Bangladesh Mathematical Olympiad 2018

www.artofproblemsolving.com/community/c854514

by SINAN_EXPERT, Olympus_mountaineer, Helium, thegreatp.d

---

1 Solve:

$x^2(2-x)^2 = 1+2(1-x)^2$

Where x is real number.

---

2 BdMO National 2018 Higher Secondary P2

AB is a diameter of a circle and AD & BC are two tangents of that circle.AC & BD intersect on a point of the circle.$AD = a$ & $BC = b$.If $a \neq b$ then $AB = ?$

---

3 BdMO National 2018 Higher Secondary P3

Nazia rolls four fair six-sided dice. She doesnt see the results. Her friend Faria tells her that the product of the numbers is 144. Faria also says the sum of the dice, S satisfies $14 \leq S \leq 18$. Nazia tells Faria that S cannot be one of the numbers in the set $14, 15, 16, 17, 18$ if the product is 144. Which number in the range $14, 15, 16, 17, 18$ is an impossible value for S ?

---

4 Yukihira is counting the minimum number of lines m, that can be drawn on the plane so that they intersect in exactly 200 distinct points.What is m?

---

5 Four circles are drawn with the sides of quadrilateral $ABCD$ as diameters. The two circles passing through A meet again at E . The two circles passing through B meet again at F . The two circles passing through C meet again at G. The two circles passing through D meet again at H. Suppose, E, F, G, H are all distinct. Is the quadrilateral $EFGH$ similar to $ABCD$? Show with proof.

---

6 Find all the pairs of integers (m, n) satisfying the equality $3(m^2 + n^2) - 7(m + n) = -4$

---

7 **Evaluate**

$\int_0^{\pi/2} \frac{\cos^4 x+\sin x \cos^3 x+\sin^2 x \cos^2 x+\sin^3 x \cos x}{\sin^4 x+\cos^4 x+2\ sinx \cos^3 x+2\sin^2 x \cos^2 x+2\sin^3 x \cos x} dx$

---

8 a tournament is playing between n persons. Everybody plays with everybody one time. There is no draw here. A number k is called n good if there is any tournament such that in that tournament they have any player in the tournament that has lost all of k's.
prove that
1. n is greater than or equal to $2^{k+1} - 1$
2.Find all n such that 2 is a n-good
