Problem 1

In the diagram, line segment PS has length 4. Points Q and R are on line segment PS. Four semi-circles are drawn on the same side of PS. The diameters of these semi-circles are PS, PQ, QR, and RS. The region inside the largest semi-circle and outside the three smaller semi-circles is shaded. What is the area of a square whose perimeter equals the perimeter of the shaded region?
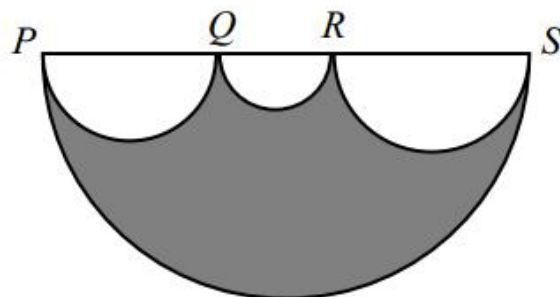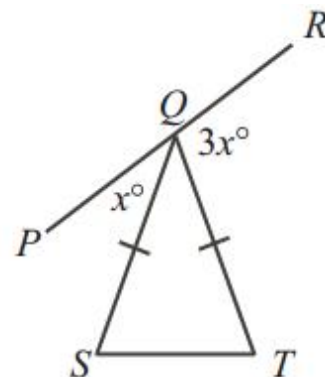
(A) 4 (B) π (C) π^2

(D) $2\pi^2$ (E) $\dfrac{\pi^2}{4}$

Don't just select an answer! Show work to support the answer that you have chosen!

Problem 2

In the diagram, PQR is a straight line segment and $QS = QT$. Also, $\angle PQS = x°$ and $\angle TQR = 3x°$. If $\angle QTS = 76°$, the value of x is
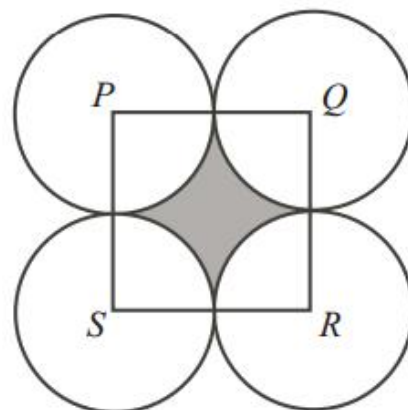
(A) 28 (B) 38 (C) 26

(D) 152 (E) 45

Problem 3

In the diagram, $PQRS$ is a square with side length 2. Each of P, Q, R, and S is the centre of a circle with radius 1. What is the area of the shaded region?

(A) $16 - \pi^2$ (B) $16 - 4\pi$ (C) $4 - 4\pi$

(D) $4 - 4\pi^2$ (E) $4 - \pi$

A water tower in the shape of a cylinder has radius 10 m and height 30 m. A spiral staircase, with constant slope, circles once around the outside of the water tower. A vertical ladder of height 5 m then extends to the top of the tower. Which of the following is closest to the total distance along the staircase and up the ladder to the top of the tower?
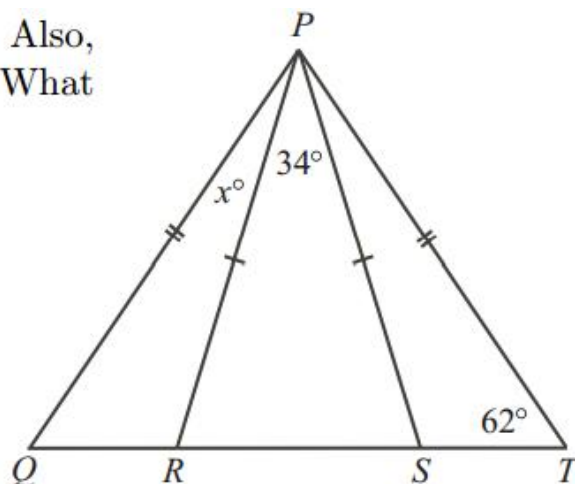
(A) 72.6 m   (B) 320.2 m   (C) 74.6 m

(D) 67.6 m   (E) 45.1 m
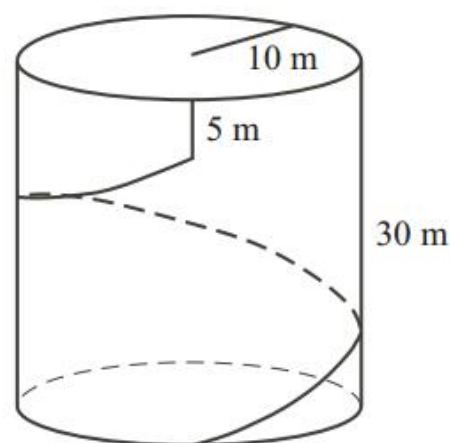
In the diagram, points R and S lie on QT. Also, $\angle PTQ = 62°$, $\angle RPS = 34°$, and $\angle QPR = x°$. What is the value of x?
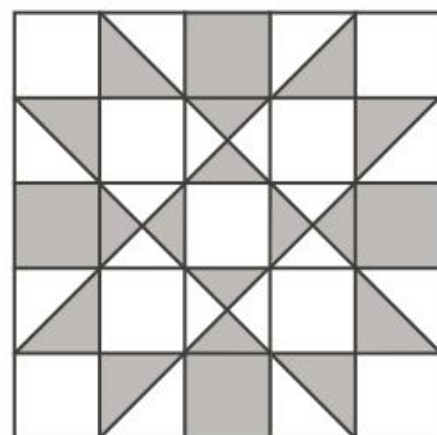
(A) 11   (B) 28   (C) 17

(D) 31   (E) 34

The diagram shows a square quilt that is made up of identical squares and two sizes of right-angled isosceles triangles. What percentage of the quilt is shaded?
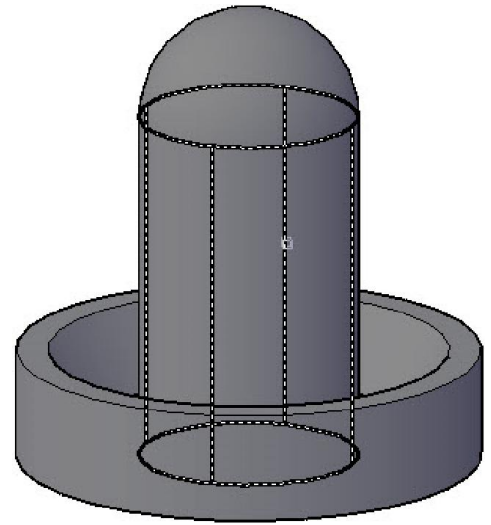
(A) 36%   (B) 40%   (C) 44%

(D) 48%   (E) 50%

Problem 7

The shape shown at the right consists of cylinder with a radius of 5 m and a height of 10 m, capped with a hemisphere and inserted into a "carved-out" cylinder with a height of 2 m, an inner radius of 9 m and an outer radius of 10 m.

Calculate both the volume and the surface area of the shape.

Problem 8: Guaranteed to Drive you Crazy!

This problem is sometimes called "The World's Hardest Easy Geometry Problem." At first glance, this seems like a silly way to describe the problem because the words "hardest" and "easy" contradict each other. A little punctuation can resolve the contradiction: "The World's Hardest Easy-Geometry Problem."

In case you are still at a loss, this means that this problem is the most difficult of "easy geometry," that is, the geometry that is learned in elementary and secondary schools.

Finally, we come to the goal of the problem. Simply put, the goal is to find the value of "*x*" using only the simple geometry that you have learned thus far in school.