Activity Sheet for the November, 2016, MATHCOUNTS Mini
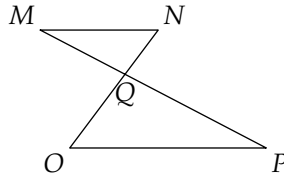
Warm-Up!

Try these problems before watching the lesson.

1. An isosceles triangle has legs with length 39 and a base with length 30. What is the area of the triangle?

2. In the diagram below, $\overline{MN} \parallel \overline{OP}$, $MN = 12$, and $OP = 20$. If $ON = 24$, then what is QN?
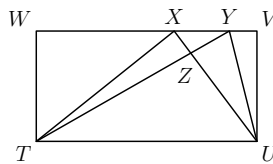

3. The area of $\triangle STU$ is 45. Points P and Q are on sides $\overline{ST}$ and $\overline{SU}$, respectively, such that $\overline{TU} \parallel \overline{PQ}$. If $SP = 2PT$, what is the area of $\triangle SPQ$?

4. Triangle PQR is a right triangle with $\angle P = 90°$. Point S is on $\overline{QR}$ such that $\overline{PS} \perp \overline{QR}$. If $PS = 6$ and $SR = 8$, then what is PQ? Express your answer as a common fraction.
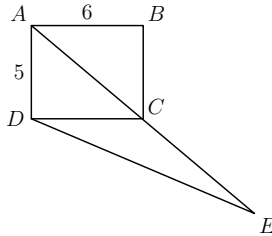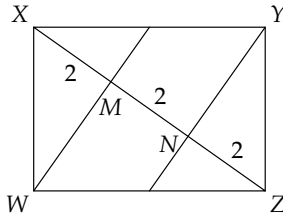
The Problems

First Problem: In rectangle $TUVW$, shown here, $WX = 4$ units, $XY = 2$ units, $YV = 1$ unit and $UV = 6$ units. What is the absolute difference between the areas of triangles TXZ and UYZ?

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Second Problem: Rectangle $ABCD$ is shown with $AB = 6$ units and $AD = 5$ units. If AC is extended to point E such that $\overline{AC}$ is congruent to $\overline{CE}$, what is the length of $\overline{DE}$?


Third Problem: Diagonal XZ of rectangle $WXYZ$ is divided into three segments each of length 2 units by points M and N as shown. Segments MW and NY are parallel and are both perpendicular to XZ. What is the area of $WXYZ$?


Follow-up Problems

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 $EFGH$? Express your answer as a common fraction.

6. Triangle PQR is a right triangle with $\angle Q = 90°$, $PQ = 3$, and $QR = 4$. Points S, T, and U are on sides $\overline{PQ}$, $\overline{PR}$, and $\overline{QR}$, respectively, such that $QSTU$ is a square. Find the length of $\overline{ST}$. Express your answer as a common fraction.

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7. In the diagram below, $\overline{BE} \parallel \overline{CD}$. If the area of trapezoid $BCDE$ is 8 times the area of $\triangle ABE$, and the area of $\triangle CDX$ is 27 square units, then what is the area of $\triangle ACD$?
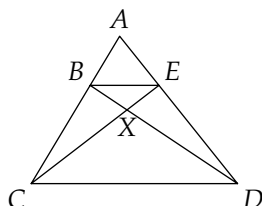
8. In the diagram below, we have $DE = 2EC$ and $AB = DC = 20$. Find the length of $\overline{FG}$.
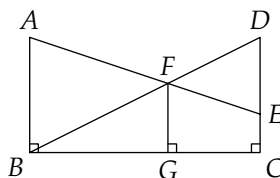
Wow! Share Your Thoughts

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).