1. The symbol denotes the absolute value of . It is such that . Find the coordinates of all intersections between the graphs of and .
2. A right isosceles triangle has side lengths of and . Its exact area can be expressed as . Solve for its area.
3. Tata, Andy, Doris and Evan are standing on a 5-by-5 grid. In how many different ways can they stand on the grid such that no two of them are standing on the same diagonal?
4. A *recursive decimal* is a decimal that is pure periodic, i.e., repeats in a fixed cycle. For instance, is recursive, while is not. Let be positive recursive decimals such that . Assume . Solve for one value of .
5. (used for MCOMT p. 3) A cubic polynomial with integer coefficients and leading coefficient 1 intersects a quartic polynomial with integer coefficients and constant coefficient 0 at two points with coordinates , such that one is the reflection of the other through and that the quartic polynomial is strictly increasing on and . Find the equations of both polynomial functions.
6. A *triangular number* counts objects arranged in an equilateral triangle. For instance, 6 is a triangular number since it can be arranged in an equilateral triangle as follows:

The first few triangular numbers are 1, 3, 6, etc. A *square triangular number* is namely a square number that is also a triangular number. Find the sum of the first 5 square triangular numbers.

1. Calculate the sum of all real roots of

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1. The graphs of a circle with radius and a linear function with -intercept of intersect at point . A reflection of the circle across the linear function is tangent to both the and axis. Solve for .
2. Have isosceles right triangle with . Let circle be tangent to all sides of the triangle. Let be midpoints of , and , respectively. Construct circle tangent to at point and passes through points . Calculate distance .