MATHCOUNTS Minis
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Activity Sheet for the December, 2011, MATHCOUNTS Mini

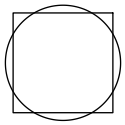
Warm-Up!

Try these problems before watching the lesson.

1. In right triangle ABC, we have $m\angle A = 30^\circ$ and $m\angle B = 60^\circ$. If $AB = 4$, then what is the area of the triangle?
2. What is the area of an equilateral triangle with side length 6?
3. $ABCD$ is a rectangle. Point X is on side $\overline{AB}$ and point Y is on side $\overline{CD}$ such that $\overline{XY}$ is parallel to $\overline{AD}$. If the area of quadrilateral $XBCY$ is 5 times the area of quadrilateral $AXYD$, then what is the ratio of the length of $\overline{YD}$ to the length of $\overline{CD}$?

The Problem

First Problem: A square and a circle intersect so that each side of the square contains a chord of the circle equal in length to the radius of the circle. What is the ratio of the area of the square to the area of the circle?



Second Problem: In a rectangle $ABCD$, point E is on side $\overline{CD}$. The area of triangle ADE is one-fifth of the area of quadrilateral $ABCD$. What is the ratio of the length of segment $\overline{DE}$ to the length of segment $\overline{DC}$?

Third Problem: Let M be the midpoint of the segment $\overline{FG}$. Let A and B be points coplanar to points F and G. Points A and B are positioned on the same side of the line containing segment $\overline{FG}$ such that triangles FMA and MGB are equilateral. The lines $\overline{FB}$ and $\overline{GA}$ intersect at point K. What is the measure of angle GKB?

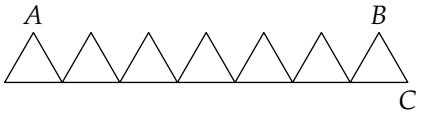
Follow-up Problems

4. The altitudes of equilateral triangle ABC all pass through point H inside the triangle. If $AB = 6$, then what is AH?

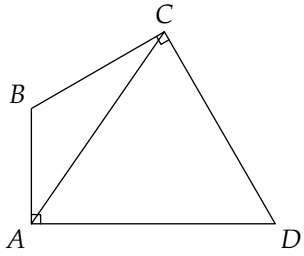
5. $EFGH$ is a parallelogram. If point X is on $\overline{EF}$ such that $EF = 5EX$, then what is the ratio of the area of $\triangle EXH$ to the area of parallelogram $EFGH$?

6. Find the area of a regular hexagon with side length 6.

7. Naoki draws 7 identical equilateral triangles along a line as shown below. If each triangle has side length 8, then how far is point A from point B? Extra challenge: How far is point A from point C?



8. In triangle ABC, $m\angle ABC = 120°$, $AB = 3$ and $BC = 4$. If lines perpendicular to $\overline{AB}$ at point A and to $\overline{BC}$ at point C meet at point D, then find CD. *(Source: AMC 12)*



Share Your Thoughts

Have some thoughts about the video? Want to discuss the problems on the Activity Sheet? Visit the MATHCOUNTS Facebook page or the Art of Problem Solving Online Community (www.artofproblemsolving.com).