

Part A Numerical Answer Questions

1. (4 pts) Two tangents to a circle of radius 10'' meet at an angle of 60° . Find the area of the region enclosed by the tangents and the minor arc of the circle.

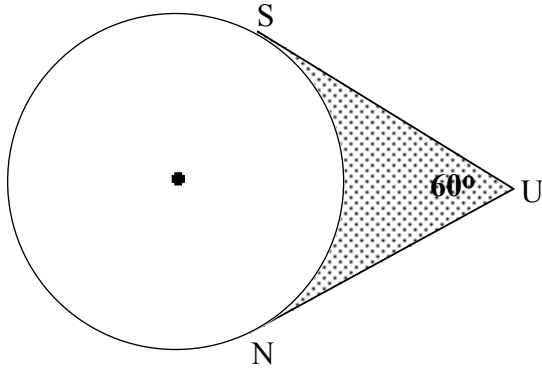


Figure for Problem 1

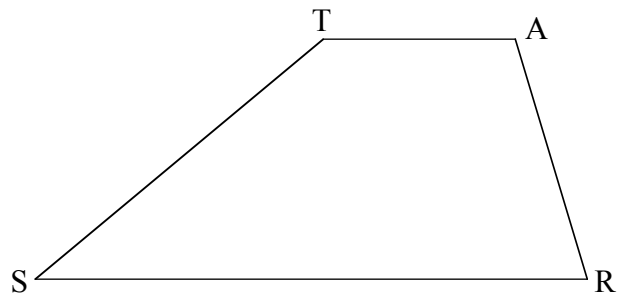


Figure for Problem 2

2. (4 pts) Find the area of trapezoid STAR in which the parallel sides are 10'' and 31'' and the non-parallel sides are 17'' and 10''.
3. (4 pts) $\triangle RAM$ has $m\angle A = 80^\circ$. The bisectors of the exterior angles at M and R meet at S. Find the size of $\angle MSR$.

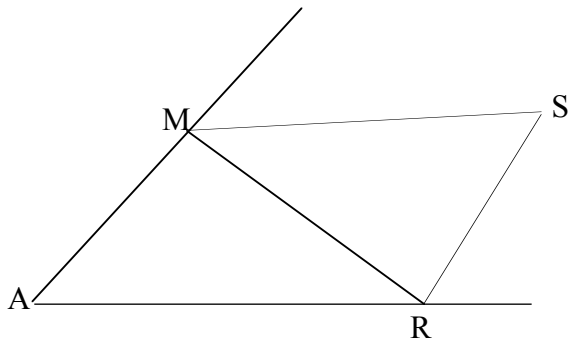


Figure for Problem 3

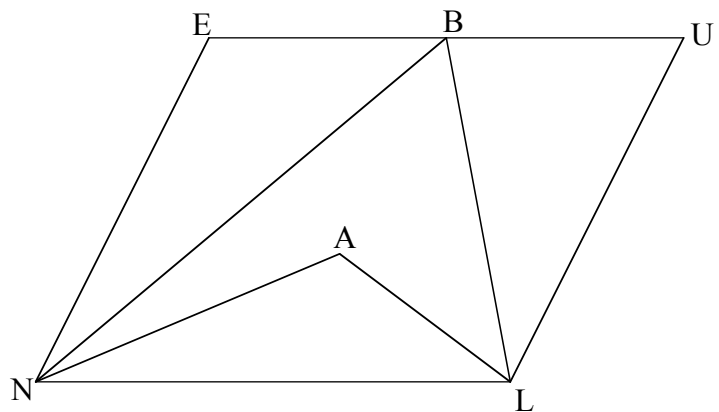


Figure for Problem 4

4. (4 pts) NEUL is a parallelogram. The angles at N and L have been trisected. Find the sum of $m\angle NBL$ and $m\angle NAL$.

5. (6 pts) In the diagram below, where L is the center of the circle, find the length RA and $m\angle PAS$.

$m\angle PLS = 41^\circ$
 $m\angle ILR = 103^\circ$
 $AP = 2.4$ inches
 $AS = 3.0$ inches
 $AI = 6.0$ inches

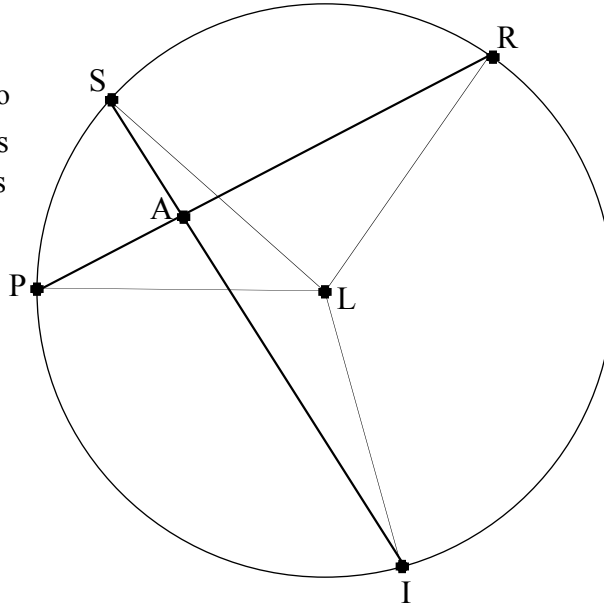


Figure for Problem 5

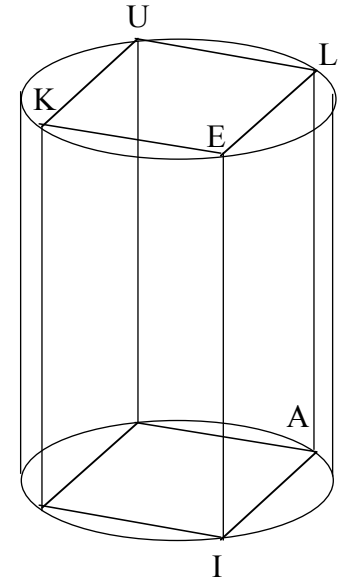


Figure for Problem 6

6. (6 pts) A right prism of height 10cm whose base is a square is inscribed in a cylinder of radius 5. Find the length of the diagonal KA and the volume of the prism. Express your answer in exact (radical) form.
7. (6 pts) In the diagram below, where a circle centered at A is inscribed in $\triangle EUO$, P and R are points on circle A, OR = 5 and points A, R, and O are points on circle P, find $m\angle AOR$ and the area of circle A.

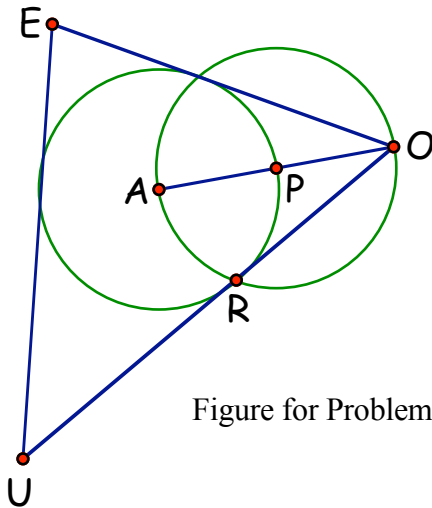


Figure for Problem 7

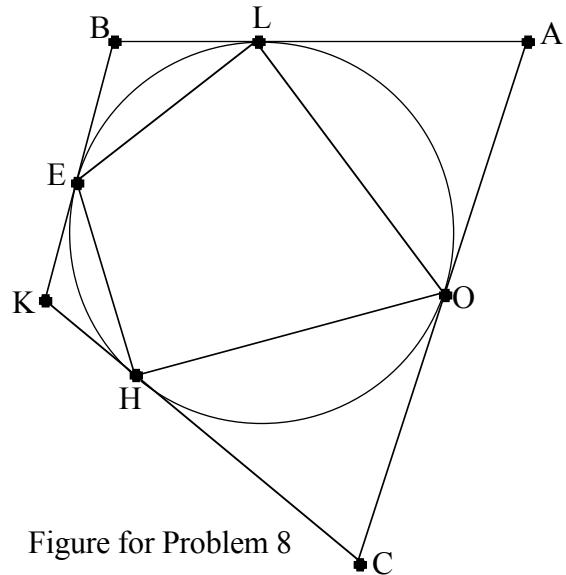


Figure for Problem 8

8. (6 pts) A quadrilateral BACK is circumscribed about a circle. $m\angle B = 108^\circ$, $m\angle A = 86^\circ$, $m\angle C = 72^\circ$. Join the points of contact of the original quadrilateral with the circle. Find the measures of $\angle LOH$ and $\angle OLE$.

Choose four of the five proofs from Part B and write a plan (a two-column proof is not necessary)

1. Take any two isosceles right triangles like $\triangle VEN$ and $\triangle SUN$ and place them back-to-back as shown below. Mark the midpoints of segments VE, EU, US, and VS, and then connect them. Describe, briefly, your plan to prove that the connected midpoints form a rhombus.

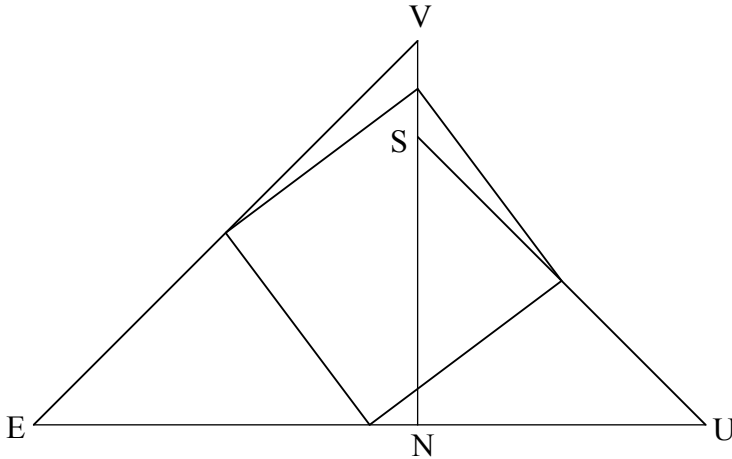


Figure for Problem 1

2. From the diagram below, prove that $UJ \cdot UI = UP \cdot UR$

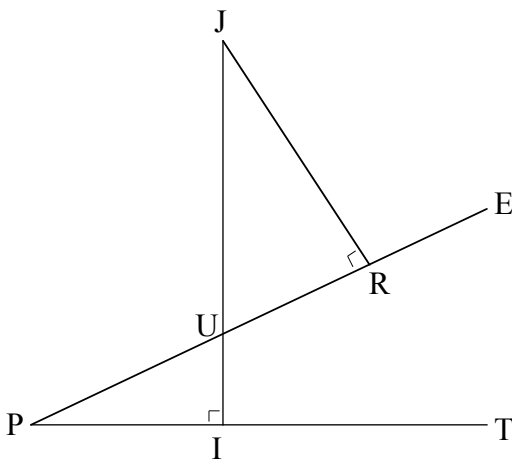


Figure for Problem 2

3. In the figure below, points $L, M, W, A,$ and I are on the circle, K and Y are outside the circle, and YM, YW and KW are straight lines. If minor arc AI has n degrees, express n in terms of p and q . Justify your answer.

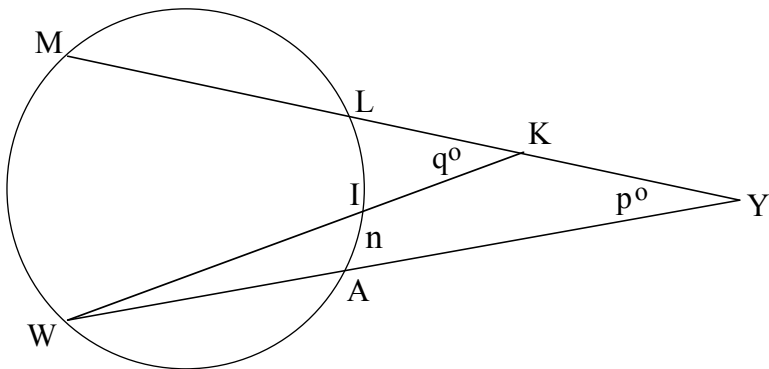


Figure for Problem 3

4. In the figure below, equilateral triangles ASP and ACE were drawn on AS and AE , as shown. Write a plan to prove triangle EPA congruent to triangle CSA .

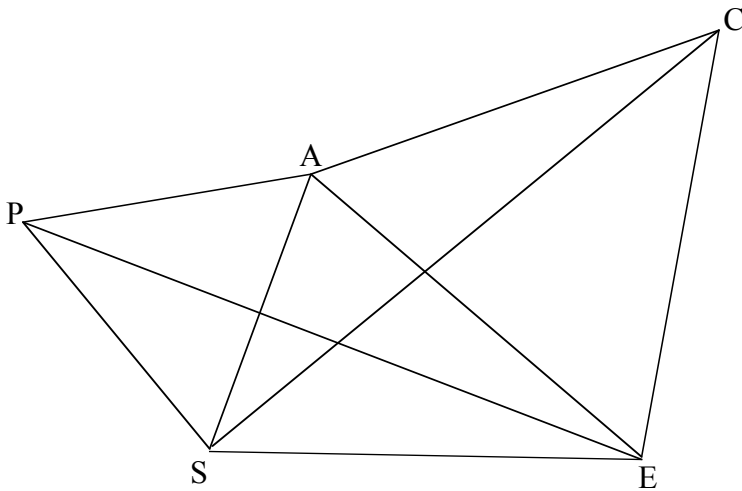
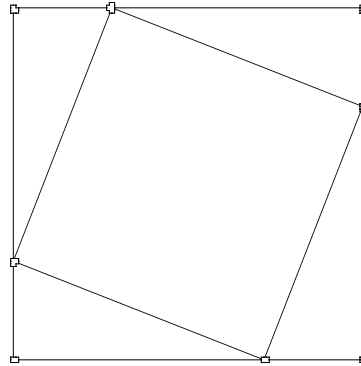
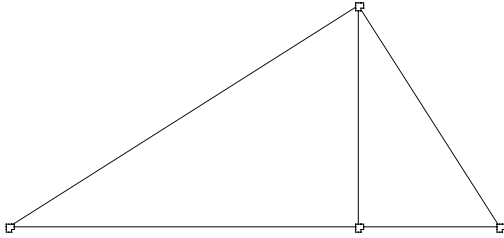


Figure for Problem 4

5. The diagrams for two well-known proofs of the Pythagorean Theorem are shown here. **Choose and label** one of the diagrams (or draw one of your own), and write a proof of the Pythagorean Theorem.

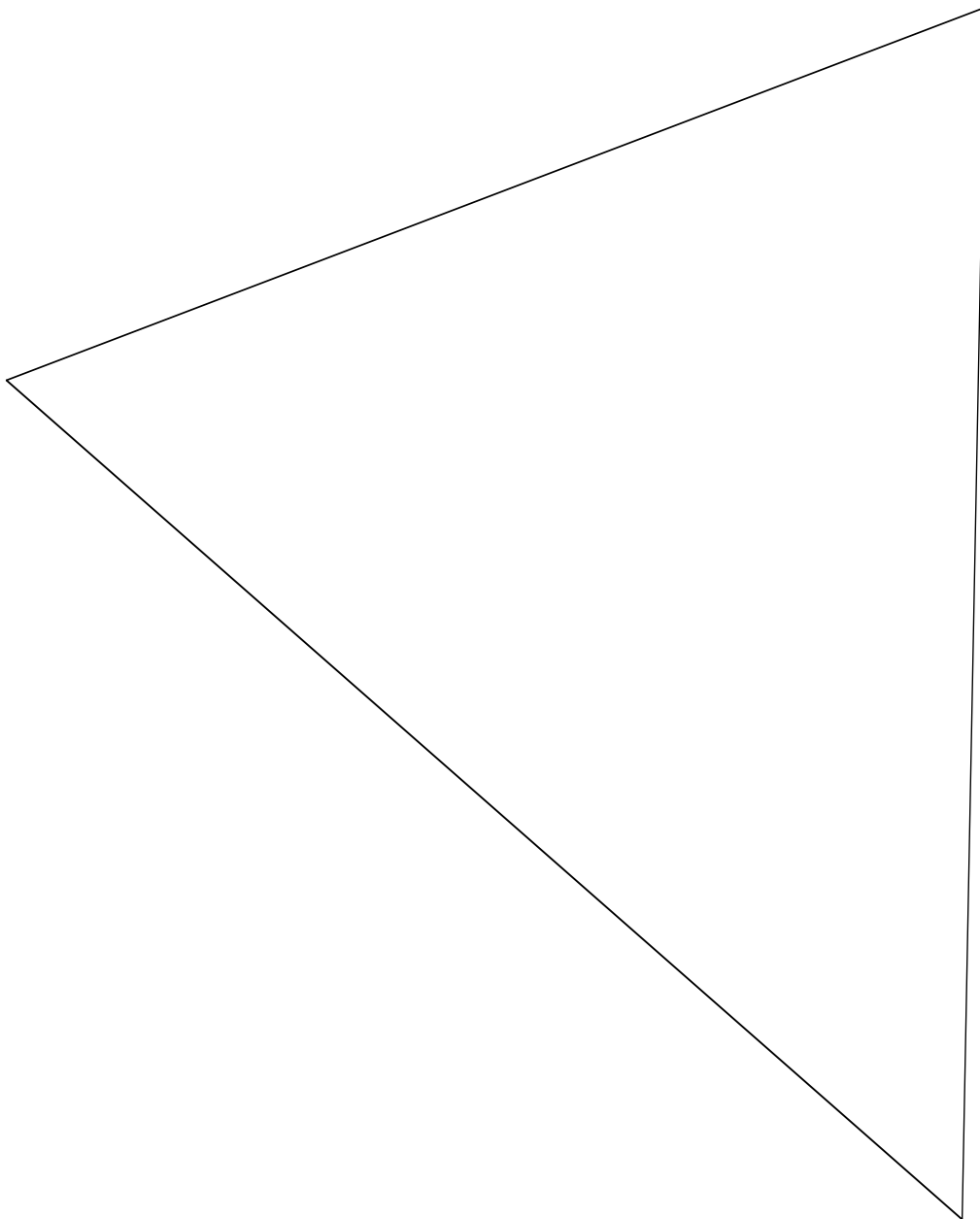


Part C

Open Response Questions (partial credit available for work shown)

10 pts each

1. Construct the inscribed circle in the triangle shown. Leave all pertinent construction marks to show how you constructed the circle.



2. Given the points $(0, 0)$, $(1, 7)$, $(4, -2)$, find the location of the circumcenter using coordinate geometry techniques.

