MATHCOUNTS® Problem of the Week Archive

Combining Shapes – April 1, 2019

Problems & Solutions

The radius of circle N is 3 inches, and the radius of circle O is 4 inches. What is the radius of circle P whose area is the sum of the areas of circles N and O?

*The formula for the area of a circle is $A = \pi r^2$. So, the area of circle N is $3^2\pi = 9\pi$ in^2, and the area of circle O is $4^2\pi = 16\pi$ in^2. The area of circle P is $9\pi + 16\pi = 25\pi$ in^2. So, for circle P, we have $\pi r^2 = 25\pi \rightarrow r^2 = 25 \rightarrow r = $ **5** inches.*

A small square has side length 7 cm, and a medium square has side length 24 cm. What is the side length of a large square whose area is the sum of the areas of the small and medium squares?

*The formula for the area of a square is $A = s^2$. So, the area of the small square is $7^2 = 49$ cm^2, and the area of the medium square is $24^2 = 576$ cm^2. The area of the large square is $49 + 576 = $ cm^2. So, for the large square, we have $s^2 = 625$ and $s = $ **25** cm.*

The side length of a small equilateral triangle is 10 feet, and the side length of a medium equilateral triangle is 24 feet. What is the side length of a large equilateral triangle whose area is the sum of the areas of the small and medium equilateral triangles?

*The formula for the area of an equilateral triangle is $A = s^2\sqrt{3}/4$. The area of the small equilateral triangle is $10^2\sqrt{3}/4 = 100\sqrt{3}/4 = 25\sqrt{3}$ ft^2, and the area of the medium equilateral triangle is $24^2\sqrt{3}/4 = 576\sqrt{3}/4 = 144\sqrt{3}$ ft^2. The area of the large equilateral triangle is $25\sqrt{3} + 144\sqrt{3}$ ft$^2 = 169\sqrt{3}$ ft^2. So, for the large equilateral triangle, we have $s^2\sqrt{3}/4 = 169\sqrt{3} \rightarrow s^2 = 169 \times 4 \rightarrow s = \sqrt{(169 \times 4)} = \sqrt{169} \times \sqrt{4} = 13 \times 2 = $ **26** cm.*

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