

## Classroom Activity

# Getting Active with Angles!

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*Many students can find the volume of new vocabulary terms in the high school Geometry curriculum quite intimidating. Geometry students can be exposed to over 100 new terms in just the first semester! If students do not understand the terminology, they will have a hard time applying and communicating the mathematics they are learning. A series of activities is introduced that uses a kinesthetic approach to learning the terminology relating to the special angle pairs formed by intersecting lines and transversals.*

### Introduction

Howard Gardner (1983) identified multiple distinct intelligences that influence how we learn. Through cognitive research, these intelligences (e.g., language, logical-mathematical analysis, spatial representation, and musical thinking) describe the extent to which students possess different strengths in their thinking and processing abilities and therefore learn, remember, perform, and understand in different ways. Where individual learners can differ is in the strength of these intelligences and in the ways in which such intelligences are invoked and combined to carry out different tasks, solve challenging and diverse problems, and progress in various domains. Gardner has challenged our educational system to design lessons, activities, and assessments that engage a variety of intelligences. The following activities are a response to this challenge.

The high school Geometry curriculum is riddled with new vocabulary words, almost on a daily basis. Geometry students can be exposed to over 100 new terms in just the first semester! As any Geometry teacher knows, if the students do not understand the terminology, they will have a hard time applying and communicating the mathematics they are learning. Our team of Geometry teachers recognized the need for our students to develop a better working knowledge of some of the terminology and developed a series of activities that highlight a more kinesthetic approach to learning terms. Specifically, these activities emphasize the terminology relating to the special angle pairs formed by intersecting lines and transversals.

### Activity 1: Dance Dance Angles!!!

Dance Dance Revolution (DDR) is a popular music video game series, first introduced in North America in 1999. In DDR, players stand on a “dance platform” or stage and stomp on colored arrows laid out in a cross pattern when prompted by musical and visual cues. Players are judged on their speed and accuracy as they dance to the patterns presented to them. We designed Dance Dance Angles (DDA) in the same vein as DDR in that the students are given a series of directions they must match with the motions of their feet on a “dance stage” of two lines intersected by a transversal. This activity not only presents a kinesthetic platform for understanding but also a fun and interesting way to gain engage students.

Students are divided into groups of four and assigned roles: a reader, counter, performer, and a timer. (Students can also be placed in groups of three, with a class timer for all groups.) When the timer gives the cue to start, the reader will call out from a printed list of special angle pair names (see Appendix A) at a pace that the performer can follow. The reader can pace his/her reading to match the pace that the performer can “dance” the angles. The counter will tally the correct angle pair matches by the performer within the 45-second time frame. Group members change roles after each 45-second trial so that each student has a chance to be the performer. If the performer makes an error, it is the job of the group members to explain the correct angle relationship and show the performer an example. The top performers from each group will have a final “dance off” so that a class champion can be crowned! Figures 1 and 2 illustrate students reviewing angle pair relationships through the DDA activity. Figure 1 provides an example of how DDA can be performed outside on a sidewalk, using chalk to mark the lines, while Figure 2 shows students performing DDA in a classroom with the lines taped to the floor.



Fig 1 DDA outside on the sidewalk



Fig 2 DDA inside the classroom

### Activity 2: Angles Angles Everywhere!!!

Angles Angles Everywhere is a hands-on/minds-on activity in which the students can reinforce their knowledge of special angle pairs and line types learned in the beginning of the Geometry curriculum. It is a group “scavenger” hunt to “capture” different angle pairs and lines around the school property and can be completed in two 50-minute class periods. Students are placed in small groups. Each group is provided with a digital camera and a list of the angles and lines that they have to “capture,” as well as some other challenges along the way.

Using their camera, they scavenge the school property for examples of special angle pairs and line relationships, such as alternate interior angles or skew lines (see Appendix B). For example, each group must find a set of parallel lines; however, if they find a set of three or more parallel lines that are not vertical or horizontal (Figure 3), they earn a higher score on the rubric (see Appendix C). An additional challenge of the “hunt” is to form an angle pair with their bodies (Figure 4). On Day 2 of this activity, the student groups share their findings with the class by showing each photo and identifying the angle or line relationship represented. Other groups are given a grading rubric with which to peer grade the other

teams' findings, as each group presents their angles and lines. This reinforces individual understanding and identification of the angle pairs and lines and enhances their ability to communicate about the Geometry terminology.



**Fig 3** Multiple parallel lines



**Fig 4** Linear pair formed by students

Our students not only enjoy these change-of-pace activities but also see the reasoning behind why we do them. When asked for feedback after these activities, one student shared, regarding the DDA activity: "It helped me because I saw people doing it and when I was physically doing it, it made me remember the [angles] more." Yet another student was able to connect this activity with improving his (her) retention of the angle pair names stating, "I think that getting up and doing something fun makes learning easier. People can easily forget a lecture but it seems harder to forget a game like that!" Regarding the Angles Angles Everywhere activity, they believed that it was also beneficial to their learning of the angles and line relationships. One student commented that she "liked getting out of the classroom and seeing the angles on my own, not from someone else showing me." Another shared that "it helped me realize how many angles were around us. I didn't realize it before!" Through these alternative activities, our students were given the opportunity to solidify their understanding of these geometric relationships in a fun and meaningful way.

Feel free to email the authors for further directions, handouts, and rubrics for these activities.

### Works Cited

Gardner, H. (1983) *Frames of mind: the theory of multiple intelligences*. New York: Basic Books.



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Read the following angles relationships and count how many the performer can correctly locate in 45 seconds. Speed up your reading if s/he can go faster and slow it down if s/he is getting behind. Ready, set, go!

Alternate Interior

Corresponding

Consecutive Interior

Alternate Exterior

Vertical

Linear Pair

Consecutive Interior

Corresponding

Alternate Interior

Alternate Exterior

Vertical

Linear Pair

Alternate Exterior

Vertical

Linear Pair

Alternate Interior

Corresponding

Consecutive Interior

Consecutive Interior (must switch to different pair of angles)

Vertical

Alternate Exterior

Corresponding

Read the following angles relationships and count how many the performer can correctly locate in 45 seconds. Speed up your reading if s/he can go faster and slow it down if s/he is getting behind. Ready, set, go!

Consecutive Interior

Vertical

Corresponding

Linear Pair

Alternate Interior

Consecutive Interior

Alternate Exterior

Alternate Interior

Corresponding

Vertical

Alternate Exterior

Alternate Exterior (must switch to different pair of angles)

Linear Pair

Alternate Interior

Alternate Exterior

Linear Pair

Vertical

Corresponding

Consecutive Interior

Alternate Exterior

Corresponding

Vertical

**Appendix B***Angles, Angles Everywhere!* Student Handout

## Angles Scavenger Hunt



*Directions: Your mission is to “capture” examples of the following lines and angles in the school within a given period of time. Then, return to class to download your findings! Be sure to work together to find the different angles and lines on the list below. You need a different picture for each type of angle or line. You must find the examples in structures that already exist, with the exception of the ones you form with people.*

Read through everything before you start and make a plan!!! [See rubric for point values.]

- Parallel lines
- Parallel planes
- Skew Lines
- A linear pair
- Supplementary angles
- Vertical angles
- Alternate interior angles
- Alternate exterior angles
- Corresponding angles
- Same side (consecutive) interior angles

Other challenges you must face:

**Challenge #1:** Your teammates must form one type of angle pair from above with their bodies. All team members must be in the picture (minus photographer) and must form one of the angle pairs or lines together.

**Challenge #2:** Your teammates must form a picture of a secretary, custodian, hall monitor, teacher, guidance counselor, or administrator (and know his/her name!) making an angle pair or line relationship (different than the one used for Challenge #1) with at least one member of your group.

\*\*\* There is a prize for the most creative/unique picture. Be on the lookout for something that others might not see!

## Appendix C

### Angles, Angles Everywhere! Rubric

Category	Value	Item Description	Category	Value	Item Description
<b>Parallel lines</b>	1	2 Parallel lines (any 2 // lines – no restriction)	<b>Alternative Exterior Angles</b>	1	Alternate exterior angles (no restriction)
	2	2 Parallel lines that are NOT horizontal nor vertical.		2	Alternate exterior angles the // lines are horizontal or vertical and the transversal is NOT $\perp$
	3	3 or more Parallel lines that are NOT horizontal nor vertical		3	Alternate exterior angles the // lines are NOT horizontal nor vertical and the transversal is not $\perp$
<b>Parallel Planes</b>	1	2 Parallel Planes	<b>Corresponding Angles</b>	1	Corresponding angles (no restriction)
	2	2 Parallel Planes that are NOT horizontal or vertical		2	Corresponding angles the // lines are horizontal or vertical and the transversal is NOT $\perp$
<b>Skew Lines</b>	2	Skew Lines – any		3	Corresponding angles the // lines are NOT horizontal nor vertical and the transversal is NOT $\perp$
<b>Linear pair</b>	1	Linear Pair formed by $\perp$ lines	<b>Consecutive Interior Angles</b>	1	Consecutive interior angles (no restriction)
	2	Linear Pair formed by lines that are NOT perpendicular		2	Consecutive interior angles the // lines are horizontal or vertical & the transversal is NOT $\perp$
<b>Supplementary Angles</b>	1	Supplementary angles (no restriction)		3	Consecutive interior angles the // lines are NOT horiz. nor vertical and the transversal is NOT $\perp$
	2	Supplementary angles that are NOT adjacent	<b>Alternative Interior Angles</b>	1	Alternate interior angles (no restriction)
	3	Supplementary angles that are NOT adjacent and are NOT right angles.		2	Alternate interior angles the // lines are horizontal or vertical and the transversal is NOT $\perp$
<b>Vertical Angles</b>	1	Vertical angles formed by two intersecting $\perp$ lines		3	Alternate interior angles the // lines are NOT horizontal or vertical & the transversal is NOT $\perp$
	2	Vertical angles formed by two lines that are NOT $\perp$	<b>Other Criteria to Include</b>	2	Picture of your group members (less camera person) making an angle pair from those listed
<i>Helpful Hint: Make notes below that will help you remember what you saw in each picture. (For example, "Our linear pair is of tree branches.")</i>				2	Picture of an adult (must list name) making an angle pair with your group members from those listed Adult's Name _____