle 3$ by the definition of congruent angles. Using substitution, $\angle 2+\angle 1=90°$. Thus by the definition of complementary angles, $\angle 1$ and $\angle 2$ are complementary.

Image from: tutorportland.com

Work with others in your grade level to read the statement and confirm the proof statement.

You have 10 minutes for this paragraph proof.

ACTIVITY #3: COUNTEREXAMPLE PROOF

Every odd number is Prime
15 is a composite number because it has more than two factors (1, 3, 5, and 15).

Around the room you currently have examples of counterexample proofs by Grade Level. There are two posters per grade level, so spread out!

Work with others in your grade level to read the statement and confirm the proof statement.
You have 7 minutes for this counterexample proof.

NOTES

LET'S REVISIT: WHY ARE PROOFS IMPORTANT

Proofs help us discover real mathematical truths.

Proofs help us develop our critical thinking skills.

Proofs help us to develop our ideas more clearly.

We use proofs in nearly every math class, but especially Algebra and Geometry.