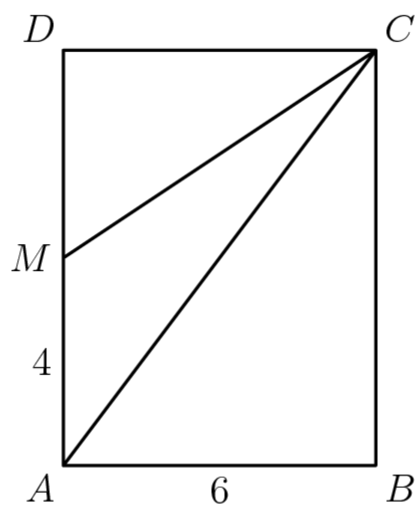
# Problem Set - 19 Jan 2024

## **PROBLEM 1** (2016 AMC 8 #2)

In rectangle $ABCD$, $AB = 6$ and $AD = 8$. Point $M$ is the midpoint of $\overline{AD}$. What is the area of $\triangle AMC$?




(A) 12 (B) 15 (C) 18 (D) 20 (E) 24

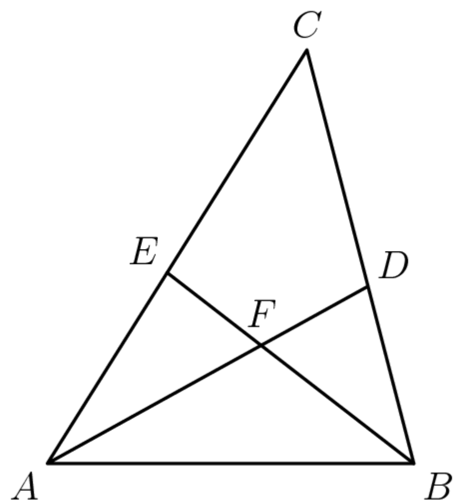
## **PROBLEM 2** (2011 AMC 10B #6)

On Halloween Casper ate $\frac{1}{3}$ of his candies and then gave $2$ candies to his brother. The next day he ate $\frac{1}{3}$ of his remaining candies and then gave $4$ candies to his sister. On the third day he ate his final $8$ candies. How many candies did Casper have at the beginning?

**(A)** 30 **(B)** 39 **(C)** 48 **(D)** 57 **(E)** 66

## **PROBLEM 3** (2016 AMC 12A #12)

In $\triangle ABC$, $AB = 6$, $BC = 7$, and $CA = 8$. Point $D$ lies on $\overline{BC}$, and $\overline{AD}$ bisects $\angle BAC$. Point $E$ lies on $\overline{AC}$, and $\overline{BE}$ bisects $\angle ABC$. The bisectors intersect at $F$. What is the ratio $AF : FD$?




$\textbf{(A)}\ 3:2 \qquad \textbf{(B)}\ 5:3 \qquad \textbf{(C)}\ 2:1 \qquad \textbf{(D)}\ 7:3 \qquad \textbf{(E)}\ 5:2$

## **PROBLEM 4** (2018 AMC 10A #17)

Let $S$ be a set of 6 integers taken from $\{1, 2, \dots, 12\}$ with the property that if $a$ and $b$ are elements of $S$ with $a < b$, then $b$ is not a multiple of $a$. What is the least possible value of an element in $S$?

$\textbf{(A)}\ 2 \qquad \textbf{(B)}\ 3 \qquad \textbf{(C)}\ 4 \qquad \textbf{(D)}\ 5 \qquad \textbf{(E)}\ 7$

## **PROBLEM 5** (2017 IMO #4)

Let $R$ and $S$ be different points on a circle $\Omega$ such that $RS$ is not a diameter. Let $\ell$ be the tangent line to $\Omega$ at $R$. Point $T$ is such that $S$ is the midpoint of the line segment $RT$. Point $J$ is chosen on the shorter arc $RS$ of $\Omega$ so that the circumcircle $\Gamma$ of triangle $JST$ intersects $\ell$ at two distinct points. Let $A$ be the common point of $\Gamma$ and $\ell$ that is closer to $R$. Line $AJ$ meets $\Omega$ again at $K$. Prove that the line $KT$ is tangent to $\Gamma$.