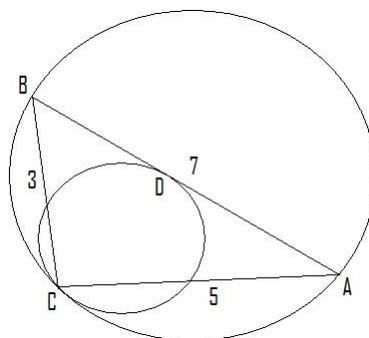




## Geometry B

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1. A pirate ship spots, 10 nautical miles to the east, an oblivious caravel sailing  $60^\circ$  south of west at a steady 12 nm/hour. What is the minimum speed that the pirate ship must maintain at to be able to catch the caravel?
2. A black witch's hat is in the classic shape of a cone on top of a circular brim. The cone has a slant height of 18 inches and a base radius of 3 inches. The brim has a radius of 5 inches. What is the total surface area of the hat?
3. Suppose that ABCD is a rectangle with sides of length 12 and 18. Let  $S$  be the region of points contained in ABCD which are closer to the center of the rectangle than to any of its vertices. Find the area of  $S$ .
4. ABCDE is a regular pentagon (with vertices in that order) inscribed in a circle of radius 1. Find  $AB \cdot AC$ .
5. Four circles of radius 1 are each tangent to two sides (line segments) of a square and externally tangent to a circle of radius 3. What is the area of the space that is inside the square but not contained in any of the circles?
6. Triangle  $ABC$  has  $AC = 3$ ,  $BC = 5$ ,  $AB = 7$ . A circle is drawn internally tangent to the circum-circle of  $ABC$  at  $C$ , and tangent to  $AB$ . Let  $D$  be its point of tangency with  $AB$ . Find  $BD - DA$ .



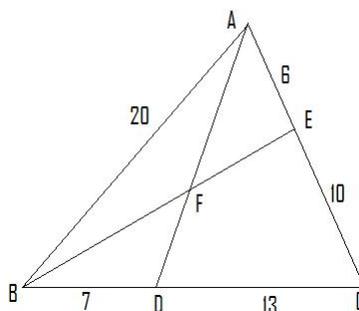
7. A, B, C, and D are all on a circle, and ABCD is a convex quadrilateral. If  $AB = 13$ ,  $BC = 13$ ,  $CD = 37$ , and  $AD = 47$ , what is the area of ABCD?
8. Points  $P_1$ ,  $P_2$ ,  $P_3$ , and  $P_4$  are  $(0, 0)$ ,  $(10, 20)$ ,  $(5, 15)$ , and  $(12, -6)$ , respectively. For what point  $P \in \mathbb{R}^2$  is the sum of the distances from  $P$  to the other 4 points minimal?



## Geometry B

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9. Find  $\frac{\text{area}(CDF)}{\text{area}(CEF)}$  in the figure.



10.  $A$  and  $B$  are on a circle of radius 20 centered at  $C$ , and  $\angle ACB = 60^\circ$ .  $D$  is chosen so that  $D$  is also on the circle,  $\angle ACD = 160^\circ$ , and  $\angle DCB = 100^\circ$ . Let  $E$  be the intersection of lines  $AC$  and  $BD$ . What is  $DE$ ?