Date
Period $\qquad$ GEOMETRY H

## Unit 1: Tools of Geometry / Reasoning and Proof

Day $\quad$ Topic
1 Points, Lines and Planes

2
Segments, Rays, Parallel Lines and Planes

3

4
Measuring Angles
Basic Constructions

5 The Coordinate Plane
Perimeter, Circumference and Area
6 Quiz
$7 \quad$ Conditional Statements
Biconditionals and Definitions
$8 \begin{aligned} & \text { Deductive Reasoning } \\ & \text { Reasoning in Algebra }\end{aligned}$
$9 \quad$ Proving Angles Congruent

10
Review

Test
$\qquad$
$\qquad$

## U1 D1: Points, Lines, and Planes

1. The most basic figure in geometry:

- It is know as a $\qquad$ .
a. It is represented by a dot, but it really has no $\qquad$ or $\qquad$ .
b. Points are named with $\qquad$ letters! Example:
c. Every geometric figure is made up of points!
d. Two different types of arrangements of points (on a piece of paper).

e. A group of points that "line up" are called $\qquad$ points.

2. The second basic figure in geometry is a $\qquad$ .
a. Explanation: A series of points that extends $\qquad$ in 2 opposite directions.

-     - • - • - •
b. We use $\qquad$ at the end of the line to save time (and space!)
c. Naming lines (two options)
i. Option 1: List any two points with a line (with arrows) over it:
ii. Option 2: With an italicized (scripted) lowercase letter:

3. The third basic figure in geometry is called a $\qquad$ .
a. Explanation: a flat surface with no thickness that extends forever in all directions.


How we $\qquad$ a plane.


How planes work (extend forever).
b. Naming - Option 1: The word "Plane" followed by any $\qquad$ points in the plane.

Option 2: The word "Plane" followed by a $\qquad$ italic letter.
4. The 3 basic shapes of geometry ( $\qquad$ , $\qquad$ , and $\qquad$ are the "undefined terms of geometry" because they are so basic, we can't define them.
5. At your seat: Describe the two different sets of points, name them if possible.

Set \#1:


Set \#2:

6. Set \#1: $\qquad$ points because all points lie in the same $\qquad$ .
7. Set \#2: $\qquad$ points, not all points lie in the same $\qquad$ _.
8. Question: What is your name? How do you know?
a. A $\qquad$ is an accepted statement or fact.
b. A synonym for the word $\qquad$ is the word $\qquad$ .
9. Fact: Through any two points there is exactly $\qquad$ line.
10. Fact: If two lines intersect, then they intersect in exactly one $\qquad$ .

11. Fact: If two planes intersect, then they intersect in exactly one $\qquad$ .


Date $\qquad$ Period $\qquad$

## U1 D2: Segments, Rays, Parallel Lines \& Planes

1. Lines that do not intersect are called $\qquad$ lines
a. Only when the lines are $\qquad$ !

lines (same $\qquad$
2. When lines are $\qquad$ and they don't' intersect, they are called $\qquad$ .

lines (different $\qquad$
3. Look at our line...

4. Each of these "new" figures are called $\qquad$ .


Called the $\qquad$ , when written it MUST come $\qquad$

* What do two rays that face opposite directions and have the same endpoint create?

Definition (Opposite Rays): two $\qquad$ rays with the same endpoint.
$\qquad$ form a line.
5. What do we get if we "cut" the line twice? This is called a $\qquad$ .


Written $\qquad$ , spoken "
Called $\qquad$ . Now order does $\qquad$ matter. Why?
6. Quick Vocabulary Review. Fill in the Missing Information.
b. Line: Extends forever in $\qquad$ direction(s).
c. Ray: Extends forever in $\qquad$ direction(s).
d. Segment: Extends forever in $\qquad$ direction(s).
7. What's the difference between the two pairs of planes shown below?

8. Two planes that do not $\qquad$ are said to be $\qquad$ planes.
9. Look at the figure below and describe the connection between line $t$ and plane ABC .


## More Questions

a. Name a pair of parallel planes.
b. Name a pair of skew lines.
c. Name a pair of parallel lines.
d. Name a ray.

Date $\qquad$
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## U1 D3: Measuring Segments

1. What's the distance between your house and the your school?

2. Is your house and your school in a "straight line?"
e. Answer: $\qquad$ establish a (straight) line.
f. The $\qquad$ Postulate:
i. Any two points can be put onto a number line and measured.

3. A number line is like an endless ruler...

4. Find the length of each segment listed below:

$\mathrm{AB}=$ $\qquad$
$\mathrm{BE}=$ $\qquad$
$\mathrm{CF}=$ $\qquad$

DG = $\qquad$

$$
\mathrm{BG}=
$$

$\mathrm{BA}=$ $\qquad$
$\mathrm{DF}=$ $\qquad$
5. How do you find the distance between two points on a number when the units are variables?

*** Distance formula on a number line:
6. Two segments that have the same length are said to be $\qquad$ .
g. The symbol means " $\qquad$ ."

Definition: Congruent figures have the same $\qquad$ \& $\qquad$ .
Why do we only need to check one of these for segments?

segments

$\qquad$ segments

* "Tick Marks" are used to indicate $\qquad$ segments.

7. Is there a place between your house and Conestoga where you are equally far from both?


10 ft .
The "halfway" point is called the $\qquad$ .

8. Length of our stick:


Note: The stick can be broken any way you want, but the two pieces must add up to $\qquad$ .

Does this seem obvious? What do we call something that we accept as obvious?
This illustrates the $\qquad$ .

Solve for $x$.

$\qquad$

## U1 D4: Angles Vocabulary

Fill in the boxes below... use all resources available (friends, books, etc.)

| Angle Type | Draw an Example | Describe or Define |
| :---: | :---: | :---: |
| Acute Angle |  |  |
| Obtuse Angle |  |  |
| Right Angle |  |  |
| Straight Angle |  |  |
| Congruent Angles |  |  |
|  |  |  |


| Complimentary Angles |  |  |
| :---: | :--- | :--- |
| Supplementary Angles |  |  |
| Angle Addition Postulate |  |  |
| Angle Bisector |  |  |
| Vertical Angles |  |  |

$\qquad$
$\qquad$

## U1 D4 Continued: Problem Set for Vocabulary

Directions: Use the figure below to answer questions 1-5.


1. Name an angle complimentary to $\angle A G B$.
2. Name an angle supplementary to $\angle A G B$.
3. What type of angle is $\angle A G D$ ?
4. What angle is vertical to $\angle B G C$ ? What is its measure?
5. Name an angle that is congruent to $\angle A G B$.
6. In the figure below $\overrightarrow{S X}$ bisects $\angle R S T$. Find the measure of $\angle R S T$.

7. Use the figure below to find $m \angle W Y Z$.

8. In the figure below, $m \angle A B C=43+x$. Find $x$.

9. What postulate did you need to use to solve the problem in \#8?
10. $\angle 1$ is twice the size of its compliment. What are the degree measures of both angles?
$\qquad$
$\qquad$

## U1 D5 Part 1: The Coordinate Plane

1. The coordinates of point $A$ is $(\mathbf{6}, \mathbf{6})$ and point $B$ is $(3,2)$. Plot the points below.
2. What is the length of segment $A B$ (round to nearest tenth if necessary)?
3. What is the midpointof segment $A B$ ?



Honors Level Question: The endpoint of a segment is $(2,3)$ and the midpoint is $(3,-4)$. What is the other endpoint?
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## U1 D5 Part 2 Perimeter, Circumference and Area



Area
Perimeter


Area
Circumference

1. What is the perimeter and area of a rectangle with a height of 6 and base of 14 ?
2. What is the area of a circle with a circumference of $14 \pi$ ?
3. What is the perimeter of the figure created on the coordinate plane with the points... $\mathrm{A}(-4,-1), \mathrm{B}(4,5), \mathrm{C}(4,-2)$

Wrap Up: Confidence Meter for tomorrow's quiz?

$$
\begin{array}{llllllllll}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10
\end{array}
$$

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## U1 D7: Conditional Statements, Biconditionals \& Definitions

Conditionals can be represented visually using a $\qquad$ diagram.

Conditional: If you live in Berwyn, then you live in Pennsylvania.


Example \#1: If an animal is a reptile, then it is cold-blooded.

Conditional: If an angle's measure is 90 degrees, then the angle is right.

Converse: If an angle is right, then its measure is 90 degrees.

When both the conditional and the converse are true, you can combine them into one statement.

known as a $\qquad$ .

Make up a Biconditional...
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## U1 D8: Deductive Reasoning \& Reasoning in Algebra

Directions: Make a valid conclusion from each set of statements below.

1. If a student wants to go to college, then a student must study hard.

Rashid wants to go to the University of North Carolina.

## Conclusion:

2. If an animal is a red wolf, then its scientific name is Canis rufus. If an animal is named Canis rufus, then it is endangered.

Conclusion:
3. If you read a good book, then you enjoy yourself.

If you enjoy yourself, then your time is well spent.
4. If there is lightning, then it is not safe to be out in the open.

Maria sees lightning from the soccer field.
Conclusion:

## The Law of Detachment:

## The Law of Syllogism:

These laws are forms of $\qquad$ reasoning, which is strong reasoning based on facts.

Inductive reasoning is more of a "guess," and is based on continuing a $\qquad$ .

1. We can use deductive reasoning to perform proofs.
a. Remember, a theorem must be proven!
2. Example: An Algebraic Proof. Solve $\frac{1}{2} x+6=10$

| Statements (Steps to Solve) | Reasons (What you did) |
| :--- | :--- |
| 1. $\frac{1}{2} x+6=10$ | 1. |
| 2. $\frac{1}{2} x=4$ | 2. |
| 3. $x=8$ | 3. |

3. Properties you are probably familiar with...
a. Addition Property of Equality
b. Subtraction Property of Equality
c. Multiplication Property of Equality
d. Division Property of Equality
e. The Distributive Property
f. Simplifying
4. For the two examples below, describe the difference in the operations. Which reason would you use for each?

| a) If $8+2 x+3=23$, then $2 x+11=23$ | b) If $3 x-5=13$, then $3 x=18$ |
| :--- | :--- |

5. Properties you probably are not familiar with
a. The Reflexive Property
b. The Symmetric Property
c. The Transitive Property

## d. Substitution Property

a) The Reflexive Property: Think of when you look in a mirror and you see your reflection.


Any time you have a number (angle, side length, etc.), you can always write that it is equal (or congruent) to itself.

$$
\text { Examples: } 10=10, \quad x=x, \quad \overline{A B} \cong \overline{A B}, \quad m \angle A B C=m \angle A B C
$$

When will this be used? Whenever two figures share something.

b) The Symmetric Property: Think of when you solve equations and the $x$ is on the right.

You might like to always have your $x$ on the left hand side, and you probably learned that you are allowed to switch sides - this is the symmetric property.

When solving an equation, if you end with this: $\quad 6=x$
You can switch it to this: $\quad x=6$

Other examples: $\overline{C D} \cong \overline{F G}$ switches to $\overline{F G} \cong \overline{C D} \quad \angle 1 \cong \angle 2$ switches to $\angle 2 \cong \angle 1$
c) The Transitive Property (Substitution): Think of your two closest friends...


Example \#1: Fill in each reason on the right that matches with the statement on the left

| 1. $5(x+3)=5-9$ | 1. |
| :--- | :--- |
| 2. $5 x+15=5-9$ | 2. |
| 3. $5 x+15=-4$ | 3. |
| 4. $5 x=-19$ | 4. |
| $5 . \quad x=\frac{-19}{5}$ | 5. |

Example \#2: Geometric Proof.

Given: $X Y=42$

| 1. $\quad X Z+Z Y=X Y$ | 1. |
| :--- | :--- |
| 2. $3(n+4)+3 n=42$ | 2. |
| 3. $3 n+12+3 n=42$ | 3. |
| 4. $6 n+12=42$ | 4. |
| 5. $6 n=30$ | 5. |
| 6. $n=5$ | 6. |

Other Reasons you might use...
a. Definition of a midpoint
b. Definition of an angle bisector
c. Vertical angles property


## Wrap Up: Partner Quizzo

Partner A: use your notes and quiz your partner B about reasons we learned today.
Once you have successfully described 3 reasons, switch places...
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## U1 D9: Proving Angles Congruent

1. Vocabulary Review:
h. An accepted fact is known as a $\qquad$ .
i. An educated guess is known as a $\qquad$ .
j. A proven fact is known as a $\qquad$ .
2. Let's prove a theorem:
k. The Vertical Angles Theorem: Vertical angles are congruent.

i. Given: Intersecting lines that form angles $1-4$.


Sometimes this is stated for you, sometimes you must "get it" from a picture.
ii. Prove: $\angle 1 \cong \angle 2$
3.


| Statements |  |
| :--- | :--- |
| 1. | Reasons (Postulates, Theorems, Definitions) |
| 2. | 1.2. |
| 3. | 3. |
| 4. | 4. |
| 5. | 5. |
| 6. | 6. |

The type of proofs we've done so far are called $\qquad$ proofs.
You can also do $\qquad$ proofs by writing your steps out as sentences (this is usually more difficult - especially for beginners).
4. Congruent Supplements Theorem: If two angles are supplements of the same angle (or of congruent angles), then the two angles are congruent

Given: $\angle 1$ and $\angle 2$ are supplementary $\& \angle 3$ and $\angle 2$ are supplementary Prove: $\angle 1 \cong \angle 3$

(The proof above can also be done as a paragraph proof)
\#31 from tonight's Homework:

$\qquad$
$\qquad$

## U1 D10 - Test Review: Sections 1.3-1.9, 2.1-2.5

12. Fill in the blanks below with always, sometimes, or never.
a. $\overrightarrow{A C}$ is in Plane $Q$, so point $B$ is $\qquad$ in Plane Q.
b. Two planes that do not intersect are $\qquad$ parallel.
c. $\overrightarrow{J K}$ are $\overrightarrow{J M}$ $\qquad$ the same ray.
d. Three points are $\qquad$ coplanar.
e. Intersecting lines are $\qquad$ parallel.
13. $\angle A$ and $\angle B$ are complimentary. $\angle A$ is twice as big as $\angle B$, what are the measure of the two angles?
14. $\overrightarrow{B D}$ bisects $\angle A B C ; \angle A B D=6 x+2$ and $\angle D B C=3 x+26$. Draw the figure and find $m \angle A B C$.
15. Point X is the midpoint of W and $\mathrm{Y} . \mathrm{XW}=3 x+8$ and $\mathrm{XY}=9 x-10$. What is the length of WY?
16. The area of a circle is $36 \pi$, what is the circumference of that circle?
17. A rectangle has coordinates $\mathrm{A}(5,3), \mathrm{B}(5,-2), \mathrm{C}(1,-2), \mathrm{D}(1,3)$. What is the area of rectangle ABCD ?

18. $M$ is the midpoint of segment $A B . A(5,9)$ and $M(11,19)$. What are the coordinates of $B$ ?
19. Line AB is in Plane Q . Line t intersects plane Q at point A . Draw and label the figure.
20. Solve for $x$ and $y$ in the figure below.

21. Draw skew lines.
22. In the conditional below, underline the hypothesis, and circle the conclusion.

If two segments have equal measures, then they are congruent.
23. Write the converse of the condition from \#11.
24. Define/Describe a biconditional. Give a mathematical example
25. Write a valid conclusion or write "no valid conclusion for the statements below."
a. Conditional: If $M$ is the midpoint of $A B$, then $A M=B M$.
i. Given: M is the midpoint of AB
ii. Conclusion:
b. Conditional: Given 3 random points, they are always coplanar.
i. Given: Points $\mathrm{X}, \mathrm{Y}, \mathrm{Z}$

## ii. Conclusion:

26. Find the measures of the indicated angles below.

a. $\angle B F D=$ $\qquad$
b. $\angle C F E=$ $\qquad$
c. $m \angle A F B=55 ; m \angle B F C=$ $\qquad$
d. $m \angle C F D=42 ; m \angle D F E=$ $\qquad$

Note: $\overrightarrow{A E} \perp \overrightarrow{F C}, \overline{B F} \perp \overline{F D}$
27. Complete the proof below...

Given: $M I=L D$
Prove: $M L=I D$


| Statements | Reasons |
| :--- | :--- |
| 1. $M I=L D$ | 1. |
| 2. $I L=I L$ | 2. |
| 3. $M I+I L=L D+I L$ | 3. |
| 4. $M I+I L=M L$ and | 4. |
| $\quad L D+I L=I D$ | 5. |

28. Solve for $x$, then find $m \angle C B D$ given that $m \angle A B D=(43+x)^{\circ}$.

$\qquad$

## Solving Problems Involving Angles

There will be three main options for problems with angles: $\angle 1=\angle 2, \angle 1+\angle 2=90^{\circ}, \angle 1+\angle 2=180^{\circ}$.

1. Set the two expressions equal to each other: $($ Angle 1$)=($ Angle 2$)$


Vertical Angles

2. Add the two angles up and set them equal to 90: $($ Angle 1$)+($ Angle 2$)=90$.


Right Angle Symbol


Perpendicular Lines


Complimentary Angles
3. Add the two angles up and set them equal to 180: $($ Angle 1 $)+($ Angle 2) $=180$.


## EXAMPLES: Problems Involving Angles

1. Angles are equal to each other.


$$
\begin{aligned}
8 x+5 & =4 x+21 \\
4 x+5 & =21 \\
4 x & =16 \\
x & =4
\end{aligned}
$$



$$
\begin{aligned}
10 x+1 & =6 x+21 \\
4 x+1 & =21 \\
4 x & =20 \\
x & =5
\end{aligned}
$$

2. Angles add up to $90^{\circ}$.


$$
\begin{aligned}
4 x+15+6 x+25 & =90 \\
10 x+40 & =90 \\
10 x & =50 \\
x & =5
\end{aligned}
$$



$$
\begin{array}{r}
4 x+15+15=90 \\
4 x+30=90 \\
4 x=60 \\
x=15
\end{array}
$$

3. Angles add up to $180^{\circ}$.


$$
\begin{aligned}
8 x+20+7 x+10 & =180 \\
15 x+30 & =180 \\
15 x & =150 \\
x & =10
\end{aligned}
$$



$$
\begin{aligned}
5 x+31+7 x+17 & =180 \\
12 x+48 & =180 \\
12 x & =132 \\
x & =11
\end{aligned}
$$

