

*University of North Georgia
Sophomore Level Mathematics Tournament
April 5, 2014*



There are 4 people in a room. Each person randomly chooses a positive integer less than 11. What is the probability that at least two of the people choose the same number?

Express your answer as a decimal.

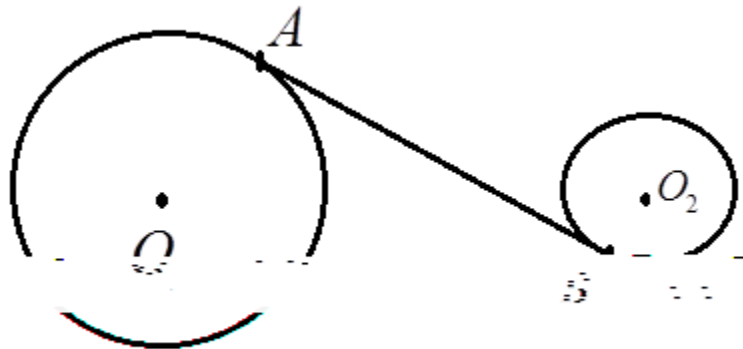
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Let $f(x) = x^4 + ax^2 + bx + c$ where $a, b,$ and

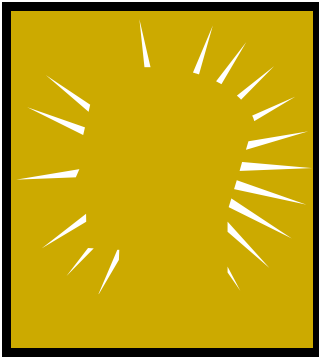
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The centers O_1 and O_2 , of two circles are 24 centimeters apart. The larger circle has a radius of 6 centimeters and the smaller circle has a radius of 3 centimeters.

What is the length AB of their common internal tangent? Provide an exact answer.



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cot cot 4. Provide an exact answer.

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One *inch* is exactly 2.54 *centimeters*. Find the radius of the smallest circle whose area is both a natural number of *square inches* and a natural number of *square centimeters*. Give your answer as an exact number of *inches*.

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Given $f(x) = 2x^2 + 4x^4 + 6x^6 + \dots + 100x^{100}$ and $g(x) = x + 3x^3 + 5x^5 + \dots + 99x^{99}$,

evaluate $\frac{f(g(x))}{g(f(x))}$ in simplest form (an integer).

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Find the largest number less than 1,200 that is a product of four different prime numbers.

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Consider the grid of points given below. Let a path from S to F consist of only those paths that can travel down or to the right at each intersection point. How many paths from S to F pass through M or N ?



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If $y = \log_{\frac{1}{3}} \frac{1}{x^2 - 2}$, for what values of x is $y < 0$?

Provide an exact answer written in interval notation.

