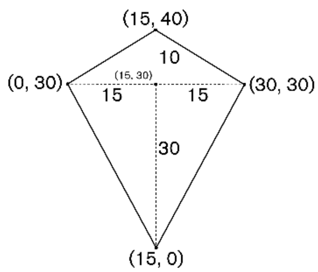
MATHCOUNTS® Problem of the Week Archive

Fly a Kite – March 24, 2025

Problems & Solutions

Molly has sketched a design for her new kite on a coordinate grid. The sides of her quadrilateral kite design are given by the equations $y = (2/3)x + 30$, $y = (-2/3)x + 50$, $y = -2x + 30$ and $y = 2x - 30$. How many square units are in the area of Molly's design?



The figure shows the graph of Molly's kite design. Notice that one diagonal is a horizontal line that has endpoints (0, 30) and (30, 30) and length of 30 units. The other diagonal is a vertical line that has endpoints (15, 0) and (15, 40) and length of 40 units. Recall that a kite with diagonals of lengths d_1 and d_2 has area $A = (1/2)d_1d_2$. So, Molly's kite design has area (1/2)(30)(40) = ***600*** *units^2.*

Based on the previous problem, what is the perimeter of Molly's kite design? Express your answer in simplest radical form.

The two diagonals intersect at (15, 30). As the figure shows, the diagonals divide the kite design into two isosceles triangles, one is with the shorter sides of the kite being the two congruent sides and the shorter diagonal being the base, the other with the longer sides of the kite being the two congruent sides and the shorter diagonal being the base. To determine the lengths of the sides of the kite we'll use the Pythagorean Theorem; although, the distance formula can also be used. For the shorter sides, we have $15^2 + 10^2 = a^2 \rightarrow 225 + 100 = a^2 \rightarrow a = \sqrt{325} = 5\sqrt{13}$ units. For the longer sides, we have $15^2 + 30^2 = b^2 \rightarrow 225 + 900 = b^2 \rightarrow b = \sqrt{1125} = 15\sqrt{5}$ units. Therefore, Molly's kite design has perimeter $P = 2(5\sqrt{13}) + 2(15\sqrt{5})$ = $\boldsymbol{10\sqrt{13} + 30\sqrt{5}}$ *units.*

The length of the tail that Molly needs for her kite must be 1.5 times the average length of the kite's diagonal lengths. Based on the previous problems, how many units long is the tail Molly designs for her new kite? Express your answer as a decimal to the nearest tenth.

In the first problem, we determined that the diagonals had lengths 30 units and 40 units. The average of these lengths is (30 + 40)/2 = 70/2 = 35 units. So, the tail for Molly's kite design must have length (1.5)(35) = ***52.5*** *units.*

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Based on the previous problem, what is the perimeter of Molly's kite design, in units? Express your answer in simplest radical form.

The length of the tail that Molly needs for her kite must be 1.5 times the average length of the kite's diagonal lengths. Based on the previous problems, how many units long is the tail Molly designs for her new kite? Express your answer as a decimal to the nearest tenth.