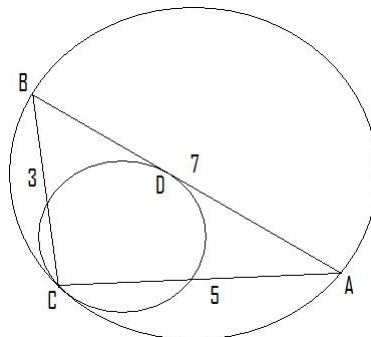


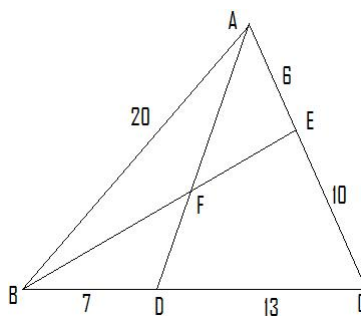


Geometry A

- Triangle ABC has $AC = 3$, $BC = 5$, $AB = 7$. A circle is drawn internally tangent to the circumcircle of ABC at C , and tangent to AB . Let D be its point of tangency with AB . Find $BD - DA$.



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



- 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 ?
- A sphere of radius $\sqrt{85}$ is centered at the origin in three dimensions. A tetrahedron with vertices at integer lattice points is inscribed inside the sphere. What is the maximum possible volume of this tetrahedron?



Geometry A

7. A set of points P_i covers a polygon if for every point in the polygon, a line can be drawn inside the polygon to at least one P_i . Points A_1, A_2, \dots, A_n in the plane form a 2007-gon, not necessarily convex. Find the minimum value of n such that for any such polygon, we can pick n points inside it that cover the polygon.
8. What is the area of the region defined by $x^2 + 3y^2 \leq 4$ and $y^2 + 3x^2 \leq 4$?
9. There are four spheres each of radius 1 whose centers form a triangular pyramid where each side has length 2. There is a 5th sphere which touches all four other spheres and has radius less than 1. What is its radius?
10. In triangle ABC with $AB \neq AC$, points $N \in CA$, $M \in AB$, $P \in BC$, and $Q \in BC$ are chosen such that $MP \parallel AC$, $NQ \parallel AB$, $\frac{BP}{AB} = \frac{CQ}{AC}$, and A, M, Q, P, N are concyclic. Find $\angle BAC$.