

Geometric Proofs... The 'Two-Column Proof'

Key Terms (in your notes)...

deductive reasoning

Drawing a specific conclusion through logical reasoning by starting with general assumptions that are known to be valid.

proof

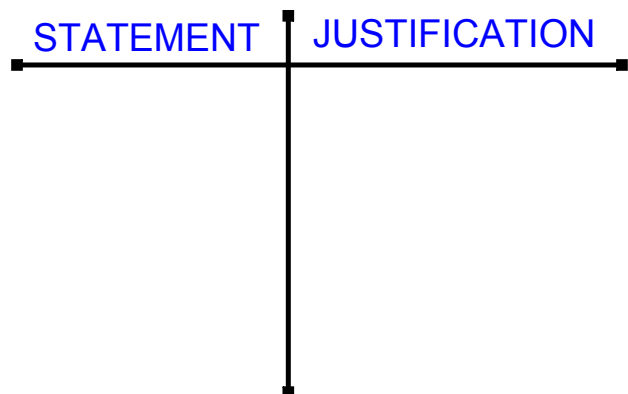
A mathematical argument showing that a statement is valid in all cases, or that no counterexample exists.

transitive property

If two quantities are equal to the same quantity, then they are equal to each other.
If $a = b$ and $b = c$, then $a = c$.

two-column proof

A presentation of a logical argument involving deductive reasoning in which the statements of the argument are written in one column and the justifications for the statements are written in the other column.



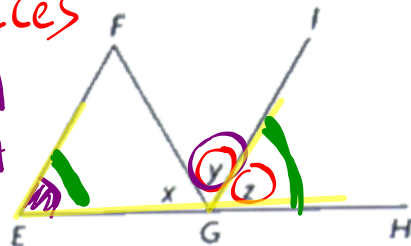
Example #1:

In $\triangle EFG$, GI bisects $\angle FGH$

a) If $\angle E = \angle y$, then prove that $EF \parallel GI$

2 equal pieces

① AIA
② CIA
③ CA

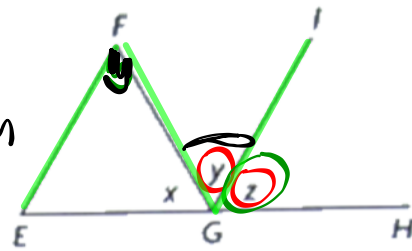


Statement	Justification
$\angle y = \angle z$	Bisected
$\angle E = \angle y$	Given
$\angle E = \angle z$	Transitive Property
$EF \parallel GI$	CA

Therefore \therefore

In $\triangle EFG$, GI bisects $\angle FGH$

b) If $\angle F = \angle z$, then prove that $EF \parallel GI$

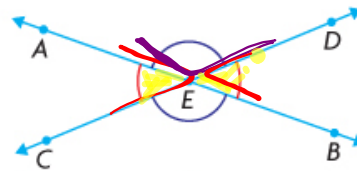


Statement	Justification
$\angle y = \angle z$	Bisect
$\angle F = \angle z$	Given
$\angle F = \angle y$	Transitive
$\therefore EF \parallel GI$	ATA

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EXAMPLE 4 Using deductive reasoning to prove a geometric conjecture

Prove that when two straight lines intersect, the vertically opposite angles are equal.



Jose's Solution: Reasoning in a two-column proof

Statement	Justification
$\angle AEC + \angle AED = 180^\circ$	Supplementary angles
$\angle AEC = 180^\circ - \angle AED$	Subtraction property
$\angle BED + \angle AED = 180^\circ$	Supplementary angles
$\angle BED = 180^\circ - \angle AED$	Subtraction property
$\angle AEC = \angle BED$	Transitive property

(SAT)

APPLY the Math

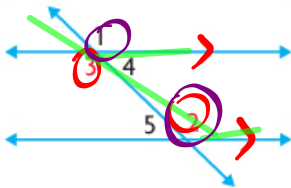
EXAMPLE 1
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Reasoning about conjectures involving angles formed by transversals

Make a conjecture that involves the interior angles formed by parallel lines and a transversal. Prove your conjecture.

Tuyet's Solution

My conjecture: When a transversal intersects a pair of parallel lines, the **alternate interior angles** are equal.



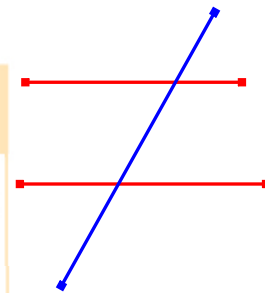
I drew two parallel lines and a transversal as shown, and I numbered the angles. I need to show that $\angle 3 = \angle 2$.

Statement	Justification
$\angle 1 = \angle 2$	Corresponding angles
$\angle 1 = \angle 3$	Vertically opposite angles
$\angle 3 = \angle 2$	Transitive property
My conjecture is proved.	

Since I know that the lines are parallel, the corresponding angles are equal.

When two lines intersect, the opposite angles are equal.

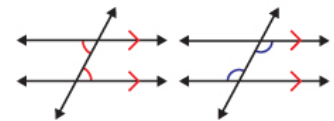
$\angle 2$ and $\angle 3$ are both equal to $\angle 1$, so $\angle 2$ and $\angle 3$ are equal to each other.



Pull for Lesson Notes

alternate interior angles

Two non-adjacent interior angles on opposite sides of a transversal.



Homework...

p. 72: #4-6

p. 78: #2, 8, 10, 12, 20

Perpendicular

prove

error

x algebra