Geometry

2.1 Conditional Statements

Conditional Statements

Logical statement with two parts

- ______________________
- ______________________
- Often written in If-Then form
- If part contains ________________________
- Then part contains __________________________

If <u>we confess our sins</u>, then <u>He is faithful and just to forgive us our sins</u>. 1 John 1:9

________________ ________________

If-then Statements $p \rightarrow q$

The if part implies that the then part _______________.

The then part ___________________ imply that the first part happened.

If you are hungry, then you should eat.

John is hungry, so… ______________________

Megan should eat, so… _____________________

Negation $\sim p$

____.

The board is white.

____

Converse $q \rightarrow p$

____

If we confess our sins, then he is faithful and just to forgive us our sins.

p = ____

q = ____

Converse = If ____, then __________________________________.

Does not necessarily make a true statement (He may be faithful and just, but many people still don't ask for forgiveness.)

Inverse $\sim p \rightarrow \sim q$

____.

If we confess our sins, then he is faithful and just to forgive us our sins.

_______ = we confess our sins

_______ = he is faithful and just to forgive us our sins

Inverse = If __________________________________, then____.

Not necessarily true (He is still faithful and just even if we do not confess.)

Contrapositive $\sim q \rightarrow \sim p$

____.

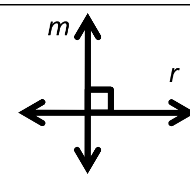
If we confess our sins, then he is faithful and just to forgive us our sins.
p = we confess our sins *q* = he is faithful and just to forgive us our sins
Contrapositive = If ____, then _________________________________.
Always true.

Write the following in If-Then form and then write the converse, inverse, and contrapositive
All whales are mammals.

Biconditional Statement

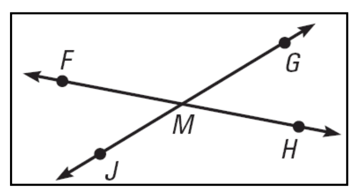
Logical statement where the __________________________ and ________________________ are both true
Written with "if and only if" _________________
An angle is a right angle if and only if it measure 90°.
All definitions can be written as __________________________ and ________________________ statements

Perpendicular Lines
Lines that intersect to _______________________________________ *m* ________ *r*



Write this definition as a biconditional statement.

Use the diagram shown. Decide whether each statement is true. Explain your answer using the definitions you have learned.



1. $\angle JMF$ and $\angle FMG$ are supplementary

2. Point *M* is the midpoint of $\overline{FH}$

3. $\angle JMF$ and $\angle HMG$ are vertical angles.

4. $\overleftrightarrow{FH} \perp \overleftrightarrow{JG}$

Assignment: 69 #2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 26, 28, 30, 32, 49, 68, 71, 74, 76 = 20 total

Geometry

2.2A Inductive Reasoning

Conjecture and Inductive Reasoning

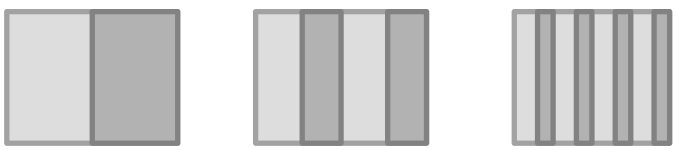
Conjecture

- ____________________ statement based on ____________________________

Inductive Reasoning

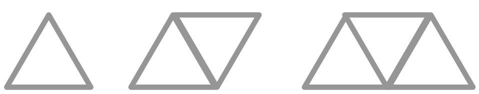
- First find a ______________________ in ____________________________ cases
- Second write a _______________________ for the _______________________ case

Sketch the fourth figure in the pattern



Describe the pattern in the numbers 1000, 500, 250, 125, … and write the next three numbers in the pattern

Given the pattern of triangles below, make a conjecture about the number of segments in a similar diagram with 5 triangles



Make and test a conjecture about the product of any two odd numbers

Proving by Inductive Reasoning

The only way to show that a conjecture is true is to _____________________________

To show a conjecture is false is to show ______________________ where it is false

- This case is called a ___________________________

Find a counterexample to show that the following conjecture is false

The value of x^2 is always greater than the value of x

Assignment: 78 #1, 2, 4, 6, 7, 8, 10, 12, 13, 14, 36, 43, 45, 46, 49 = 15 total

Geometry

2.2B Deductive Reasoning

Deductive Reasoning

Use _____________, ___________________, ______________________, _____________________ to form an argument.

Deductive reasoning

- _______________ true
- _______________ → __________________

Inductive reasoning

- _______________ true
- _______________ → __________________

Laws of Logic

Law of Detachment

If the _______________________ of a true conditional statement is _________, then the ________________ is also ____________.

Detach means ___________________________, so the 1st statement is _________________________.

1. If **we confess our sins**, <u>he is faithful and just to forgive us our sins</u>. 1 John 1:9
2. **Jonny confesses his sins.**
3. <u>God is faithful and just to forgive Jonny his sins.</u>

1. If you love me, keep my commandments.
2. I love God.
3. _____________________________________

1. If you love me, keep my commandments.
2. I keep all the commandments.
3. _____________________________________

Law of Syllogism

If hypothesis ______, then conclusion ______.
If hypothesis ______, then conclusion ______.
If hypothesis ______, then conclusion ______.

If these statement are true,

then this statement is true

1. If <u>we confess our sins</u>**, He is faithful and just to forgive us our sins.**
2. **If He is faithful and just to forgive us our sins**, then <u>we are blameless</u>.
3. If <u>we confess our sins</u>, then <u>we are blameless</u>.

1. If you love me, keep my commandments.
2. If you keep my commandments, you will be happy.
3. ____

1. If you love me, keep my commandments.
2. If you love me, then you will pray.
3. ____

Assignment: 78 #16, 17, 18, 19, 21, 22, 24, 25, 26, 30, 32, 34, 40, 51, 54 = 15 total

Geometry

2.3 Postulates and Diagrams

Postulates and Theorems

Postulate

- Rule that is __________________________

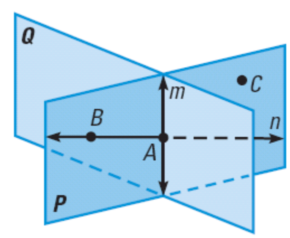
Theorem

- Rule that is __________________________

Basic Postulates

- Through any __________________ there exists exactly ________________________.
- A line contains at least __________________.
- If two ___________ intersect, then their intersection is exactly ______________________.
- Through any _______________________________ points there exists exactly ___________________.
- A plane contains at least three ________________________.
- If two points lie in a __________, then the line containing them lies in the _____________.
- If two ____________ intersect, then their intersection is a _____________.

Which postulate allows you to say that the intersection of plane *P* and plane *Q* is a line?

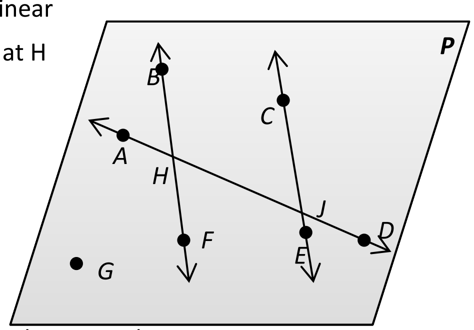


Use the diagram to write examples of the 1st three postulates.

Interpreting a Diagram

You Can Assume

- All points shown are coplanar
- ∠*AHB* and ∠*BHD* are a linear pair
- ∠*AHF* and ∠*BHD* are vertical angles
- *A*, *H*, *J*, and *D* are collinear
- $\overleftrightarrow{AD}$ and $\overleftrightarrow{BF}$ intersect at H



You Cannot Assume

- *G*, *F*, and *E* are collinear
- $\overleftrightarrow{BF}$ and $\overleftrightarrow{CE}$ intersect
- $\overleftrightarrow{BF}$ and $\overleftrightarrow{CE}$ do not intersect
- ∠*BHA* ≅ ∠*CJA*
- $\overleftrightarrow{AD} \perp \overleftrightarrow{BF}$
- m∠*AHB* = 90°

Sketch a diagram showing $\overrightarrow{FH} \perp \overline{EG}$ at its midpoint M.

State whether each of the follow can be assumed.

A, B, and C are collinear

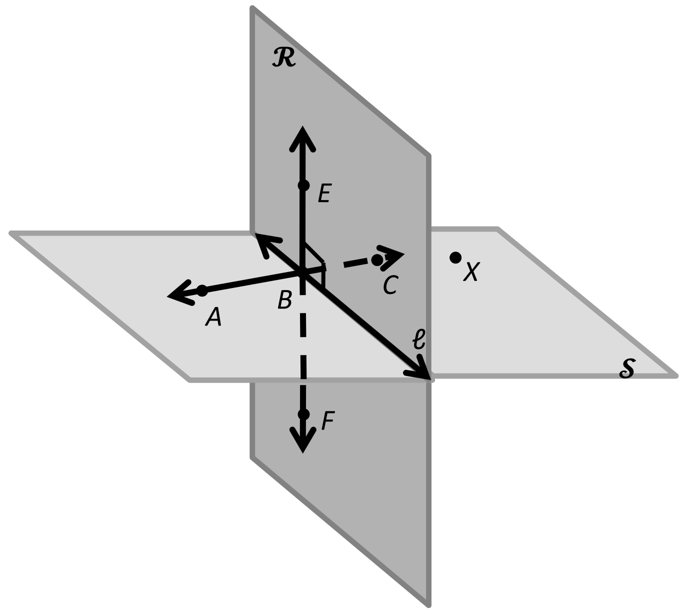
$\overleftrightarrow{EF} \perp$ line ℓ

$\overleftrightarrow{BC} \perp$ plane $\mathcal{R}$

$\overleftrightarrow{EF}$ intersects $\overleftrightarrow{AC}$ at B

line ℓ $\perp \overleftrightarrow{AB}$

Points B, C, and X are collinear



Assignment: 85 #2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 21, 22, 23, 25, 26, 31, 32, 36, 38, 39 = 20 total

Geometry

2.4 Algebraic Reasoning

Segment length and angle measure are __________________________ just like _________________, so you can solve ______________________ from geometry using _______________________ from algebra to justify each step.

Property of Equality	Example
Reflexive	
Symmetric	
Transitive	
Add and Subtract	
Multiply and divide	
Substitution	
Distributive	

Name the property of equality the statement illustrates.

If m∠6 = m∠7, then m∠7 = m∠6.

If *JK* = *KL* and *KL* = 12, then *JK* = 12.

m∠*W* = m∠*W*

Solve the equation and write a reason for each step

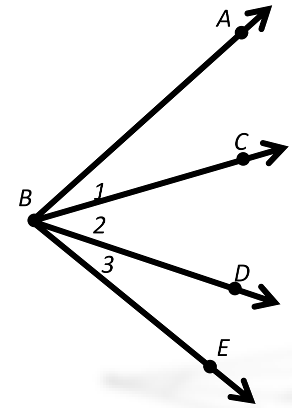
$14x + 3(7 - x) = -1$

Solve $A = \frac{1}{2} bh$ for *b*.

Geometry 2.4 Name: ____________________

Given: m∠*ABD* = m∠*CBE*

Show that m∠1 = m∠3



Assignment: 92 #2, 4, 6, 8, 10, 16, 20, 22, 24, 28, 30, 32, 34, 36, 38, 53, 54, 60, 61, 63 = 20 total

Geometry

2.5 Proving Statements about Segments and Angles

Given: Loaf of bread, jar of peanut butter, and jelly sitting on counter

Prove: Make a peanut butter and jelly sandwich

Congruence of segments and angles is reflexive, symmetric, and transitive.

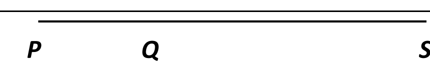
Writing proofs follow the same step as the sandwich.

1. Write the ____________________ and _______________________ written at the top for reference
2. Start with the ______________________ as step 1
3. The steps need to be in an _______________________ order
4. You cannot use an object without it ____
5. Remember the hypothesis states the _______________________ you are working with, the conclusion states what you are ________________________ with it
6. If you get stuck ask, "Okay, now I have _______. What do I know about ______ ?" and look at the _________________________ of your theorems, definitions, and properties.

Complete the proof by justifying each statement.

Given: Points *P*, *Q*, and *S* are collinear

Prove: $PQ = PS - QS$



Statements	Reasons
Points *P*, *Q*, and *S* are collinear	
$PS = PQ + QS$	
$PS - QS = PQ$	
$PQ = PS - QS$	

Geometry 2.5 Name: ____________________

Write a two column proof

Given: $\overline{AC} \cong \overline{DF}$, $\overline{AB} \cong \overline{DE}$

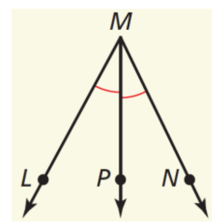
Prove: $\overline{BC} \cong \overline{EF}$

Statements	Reasons

Prove this property of angle bisectors: If you know $\overrightarrow{MP}$ bisects $\angle LMN$, prove that two times m$\angle LMP$ is m$\angle LMN$.

Given: $\overrightarrow{MP}$ bisects $\angle LMN$

Prove: 2(m$\angle LMP$) = m$\angle LMN$



Assignment: 99 #1, 2, 4, 6, 10, 12, 14, 16, 17, 18, 23, 24, 25, 27, 30 = 15 total

Geometry

2.6 Proving Geometric Relationships

Theorems

All right angles are ___________________________.

Congruent Supplements Theorem

If two angles are _______________________ to the same angle (or to congruent angles), then they are ________________.

Congruent Complements Theorem

If two angles are _______________________ to the same angle (or to congruent angles), then they are ________________.

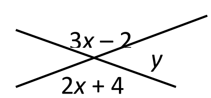
Linear Pair Postulate

If two angles form a ______________________________, then they are ________________________.

Vertical Angles Congruence Theorem

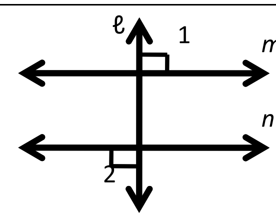
Vertical angles are ___________________________.

Find *x* and *y*



Given: ℓ ⊥ *m*, ℓ ⊥ *n*

Prove: ∠1 ≅ ∠2



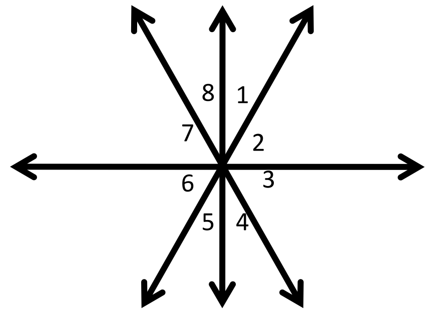
Statements	Reasons

Write a paragraph proof.

Given: ∠1 and ∠3 are complements

∠3 and ∠5 are complements

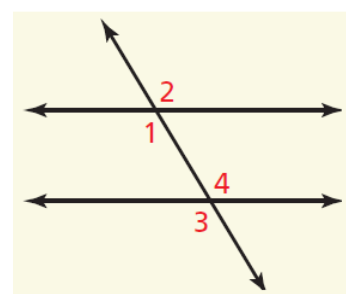
Prove: ∠1 ≅ ∠5

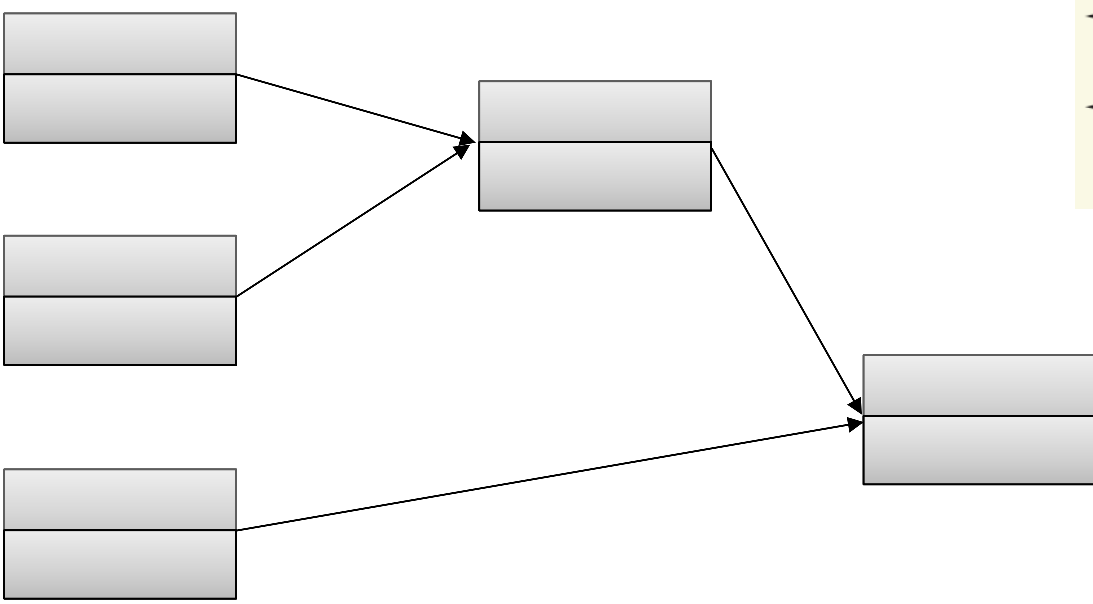


Write a flow proof.

Given ∠1 ≅ ∠4

Prove ∠2 ≅ ∠3





Assignment: 107 #2, 4, 6, 8, 10, 12, 13, 15, 17, 18, 19, 24, 26, 29, 31 = 15 total

Name: ___________________

Geometry Chapter 2 Review

Describe the pattern in the numbers. Write the next number.

1. $-6, -1, 4, 9, \ldots$

2. $100, -50, 25, -12.5, \ldots$

Write the converse, the inverse, and the contrapositive for the given statement.

3. If they are right angles, then they are congruent.

4. If it is a frog, then it is an amphibian.

Make a valid conclusion based on the information. Then state whether you used the *Law of Detachment* or the *Law of Syllogism*.

5. If Margot goes to college, then she will major in Chemistry.
   If Margot majors in Chemistry, then she will need to buy a lab manual.

6. If you decide to go to the football game, then you will miss band practice.
   Tonight, you are going the football game.

Fill the blanks.

7. If two points lie in a plane, then the ____ containing them lies in the _____.

8. A line contains at least ___ points.

9. Through any three noncollinear points there exists exactly one _____.

10. A plane contains at least ______ noncollinear points.

11. If two lines intersect, then their intersection is exactly one _____.

12. If two planes intersect, then their intersection is a ___.

13. Through any ___ points there exists exactly one ____.

Solve the equation. Write a reason for each step.

14. $9x + 31 = -23$

15. $-7(-x + 2) = 42$

16. $26 + 2(3x + 11) = -18x$

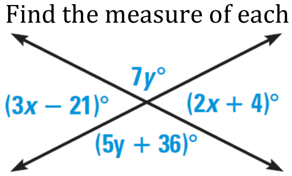
Name the statement with the property that it illustrates.

17. If $\angle RST \cong \angle XYZ$, then $\angle XYZ \cong \angle RST$

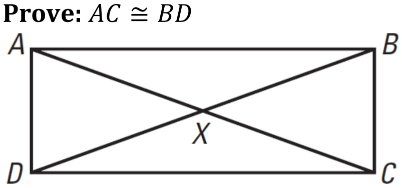
18. $\overline{PQ} \cong \overline{PQ}$

19. If $\overline{FG} \cong \overline{JK}$ and $\overline{JK} \cong \overline{LM}$, then $\overline{FG} \cong \overline{LM}$.

20. Find the measure of each angle in the diagram.



21. Write a two-column proof.
    Given: $\overline{AX} \cong \overline{DX}, \overline{XB} \cong \overline{XC}$
    Prove: $\overline{AC} \cong \overline{BD}$



Name: ___________________

Answers

1. Add 5; 14
2. Multiply by $-\frac{1}{2}$; 6.25
3. Converse: If the angles are congruent, then they are right angles.
Inverse: If the angles are not right angles, then they are not congruent.
Contrapositive: If the angles are not congruent, then they are not right angles.
4. Converse: If it is an amphibian, then it is a frog.
Inverse: If it is not a frog, then it is not an amphibian.
Contrapositive: If it is not an amphibian, then it is not a frog.
5. If Margot goes to college, then she will need to buy a lab manual.; Law of Syllogism.
6. You will miss band practice.: Law of Detachment
7. Line; Plane
8. Two
9. Plane
10. Three
11. Point
12. Line
13. Two; Line
14.

$9x + 31 = -23$	Given
$9x = -54$	Subtraction
$x = -6$	Division

15.

$-7(-x + 2) = 42$	Given
$-x + 2 = -6$	Division
$-x = -8$	Subtraction
$x = 8$	Division

16.

$26 + 2(3x + 11) = -18x$	Given
$26 + 6x + 22 = -18x$	Distributive Property
$48 + 6x = -18x$	Simplify
$48 = -24x$	Subtraction
$-2 = x$	Division
$x = -2$	Symmetric

17. Symmetric
18. Reflexive
19. Transitive
20. $54°, 54°, 126°, 126°$
21.

1. $\overline{AX} \cong \overline{DX}, \overline{XB} \cong \overline{XC}$	Given
2. $AX = DX, XB = XC$	Definition of Congruent Segments
3. $AX + XC = AC, BX + XD = BD$	Segment Addition Postulate
4. $DX + XC = AC, XC + XD = BD$	Substitution
5. $AC = BD$	Substitution (or Transitive)
6. $\overline{AC} \cong \overline{BD}$	Definition of Congruent Segments