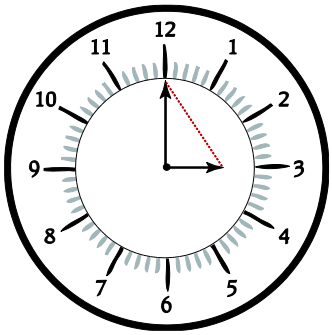
MATHCOUNTS® Problem of the Week Archive

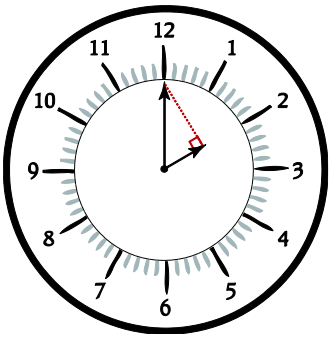
A Matter of Time – May 30, 2022

Problems & Solutions



Temi's analog clock, shown here, has an hour hand of length 9 in and a minute hand of length 15 in. When Temi's clock strikes 3 o'clock, what is the length of the segment drawn from the end of the minute hand to the end of the hour hand? Express your answer in simplest radical form.

The segment connecting the ends of each of the clock hands is the hypotenuse of a right triangle with legs of length 9 in and 15 in. Let x be the length of the hypotenuse. We can use the Pythagorean theorem to determine its length. So, the length of the segment connecting the hands of the clock is $x^2 = 9^2 + 15^2 \rightarrow x^2 = 81 + 225 \rightarrow x^2 = 306 \rightarrow x = \sqrt{306} \rightarrow x =$ ***3√34*** *in.*



Kari has an analog clock, shown here, with a minute hand of length 12 in. When Kari's clock strikes 2 o'clock, what is the area of the right triangle formed by drawing a segment from the end of the minute hand to the end of the hour hand? Express your answer in simplest radical form.

At 2 o'clock, the minute hand points to the number 12, while the hour hand points to the number 2. Since any two adjacent numbers on the face of the clock are 30 degrees apart, the angle formed by the hands of the clock at 2 o'clock measures 60 degrees. We are told that the triangle formed is a right triangle; therefore, the triangle must be a 30-60-90 right triangle. We are also told that the length of the minute hand, the hypotenuse of the right triangle, is 12 in. By the properties of 30-60-90 right triangles, it follows that the length of the hour hand, the shorter leg of the right triangle must be ½(12) = 6 in, and the length of the longer leg measures 6√3 in. The area of the triangle is (1/2)(6)(6√3) = 3(6√3) = ***18√3*** *in².*

Mitch practices playing the violin every evening for 1 hour and 45 minutes. What is the positive difference between the total degrees traveled by the minute hand and the total degrees traveled by the hour hand during Mitch's practice? Express your answer as a decimal to the nearest tenth.

It takes 720 minutes for the hour hand of the clock to rotate completely around the clock a total of 360 degrees. That means the hour hand rotates at a rate of 360/720 = ½ degree per minute. One hour and 45 minutes is equal to 105 minutes, and in 105 minutes, the hour hand rotates a total of 105(1/2) = 52.5 degrees. It takes the minute hand 60 minutes to rotate complete around the clock a total of 360 degrees. That means the minute hand rotates at a rate of 360/60 = 6 degrees per minute. In 105 minutes, the minute hand rotates 105(6) = 630 degrees. The difference between the total degrees traveled by the minute hand and the total degrees traveled by the hour hand of the clock during Mitch's 1 hour and 45-minute practice is 630 – 52.5 = ***577.5*** *degrees.*

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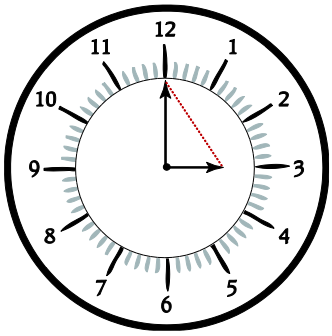

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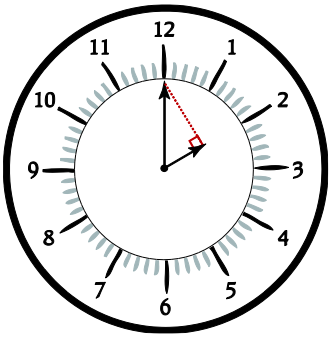

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