# Trigonometry

**JV Practice 9/6/20**

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## Warm Up Problems

1. (1988 AHSME #13) If $\sin(x) = 3 \cdot \cos(x)$, then what is $\sin(x) \cdot \cos(x)$?
2. (AMC 2012 12A #10) A triangle has area 30, one side of length 10, and the median to that side of length 9. Let $\theta$ be the acute angle formed by that side and the median. What is $\sin\theta$?
3. (C.J.) In triangle $ABC$, side $AB = 6$, $AC = 12$, and $\tan(A) = 2$. Compute the area of $ABC$.

## Guided Problems

1. (Law of Sines) In triangle $ABC$, with side lengths $BC = a$, $AC = b$, and $AB = c$, prove that

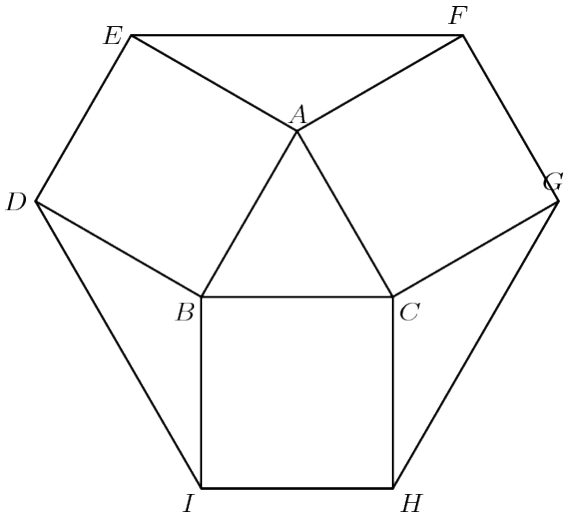
$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}.$$

*Hint: use the area formula.*

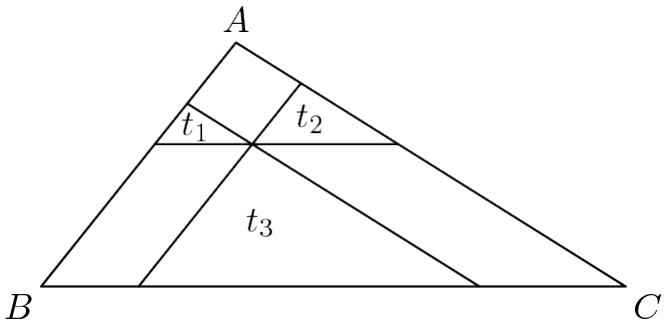
## Problems

1. (C.J.) Triangle $ABC$ has $AB = 9$, $AC = 5$. Angles $B$ and $C$ are actue with $\tan(C) = 3\tan(B)$. Compute the area of $ABC$.
2. (1999 AHSME #15) Let $x$ be a real number such that sec($x$) - tan($x$) = 2. What is sec($x$) + tan($x$)?
3. (CEMC ???) In triangle $PQS$, point $R$ lies on side $QS$ such that $\angle SPR = 90^\circ$ and $\angle PRQ = 120^\circ$. If $QR = 8$ and $PR = 12$, what is the area of $\triangle QPS$?
4. (2005 AMC 10B #14) Equilateral $\triangle ABC$ has side length 2, $M$ is the midpoint of $\overline{AC}$, and $C$ is the midpoint of $\overline{BD}$. What is the area of $\triangle CDM$?

5. (2014 AMC 10A #13) Equilateral $\triangle ABC$ has side length 1, and squares $ABDE$, $BCHI$, $CAFG$ lie outside the triangle. What is the area of hexagon $DEFGHI$?




6. (1984 AIME Problems #3) A point $P$ is chosen in the interior of $\triangle ABC$ such that when lines are drawn through $P$ parallel to the sides of $\triangle ABC$, the resulting smaller triangles $t_1$, $t_2$, and $t_3$ in the figure, have areas 4, 9, and 49, respectively. Find the area of $\triangle ABC$.




7. (C.J.'s crazy area problem) Prove that ACE = BDF in area.