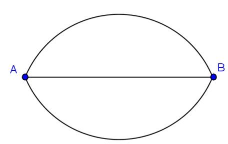
These problems are in a **roughly** increasing difficulty order. Consult the answer sheet for more instructions. Good luck!

1. Compute the area of a right triangle with a side length of 12 and a hypotenuse of 20.
2. Quadrilateral $ABCD$ has angles $\angle A = 62^\circ$ and $\angle B = 91^\circ$. If angle $\angle C$ is half the measure of angle $\angle D$, compute, in degrees, the value of $\angle D$.
3. The coordinate of the intersection of the lines $y = 6x + 8$ and $y = 9x - 7$ is (x, y) for soem x and y. Compute $x + y$.
4. Pyramid α has a volume that is 337.5% of pyramid β. The ratio of the perimeter, or sum of the lengths of all the edges, of pyramid a and pyramid β, assuming they're similar pyramids, can be expressed in the form $\frac{a}{b}$, where a and b are relatively prime[1] positive integers. Compute $a + b$.
5. Triangle ABC has side lengths $\overline{AB} = 20$, $\overline{BC} = 21$, and $\overline{AC} = 29$. Let the midpoint of side $\overline{AC}$ be M. The length of $\overline{BM}$ can be represented in the form $\frac{a}{b}$, where a and b are relatively prime positive integers. Compute $a + b$.
6. Triangle ABC has side lengths $\overline{AB} = 4$, $\overline{BC} = 6$, and a right angle at B. The inradius, which is the radius of the circle inscribed within triangle ABC, can be represented in the form $a - \sqrt{b}$, where a and b are positive integers and b is not divisible by the square of any prime. Compute $a + b$.
7. Triangle ABC has a right angle at B. If $\overline{AB} = \overline{BC} = 5$, the area of the largest semicircle that can be inscribed within triangle ABC can be represented by $\frac{a}{b}\pi$, where a and b are relatively prime positive integers. Compute $a + b$.
8. Define an eye as the region bounded by two congruent circular arcs, $\widehat{AB}$, as shown below. If the measure of both arcs is 60° and $\overline{AB} = 8$, then the radius of the largest circle that can be inscribed within eye AB can be represented by $a + b\sqrt{c}$, where a, b, and c are integers and c is not divisible by the square of any prime. Compute $a + b + c$.



9. Triangle ABC has side lengths $\overline{AB} = 13$ and $\overline{AC} = 15$. M is on $\overline{BC}$ such that $\overline{AM}$ bisects angle $\angle BAC$. Compute the sum of the possible integer lengths of $\overline{MC}$.
10. P is a point on circle O. Line $\overline{AP}$ is tangent to circle O. Points B and C are on the circle such that $\overline{BC}$ is a diameter of the circle and A, B, and C are collinear, in that order. If $\overline{PA} = 10$ and $\overline{AB} = 5$, the value of $\overline{PB}$ can be expressed in the form $a\sqrt{b}$ where a and b are positive integers and b is not divisible by the square of any prime. Compute $10a + b$.

[1]Definition: Two numbers are relatively prime when they do not share any common factors besides 1. For example, 2 and 5 are relatively prime, but 6 and 8 are not.