Summer Work for ADV Geometry

If possible, please print this document 2-sided, for a total of 3 sheets of paper. You may find that a color copy is helpful, but it is not necessary.

Hello students! Please read the following information carefully.

This summer work has two purposes:

1. The problems are designed to help you review geometry topics that you learned in Pre-Algebra and Algebra I. As you work, rate your comfort with each topic as follows:

   - This was too easy...give me more of a challenge!
   - This topic is familiar and I am confident I understand it.
   - This topic is familiar, but I feel like I need some help with it.
   - I don't remember seeing this before, and don't know where to start.

2. Your work also provides the teacher with a picture of your basic understanding of a few geometry topics, the way you approach problem-solving, how you communicate your thought process, and how well you read directions.

Instructions:

- **Work alone**, and use only your knowledge and memory as a resource. While your work will be submitted at the beginning of the year, you will not be penalized for incorrect answers as long as you give your best effort and clearly communicate your thought process.

  - This means no help from friends, parents, tutors, textbooks, videos, online resources, etc.
  - If you are stuck, that's okay! Write down what you DO know, using sentences if needed.
  - You may use a calculator if needed, but the work is possible without one.
  - You will need a protractor. (One exception to the “work alone” rule: If you are not familiar with using a protractor to measure angles, you may ask someone to show you how.)

- **Communicating your thought process is more important than having correct final answers.**
  - Show all of your steps.
  - Use complete sentences.
  - Write clear explanations, and add a sketch or diagram if needed.

- **Pages 5-6 of this document are what you will submit on the first day of school.** There is a partial answer key for checking your work (answers are in red), as well as a place to rate each topic, provide some of your own answers, and space to show your work for selected problems.
  - You may find it easiest to separate the last sheet from the packet while you work.
  - Please print pages 5 and 6 of this document on the front and back of a single sheet of paper.

- **In order for this to be fresh in your mind when we begin our study of geometry, you should complete this 1-2 weeks before school starts.** This work is due when we return to school.
Topic 1 - Segments and Angles

1. $\angle TRS$ is a straight angle. $\angle TRX$ is a right angle. If $m\angle TRX = 2x + 5y$ and $m\angle XRS = 3x + 3y$, solve for $x$ and $y$.

(Do your work in the space below first and then check your final answer with the provided key on the sheet at the end of this packet.)

2. On $\overline{AC}$, point $B$ is between $A$ and $C$, and $AB = x^2 + 3$, $BC = 4 + 2x$, and $AC = 15$.

(Show your work and answers on the sheet at the end of this packet.)

   a. Find the value of $x$.
   b. Find the length of $AB$.
   c. Is point $B$ the midpoint of $\overline{AC}$? Why or why not?

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Topic 2 - Triangles and their Angles

(Write your answers on the sheet at the end of this packet.)

3. Based on what you know about triangles, what should the sum of the measures of the three angles of any triangle equal?

4. Using a protractor, measure the angles in this triangle to the nearest degree and record your results on the answer sheet. Remember, if you are unfamiliar with how to use a protractor, you may ask someone to show you how.

5. Do your measurements confirm your answer to question 3? If not, what is the difference between your value and the expected value? How do you explain this difference?

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Topic 3 - Parallel Lines

(Write your answers for 6-10 here first and afterwards check with the provided key on the sheet at the end of this packet.)

6. Line $a$ is parallel to line $b$, and they are intersected by line $m$ (which is called a transversal). The following questions ask you to recall some vocabulary...these pairs of angles have special names based on their positions in the diagram. Provide the names for these special angle pairs (if you remember them).

   a. $\angle 2$ and $\angle ?$ ____________
   b. $\angle 5$ and $\angle 8$ ____________
   c. $\angle 1$ and $\angle 3$ ____________
   d. $\angle 4$ and $\angle ?$ ____________

(Vocabulary note: congruent angles are angles with equal measures.)

7. Identify all of the numbered angles in the diagram which are congruent to $\angle 1$.

8. Identify all of the numbered angles in the diagram which are supplementary to $\angle 1$.

9. If lines $a$ and $b$ were not parallel, which angle(s) would still be congruent to $\angle 1$?

10. If lines $a$ and $b$ were not parallel, which angle(s) would still be supplementary to $\angle 1$?

11. On the answer sheet, sketch two parallel lines with a transversal such that a pair of corresponding angles are not only congruent but also supplementary.
Topic 4 - Points, Lines & Planes

This diagram represents two intersecting planes, one of them vertical and the other horizontal. Imagine a blueprint for a multi-story building, and you are able to see part of a cross-section where the walls and floors meet. However, the planes are not limited to the visible rectangles in the diagram. Picture these surfaces extending infinitely in all directions, much the same as we understand that lines extend infinitely.

The planes are labeled with capital cursive letters: the vertical plane is labeled L and the horizontal plane is labeled K.

The lines are labeled with lowercase cursive letters: k, l, and m. Points are labeled with plain uppercase letters. Line l contains points R, S, F, and Y. Line k contains points B and M. Line m contains points M, F, and N.

Use the diagram to answer questions 12 - 19 on the answer sheet at the end of this packet.

Topic 5 - Logic and Reasoning

Study the following statements. Determine whether the reasoning is logically correct or not, and write an explanation. On the answer sheet, write “c” for correct or “i” for incorrect, and give your reasoning.

20. If two angles are right angles, then the angles are congruent.
21. I’ve flipped this coin five times and the toss has come up heads each time. Therefore, it is more likely that the toss will come up heads the next time.
22. I know that if a student at Kalani High School attends orientation on the first day of school, then that student is a freshman. Bonnie Patterson attends the orientation. Therefore, Bonnie must be a freshman.
23. All school buses stop at railroad crossings. A vehicle is stopped at the railroad crossing on Gate City Boulevard. Therefore, that vehicle is a school bus.

24. In problem 3, you answered what the sum of the measures of the angles of any triangle (3-sided polygon) should be. What about the sum of the measures of the angles of a quadrilateral (4-sided polygon)? Can you apply what you know about triangles to write a convincing argument for the angle sum of quadrilaterals? In the space provided on the answer sheet, write a logical argument for answers to as many of the following questions as you can.

Note: This is supposed to be challenging. It’s okay to be wrong, or to feel stuck. I mostly want to see your thought process and get a sense of your writing style. Remember: do this entirely on your own with no outside help.

- How can triangles be used to give a reasonable answer to what the sum of the measures of the 4 angles of a quadrilateral should be?
- Can you continue to use triangles to explain the angle sum for a pentagon (which is a 5-sided polygon)?
- How about a hexagon (6 sides)? An octagon (8 sides)?
- Could you calculate the angle sum of a 63-sided polygon?
- Can you generalize the pattern you are seeing to write a formula for the angle sum of an n-gon, a polygon with n sides?
Name ______________________________

*Separate this sheet from the rest of the packet (please print it two-sided on a single sheet of paper). This is the only portion that you will submit.

**Topic 1 - Segments and Angles**

1. **Check your answer:** $x = 20$ and $y = 10$  
   - I got this correct on the first try.  
   - I was not correct at first, but was able to figure it out.  
   - I couldn't get this answer.

2. **Show all of your steps and your final answers.**
   a. Find the value of $x$.
   b. Find the length of $BC$.
   c. Is point $B$ the midpoint of $\overline{AC}$? Why or why not?

**Rate Topic 1 - Segments and Angles**
- This was too easy...give me more of a challenge!
- This topic is familiar and I am confident I understand it.
- I feel like I learned this once, but I need some help with it.
- I don't remember seeing this before, and don't know where to start.

**Topic 2 - Triangles and their Angles**

3. Triangle angle sum should be = ________
4. Your measurements:
   a. $m\angle 1 =$ ________
   b. $m\angle 2 =$ ________
   c. $m\angle 3 =$ ________

5. Write your answer here:

**Rate Topic 2 - Triangles and their Angles**
- This was too easy...give me more of a challenge!
- This topic is familiar and I am confident I understand it.
- I feel like I learned this once, but I need some help with it.
- I don't remember seeing this before, and don't know where to start.

**Topic 3 - Parallel Lines**

6. **Check your answers:**
   a. Alternate Interior $\angle$ s
   b. Same-side Exterior $\angle$ s
   c. Corresponding $\angle$ s
   d. Vertical $\angle$ s

7. Angles congruent to $\angle 1$:
   $\angle 6$, $\angle 3$, $\angle 8$
8. Which angles are supplementary to $\angle 1$?
   $\angle 5$, $\angle 2$, $\angle 7$, $\angle 4$
9. If lines $a$ and $b$ were not parallel...
   $\angle 6$ would still be congruent to $\angle 1$
10. If lines $a$ and $b$ were not parallel...
    $\angle 2$ and $\angle 5$ would still be supplementary to $\angle 1$
11. Draw your sketch here:
Topic 4 - Points, Lines & Planes

12. Which point is the intersection of line k and plane K?  Your answer: ___________

13. Which plane contains $\overline{FN}$?
   ○ Plane K  ○ Plane L  ○ Both planes  ○ Neither plane

14. Which plane contains $\overline{SY}$?
   ○ Plane K  ○ Plane L  ○ Both planes  ○ Neither plane

15. Which plane contains point J?
   ○ Plane K  ○ Plane L  ○ Both planes  ○ Neither plane

16. Which plane contains point B?
   ○ Plane K  ○ Plane L  ○ Both planes  ○ Neither plane

17. Which plane contains point R?
   ○ Plane K  ○ Plane L  ○ Both planes  ○ Neither plane

18. In the diagram, if you extend lines k and l downward, they appear to intersect. Do the lines actually intersect? Why or why not?

19. Draw a sketch below which illustrates a line labeled $\overline{m}$ intersecting a plane $\mathcal{Y}$ at a point $P$.

Rate Topic 4 - Points, Lines & Planes
○ This was too easy...give me more of a challenge!
○ This topic is familiar and I am confident I understand it.
○ This topic is familiar, but I feel like I need some help with it.
○ I don't remember seeing this before, and don't know where to start.

Topic 5 - Logic and Reasoning

20. ______ Explanation:

21. ______ Explanation:

22. ______ Explanation:

23. ______ Explanation:

24. Write your paragraph here:

Rate Topic 5 - Logic and Reasoning
○ This was too easy...give me more of a challenge!
○ This topic is familiar and I am confident I understand it.
○ This topic is familiar, but I feel like I need some help with it.
○ I don't remember seeing this before, and don't know where to start.