1. *AMC 2012 Senior Division, Q12.*
   Triangle PQR is right-angled at R. The circle with centre P and radius PR cuts PQ at S and the circle with centre Q and radius QS cuts QR at T.
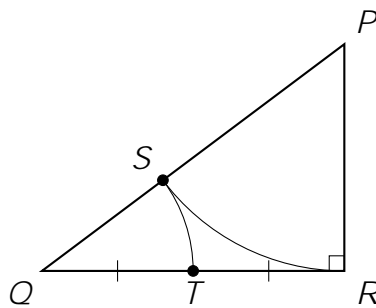
   If T bisects QR, nd the ratio $QS : SP$.

2. Find all possible solutions to
$$\frac{x}{y} + \frac{1}{x} + \frac{1}{y} = \frac{1}{4}$$

   if x and y

Senior Questions

1. The triangular numbers are given by $T_n = 1 + 2 + \ldots + n$ for n a positive integer ($T_1 = 1$).

   Discover and prove a formula for

   $$T_n \left(\frac{1}{T_1} + \frac{1}{T_2} + \ldots + \frac{1}{T_n} \right).$$

2. A, B, C and D are points on the parabola $y = x^2$ such that AB and CD intersect on the y-axis. Determine the x-coordinate of D in terms of the x-coordinates of A, B and C, which are a, b and c respectively.