Lesson 9 – Unknown Angle Proofs – Writing Proofs

Geometry

Entry Task

- Complete the maze as quickly as you can.
- When you are finished, write down the strategy you used to complete the task quickly.

Goals

- Review algebraic reasoning.
- Look for and make sense of structure.
- Construct reasonable arguments and provide justification.

Major Accepted Facts in Geometry

1. Reflexive Property
2. Transitive Property
3. Substitution Property of Equality
4. Subtraction Property of Equality

Justification Review

1. Reflexive Property

   "Like looking in a mirror" $a = a$

2. Transitive Property

   "Trans-itions make connections" If a = b and b = c, then a = c

3. Substitution Property of Equality

   "substitute values like a teacher"

4. Subtraction Property of Equality

   "subtracting equally is equal"

Reflexive Property

AB = AB

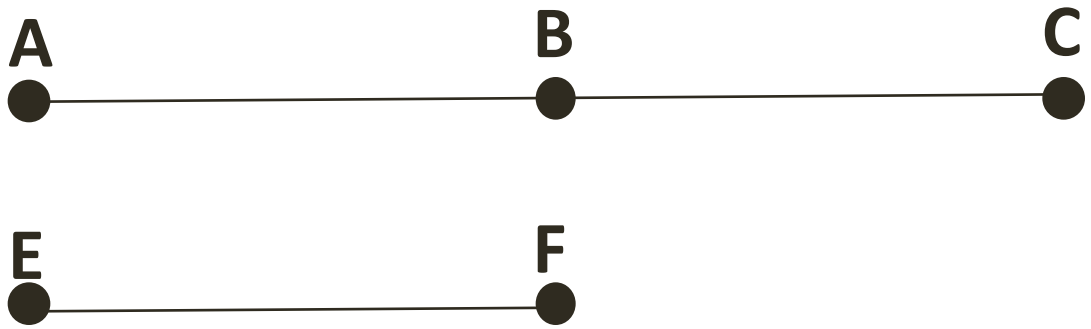
$m\angle x = m\angle x$

A quantity is equal to itself.

Transitive Property

If AB = BC and BC = EF,

Then AB = EF



Substitution Property of Equality

If A + B = C and D = B,
then A + D = C.

If DE + CD = CE and CD = AB, then DE + AB = CE.

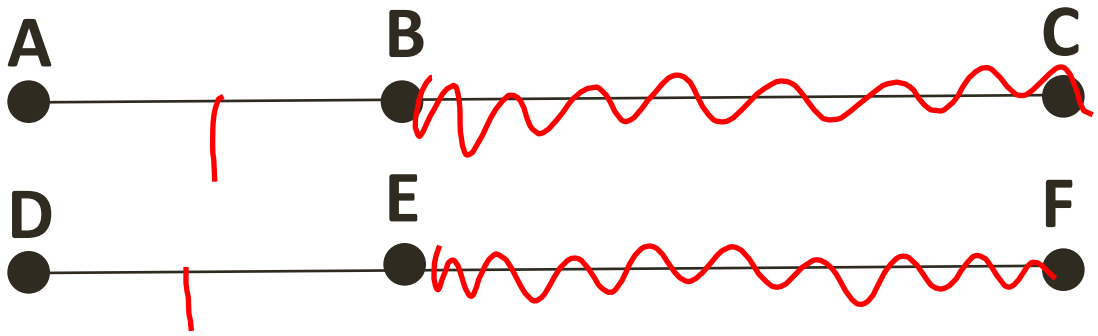
Subtraction Property of Equality

$b = d$ $\quad a + b = c + d$

$-b \quad -d$

$a = c$

If AB + BC = DE + EF *and* BC = EF, I can subtract such that AB = DE.



Algebra with Reasons

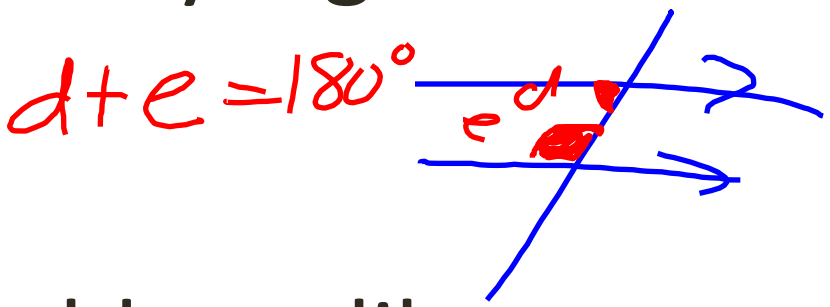
Assume (you are given):

- $g = 2h$
- $g + h = k$
- $k = m$

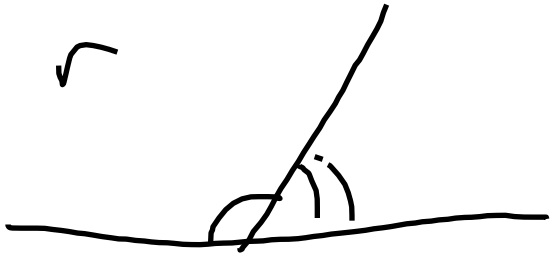
Prove: $m = 3h$

Other Reasons

Use your vocabulary log to list other reasons.



Which ones would you like reviewed for tomorrow's quiz?

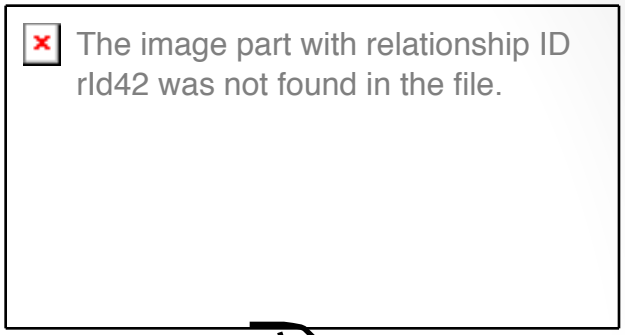


Two-Column Proof

Statement	Justification

Two-Column Proof

Pg 49



Prove that $m\angle z = m\angle x + m\angle y$.

Statement	Justification
$\boldsymbol{m\angle x + m\angle y} + m\angle w = 180°$	Triangle Angle Sum
$m\angle w + m\angle z = 180°$	Linear Pair
$m\angle w + m\angle z = m\angle x + m\angle y + m\angle w$	Substitution Property
$\therefore m\angle z = m\angle x + m\angle y$ ■	Subtraction Property

Engage NY pg. 50

Attempt question 1 for 3 minutes, use the justifications just mentioned.

After 3 minutes we will review.

Engage NY pg. 50

Mr. Germanis overviews Exercise 1 proof. See annotated document.

November 18, 2015

Entry Task

1. Obtain a half-sheet entry task.
2. Practice each task with the members at your table group.
3. Determine what questions you have before beginning.

Prepare for Quiz

- Cell phones away & headphones out of your ears.
- Backpacks/bags on floor
- Blinders between each person (including the person across from you).
- You may use you Vocab. Log.

When you are done

1. Turn your quiz face-down on your desk (do not raise your hand)!
2. Complete #1 on pg. 50
3. Take a nap or work on another class's work.
4. **DO NOT TALK!!!**

November 19, 2015

Entry Task

Respond in your interactive notebook:

- In your own words, what does it mean to “prove” something?
- Why do you think it’s important to be *explicit* about each step?

Goals

- Construct viable arguments and provide justification.

Success Criteria:

- I can write down the steps from the start to the finish.
- I can provide reasons for each step in the proof.

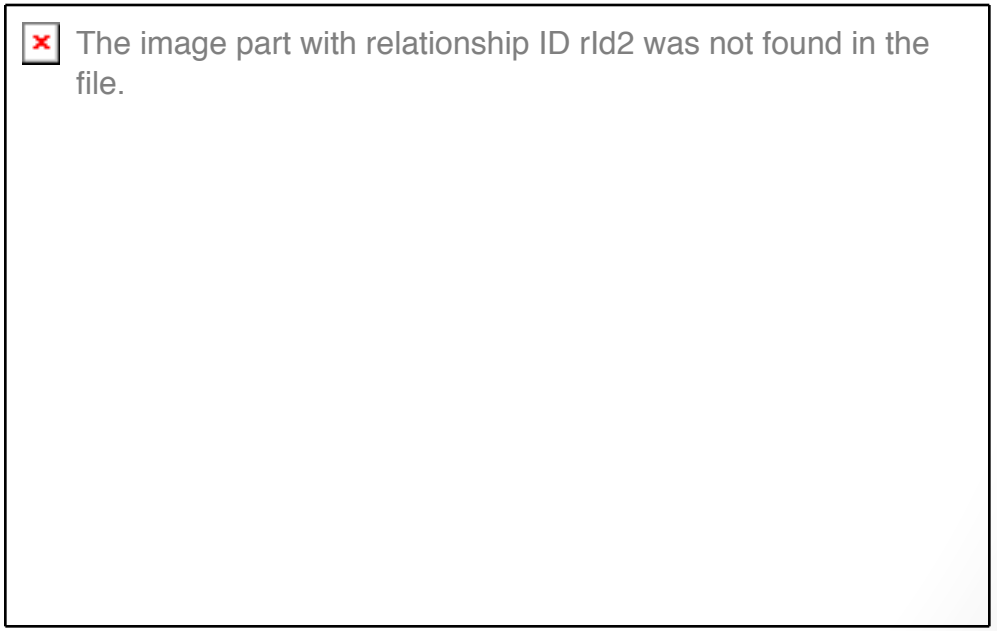
Two-Column Proof

Prepare a page for a two column proof.

	Justification

Remember…

It’s about the journey, not the destination!



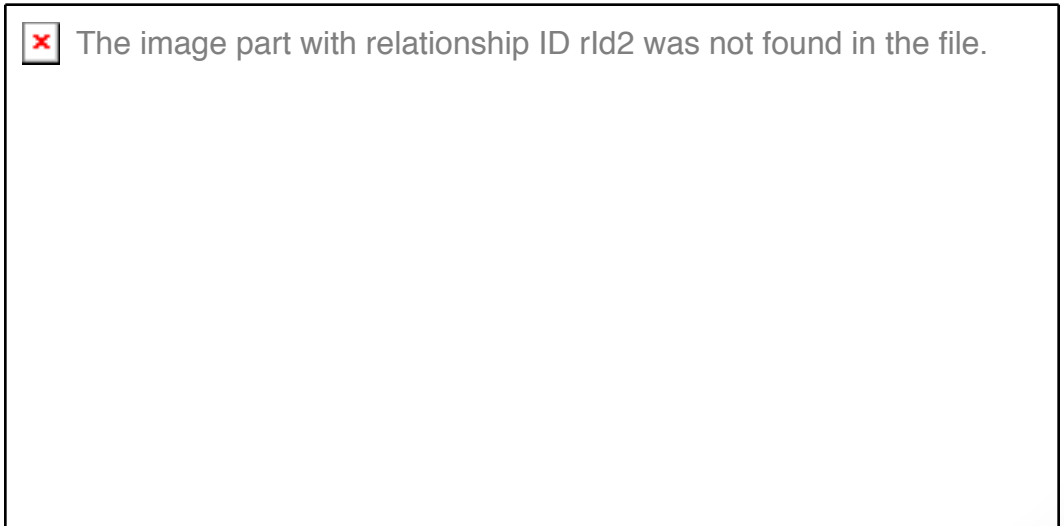
Break it down…

Given (assume, you know…)

- Angles on a line sum to 180◦

Prove:

- Vertical angles are congruent.

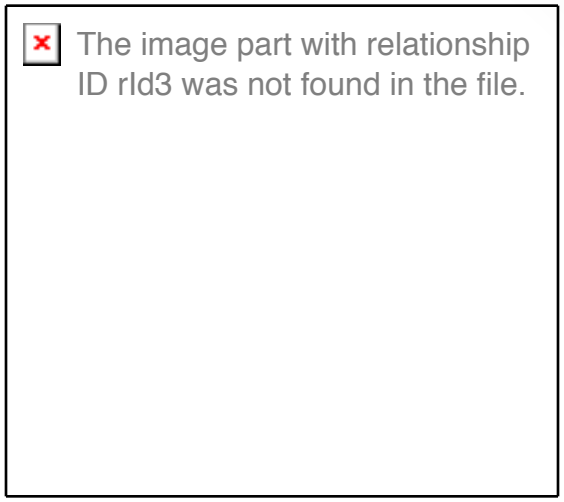


Group Work

Work with your team to organize the proofs using the two column proof template.

Write these proofs into your Engage New York Workbook.

Check



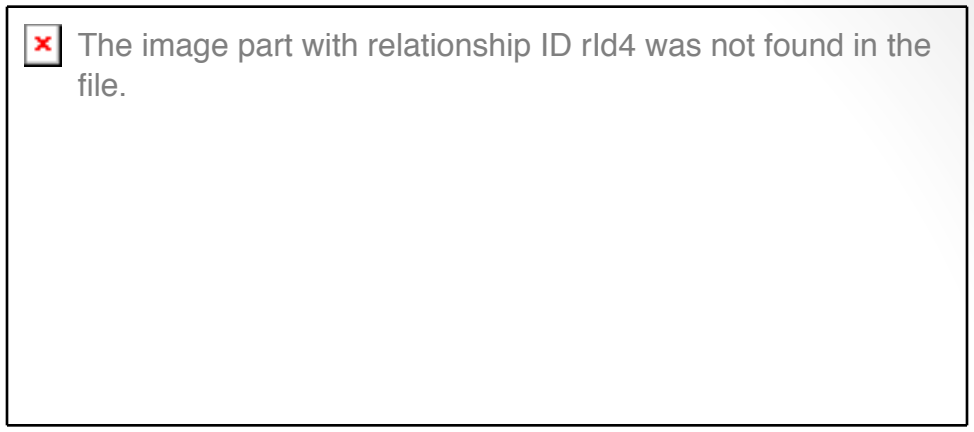
Prove that

$$\mathbf{m}\angle w + \mathbf{m}\angle x + \mathbf{m}\angle z = 180°.$$

Statement	Justification
$\mathbf{m}\angle y + \mathbf{m}\angle x + \mathbf{m}\angle z = 180°$	*Sum of the angles of a triangle is* $\mathbf{180°}$.
$\mathbf{m}\angle y = \mathbf{m}\angle w$	*Vertical angles are equal in measure.*
$\therefore\ \mathbf{m}\angle w + \mathbf{m}\angle x + \mathbf{m}\angle z = 180°$	*Substitution property of equality*

■

Check



Prove that

$$m\angle w = m\angle y + m\angle z.$$

Statement	Justification
$\mathrm{m}\angle w = \mathrm{m}\angle x + \mathrm{m}\angle z$	*Exterior angle of a triangle equals the sum of the two interior opposite angles*
$\mathrm{m}\angle x = \mathrm{m}\angle y$	*Vertical angles are equal in measure*
$\therefore\ \mathrm{m}\angle w = \mathrm{m}\angle y + \mathrm{m}\angle z$	*Substitution property of equality*

■

Take 10 minutes

SLOW DOWN!!!

Take a full 10 minutes to work through problem 3 (pg. 51).

- Use vocabulary log for *reasons*.
- Carefully, detail each statement and justification.
- Work with your group to create a presentation ready proof with your table group.

Goals

- Construct viable arguments and provide justification.

Success Criteria:

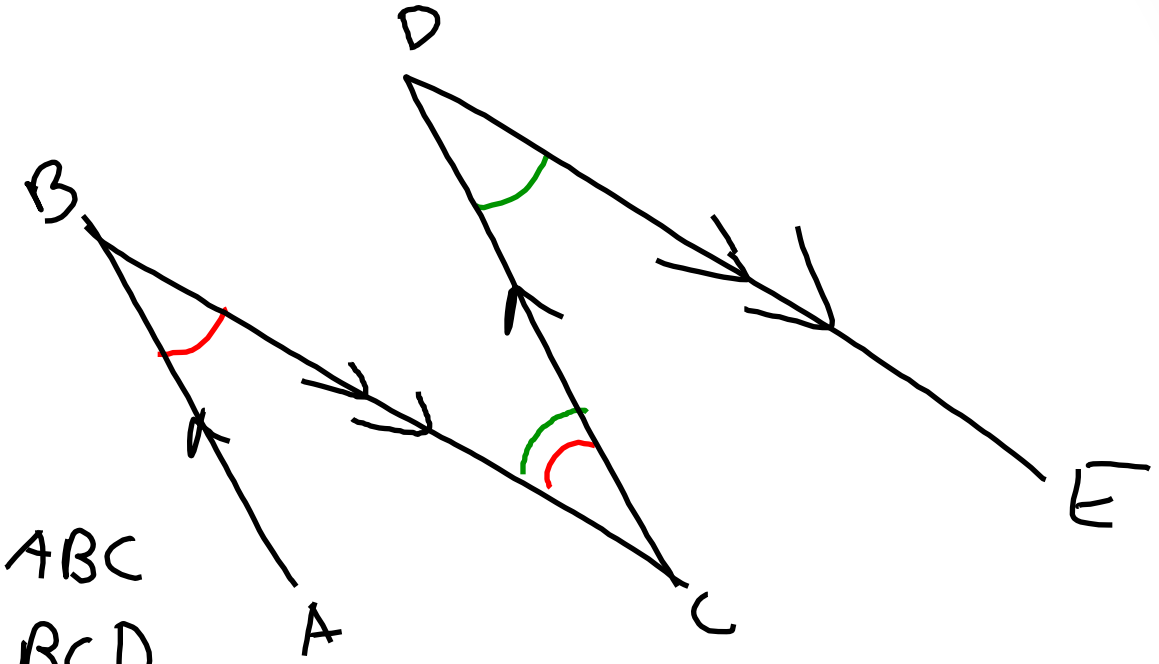
- I can write down the steps from the start to the finish.
- I can provide reasons for each step in the proof.

Review

Volunteer group for Exercise #2 on page 50.

- Did they use a two-column proof?
- Did they *justify* all of their statements?
- What is something they did really well!

Prove $\angle B = \angle D$.



$\angle B = \angle ABC$

$\angle C = \angle BCD$

$\angle d = \angle CDE$

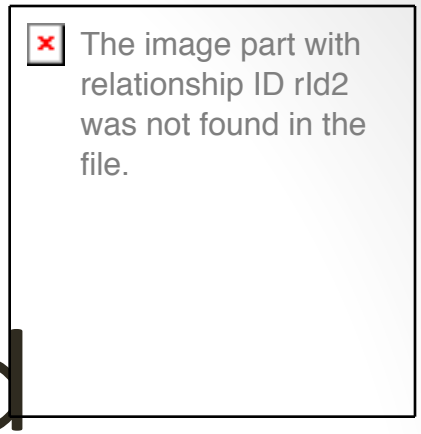
November 20, 2015

Entry Task

Check your answer to problem 3 (pg. 51) with your neighbor.

- Hint: Start by writing out the angle measures of *both* triangles.

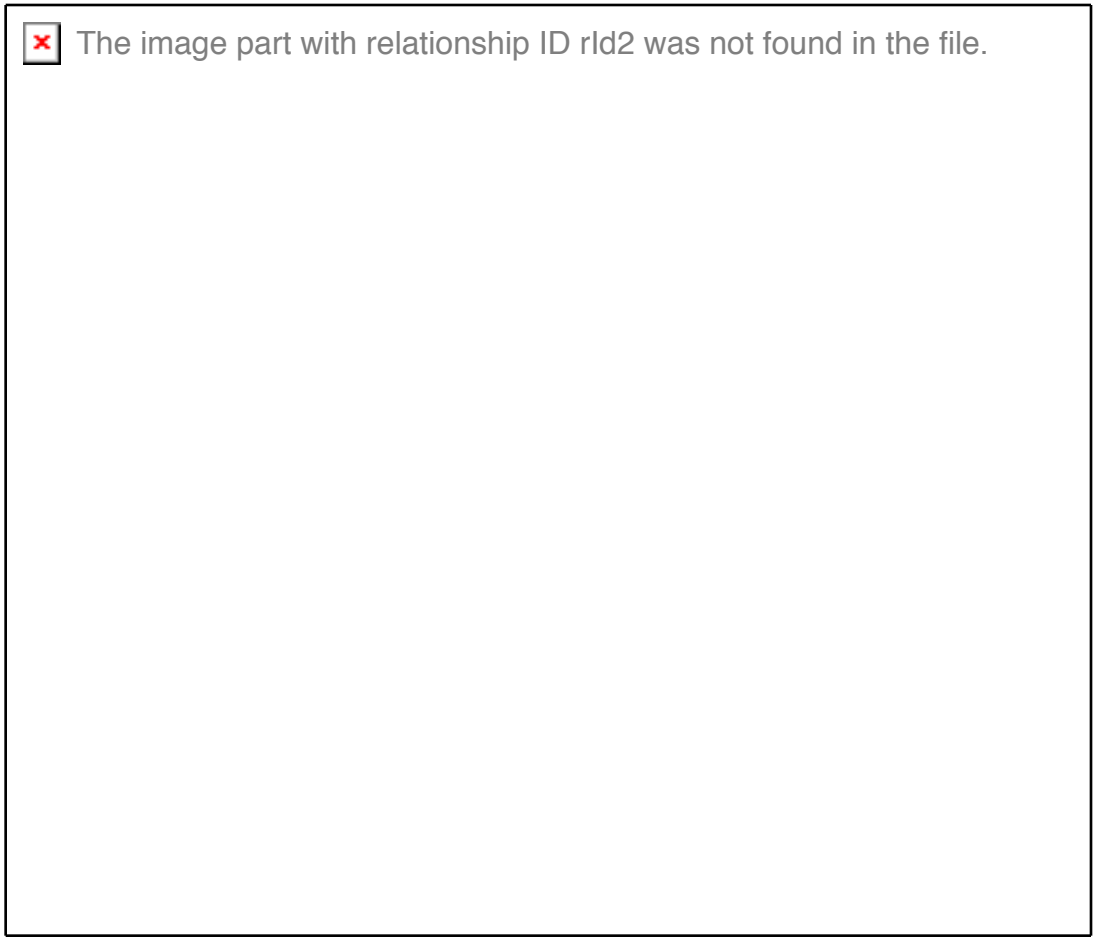
Party Time?



What do party's and proofs have in common?

It's proper to invite the guests who arrive unexpectedly.

Joke of the Week



Video – Sorry Ladies

https://youtu.be/HyRGLDqSPRA?t=8s

Work Time

Complete Proof 4 and 5.

Be VERY clear, check your solution with your neighbor.

Complete a Proof Checklist with your neighbor before talking with Mr. Germanis.

Hints

|| Parallel

⊥ Perpendicular

Problem 4:

- Find the parallel lines and the transversals.
- Use vocabulary log for ideas.

Problem 5:

- Label all of the angles
- What do we know about adjacent angles around a point.

November 23, 2015

Entry Task

1. Be prepared to explain reflexive property and transitive property.
2. Take out your vocabulary log.
3. Solve this riddle.
   - What do you call an angle that just got in a car crash?

Riddle

What do you call an angle that just got in a car crash?

A wrecked-angle (rectangle).

Reflexive Property

Add this to your vocabulary log.

Everything is equal to itself.

$$a = a$$

Bob = Bob

Sally = Sally

$$\angle ABC = \angle ABC$$

Transitive Property

If two quantities are equal to the same quantity, then they are equal to each other.

School = Success
Success = Money

Given

Conclusion

∴School = Money

Substitution Property

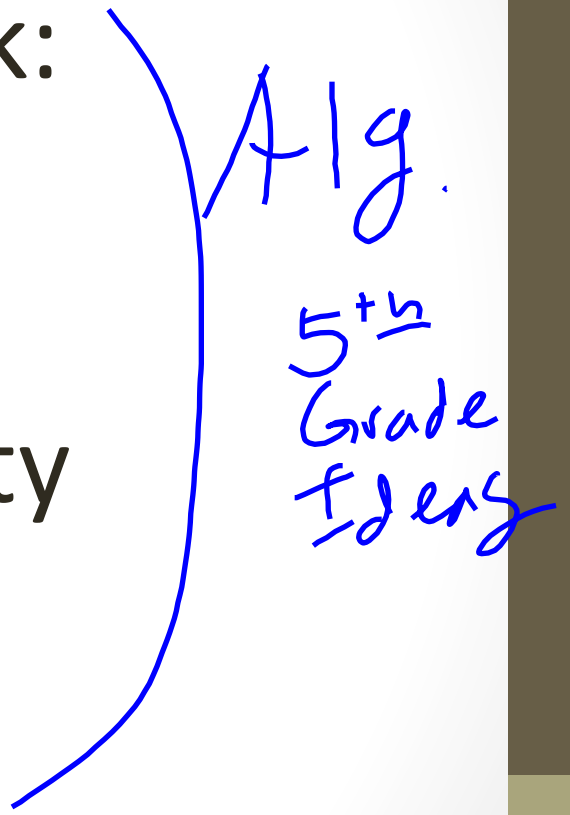
One thing can replace another thing if we know they're equal.

We know ⋈ = ⊞
And ⋈ = ∇
And ⋈ = ⋈ (reflexive property)
So, ⊞ = ∇ (substitution)

Other Properties

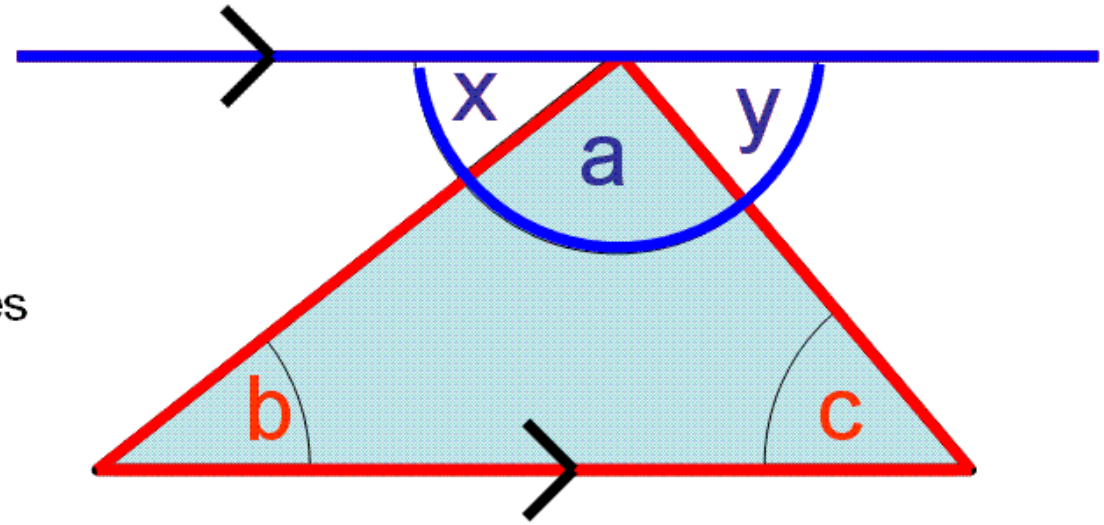
All arithmetic ideas work:

- Addition Property
- Subtraction Property
- Multiplication Property
- Division Property



Geometric Proof

Prove that the sum of the angles in a triangle is 180°.



Draw a line parallel to one side.

Let *x* and *y* be the other two angles formed with the line.

Then x = b (alternate angles)

and y = c (alternate angles)

We can also see that x + y + a = 180°. (angles on a line)

Therefore, a + b + c = 180°.

Quiz Results…

Period 1

Period 2

Period 6

Quiz Results…

Out of 30 pts

Period 1

Mean: 22.52

Min: 8

Median: 23

Max: 30

Standard Deviation: 6.65

About 70% scored within 1sd of the mean

Quiz C's

Quiz Results…

<u>Period 2</u>

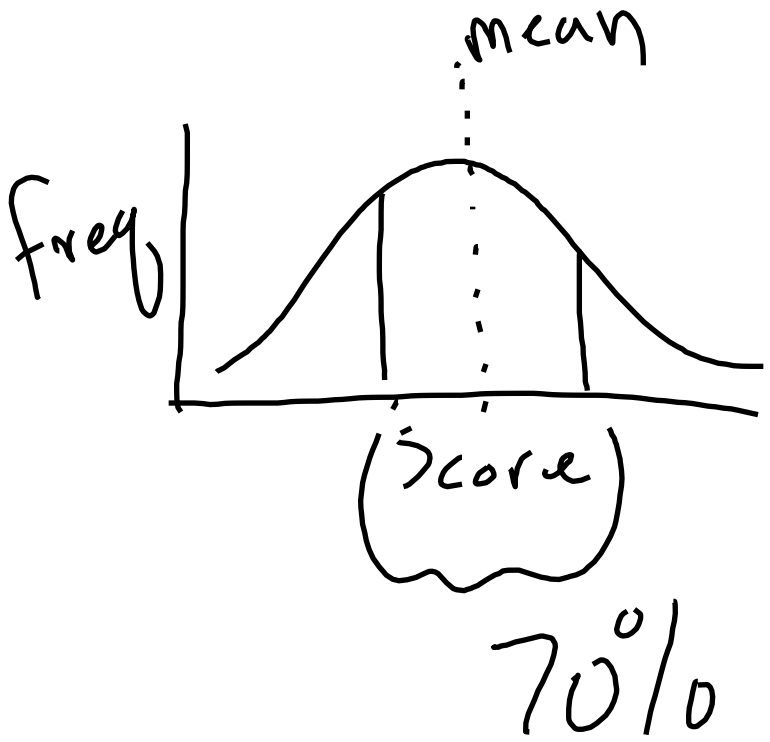
Mean: 22.4

Min: 10

Median: 24

Max: 30

Standard Deviation: 5.19



About 70% scored within 1sd of the mean

Quiz C's

Quiz Results…

<u>Period 6</u>

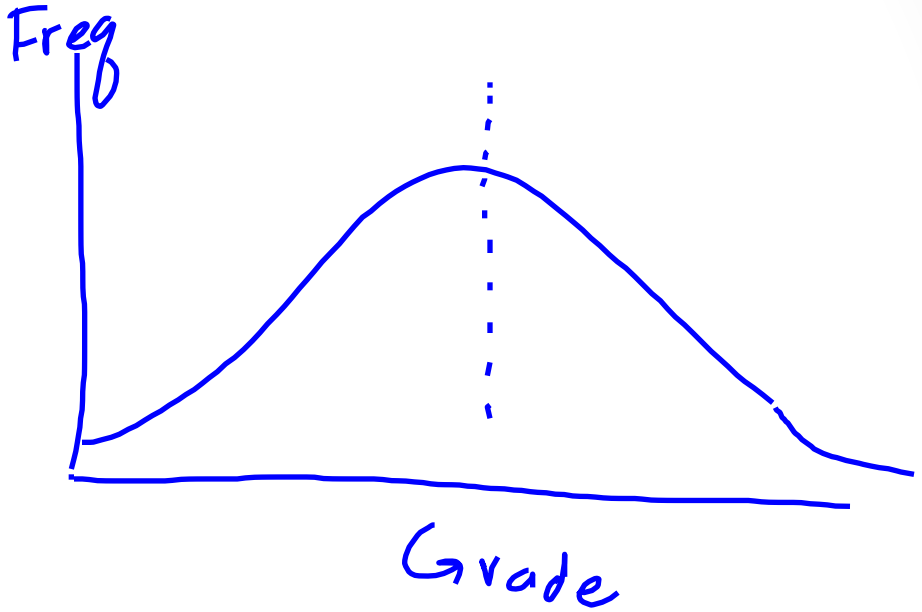
Mean: 22.13

Min: 10

Median: 24

Max: 28

Standard Deviation: 5.47



About 70% scored within 1sd of the mean

Quiz C's

Quiz Corrections

- Reclaim 50% of missed points
- Must complete on a separate sheet of paper.
- Complete the entire question over again to receive points.
- **Due next Monday (11/30).**

G-Money Auction

- Take out your G-Money
- Highest bidder wins prize
- At the end, you may purchase according to my price sheet.

Thanksgiving Proofs

Begin working on Thanksgiving proofs.

Keep these for tomorrow we will reveal the solutions in class.

November 24, 2015

Entry Task

1. Take out your Vocabulary Log.
2. Create a team of 4.
3. Pick a team name and mascot!
4. Make a sign for your team.

Today's Outline

Turkey Gone Game

G-Money Auction

Thanksgiving Proofs

- Review ENY proofs (possible).

Turkey Gone Game

Given the definition, your team must be the first to provide the term of the definition.

G-Money Auction

- Take out your G-Money
- Highest bidder wins prize
- At the end, you may purchase according to my price sheet.

Quiz Corrections

Reminder:

If you plan to complete these, they are due on Monday when we return from the break.

Return classwork

Volunteer(s) needed to return work to students.

Thanksgiving Proofs

Finish Thanksgiving Proofs

Overview proof reasons for thanksgiving proofs as a class.

November 30, 2015

Entry Task

1. Talk with your neighbors for 5 minutes about your break.
2. Obtain your Engage New York Workbook
3. Take out your vocabulary log (update any terms if needed).
4. Turn in Quiz Corrections.

Our story…

- Where we have been.
  - Explored angle relationships
  - Found angle measures with Alg.
- Where we are now.
  - Formally explaining thinking.
  - Providing reasons for each step.
- Where we are going.
  - Proving topics formally
  - Transformations.

Table Group Work

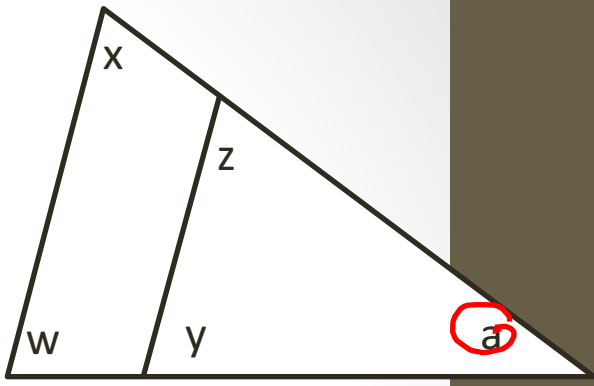
- Each table work as a team to complete the activity.
- The purpose is to review older concepts we still need in our toolbox.
- Review in about 15 minutes.

Elegant Proofs

Showing the Engage NY Proofs

Take a second look at each!

Pg. 51 #3



Prove $\angle y + \angle z = \angle x + \angle w$

Proof:

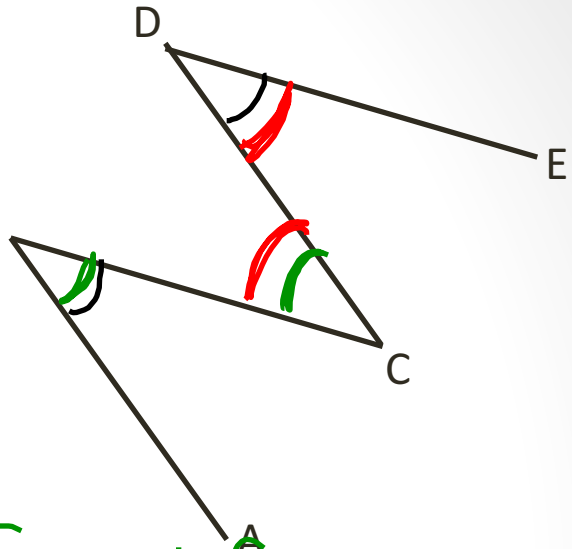
$\angle y + \angle z + \angle a = 180°$ ← Triangle Angle Sum

$\angle x + \angle w + \angle a = 180°$

$\angle y + \angle z + \angle a = \angle x + \angle w + \angle a$ Reflexive Subst.

$\angle y + \angle z = \angle x + \angle w$

Pg. 51 #4



Given $\overline{AB} \parallel \overline{CD}$ and $\overline{CB} \parallel \overline{ED}$, prove $\angle B \cong \angle D$.

Proof:

$m\angle B = m\angle C$ Alternate Interior.

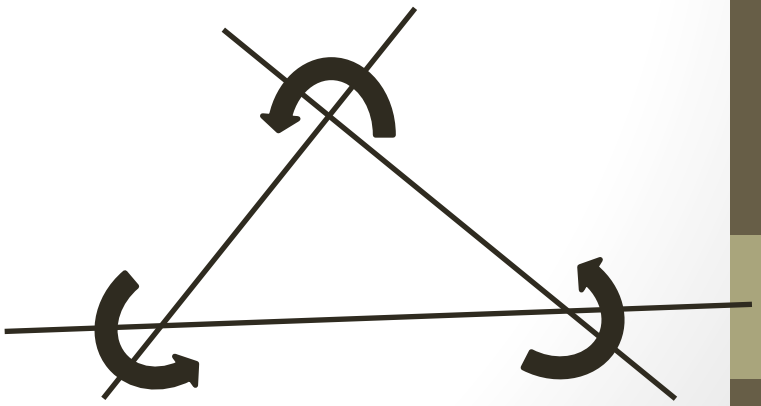
$m\angle C = m\angle D$ Alternate interior

$\therefore m\angle B = m\angle D$ ■ Transitive Property

December 1, 2015

Entry Task

- Work with your table group on ENY page 51 #5.
  - Prove the exterior angles sum to 900 degrees.



Maze Analogy

Use pg. 52 #6 and answer these questions?

- What are you asked to prove? What is your ending point?
- Which relationships do you already know?
- Which are simple to find?

Toolbox

This is a short list of topics in your toolbox (do you need more?):

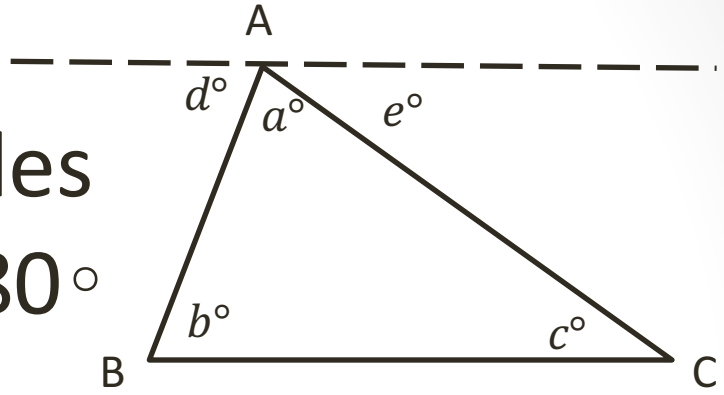
- Perpendicular linear are 90 degrees.
- Triangle's angles sum to 180 degrees.

Be as clear as possible, your team may share your result.

December 2, 2015

Geometry

Find the error(s)!

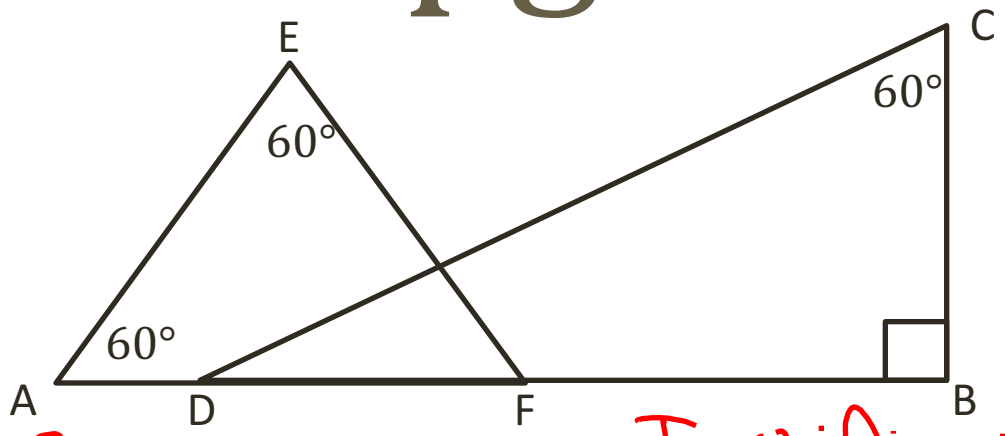


Prove the interior angles of a triangle sum to $180°$

Draw an auxiliary line parallel to $\overline{BC}$

✗ $d + a + e = 360°$ (180)	Angles on line sum to $180°$
✓ $d = b$	Alternate Interior Angles
✓ $e = c$	Alternate Interior Angles
$\therefore a + b + c = 180°$	~~Transitive~~ Substitution Property ■

Demo pg. 52 #6



Statement	Justification
A+F+F=180	angle

Work time

Complete Lesson 9 Problem Set:

- Pg. 53 #1-3 (only)

Show Mr. Germanis:

- Lesson 8 Exercises (pg. 45) and Problem Set (pg. 48)
- Lesson 9 Class Activities (pg. 50)

Quiz?

When: Friday, Tues, Wednes Thurs
Period 1 Peri
Period 2

Subject: Proofs

Open book/open note? Small Group?
Period 1
Period 2
Period 6

No cell phones!

More Practice

Complete the Lesson 10 Opening Exercise on Page 54.