It's Only $\frac{1}{(6+1)!}\prod_{k=1}^{6}(4k-2)$ Days until π-Day !

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Although π-Day is an international celebration held on March 14th (i.e. 3-14), this π-fest will reveal some of the oddest facts about π and will help you and your students celebrate π-Day with new perspective year-round! What mysteries do origami, Vladimir Horowitz's piano, and tennis cans have regarding π? What popular foods have amazing π properties? Can simple square paper-folding exhibit profound aspects of circle geometry?

The number π occurs in many mathematical applications and has forever been an area of fascination. Come and learn about some of the most natural occurrences of geometry and some unusual and rarely discussed properties of π. As students see the ubiquitous nature of geometry in symmetry, they will see it as a unifying concept throughout all of mathematics. Many humorous and off-beat occurrences of π will be uncovered and provide teachers with a wide repertory of perspectives to renew interest in geometry for their students.

TRIVIA

- The symbol for pi was reportedly first used in William Jones in 1706, but was popular after it was adopted by the Swiss mathematician Leonhard Euler in 1737.

- The millionth digit of **π** is 1.

- World's record (verified) for number of calculated digits of **π**:
  5 trillion digits by Alexander Yee and Shigeru Kondo using the Chudnovsky formula, taking 90 days ending August 3, 2010. For details, see:
  http://www.numberworld.org/misc_runs/pi-5t/details.html

- Memorizing the digits of **π**
  World's record (confirmed) for memorizing the number of digits of **π**:
  67,890 digits by Chao Lu of China on November 20, 2005; taking 24 hours, 4minutes to recite with no breaks.

  World's record (unconfirmed) for memorizing the number of digits of **π**:
  100,000 digits claimed by Akira Haraguchi of Japan in October 4, 2006.
  See: http://www.foxnews.com/story/0,2933,217765,00.html

  30,000,000 digits claimed by Ukranian neurosurgeon and professor Andriy Slyusarchuk on June 17, 2009.

- Strange occurrences in **π**
  The sequence 0123456789 first appears at the 17,387,594,880th place.
  The sequence 9876543210 first appears at the 21,981,157,633rd place.
  Aside from the very beginning, the sequence 314159 first appears at the 176451st place.

- The Star Trek episode "Wolf in the Fold" (Season 2, Production #36, broadcast 12-22-1967) has Spock banishing an evil entity from the Enterprise computer by having it "compute to the last digit the value of **π**."

- It is *not* known if **π** is normal (i.e. each digit appears with average frequency of 1/10), although the first 30 million digits *are* very uniformly distributed.

- A strange NON-occurrence of **π** is in the Lunes of Hippocrates. See: http://en.wikipedia.org/wiki/Lune_of_Hippocrates

- The Haga Theorem is one of the most remarkable occurrences of circular arcs from simple origami folding. The pdf of the investigation is on http://www.iolani.org/nctm_talk.htm

  A discussion may be found in Thomas Hull's *Project Origami: Activities for Exploring Mathematics* (Wellesley: A.K. Peters, 2006).

ACTIVITIES

- Have students calculate the day which is 314 (i.e. approximately 100 π days) before π-Day. Does it depend on whether a leap year is involved?

  May 5, 2011 (Cinco de Mayo, Children's Day etc.), is 314 days before π-Day. Note that 2012 has a leap year day in February so typically May 4 is 314 days before π-Day.

- Find products with 3.14 in it, e.g. the ounces of Sharing Sizes of M & M's plain and dark chocolate candies, Knorr powdered soup, luggage weighing 3.14 pounds, Horowitz's Steinway piano serial number (#314503), etc.

- Is there a product which together with your local taxes will equal $3.14? How would you determine that?

- Make a story, poem or verse whose word letter counts can be used as a mnemonic for **π**. Such a poem is sometimes known as a "piem" (i.e. **π-**em).

- Run a **π** memorization contest (class-wide, department-wide, school-wide, district-wide, etc.).

- Find products which involve an approximate 3:1 ratio, e.g. the original tennis can. How does it compare to a Pringles can?

- Do a continuing activity which involves the places of **π**, e.g. stringing beads which represent digits of **π** using the resistor color code.

- Find unusual occurrences of **π**, e.g. the formula for the volume of a pizza (using "a" for altitude and "z" for radius), making pizza the only food whose name is a formula for its volume!

- Do an activity which involves the relationships of area, or area to circumference: a record in a record sleeve, origami investigation of polygons, passing a quarter through a dime-sized hole, the height of a tennis can compared to its diameter.

- Find examples of **π** where its expansion is incorrect. Remarkably, this is easier to find than it seems. For example:

  The Washington Park station in Portland, Oregon's MAX Light Rail system has a value of **π** carved into the wall of the eastbound platform. Unfortunately, only the first 11 decimal places are correct. See:
  http://en.wikipedia.org/wiki/Washington_Park_%28MAX_station%29

- Kate Bush's song, "Pi" gives a recitation of **π** which is incorrect. See:
  http://www.youtube.com/watch?v=OLwmxuI1ZIw

RESOURCES

There are many books and websites about **π**. Here is a sampling of them:

- Calculating the digits of **π**:
  http://mathworld.wolfram.com/PiDigits.html

- "Happy Pi Day from the Pi Guy," an NPR story on All Things Considered about Marc Umile, the North American record holder for the number of places of **π** memorized (15314 digits), including a recitation of 41 dozen digits:
  http://www.npr.org/templates/story/story.php?storyId=8900845

  Marc Umile types out 1000 digits of **π** in 5 minutes and checks it against a spreadsheet macro on YouTube:
  http://www.youtube.com/watch?v=CSGK8IEXvXU

- " Pi Day: An Infinite Number of Ways to Celebrate," an NPR story on Talk of the Nation about Pi Day: http://www.npr.org/templates/story/story.php?storyId=88239845

- See if your birthday is within the first 1,254,543 digits of **π** on the website, "Am I in Pi" (e.g. Barack Obama's birthday starts at the 373646th place):
  http://www.facade.com/legacy/amiinpi/

- On the website, "Phone Spell" (www.phonespell.org), the first 16 digits of **π** (3141592653589793) can spell:
  31-I-159-aOK-flux-rye

- Dane Camp of New Trier High School has a song about **π**, "I'm So Lonesome for You, **π**." You can download it at: http://www.iolani.org/nctm_talk.htm

  His website contains many math songs which are playable in Powerpoint. Go to: http://org.newtrier.k12.il.us/academics/faculty/camp/mathsongs/index.html

- Dan Hellerich maintains a site for **π** Day which is a clearing house for many other sites including social networking sites about **π** Day: www.piday.org

- For infinite series representations of **π** and approximations of **π** (including a program that you can use on your home computer), see: http://en.wikipedia.org/wiki/Approximations_of_ π

- For the information on the Indiana Legislature Bill #246 of 1897 regarding **π**, see: http://www.straightdope.com/columns/read/805/did-a-state-legislature-once-pass-a-law-saying-pi-equals-3

- Want to hear the digits of **π**? Go to: http://www.youtube.com/watch?v=YOQb_mtkEEE

Books:

Beckmann, Petr. *A History of Pi.* New York, St. Martin's, 1971.
An interesting account of **π ,** especially the history of its computation. One of the most famous early books on a particular aspect of the history of mathematics.

Berggren, Lennart; Jonathan Borwein and Peter Borwein. *Pi: A Source Book, 3rd edition.* New York: Springer, 2004.
A very large and comprehensive 800-page resource book which covers every major article written about **π** in the last 3000 years.

Blatner, David. *The Joy of **π**.* New York: Walker, 1997.
A small format paperbook which is full of essential information and resources. The author has a website for reference: www.joyofpi.com

Posamentier, Alfred S. and Ingmar Lehmann. *Pi: A Biography of the World's Most Mysterious Number.* New York: Prometheus, 2004.
A 324 page book covering the history of **π** and its computation which includes curiosities, applications and paradoxes.