Bergen County Mathematics League

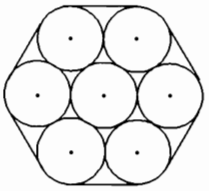
Good Luck To You — Good Luck To All

Contest #4 (Calculators Allowed) — 2007-2008

Part I *Time Limit: 12 minutes* Answers must be exact ***or*** have 4 (or more) significant digits, correctly rounded.

4-1. Write the three three-digit perfect squares which, when taken together, use every non-zero digit exactly once.

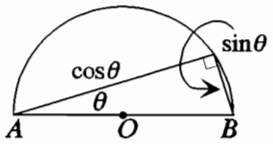
4-2. Seven circular cylinders are strapped together as shown at the right. The cross-section of each cylinder is a circle of radius 1. Presuming that the strap used to bind the cylinders together has no thickness and no extra length, how long is the binding strap?



Part II *Time Limit: 12 minutes* Answers must be exact ***or*** have 4 (or more) significant digits, correctly rounded.

4-3. If $x \neq 0$ is real, then, for what value of k does $\dfrac{x^{n+2}+x^n}{x^{n+4}+x^{n+2}}$ simplify to x^k for all real n?

4-4. In the diagram at the right, the semicircle's diameter has a length of 1. If the area of the semicircle is twice that of the right triangle, what is the measure of the triangle's smaller acute angle (to the nearest degree)?



Part III *Time Limit: 12 minutes* Answers must be exact ***or*** have 4 (or more) significant digits, correctly rounded.

4-5. What are all values of x for which $(x!)^2 - 7x! + 6 = 0$, where $x!$ represents x factorial?

4-6. Write a list, in increasing size order, of every four-digit number greater than 1000 which has four different digits. What is the 111th entry on this list?

***Notice*: Questions next meet will repeat the themes of questions 2-5 and 4-5.**

Answers

4-1. 361, 529, 784

4-2. $12+2\pi$

4-3. -2

4-4. 26 or 26°

4-5. 0, 1, 3

4-6. 1297