

## Geometry Exercise Solutions

Do you think a student who is at van Hiele Level 2 is capable of doing a problem more than one way as was discussed in problem solving? Explain your position.

Solution: Answers will vary. Generally the answer is no because they lack the flexibility of thought necessary to look at things more than one way.

Do you see a need for concern that students entering a high school geometry course that appears to be van Hiele Level 3 are only at van Hiele Level 2? Why or why not?

Solution: Answers will vary. There should be a concern because either the student is doomed to fail or the course needs to be weakened. Either way is not good for the study of mathematics in general, and the study of geometry in particular.

Compare and contrast the basic tenets of Piaget and the van Hieles. Conclude with a position statement dealing with which seems most logical to you, and support it with some explanation of how you arrived at your conclusion.

Solution: Answers will vary. The value lies as much in the investigation into the learning of geometry as in the concluding which approach seems more logical.

Describe the sequence of steps necessary to bisect an angle by folding it with paper. You should do this before you describe it. Give your instructions to a novice to determine if they are clear enough to produce the desired results.

Solution: Fold the paper. Open it and fold again, assuring that the second fold intersects the first, preferably close to an edge so most of the paper reveals an angle. After opening the paper, carefully refold the paper so one side of the angle lies on top of the other, while having the vertex of the angle on this new fold. The new fold will be the angle bisector.

Is there a need for an informal geometry course in the curriculum that precedes the typical high school geometry course? Why or why not?

Solution: Answers will vary. Basically, the more informal geometry that can be given to students, the better. Many do not take a formal geometry course and thus struggle to have any feel for the value of the subject. The informal course could supply that feel.

Eratosthenes measured the earth's circumference to within 1% of what we now have it to be. He did it in the late part of the third century B.C. Eratosthenes knew that at summer solstice (about June 21) the sun would be directly over the city of Syene in Egypt. He could tell this because the sun's rays were reflected from the water in a deep well with no well wall shadows. He put a vertical rod in the ground at Syene and also at Alexandria. The Syene stick cast no shadow at noon and the Alexandria one did. From that, Eratosthenes calculated the angle of elevation of the sun to be  $82.6^\circ$ . He knew the distance between the two sticks was about 500 miles. He used the alternate interior angle theorem to conclude

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that the central angle between the two sticks was  $7.2^\circ$ . But, because  $7.2^\circ$  is  $\frac{1}{50}$  of the circumference of a circle, he deduced that the circumference was about 25,000 miles. Find another example of measurement in the history of mathematics. Describe how the measurements were done and create a sketch using dynamic software that will show what was done.

Solution: Answers will vary.