

Quiz 2.3-2.4

Geometry 2.6

Use algebra to write 2-column proofs

Use properties of equality to write geometric proofs

algebraic proof

paragraph proof (sentence form...less formal) ||

2-column proof (formal proof) ||

Given (hypothesis)

Prove (conclusion)

Picture (if any)

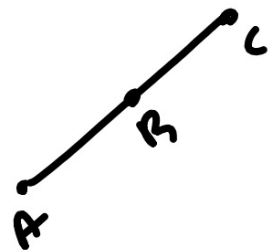
Reasoning from G to P

justify (reason)

activity: scrambled proofs

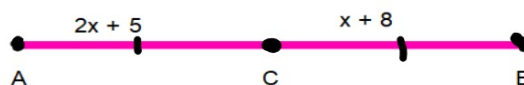
Given:

Prove:



Given C is the midpoint of AB

Prove $x=3$



1. C is mp of AB
2. $AC = CB$
3. $2x + 5 = x + 8$
4.
$$\begin{array}{r} 2x + 5 = x + 8 \\ -x \quad -5 \quad -x \quad -5 \\ \hline x = 3 \end{array}$$

1. given.
2. def mp
3. Subst.
4. Subtr. (Subs.)

An **algebraic proof** is a proof that is made up of a series of algebraic statements. The properties of equality provide justification for many statements in algebraic proofs.

Example 1

Justify Each Step When Solving an Equation



Prove that if $-5(x + 4) = 70$, then $x = -18$. Write a justification for each step.

Given: $-5(x + 4) = 70$

Prove $x = -18$

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. $-5(x + 4) = 70$ 2. $-5x - 20 = 70$ 3. $\quad +20 \quad +20$ 4. $\frac{-5x}{-5} = \frac{90}{-5}$ 5. $x = -18$ | <ol style="list-style-type: none"> 1. given. 2. distrib. 3. add prop 4. subs. 5. div prop / subs |
|---|---|

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$$3 = x$$

$$x = 3$$

Reflex $a = a$

Symm $a = b$
 $b = a$

Trans.

$a = b$ $b = c$ then

$$a = c$$

Real-World Example 2 Write an Algebraic Proof



SCIENCE If the formula to convert a Fahrenheit temperature to a Celsius temperature is $C = \frac{5}{9}(F - 32)$, then the formula to convert a Celsius temperature to a Fahrenheit temperature is $F = \frac{9}{5}C + 32$. Write a two-column proof to verify this conjecture.

Begin by stating what is given and what you are to prove.

Given: $C = \frac{5}{9}(F - 32)$

Prove: $F = \frac{9}{5}C + 32$

Proof:

Where do I start?
Where am I trying to go?

scrambled proofs



1. $C = \frac{5}{9}(F - 32)$

1. Given

2.

3.

4.

5.

6.

StudyTip

Commutative and Associative Properties

Throughout this text we shall assume that if a , b , and c are real numbers, then the following properties are true.

Commutative Property of Addition

$$a + b = b + a$$

Commutative Property of Multiplication

$$a \cdot b = b \cdot a$$

Associative Property of Addition

$$(a + b) + c = a + (b + c)$$

Associative Property of Multiplication

$$(a \cdot b) \cdot c = a \cdot (b \cdot c)$$

Callback to algebra:

Property	Segments	Angles
Reflexive	$AB = AB$	$m\angle 1 = m\angle 1$
Symmetric	If $AB = CD$, then $CD = AB$.	If $m\angle 1 = m\angle 2$, then $m\angle 2 = m\angle 1$.
Transitive	If $AB = CD$ and $CD = EF$, then $AB = EF$.	If $m\angle 1 = m\angle 2$ and $m\angle 2 = m\angle 3$, then $m\angle 1 = m\angle 3$.

Copy and complete

5. Complete the following proof.

Given: $\frac{y+2}{3} = 3$

Prove: $y = 7$

Proof:

Statements	Reasons
a. <u> ?</u>	a. Given
b. $3\left(\frac{y+2}{3}\right) = 3(3)$	b. <u> ?</u>
c. <u> ?</u>	c. <u> ?</u>
d. $y = 7$	d. Subtraction Property

If they give you a conditional
statement...
hypothesis:
conclusion:

7. If $\overline{AB} \cong \overline{CD}$, then $x = 7$.



Given:

Prove:

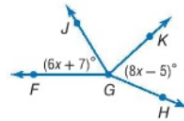
Example 3 Write a Geometric Proof

If $\angle FGJ \cong \angle JGK$ and $\angle JGK \cong \angle KGH$, then $x = 6$.
Write a two-column proof to verify this conjecture.

Given: $\angle FGJ \cong \angle JGK$, $\angle JGK \cong \angle KGH$,
 $m\angle FGJ = 6x + 7$, $m\angle KGH = 8x - 5$

Prove: $x = 6$

Proof:



Required: copy given, prove, diagram

where to start? where am I going? map?

Logical, convincing, airtight

Each statement must have a reason

Statements	Reasons
1. $m\angle FGH = 6x + 7$, $m\angle KGH = 8x - 5$ $\angle FGJ \cong \angle JGK$; $\angle JGK \cong \angle KGH$	1. Given
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	

State the property that justifies each statement.

- 13.** If $5(x + 7) = -3$, then $5x + 35 = -3$.
- 14.** If $m\angle 1 = 25$ and $m\angle 2 = 25$, then $m\angle 1 = m\angle 2$.
- 15.** If $AB = BC$ and $BC = CD$, then $AB = CD$.
- 16.** If $3\left(x - \frac{2}{3}\right) = 4$, then $3x - 2 = 4$.

Copy and



ARGUMENTS Complete each proof.

17. Given: $\frac{8-3x}{4} = 32$

Prove: $x = -40$

Proof:

Statements	Reasons
a. $\frac{8-3x}{4} = 32$	a. Given
b. $4\left(\frac{8-3x}{4}\right) = 4(32)$	b. <u> ?</u>
c. $8-3x = 128$	c. <u> ?</u>
d. <u> ?</u>	d. Subtraction Property
e. $x = -40$	e. <u> ?</u>