MATHCOUNTS® Problem of the Week Archive

Miniature Golf – September 21, 2020

Problems & Solutions

Gerald is going mini golfing at Golf-O-Rama with his family. For his family of 5 to play it costs $34. They were charged for three student tickets and two adult tickets. If a student ticket costs 3/4 as much as an adult ticket costs, how much does one student ticket cost?

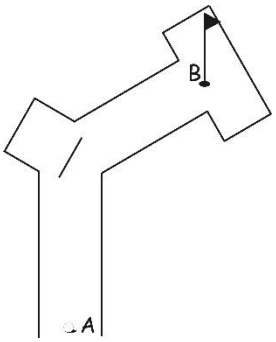
From the problem, we can write two equations: (3/4)a = s and 3s + 2a = 34, where a is the cost of an adult ticket and s is the cost of a student ticket. We can substitute the first equation into the second and simplify:

3(3/4)a + 2a = 34

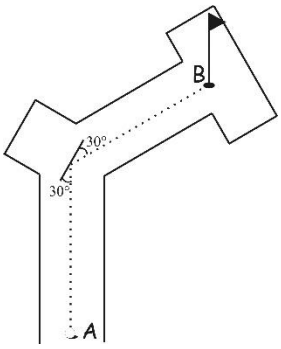
(9/4)a + 2a = 17/4a = 34

Solving for a, we find that a = 34(4/17) = 8. Thus, an adult ticket costs $8.00. Plugging this value in for a, we find that one student ticket costs (3/4)(8) = ***$6.00****.*

This is a diagram of the first hole.

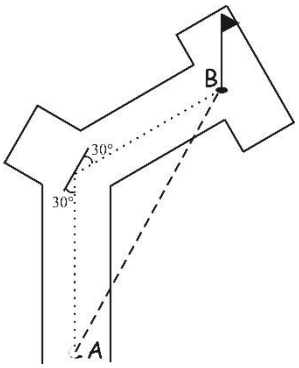


Gerald knows that when his ball hits the wall it will bounce off at the same angle at which it hit the wall. That means, if his ball hits the wall with an angle of 50 degrees relative to the wall, for example, it will bounce off with an angle of 50 degrees relative to the wall. Keeping this in mind, Gerald lines up his shot. The dotted line represents the path of his ball.

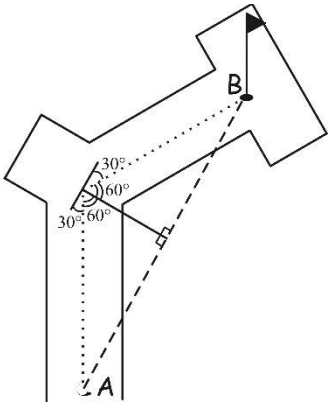


Gerald's ball traveled 6 yards before it hit the wall and then traveled another 6 yards to the hole. Using a straight segment from his ball's original position to the hole, how far was the ball's original position from the hole? Express your answer in simplest radical form.

Because the path of the ball before and after it hit the wall were each 6 yards, we know that the triangle formed by drawing a segment from the ball's original position to the hole is isosceles. Let's label that segment AB.

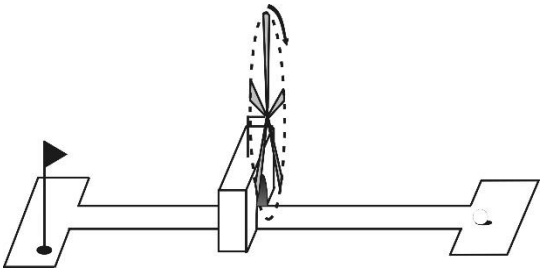


We also can see that the angle formed between the paths before and after the ball hit the wall is 120 degrees because 180 – 30 – 30 = 120. By drawing in the line to divide the 120-degree angle in half, we form two 30-60-90 triangles.



Since we know that the hypotenuse of the left/lower triangle is 6 yards, we can see that the lower half of the segment AB is (6/2)√3 = 3√3. Thus, the distance AB, or the distance from the ball to the hole, was originally 2(3√3) = ***6√3*** *yards.*

The next hole has a windmill as shown below. Gerald decides that he is never going to be able to time his shot right, so he decides to just randomly swing and hope that the ball makes it past the blades. If the end of each blade is 6 inches and the distance from the center of the fan to the end of a blade is 3 feet, what is the probability of Gerald's shot making it past the windmill? Express your answer as a percent to the nearest tenth.



Notice that the path of the tip of the blades is a circle. To determine the likelihood of the ball randomly getting past the windmill, we need to see how much of the circumference of the circle is occupied by a blade at any given time. First, let's figure out the circumference of the circle.

$C = 2\pi r = 2\pi(3\text{ ft}) = 6\pi$ ft.

Now, let's figure out how long the blade edges are all together.

(6 in)(5 blades) = 30 inches

In order to figure out what fraction of the circumference 30 inches is, we need to convert the measures to the same units. Let's convert feet to inches: $(6\pi$ ft$)(12$ in/1 ft$) = 72\pi$ in.

Thus, the probability of Gerald's randomly timed shot hitting a blade of the windmill is $30/(72\pi) = 13.3\%$. The probability of his shot getting past the blades is then $100 - 13.3 =$ ***86.7%****.*

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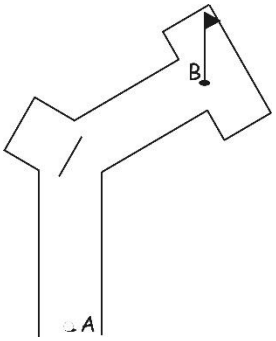

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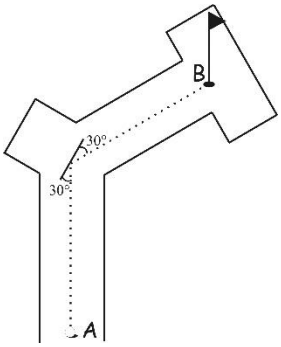

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