

MAA NCS Practice Problems
October 22, 2004

- 1) Using the geometric properties on the board, solve Descartes problem.
- 2) Given any $n + 1$ integers between 1 and $2n$, show that one of them is divisible by another. Is the conclusion still true for n integers between 1 and $2n$?
- 3) Prove the following equation is true:

$$2 = \frac{1}{2} + \frac{1}{2} + \frac{3}{8} + \frac{1}{4} + \frac{5}{32} + \frac{6}{64} + \dots$$

- 4) If n is a positive integer, show the following:

$$\lfloor \sqrt{n} + \sqrt{n+1} \rfloor = \lfloor \sqrt{4n+2} \rfloor$$

- 5) A rectangle with sides a and b is circumscribed by a rectangle of area m^2 . Find all possible values of m in terms of a and b .

- 6) Evaluate the following integral:

$$\int_{-\pi}^{\pi} (2 + x \cos(x^3)) dx$$