Geometry Unit 3 Day 1

Learning Target – Students will use inductive reasoning to make conjectures and deductive reasoning to draw conclusions.

Induction is reasoning that uses specific examples to make a conclusion. Sometimes you will make generalizations about observations or patterns and apply these generalizations to new or unfamiliar situations. For example, you may notice that when you don't study for a test, your grade is lower than when you do study for a test. You apply what you learned from these observations to the next test you take.

Deduction is reasoning that uses a general rule to make a conclusion. For example, you may learn the rule for which direction to turn a screwdriver: "righty tighty, lefty loosey." If you want to remove a screw, you apply the rule and turn the screwdriver counterclockwise.

Ms. Ross teaches an Economics class every day from 1:00 PM to 2:15 PM. Students' final grade is determined by class participation, homework, quizzes, and tests. She noticed that Andrew has not turned in his homework 3 days this week. She is concerned that Andrew's grade will fall if he does not turn in his homework.

Irrelevant Information:
Ms. Ross teaches an Economics class every day from 1:00 PM to 2:15 PM.

General information:
Students' final grade is determined by class participation, homework, quizzes, and tests.

Specific information:
Andrew has not turned in his homework 3 days this week.

Conclusion:
Andrew's grade will fall if he does not turn in his homework.

1. Did Ms. Ross use induction or deduction to make this conclusion? Explain your answer.

Induction. she is using a specific example or pattern of him not turning in his HW to draw a conclusion

2. Conner read an article that claimed that tobacco use greatly increases the risk of getting cancer. He then noticed that his neighbor Matilda smokes. Conner is concerned that Matilda has a high risk of getting cancer.

a. What was Conner's conclusion? Matilda has a high risk of getting cancer

b. Did Conner use inductive or deductive reasoning? Explain.
Deductive → the article gave a fact that his conclusion was based off of.

c. Is Conner's conclusion correct? Explain your reasoning.
Yes, there is evidence to show that smoking increasing his risk of getting cancer.

3. Molly returned from a trip to England and tells you, "It rains every day in England!" She explains that it rained each of the five days she was there.

a. Did Molly use inductive or deductive reasoning? Explain.

Inductive → she was using a specific example.

b. Is Molly's conclusion correct. Explain your reasoning.
No, while it did rain the whole time she was there, it does not rain every single day in England.

4. Dontrell takes detailed notes in history class and math class. His classmate Trang will miss biology class tomorrow to attend a field trip. Trang's biology teacher asks him if he knows someone who always takes detailed notes. Trang tells his biology teacher that Dontrell takes detailed notes. Trang's biology teacher suggests that Trang should borrow Dontrell's notes because he concludes that Dontrell's notes will be detailed.

a. What conclusion did Trang make? What information supports this conclusion?
that Dontrell takes detailed notes in bio b/c he takes detailed notes in history and math

b. What type of reasoning did Trang use? Explain your reasoning.
Inductive → based on specific example of math and history class.

c. What conclusion did the biology teacher make? What information supports this conclusion? That Trang should borrow Donkell's notes b/c they will be detailed → Trang told her they would be.

d. What type of reasoning did the biology teacher use? Explain your reasoning.

Deductive. Trang gave her a fact.

e. Will Trang's conclusion always be true? Will the biology teacher's conclusion always be true? Explain your reasoning.

No, Donkell may be ill someday and not take detailed notes.

5. The first four numbers in a sequence are 4, 15, 26, and 37.

a. What is the next number in the sequence? How did you calculate the next number?

48. added 11 b/c that's the pattern

b. Describe how you used both induction and deduction, and what order you used these reasonings to make your conclusion.

First i used inductive reasoning → the specific examples given allowed me to calculate the rule of add 11. When I applied that rule to find the next term I used deductive reasoning.

6. The first three numbers in a sequence are 1, 4, 9 . . . Marie and Jose both determined that the fourth number in the sequence is 16. Marie's rule involved multiplication whereas Jose's rule involved addition.

a. What types of reasoning did Marie and Jose use to determine the fourth number in the sequence? Both Inductive & Deductive. First they generalized the pattern using inductive reasoning. Then they used the rule to find the next term using deductive reasoning.

b. What rule did Marie use to determine the fourth number in the sequence?

Marie multiplied the term # by itself.

Jose add the next consecutive odd #.

c. What rule did Jose use to determine the fourth number in the sequence?

d. Who used the correct rule? Explain your reasoning.

Both. Either rule will get you the next term.

Geometry Unit 3 Day 1 HW

2.1 Homework

Determine whether inductive reasoning or deductive reasoning is used in each situation. ~~Then determine whether the conclusion is correct and explain your reasoning.~~

7. Jason sees a line of 10 school buses and notices that each is yellow. He concludes that all school buses must be yellow.

   It is inductive reasoning because he has observed specific examples of a phenomenon—the color of school buses—and come up with a general rule based on those specific examples.

   ~~The conclusion is not necessarily true. It may be the case, for example, that all or most of the school buses in this school district are yellow, while another school district may have orange school buses.~~

8. Caitlyn has been told that every taxi in New York City is yellow. When she sees a red car in New York City, she concludes that it cannot be a taxi.

   Deductive. Her reasoning is based on a rule.

10. Jose is shown the first six numbers of a series of numbers: 7, 11, 15, 19, 23, 27. He concludes that the general rule for the series of numbers is $a_n = 4n + 3$.

    Inductive, he used specific examples to find a pattern.

11. Isabella sees 5 red fire trucks. She concludes that all fire trucks are red.

    Inductive, she used specific examples

12. Carlos is told that all garter snakes are not venomous. He sees a garter snake in his backyard and concludes that it is not venomous.

    Deductive, reasoning is based on a rule.

continued on next page

In each situation, identify whether each person is using inductive or deductive reasoning. Then compare and contrast the two types of reasoning.

13. When Madison babysat for the Johnsons for the first time, she was there 2 hours and was paid $30. The next time she was there for 5 hours and was paid $75. She decided that the Johnsons were paying her $15 per hour. The third time she went, she stayed for 4 hours. She tells her friend Jennifer that she makes $15 per hour babysitting. So, Jennifer predicted that Madison made $60 for her 4-hour babysitting job.

Madison used inductive reasoning to conclude that the Johnsons were paying her at a rate of $15 per hour. From that general rule, Jennifer used deductive reasoning to conclude that 4 hours of babysitting should result in a payment of $60. The inductive reasoning looks at evidence and creates a general rule from the evidence. By contrast, the deductive reasoning starts with a general rule and makes a prediction or deduction about what will happen in a particular instance.

14. When Holly was young, the only birds she ever saw were black crows. So, she told her little brother Walter that all birds are black. When Walter saw a bluebird for the first time, he was sure it had to be something other than a bird.

Holly used inductive reasoning b/c she used specific examples to draw her conclusion. But Walter used deductive reasoning because it was based on his sister's "rule"

15. Tamika is flipping a coin and recording the results. She records the following results: heads, tails, heads, tails, heads, tails, heads. She tells her friend Javon that the coin alternates between heads and tails for each toss. Javon tells her that the next time the coin is flipped, it will definitely be tails.

Tamika uses specific examples so she is using inductive reasoning but Javon is baseing his conclusion on her "rule" so his is deductive.

18. As a child, the only frogs Emily ever saw were green. Emily told Juan that all frogs are green. When Juan visited a zoo and saw a blue poison dart frog he concluded that it must be something other than a frog.

Emily based her conclusion on the specific examples of frogs she saw as a child. So she used inductive reasoning. Juan based his conclusion on Emily's "Rule" so he used deductive reasoning.

Geometry Unit 3 Day 1 HW

11. Use inductive reasoning to determine the next two terms in each sequence.

a. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots$ $\frac{1}{32}, \frac{1}{64}$

b. A, B, D, G, K, ... P, V

12. Write the first five terms of two different sequences that have 10 as the second term. Describe the pattern in each of your sequences.

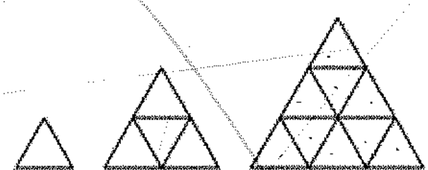
5, 10, 15, 20, 25 add 5
→ 5, 10, 20, 40, 80 multiply by 2

13. **Make sense of problems.** Generate a sequence using this description: The first term in the sequence is 4, and each other term is three more than twice the previous term.

→ 4, 11, 24, 51, ...

14. The diagram shows the first three figures in a pattern. Each figure is made of small triangles. How many small triangles will be in the sixth figure of the pattern? Support your answer.

36
b/c $6^2 = 36$



1 4 9

15. **Critique the reasoning of others.** The first two terms of a number pattern are 2 and 4. Alicia conjectures that the next term will be 6. Mario conjectures that the next term will be 8. Whose conjecture is reasonable? Explain. Both b/c it could be adding 2 or multiplying by 2.

2, 4, 6
2, 4, 8

15. Use expressions for even and odd integers to confirm the conjecture that the product of an even integer and an odd integer is an even integer.

$2m(2t+1) = 4mt + 2m$
$2(2mt + m)$
is divisible by 2 so it's even

19. Hairs found at a crime scene are consistent with those of a suspect. Based on this evidence, an investigator concludes that the suspect was at the crime scene. Is this an example of inductive or deductive reasoning? Explain.

observed data to make a conclusion
→ inductive

Yo this!

Geometry Unit 3 Day 2 Two Column Proofs

Students will use deductive reasoning and properties to write algebraic two column proofs.

The process of deductive reasoning, or deduction, must have a starting point. A conclusion based on deduction cannot be made unless there is an established assertion to work from. To provide a starting point for the process of deduction, a number of assertions are accepted as true without proof.

When you solve algebraic equations, you are using deduction. You can use properties to support your reasoning without having to prove that the properties are true.

Summary Properties of Equality

Addition Property	If $a = b$, then $a + c = b + c$.
Subtraction Property	If $a = b$, then $a - c = b - c$.
Multiplication Property	If $a = b$, then $a \cdot c = b \cdot c$.
Division Property	If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$.
Reflexive Property	$a = a$
Symmetric Property	If $a = b$, then $b = a$.
Transitive Property	If $a = b$ and $b = c$, then $a = c$.
Substitution Property	If $a = b$, then b can replace a in any expression.

Property The Distributive Property

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

Summary Properties of Congruence

Reflexive Property	$\overline{AB} \cong \overline{AB}$ $\angle A \cong \angle A$
Symmetric Property	If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$. If $\angle A \cong \angle B$, then $\angle B \cong \angle A$.
Transitive Property	If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$. If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$.

~~9~~ 8

change to no fraction.

4. Using one operation or property per step, show how to solve the equation $4x + 9 = 18 - \frac{1}{2}x$. Name each operation or property used to justify each step.

1. $4x+9=18-\frac{1}{2}x$ | 1. given
$+\frac{1}{2}x \qquad +\frac{1}{2}x$
2. $4.5x+9=18$ | 2. addition property of equality
$-9 \qquad -9$
3) $\frac{4.5x}{4.5}=\frac{9}{4.5}$ | 3. Subtraction property of equality
4. $x=2$ | 4.) division property of equality

You can organize the steps and the reasons used to justify the steps in two columns with statements (steps) on the left and reasons (properties) on the right. This format is called a ***two-column proof***.

Example A

Given: $3(x + 2) - 1 = 5x + 11$ **Prove:** $x = -3$

Statements	Reasons
1. $3(x+2)-1=5x+11$	**1.** Given equation
2. $3(x+2)=5x+12$	**2.** Addition Property of Equality
3. $3x+6=5x+12$	**3.** Distributive Property
4. $6=2x+12$	**4.** Subtraction Property of Equality
5. $-6=2x$	**5.** Subtraction Property of Equality
6. $-3=x$	**6.** Division Property of Equality
7. $x=-3$	**7.** Symmetric Property of Equality

Try These A

a. Supply the reasons to justify each statement in the proof below.

amend / easier to try

Given: $\frac{x-3}{2}=\frac{6+x}{5}$ **Prove:** $x = 9$

Statements	Reasons
1. $\frac{x-3}{2}=\frac{6+x}{5}$	**1.** given
2. $10\left(\frac{x-3}{2}\right)=10\left(\frac{6+x}{5}\right)$	**2.** multiplication property of equality
3. $5(x-3)=2(6+x)$	**3.**
4. $5x-15=12+2x$	**4.**
5. $3x-15=12$	**5.**
6. $3x=27$	**6.**
7. $x=9$	**7.**

b. Complete the *Prove* statement and write a two-column proof for the equation given in Item 4. Number each statement and corresponding reason.

Given: $4x + 9 = 18 - \frac{1}{2}x$

Prove:

we already did this.

7. Jeffrey wrote a two-column proof to solve the equation $3(x + 5) = -6x + 6$. In addition to an incorrectly written *Prove* statement, what error did Jeffrey make in his proof? Rewrite the proof so that it correctly shows how to solve the given equation.

Given: $3(x + 5) = -6x + 6$ **Prove:** ~~$x = -81$~~ $X = -1$

Statements	**Reasons**
1. $3(x + 5) = -6x + 6$	**1.** Given equation
2. $3x + 15 = -6x + 6$	**2.** Distributive Property
3. $9x + 15 = 6$	**3.** Addition Property of Equality
4. $9x = -9$	**4.** Subtraction Property of Equality
5. $x = -81$	**5.** Multiplication Property of Equality

Division property of equality

Correct

4. $9x = -9$

5. $X = -1$ 5. Division property of equality

make one for them to try!

11 10

Geometry Unit 3 Day 2 HW

1. Identify the property that justifies the statement:
   $5(x - 3) = 5x - 15$
   A. multiplication B. transitive
   C. subtraction D. distributive

Supply the missing reasons for each of the following:

11.
Given: $15y + 7 = 12 - 20y$
Conclusion: $y = \frac{1}{7}$

Statement	Reason
1. $15y + 7 = 12 - 20y$	1. given
2. $35y + 7 = 12$	2. addition PofE
3. $35y = 5$	3. Subtraction PofE
4. $y = \frac{1}{7}$	4. Division PofE

8. Identify the property that justifies the statement: If $4x - 3 = 7$, then $4x = 10$. addition PofE

9. Complete the prove statement and write a two-column proof for the equation: Fill this in!
   Given: $x - 2 = 3(x - 4)$ Prove: $x = 5$

statements	reasons
1.) $x-2=3(x-4)$	1.) given
2.) $x-2=3x-12$	2.) Distributive
3.) $-2=2x-12$	3.) Subtraction Pof
4.) $10=2x$	4.) Addition PofE
5.) $5=x$	5.) Division PofE
6.) $x=5$	6.) Symmetric PofE

11. Complete the prove statement and write a two-column proof for the equation:
    Given: $2n - 21 = \frac{n}{4}$ Prove:

statements	reasons
1.) $2n-21=\frac{n}{4}$	1.) given
2.) $8n-84=n$	2.) multiplication PofE
3.) $-84=-7n$	3.) subtraction PofE
4.) $12=n$	4.) Division PofE
5.) $n=12$	5.) Symmetric PofE

Continues

4. What are the missing reasons and statements in the two-column proof?

Given: $\frac{2x}{4} = \frac{5x+8}{2}$ **Prove:** $x = -2$

Statements	**Reasons**
1. ____a.____	**1.** Given equation
2. $2x = 2(5x + 8)$	**2.** ____b.____
3. ____c.____	**3.** Distributive Property
4. $0 = 8x + 16$	**4.** ____d.____
5. ____e.____	**5.** Subtraction Property of Equality
6. $-2 = x$	**6.** ____f.____
7. ____g.____	**7.** Symmetric Property

a.) $\frac{2x}{4} = \frac{5x+8}{2}$

b.) multiplication PofE

c.) $2x = 10x + 16$

d.) Subtraction PofE

e.) $-16 = 8x$

f.) Division PofE

g.) $x = -2$

For Items 5 and 6, complete the prove statement and write a two-column proof for the equation.

5. Given: $5(x - 2) = 2x - 4$ Prove:

6. Given: $\frac{4c - 6}{3} = 8$ Prove:

Remove from here and move to in class!

13 12

Geometry Unit 3 Day 3 More Two Column Proofs

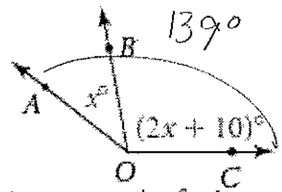
Learning Targets – Students will use algebraic and geometric concepts to write two column proofs.

1 EXAMPLE Justifying Steps in Solving an Equation

Algebra Solve for x and justify each step.

Given: $m\angle AOC = 139$

139°

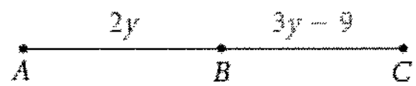


Statements	Reasons
1.) m∠AOC = 139	1.) given
2.) m∠AOB + m∠BOC = m∠AOC	2.) angle addition postulate
3.) x + 2x+10 = 139	3.) Substitution
4.) 3x + 10 = 139	4.) combine like terms
5.) 3x = 129	5.) subtraction PofE
6.) x = 43	6.) Division PofE

2 EXAMPLE Justifying Steps in Solving an Equation

Algebra Solve for y and justify each step.

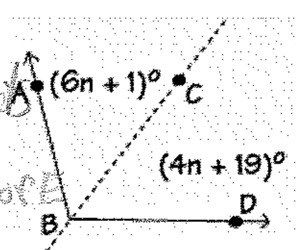
Given: $AC = 21$



Statements	Reasons
1.) AC = 21	1.) given
2.) AB + BC = AC	2.) segment addition postulate
3.) 2y + 3y − 9 = 21	3.) Substitution
4.) 5y − 9 = 21	4.) combine like terms
5.) 5y = 30	5.) addition P.o.E
6.) y = 6	6.) Division PofE

30. Algebra Point C is on the crease when you fold $\overrightarrow{BD}$ onto $\overrightarrow{BA}$. Give the reason that justifies each step. (*Hint:* See page 102, Exercises 4 and 5.) **See left.**

$\overrightarrow{BC}$ bisects $\angle ABD$.	a. ? given
$m\angle ABC = m\angle CBD$	b. ? Definition of bisect
$6n + 1 = 4n + 19$	c. ? Substitution
$2n = 18$	d. ? Subtraction PofE
$n = 9$	e. ? Division PofE



Relationships

Sample: The relationship "is younger than" is transitive. If Sue is younger than Fred and Fred is younger than Alana, then Sue is younger than Alana. The relationship "is younger than" is not reflexive because Sue is not younger than herself. It is also not symmetric because if Sue is younger than Fred, Fred is not younger than Sue.

State whether each relationship is reflexive, symmetric, transitive, or none of these.

1.) Is taller than transitive
2.) Is equal to reflexive, symmetric and transitive
3.) Is congruent to reflexive, symmetric, transitive
4.) Lives in a different state than. symmetric
5.) Is the same height as. reflexive, symmetric and transitive

Geometry Unit 3 Day 3 HW

Identify the property demonstrated in each example.

1. $m\angle ABC = m\angle XYZ$
   $m\angle ABC - m\angle RST = m\angle XYZ - m\angle RST$
   Subtraction Property of Equality

2. $m\overline{QT} = m\overline{TU}$
   $m\overline{QT} + m\overline{WX} = m\overline{TU} + m\overline{WX}$
   addition P of E

3. $\angle JKL \cong \angle JKL$
   reflexive

4. $GH = MN$ and $MN = OP$, so $GH = OP$
   transitive

5. $m\overline{XY} = 4$ cm and $m\overline{BC} = 4$ cm, so $m\overline{XY} = m\overline{BC}$
   substitution or transitive

6. $\overline{PR} \cong \overline{PR}$
   reflexive

7. $GH = JK$
   $GH - RS = JK - RS$
   subtraction P of E

8. $m\angle 1 = 134°$ and $m\angle 2 = 134°$, so $m\angle 1 = m\angle 2$
   substitution or transitive

9. $m\angle ABC = m\angle DEF$
   $m\angle ABC + m\angle QRS = m\angle DEF + m\angle QRS$
   addition P of E

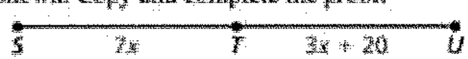
10. $GH = GH$
    reflexive

11. $ED = 3$ in. and $PQ = 3$ in., so $ED = PQ$
    substitution or transitive

12. $\angle EFG \cong \angle LMN$ and $\angle LMN \cong \angle SPT$, so $\angle EFG \cong \angle SPT$
    transitive

1. Six steps of a two-column proof are shown. Copy and complete the proof.

Given T is the midpoint of $\overline{SU}$.



Prove $x = 5$

STATEMENTS	REASONS
1. T is the midpoint of $\overline{SU}$.	1. given
2. $\overline{ST} \cong \overline{TU}$	2. Definition of midpoint
3. $ST = TU$	3. Definition of congruent segments
4. $7x = 3x + 20$	4. Substitution
5. $4x = 20$	5. Subtraction Property of Equality
6. $x = 5$	6. Division P of E

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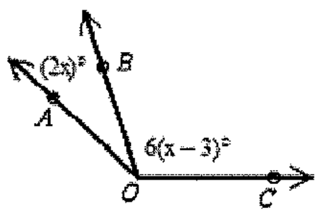
Fill in each missing reason.

3. **Given:** $m\angle AOC = 150$



Drawing not to scale

$m\angle AOB + m\angle BOC = m\angle AOC$	a. angle addition postulate
$2x + 6(x - 3) = 150$	b. substitution
$2x + 6x - 18 = 150$	c. Distributive
$8x - 18 = 150$	d. Combine like terms
$8x = 168$	e. addition Prop.
$x = 21$	f. Division Prop.

Geometry Unit 3 Day 5 Conditional Statements and counterexamples

Learning Target – Students will identify the hypothesis and conclusion of a conditional statement and give a counterexample for a false conditional statement.

Rules of logical reasoning involve using a set of given statements along with a valid argument to reach a conclusion. Statements to be proved are often written in if-then form. An if-then statement is called a ***conditional statement***. In such statements, the *if* clause is the ***hypothesis***, and the *then* clause is the ***conclusion***.

Example A

Conditional statement: If $3(x + 2) - 1 = 5x + 11$, then $x = -3$.	
Hypothesis	**Conclusion**
$3(x + 2) - 1 = 5x + 11$	$x = -3$

Try These A

Use the conditional statement: If $x + 7 = 10$, then $x = 3$.

a. What is the hypothesis?

$x+7 = 10$

b. What is the conclusion?

$x = 3$

c. State the property of equality that justifies the conclusion of the statement.

Subtraction P of E

Conditional statements may not always be written in if-then form. You can restate such conditional statements in if-then form.

READING MATH

Forms of conditional statements include:

- If *p*, then *q*.
- *p* only if *q*
- *p* implies *q*.
- *q* if *p*

1. Make use of structure. Restate each conditional statement in if-then form.

a. I'll go if you go.

If you go, then I'll go

b. There is smoke only if there is fire.

If there is fire, then there is smoke

c. $x = 4$ implies $x^2 = 16$.

If $x=4$ then $x^2=16$

An if-then statement is false if an example can be found for which the hypothesis is true and the conclusion is false. This type of example is a ***counterexample***.

2. This is a false conditional statement.

If two numbers are odd, then their sum is odd.

a. Identify the hypothesis of the statement.

two #'s are odd

b. Identify the conclusion of the statement.

their sum is odd

c. Give a counterexample for the conditional statement and justify your choice for this example.

$3+5=8$

3 and 5 are odd #'s but their sum of 8 is even

4. Give an example of a true conditional statement that includes this hypothesis: An angle is named $\angle ABC$. If an angle is named ∡ABC, then B is the vertex.

5. Give an example of a true conditional statement that includes this conclusion: The angles share a vertex. If ∡s are vertical ∡s, then the ∡s share a vertex

6. Cesar conjectures that the quotient of any two even numbers greater than 0 is odd.

a. Write Cesar's conjecture as a conditional statement. If 2 even #'s are > 0, then their quotient is odd

b. Give a counterexample to show that Cesar's conjecture is false.

counter example

$\frac{8}{4}=2$

8 and 4 are even #'s greater than 0 and their quotient is 2 which is even

7. Write the definition of *collinear points* as a conditional statement.

If 3 or more points lie on the same line, then they are collinear.

Geometry Unit 3 Day 5 Homework

8. Write the statement in if-then form:

Two angles have measures that add up to 90° only if they are complements of each other. If 2 ∠'s are complements of each other then their measures add to 90°.

9. Which of the following is a counterexample of this statement?

If an angle is acute, then it measures 80°.

A. a 100° angle **B.** a 90° angle
C. an 80° angle **D.** a 70° angle

10. Identify the hypothesis and the conclusion of the statement:

If it is not raining, then I will go to the park.
hypothesis conclusion

11. Critique the reasoning of others. Joanna says that $4 + 7 = 11$ is a counterexample that shows that the following conditional statement is false. Is Joanna correct? Explain.

If two integers are even, then their sum is even.
No 7 is not an even integer, so the hypothesis is not true

12. Construct viable arguments. Why do you only need a single counterexample to show that a conditional statement is false?
Because for it to be true it needs to be true all the time, so if you show it's false one time it shows it's not true all the time.

For Items 8–10, write each statement in if-then form.

8. Dianna will go to the movie if she finishes her homework. If she finishes her homework then Dianna will go to the movie

9. $m\angle G = 40°$ implies $\angle G$ is acute. If m∠G=40 then ∠G is acute

10. A figure is a triangle only if it is a polygon with three sides. If it is a polygon with 3 sides, a figure is a Δ.

11. State the hypothesis and the conclusion of this conditional statement.
hypothesis
If the temperature drops below 65°F, then the swimming pool closes.
conclusion

12. Given the false conditional statement, "If a vehicle is built to fly, then it is an airplane," write a counterexample. a helicopter.

13. Dustin says that $8 \cdot -1 = 8$ is a counterexample that shows that the following conditional statement is false. Is Dustin correct? Explain.

If two integers are multiplied, then the product is greater than both integers. Yes, 8 & -1 are integers being multiplied be their product 8 is not greater than both.

15. a. Write a true conditional statement that includes this hypothesis: $-3x + 10 = -5$.

b. Write a two-column proof to prove that your conditional statement is true.

a.) If $-3x+10=-5$ then $x=5$

b.

1.) $-3x+10=-5$	1) given
2.) $-3x=-15$	2.) subtraction POE
3.) $x=5$	3.) division POE

Geometry Unit 3 Day 6 Converse, Inverse, and contrapositive

Learning Target – Students will write the converse, inverse and contrapositive of a conditional statement. Students will write and interpret biconditional statements.

Every conditional statement has three related conditionals. These are the ***converse***, the ***inverse***, and the ***contrapositive*** of the conditional statement. The converse of a conditional is formed by ***interchanging*** the hypothesis and conclusion of the statement. The inverse is formed by ***negating*** both the hypothesis and the conclusion. Finally, the contrapositive is formed by interchanging *and* negating both the hypothesis and the conclusion.

Conditional:	If p, then q.
Converse:	If q, then p.
Inverse:	If not p, then not q.
Contrapositive:	If not q, then not p.

1. Given the conditional statement:

If a figure is a triangle, then it is a polygon.

Complete the table.

 Stillian 19

Mare

Form of the statement	Write the statement	True or False?	If the statement is false, give a counterexample.
Conditional statement	If a figure is a triangle, then it is a polygon.	T	
Converse of the conditional statement	If it is a polygon, then it is a △.	F	Square
Inverse of the conditional statement	If it is not a △, then it is not a polygon	F	Square
Contrapositive of the conditional statement	If it is not a polygon, then it is not a △.	T	

If a given conditional statement is true, the converse and inverse are not necessarily true. However, the contrapositive of a true conditional is always true, and the contrapositive of a false conditional is always false. Likewise, the converse and inverse of a conditional are either both true or both false. Statements with the same ***truth values*** are *logically equivalent.*

ACADEMIC VOCABULARY

When you ***interchange*** a hypothesis and a conclusion, you switch them. When you ***negate*** a hypothesis or a conclusion, you rewrite it by adding the word *not*. Note that if a hypothesis or a conclusion already includes the word *not*, you can negate it by removing *not*.

MATH TERMS

The **truth value** of a statement is the truth or falsity of that statement.

When a statement and its converse are both true, they can be combined into one statement using the words "if and only if." An "if and only if" statement is a ***biconditional statement***. All definitions you have learned can be written as biconditional statements.

4. Write the definition of perpendicular lines in biconditional form.

Two lines are ⊥ if and only if they intersect at 90°'s

5. Consider the statement: *Numbers that do not end in 2 are not even.*

a. Rewrite the statement in if-then form and state whether it is true or false.

If a number does not end in 2, then it is not even. F

b. Write the converse and state whether it is true or false. If false, give a counterexample.

If a number is not even, then it does not end in 2. T

c. Write the inverse and state whether it is true or false.

If a # ends in 2, then is it even. T

d. Write the contrapositive and state whether it is true or false. If false, give a counterexample.

If a # is even then it ends in 2. F counter ex 24.

e. Can you write a biconditional statement for the original statement? Why or why not?

No. Not all 4 are true.

Change?

8. Make use of structure. Are these two statements logically equivalent? Explain.

If a polygon is a square, then it is a quadrilateral. T

If a polygon is a quadrilateral, then it is a square. F

No a polygon can be a quadrilateral without being a square.

9. Critique the reasoning of others. Toby says that the converse of the following statement is true. Is Toby's reasoning correct? Explain.

If a number is divisible by 6, then it is divisible by 2.

If a # is divisible by 2 then it is divisible by 6 is not true. 4 is divisible by 2 but not 6.

10. Consider this statement.

All birds have wings.

a. Write the statement as a conditional statement. If it is a bird then it has wings.

b. Can you write the statement as a biconditional statement? Explain.

No, Not everything with wings is a bird.

MATH TIP

Given the biconditional statement "*p* if and only if *q*," then the following conditional statements are true.

- If *p*, then *q*.
- If *q*, then *p*.
- If not *p*, then not *q*.
- If not *q*, then not *p*.

~~23~~ 21

Geometry Unit 3 Day 6 HW

Use the following statement for Items 11–13.

If a vehicle has four wheels, then it is a car.

11. Write the converse. If it is a car, then it has 4 wheels

12. Write the inverse. If is does not have 4 wheels, then it is not a car.

13. Write the contrapositive. If it is not a car, then it does not have 4 wheels.

14. Write the definition of the vertex of an angle as a biconditional statement. If it is the vertex of an angle, then it is the point where the 2 sides meet.

~~**15.** Give an example of a true statement that has a false converse.~~

remove

Use this statement for Items 16–19.

If today is Thursday, then tomorrow is Friday.

16. Write the converse of the statement. If tomorrow is Friday then today is Thursday.

17. Write the inverse of the statement.

If today is not Thursday, then tomorrow is not Friday

18. Write the contrapositive of the statement.

If tomorrow is not Friday, then today is not Thursday.

19. Can the conditional statement be written as a biconditional statement? If so, write the biconditional statement. If not, explain why not.

Yes Today is thursday if and only if tomorrow is Friday.

For Items 23–26, tell whether each statement is true or false. If it is false, give a counterexample.

23. If a number is a multiple of 8, then it is a multiple of 4. T

24. the converse of the statement in Item 23 F, 20.

25. the inverse of the statement in Item 23 F, 20.

26. the contrapositive of the statement in Item 23 T

27. The following statement is the contrapositive of a conditional statement. What is the original conditional statement?

If a parallelogram does not have four right angles, then it is not a rectangle.

If it is a rectangle, then the parallelogram has 4 right ∠s.

Use this statement for Items 29–32.

If the sum of the measures of two angles is 90°, then the angles are complementary.

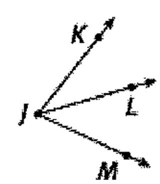
29. Write the inverse of the converse of the statement.

30. What is another name for the inverse of the converse?

31. Write the contrapositive of the inverse of the statement.

32. What is another name for the contrapositive of the inverse?

33. Write a clear definition of the term *adjacent angles*. Then use your definition to explain why $\angle KJL$ and $\angle LJM$ are adjacent angles but $\angle KJL$ and $\angle KJM$ are not adjacent angles.



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Geometry Unit 3 Day 8 Proofs about Segments and Angles

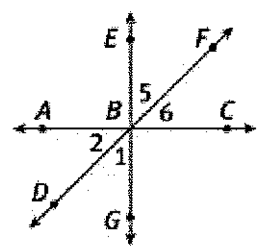
Learning Target – Students will write two column geometric proofs about segments and angles.

A proof is an argument, a justification, or a reason that something is true. A proof is an answer to the question "why?" when the person asking wants an argument that is indisputable.

There are three basic requirements for constructing a good proof.

- Awareness and knowledge of the definitions of the terms related to what you are trying to prove.
- Knowledge and understanding of postulates and previous proven theorems related to what you are trying to prove.
- Knowledge of the basic rules of logic.

To write a proof, you must be able to justify statements. The statements in Example A are based on the diagram to the right in which lines *AC*, *EG*, and *DF* all intersect at point *B*. Each of the statements is justified using a property, postulate, or definition.



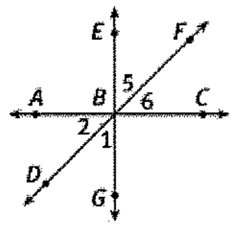
Example A

Name the property, postulate, or definition that justifies each statement.

Statement	Justification
a. If $\angle ABE$ is a right angle, then $m\angle ABE = 90°$.	Definition of right angle
b. If $\angle 2 \cong \angle 1$ and $\angle 1 \cong \angle 5$, then $\angle 2 \cong \angle 5$.	Transitive Property
c. Given: B is the midpoint of $\overline{AC}$. Prove: $\overline{AB} \cong \overline{BC}$	Definition of midpoint
d. $m\angle 2 + m\angle ABE = m\angle DBE$	Angle Addition Postulate
e. If $\angle 1$ is supplementary to $\angle FBG$, then $m\angle 1 + m\angle FBG = 180°$.	Definition of supplementary angles

Try These A

Using the diagram from the previous page, reproduced here, name the property, postulate, or definition that justifies each statement.



Statement	Justification
a. $EB + BG = EG$	Segment addition postulate
b. If $\angle 5 \cong \angle 6$, then $\overrightarrow{BF}$ bisects $\angle EBC$.	Definition of bisects
c. If $m\angle 1 + m\angle 6 = 90°$, then $\angle 1$ is complementary to $\angle 6$.	Definition of complementary
d. If $m\angle 1 + m\angle 5 = m\angle 6 + m\angle 5$, then $m\angle 1 = m\angle 6$.	transitive Property
e. Given: $\overleftrightarrow{AC} \perp \overleftrightarrow{EG}$ Prove: $\angle ABG$ is a right angle.	Definition of perpendicular

Earlier, you wrote two-column proofs to solve algebraic equations. You justified each statement in these proofs by using an algebraic property. Now you will use two-column proofs to prove geometric theorems. You must justify each statement by using a definition, a postulate, a property, or a previously proven theorem.

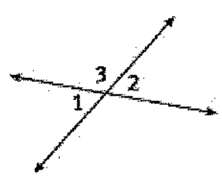
Recall that *vertical angles* are opposite angles formed by a pair of intersecting lines. In the figure below, $\angle 1$ and $\angle 2$ are vertical angles. The following example illustrates how to prove that vertical angles are congruent.

Example A

Theorem: Vertical angles are congruent.

Given: $\angle 1$ and $\angle 2$ are vertical angles.

Prove: $\angle 1 \cong \angle 2$



Statements	Reasons
1. $m\angle 1 + m\angle 3 = 180°$	**1.** Definition of supplementary angles
2. $m\angle 2 + m\angle 3 = 180°$	**2.** Definition of supplementary angles
3. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$	**3.** Substitution Property
4. $m\angle 1 = m\angle 2$	**4.** Subtraction Property of Equality
5. $\angle 1 \cong \angle 2$	**5.** Definition of congruent angles

Guided Example B

Supply the missing statements and reasons.

Theorem: All right angles are congruent.

Given: $\angle A$ and $\angle B$ are right angles.

Prove: $\angle A \cong \angle B$

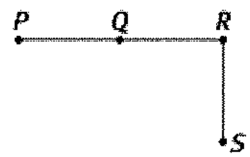
Statements	Reasons
1. $\angle A$ & $\angle B$ are right $\angle$s	1. Given
2. $m\angle A = 90°$; $m\angle B = 90°$	2. Definition of right $\angle$
3. $m\angle A =$ $m\angle B$	3. Substitution Property
4. $\angle A \cong \angle B$	4. Definition of $\cong$

Try These A-B

a. Complete the proof.

Given: Q is the midpoint of $\overline{PR}$.
$\overline{QR} \cong \overline{RS}$

Prove: $\overline{PQ} \cong \overline{RS}$

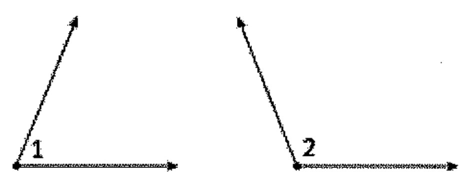


Statements	Reasons
1. Q is the midpoint of $\overline{PR}$.	1. Given
2. $\overline{PQ} \cong \overline{QR}$	2. Definition of midpoint
3. $\overline{QR} \cong \overline{RS}$	3. Given
4. $\overline{PQ} \cong \overline{RS}$	4. transitive

b. Complete the proof.

Given: $\angle 1$ and $\angle 2$ are supplementary.
$m\angle 1 = 68°$

Prove: $m\angle 2 = 112°$

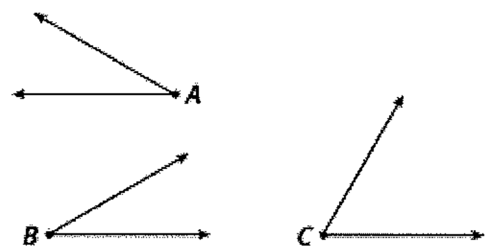


Statements	Reasons
1. $\angle 1$ & $\angle 2$ are supp.	1. Given
2. $m\angle 1 + m\angle 2 = 180°$	2. Definition of supplementary angles
3. $m\angle 1 = 68°$	3. Given
4. $68 + m\angle 2 = 180°$	4. Substitution Property
5. $m\angle 2 = 112°$	5. Subtraction Property of Equality

Example C

Arrange the statements and reasons below in a logical order to complete the proof.

Theorem: If two angles are complementary to the same angle, then the two angles are congruent.



Given: $\angle A$ and $\angle B$ are each complementary to $\angle C$.

Prove: $\angle A \cong \angle B$

The theorem stated in Example C is called the Congruent Complements Theorem.

3.)	$m\angle A + m\angle C = m\angle B + m\angle C$	Transitive Property
1.)	$\angle A$ and $\angle B$ are each complementary to $\angle C$.	Given
5.)	$\angle A \cong \angle B$	Definition of congruent segments
4.)	$m\angle A = m\angle B$	Subtraction Property of Equality
2.)	$m\angle A + m\angle C = 90°$; $m\angle B + m\angle C = 90°$	Definition of complementary angles

Try These C

a. Attend to precision. Arrange the statements and reasons below in a logical order to complete the proof.

Given: $\angle 1$ and $\angle 2$ are vertical angles; $\angle 1 \cong \angle 3$.

Prove: $\angle 2 \cong \angle 3$

3.)	$\angle 1 \cong \angle 2$	Vertical angles are congruent.
4.)	$\angle 2 \cong \angle 3$	Transitive Property
2.)	$\angle 1 \cong \angle 3$	Given
1.)	$\angle 1$ and $\angle 2$ are vertical angles.	Given

b. Write a two-column proof of the following theorem.

Theorem: If two angles are supplementary to the same angle, then the two angles are congruent.

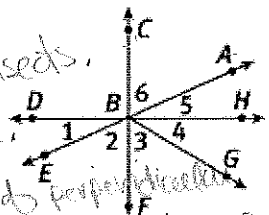
Given: $\angle R$ and $\angle S$ are each supplementary to $\angle T$.

Prove: $\angle R \cong \angle S$

Statements	reasons.
1.) $\angle R$ + $\angle S$ are each supplementary to T.	1.) given
2.) $m\angle R + m\angle T = 180$	2.) def of supp.
3.) $m\angle S + m\angle T = 180$	3.) def of supp.
4.) $m\angle R + m\angle T = m\angle S + m\angle T$	4.) transitive
5.) $m\angle R = m\angle S$	5.) Subtraction Prop.
6.) $\angle R \cong \angle S$	6.) def. of congruent.

Geometry Unit 3 Day 8 Homework

Lines CF, DH, and EA intersect at point B. Use this figure for Items 4–8. Write the definition, postulate, or property that justifies each statement.

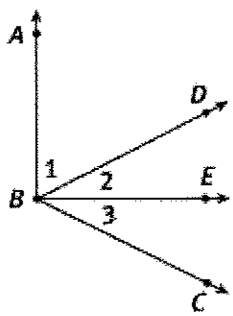


4. If $\angle 2$ is supplementary to $\angle CBE$, then $m\angle 2 + m\angle CBE = 180°$. def of supp.
5. If $\angle 2 \cong \angle 3$, then $\overrightarrow{BF}$ bisects $\angle GBE$. def of bisects.
6. $CB + BF = CF$ segment addition postulate.
7. If $\angle DBF$ is a right angle, then $\overleftrightarrow{HD} \perp \overleftrightarrow{CF}$. Def. of perpendicular
8. If $m\angle 3 = m\angle 6$, then $m\angle 3 + m\angle 2 = m\angle 6 + m\angle 2$. addition P of E.
9. **Reason abstractly.** Write a statement related to the figure above that can be justified by the Angle Addition Postulate. $\angle ABH + \angle GBH = \angle ABG$

4. Supply the missing statements and reasons.

Given: $\angle 1$ is complementary to $\angle 2$; $\overrightarrow{BE}$ bisects $\angle DBC$.

Prove: $\angle 1$ is complementary to $\angle 3$.



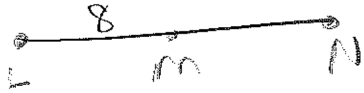
Statements	Reasons
1. $\overrightarrow{BE}$ bisects $\angle DBC$	1. given
2. $\angle 2 \cong \angle 3$	2. Definition of bisect(s)
3. $m\angle 2 = m\angle 3$	3. Definition of congruent angles
4. $\angle 1$ is complementary to $\angle 2$.	4. given
5. $\angle 1 + m\angle 2 =$ 90°	5. def. of complementary
6. $m\angle 1 + m\angle 3 = 90°$	6. Substitution.
7. $\angle 1$ is complementary to $\angle 3$	7. Definition of complementary angles

Continued

Construct viable arguments. Write a two-column proof for each of the following.

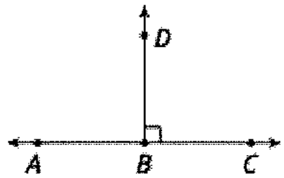
5. **Given:** M is the midpoint of $\overline{LN}$; $LM = 8$.

Prove: $LN = 16$



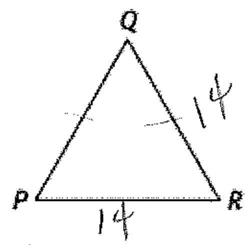
6. **Given:** $\overrightarrow{BD}$ bisects $\angle ABC$; $m\angle DBC = 90°$.

Prove: $\angle ABC$ is a straight angle.



7. **Given:** $\overline{PQ} \cong \overline{QR}$, $QR = 14$, $PR = 14$

Prove: $\overline{PQ} \cong \overline{PR}$



8. **Reason abstractly.** What type of triangle is shown in Item 7? Explain how you know.

7.)

statements	reasons
1.) $\overline{PQ} \cong \overline{QR}$	1.) given
2.) $QR = 14$	2.) given
3.) $PR = 14$	3.) given
4.) $\overline{QR} = \overline{PR}$	4.) substitution
6.) $\overline{PQ} \cong \overline{PR}$	6.) transitive

8.) equilateral → 3 sides are ≅.

5.)

Statements	reasons
1.) M is the midpoint of LN	1.) given
2.) $LM = 8$	2.) $LM = 8$
3.) $\overline{LM} = \overline{MN}$	3.) Def of midpoint.
4.) $8 = \overline{MN}$	4.) substitution.
5.) $LM + MN = LN$	5.) segment addition postulate.
6.) $8 + 8 = LN$	6.) substitution
7.) $16 = LN$	7.) combine like terms
8.) $LN = 16$	8.) symmetric

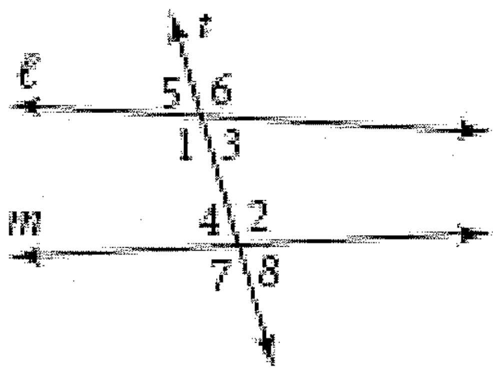
6.)

statements	reasons
1.) $\overrightarrow{BD}$ bisects $\angle ABC$	1.) given
2.) $m\angle DBC = 90°$	2.) given
3.) $\angle ABD = \angle DBC$	3.) def. of bisects
4.) $\angle ABD = 90°$	4.) substitution.
5.) $\angle ABD + \angle DBC = \angle ABC$	5.) ∠ addition postulate
6.) $90 + 90 = \angle ABC$	6.) substitution
7.) $180 = \angle ABC$	7.) combine like terms
8.) $\angle ABC$ is a straight ∠	8.) Def. of straight ∠.

Geometry Unit 3 day 11 and 12 Parallel Lines and Transversals

Learning Target – Students will identify angle pairs formed by parallel lines and transversals and use their relationship to find angle measures.

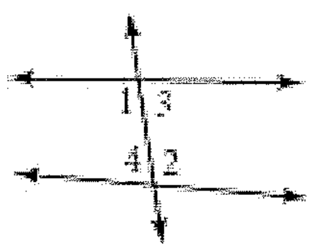
A transversal is a line that intersects two coplanar lines at two distinct points. Pairs of the 8 angles formed have special names suggested by their positions.

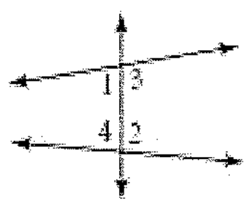


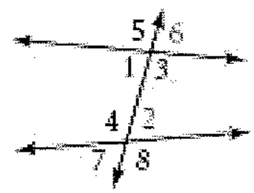
∠1 and ∠2 are **alternate interior angles.**

∠1 and ∠4 are **same-side interior angles.**

∠1 and ∠7 are **corresponding angles.**



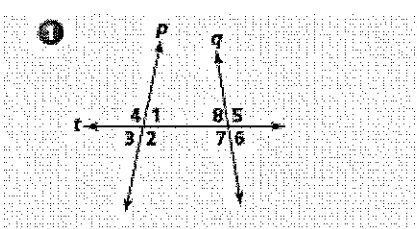




1. Name another pair of each type of angle shown in the diagram.

alt. int ∡3 & ∡4
Same side int ∡3 & ∡2
corresponding ∡5 & ∡4

2.



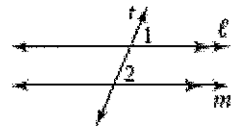
Use the diagram above. Identify which angle forms a pair of same-side interior angles with ∠1. → ∡8

Identify which angle forms a pair of corresponding angles with ∠1. → ∡5

Postulate 3-1 **Corresponding Angles Postulate**

If a transversal intersects two parallel lines, then corresponding angles are congruent.

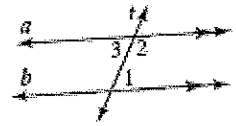
$\angle 1 \cong \angle 2$



Theorem 3-1 **Alternate Interior Angles Theorem**

If a transversal intersects two parallel lines, then alternate interior angles are congruent.

$\angle 1 \cong \angle 3$



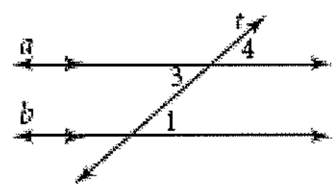
Theorem 3-2 **Same-Side Interior Angles Theorem**

If a transversal intersects two parallel lines, then same-side interior angles are supplementary.

$m\angle 1 + m\angle 2 = 180$

Proof of Theorem 3-1

If a transversal intersects two parallel lines, then alternate interior angles are congruent.



Given: $a \parallel b$

Prove: $\angle 1 \cong \angle 3$

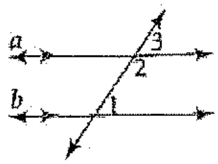
Statements	Reasons
1.) $a \parallel b$	1.) given
2.) $\angle 3 \cong \angle 4$	2.) vertical ∠s thm.
3.) $\angle 1 \cong \angle 4$	3.) corresponding ∠s postulate
4.) $\angle 1 \cong \angle 3$	4.) substitution.

29. Prove Theorem 3-2.

If a transversal intersects two parallel lines, then same-side interior angles are supplementary.

Given: $a \parallel b$

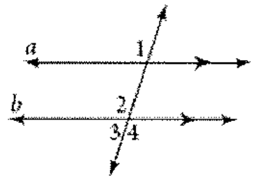
Prove: $\angle 1$ and $\angle 2$ are supplementary.



statements	reasons
1.) a∥b	1.) given
2.) ∡1 = ∡3	2.) corresponding ∡'s postulate.
3.) ∡2+∡3=180°	3.) def. of straight ∡
4.) ∡2+∡1=180°	4.) substitution
5.) ∡1 & ∡2 are supplementary	5.) def. of supp.

3 EXAMPLE Writing a Two-Column Proof

Study what is given, what you are to prove, and the diagram. Then write a two-column proof.

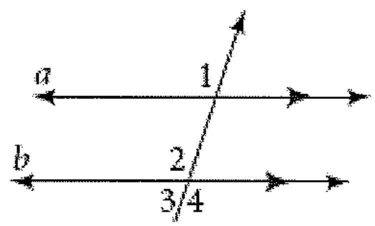


Given: $a \parallel b$

Prove: $\angle 1 \cong \angle 4$

Statements	Reasons
1.) a∥b	1.) given
2.) ∡1≅∡2	2.) corresponding ∡s postulate
3.) ∡2≅∡4	3.) vertical ∡s theorem.
4.) ∡1≅∡4	4.) substitution.

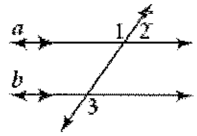
- 1 and 4 are alternate exterior angles.
- 1 and 3 are same side exterior angles.



Theorem 3-3 **Alternate Exterior Angles Theorem**

If a transversal intersects two parallel lines, then alternate exterior angles are congruent.

$\angle 1 \cong \angle 3$

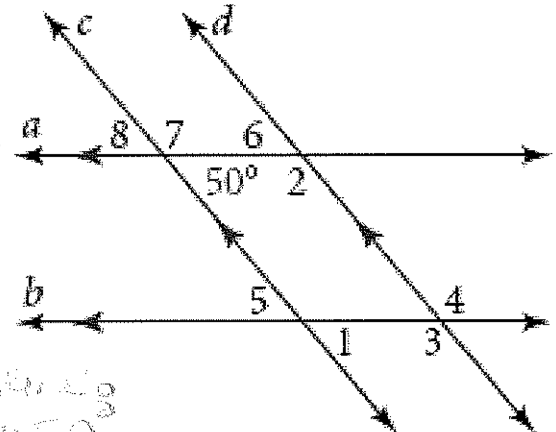


Theorem 3-4 **Same-Side Exterior Angles Theorem**

If a transversal intersects two parallel lines, then same-side exterior angles are supplementary.

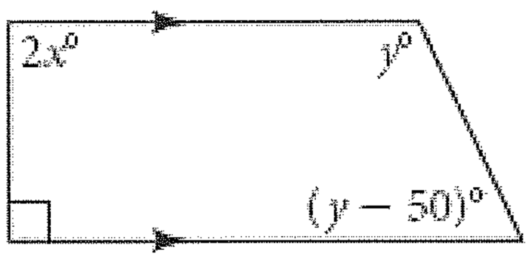
$m\angle 2 + m\angle 3 = 180$

3. Find the measure of each angle in the diagram. Name the theorem or postulate that justifies your answer and the angle it pairs with.



$m\angle 1 = 50^\circ$ corresponding with 50°
$m\angle 2 = 130^\circ$ same side int with 50°
$m\angle 3 = 130^\circ$ same side int w/ $\angle 1$
$m\angle 4 = 130^\circ$ vertical with $\angle 3$
$m\angle 5 = 50^\circ$ vertical with $\angle 1$
$m\angle 6 = 50$ alt int w/ 50°
$m\angle 7 = 130^\circ$ same side int with 50°
$m\angle 8 = 50^\circ$ vertical with 50°

4. Find the values of x and y. Find the measure of each angle.



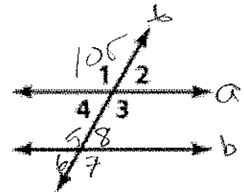
$y + y - 50 = 180^\circ$ → same side int
$2y - 50 = 180$
$2y = 230^\circ$
$y = 115^\circ$

$2x + y = 180$ same side int
$2x + 115 = 180$
$2x = 65$
$x = 32.5^\circ$

Geometry Unit 3 Day 11 and 12 Homework

TASK 1

a. Finish labeling the figure, given the following: lines *a* and *b* are cut by transversal *t*: ∠3 and ∠8 are same-side interior angles; ∠4 and ∠6 are corresponding angles, as are ∠7 and ∠3; and ∠5 and ∠3 are alternate interior angles.

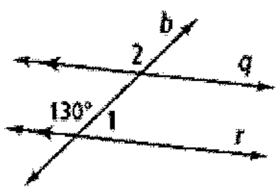


b. Name three different conditions, each involving ∠8 and another angle, any one of which is sufficient to guarantee that *a* ∥ *b*. m∠8 + m∠3 = 180 same side int
∠8 ≅ ∠4 alt int
∠8 ≅ ∠2 corresponding

c. If *a* ∥ *b* and m∠1 = 105, give the measure of the other seven angles.
m∠2 = 75° = m∠8 = m∠6 = m∠4, m∠1 = 105° = m∠3, m∠5, m∠7

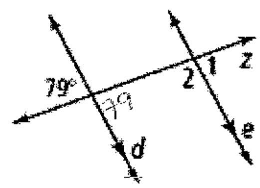
Find m∠1 and m∠2. Justify each answer.

5.



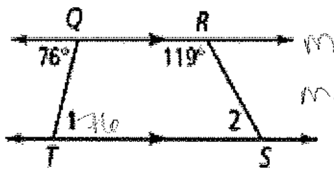
m∠1 = 52° linear pair
m∠2 = 130° corresponding

6.



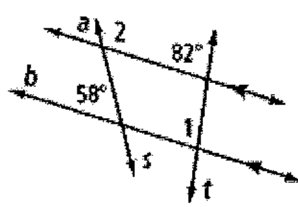
m∠2 = 101° same side int
m∠1 = 79° alt ext.

7.



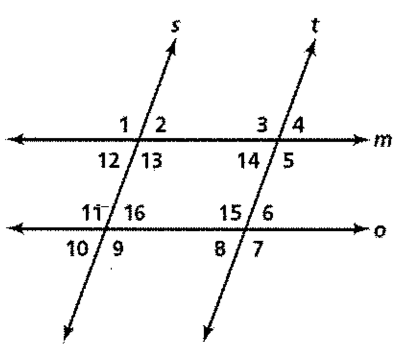
m∠1 = 76° alt int
m∠2 = 101° same side int

8.



m∠1 = 82° corresponding
m∠2 = 122°

True or False?



4. ∠13 and ∠9 are same-side interior angles. F

5. ∠2 and ∠14 are alternate interior angles. T

6. ∠13 and ∠7 are corresponding angles. F

7. If ∠12 ≅ ∠16, then *m* ∥ *o*. T

8. If ∠11 and ∠6 are supplementary, then *s* ∥ *t*. T

Geometry Unit 3 Day 13 Converses

Learning Target – students will use the converses of postulates and theorems about angle pairs and transversals to prove lines are parallel.

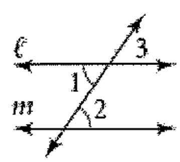
1. Write down the converse of each of the following:
   - The corresponding angles postulate — If corresponding ∠'s are ≅, then the transversal crosses a pair of ∥ lines
   - Alternate Interior Angles Theorem — If alt. int. ∠'s are ≅, then the transversal crosses a pair of ∥ lines
   - Same Side interior angles theorem — If same side interior ∠'s are supplementary, then a transversal crosses a pair of ∥ lines
2. How is the converse different from the original? proves lines are ∥, instead of gives lines are ∥.
3. How could it be used? to prove lines are ∥.

Proof of Theorem 3-5

If two lines and a transversal form alternate interior angles that are congruent, then the two lines are parallel.

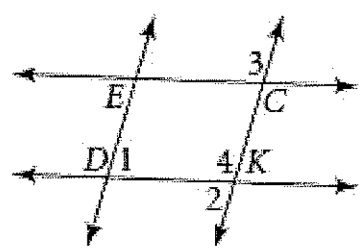
Given: $\angle 1 \cong \angle 2$

Prove: $\ell \parallel m$



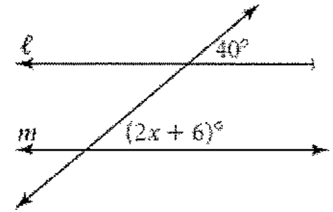
Statement	reasons
1.) $\angle 1 \cong \angle 2$	1.) given
2.) $\angle 1 \cong \angle 3$	2.) vertical ∠s thm.
3.) $\angle 2 \cong \angle 3$	3.) Substitution
4.) $\ell \parallel m$	4.) Converse of corresponding ∠'s postulate

4. Which lines, if any, must be parallel if $\angle 1 \cong \angle 2$? Justify your answer with a theorem or postulate.



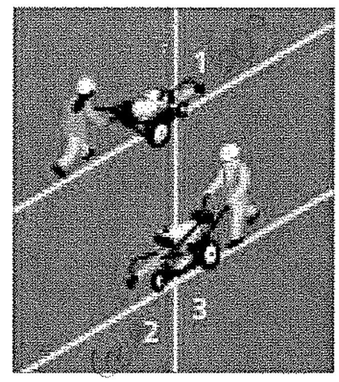
$\overline{DE} \parallel \overline{KC}$ by converse of alt. int. ∠s thm.

5. **Algebra** Find the value of x for which $\ell \parallel m$.



$2x + 6 = 40$
$2x = 34$
$x = 17°$

6. **Parking** Two workers are painting lines for angled parking spaces. The first worker paints a line so that $m\angle 1 = 60°$. The second worker paints a line so that $m\angle 2 = 60°$. Explain why their lines are parallel.



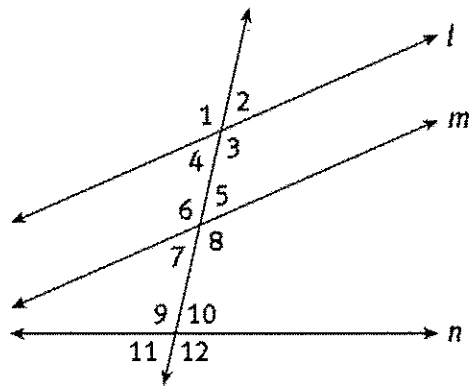
Converse of the alt int ∠s theorem

~~37~~ 35

Geometry Unit 3 Day 13 HW

Parallel Lines and Transversals

Given $l \| m$



1) $\angle 4 \cong \angle 7$ True or False

2) $\angle 3 = 2x + 2$ and $\angle 5 = 5x - 10$.

   Find x and $m\angle 5$.

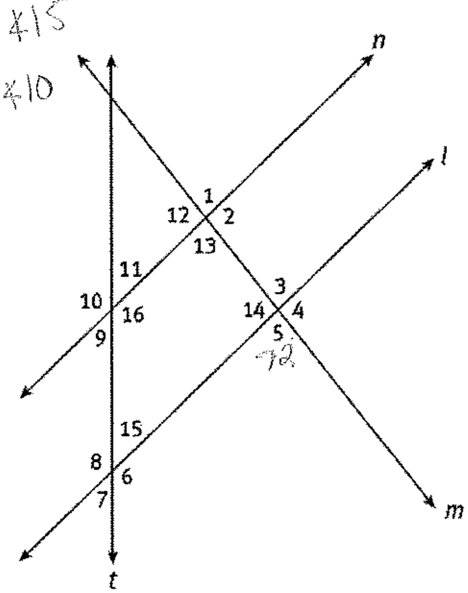
   $2x+2+5x-10=180$
   $7x-8=180$
   $7x=188$
   $x=26\frac{6}{7}$

3) $m\angle 8 + m\angle 10 = 180$ True or False

4) $\angle 2 = 34^o$, find $m\angle 4$ and $m\angle 1$.

   34° 146°

Given $n \| l$



5) Name a pair of alternate interior angles on transversal *t*. $\angle 9$ & $\angle 15$

6) Name a pair of corresponding angles on transversal *n*. $\angle 12$ & $\angle 10$

8) $\angle 10 \cong \angle 15$ True or False

9) $\angle 16 = 14x - 5$ and $\angle 8 = 13x$, find *x*.

   $14x-5=13x$
   $-5=-1x$
   $5=x$

10) $\angle 5 = 72^o$ Find each angle and justify your answer:

   $\angle 13 =$ 72°

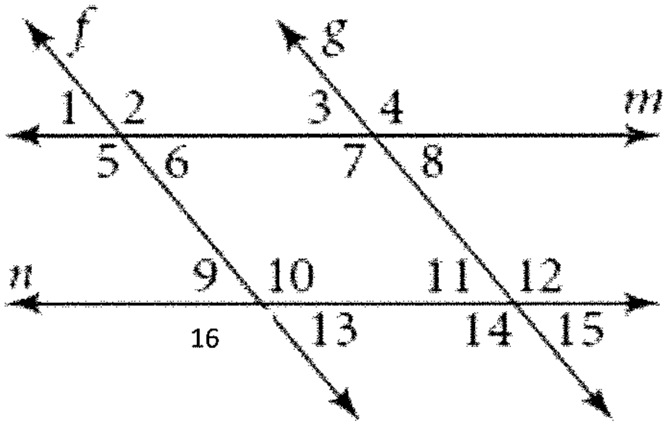
   $\angle 4 =$ 108°

   $\angle 3 =$ 72°

Geometry Unit 3 Day 14 Writing proofs with parallel and perpendicular lines.

Use the picture for questions 1-4.

1. Given: $f \parallel g, m \parallel n$
   Prove: ∡1 ≅ ∡11



Statements	reasons
1.) f∥g, m∥n	1.) given
2.) ∡1≅∡9	2.) corresponding ∡'s postulate
3.) ∡9≅∡11	3.) corresponding ∡'s postulate
4.) ∡1≅∡11	4.) substitution

2. Given: f∥g, m∥n

Prove: ∡4≅ ∡16

Statements	reasons
1.) f∥g, m∥n	1.) given
2.) ∡4≅∠14	2.) ext. ∡'s thm.
3.) ∡14≅∡16	3.) corresponding ∡'s postulate
4.) ∡4≅∡16	4.) transitive

3. Given: f∥g, m∥n

Prove: ∡7 is supplementary to ∡11 13

statements	reasons
~~1.) f∥g, m∥n~~	~~1.) given~~
~~2.) ∡7 is supp. to ∡11~~	~~2.) same side int. ∡'s thm.~~

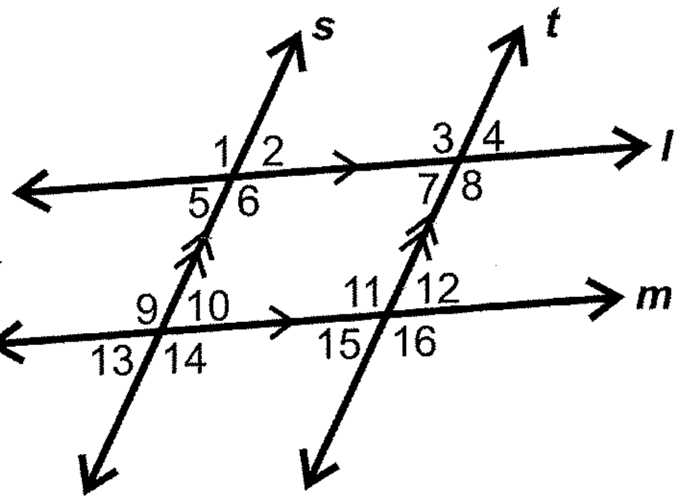
4. Given: f∥g, ∡8≅ ∡13

Prove: m∥n

Statements	reasons
1.) f∥g, ∡8≅∡13	1.) given
2.) ∡8≅∡6	2.) corresponding ∡'s thm.
3.) ∡6≅∡13	3.) transitive
4.) m∥n	4.) converse of corresponding ∡'s postulate

Geometry HW Day 14

Use the picture for questions 1-4.



1. Given: $s \parallel t, m \parallel l$

   Prove: $\measuredangle 1 \cong \measuredangle 11$

statements	reasons
1.) s‖t m‖l	1.) given
2.) ∡1 ≅ ∡9	2.) corresponding ∡'s post.
3.) ∡9 ≅ ∡16	3.) " " "
4.) ∡1 ≅ ∡16	4.) substitution

2. Given: s‖t, m‖l

   Prove: ∡1≅ ∡16

statements	reasons
1.) s‖t m‖l	1.) given
2.) ∡1 ≅ ∡9	2.) corresponding ∡'s post.
3.) ∡9 ≅ ∡16	3.) alt. ext. ∡s thm.
4.) ∡1 ≅ ∡16	4.) substitution.

add given

3. Given s‖t, m‖l

   Prove: ∡5 is supplementary to ∡11

statements	reasons
1.) given s‖t, m‖l	1.) given
2.) ∡5 ≅ ∡10	2.) alt int ∡'s thm.
3.) m∡10 + m∡11 = 180	3.) same side int. ∡'s thm.
4.) m∡5 + m∡11 = 180	4.) substitution
5.) ∡5 is supp to ∡11	5.) Def of supp.

4. Given: s‖t, :∡8≅ ∡14

   Prove: m‖l

statement	reasons
1.) s‖t ∡8≅∡14	1.) given
2.) ∡8 ≅ ∡16	2.) Corresponding ∡'s postulate
3.) ∡14 ≅ ∡16	3.) substitution
4.) m ‖ l	4.) converse of corresponding ∡'s postulate.