COUNT ON

Ideas for Promoting Mathematics in Years 7 to 10

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While we believe mathematics should be promoted everyday in classrooms where teachers and students enjoy doing mathematics, we have chosen to discuss three special events when mathematics can be promoted on a larger scale. The dates of these events may prohibit the involvement of some year levels or classes, so we present the suggestions as whole school, year level, or classroom ideas.

Special Events

1. Pi Day – March 14
2. National Mathematics Day – 23 May 2008 – AAMT site
3. National Literacy and Numeracy Week – 1-7 September 2008 - Australian Government DEST site

1. Whole School

Cross-curricula ideas:

Maths and PE – poster competition "Maths and Sport"
Maths and Science
Maths and History (see Further Suggestions on p. 2)
Maths and English – create a story from a mathematical perspective, e.g., Flatland.
Maths and Music – sing and create songs with a mathematical bent
Maths and Art – Tessellations, Islamic art and Rangoli Patterns

Guest Speakers

Organise speakers from a range of industries and organisations to talk about how they use mathematics in the workplace, or a focus on careers in mathematics.

Involve parents

Arrange a maths parents' event for an afternoon or evening. Get the pupils to plan and cost it as well as run it.
Hold a parents' quiz.
Send home a newssheet

Competitions

Guess the maths teachers' heights, weights and ages.

Student seminars and presentations

Students from higher grades present to lower grades.
Students visit local primary schools to share information and "teach" younger students mathematics.

2. Year Level

- School or local area maths trail
- A range of tasks set up in the hall for students to explore in rotating groups
- Design a board game
- Design a web page
- Internet or daily challenge involving problem solving
- Mathematics Excursion, e.g., Luna Park

3. Classroom

- Challenge and enrichment
- Explore the mathematics of games – Sudoku, Chess,
- Origami and other paper folding activities
- Clips from Movies
- Music with a mathematical 'flavour'
- Create a song or poem

Further Suggestions:

Mathematics and History

- Create a time line with some well known historical dates
- Find out about some famous mathematicians
- How many women mathematicians can you find?
- Who is the first recorded mathematician? The first woman mathematician?
- Which country has the most recorded mathematicians?
- Where did the first recorded mathematician come from?
- Investigate one of these – present your work to your class
- There is a prize for the best account of a woman mathematician

π Day

Some history

The ancient Babylonians calculated the area of a circle by taking 3 times the square of its radius, which gave a value of pi = 3. One Babylonian tablet (ca. 1900–1680 BCE) indicates a value of 3.125 for pi, which is a closer approximation.

In the Egyptian Rhind Papyrus (ca.1650 BCE), there is evidence that the Egyptians calculated the area of a circle by a formula that gave the approximate value of 3.1605 for pi.

The ancient cultures mentioned above found their approximations by measurement. The first calculation of pi was done by Archimedes of Syracuse (287–212 BCE), one of the greatest mathematicians of the ancient world. Archimedes approximated the area of a circle by using the Pythagorean Theorem to find the areas of two regular polygons: the polygon inscribed within the circle and the polygon within which the circle was circumscribed. Since the actual area of the circle lies between the areas of the inscribed and circumscribed polygons, the areas of the polygons gave upper and lower bounds for the area of the circle. Archimedes knew that he had not found the value of pi but only an approximation within those limits. In this way, Archimedes showed that pi is between 3 1/7 and 3 10/71.

A similar approach was used by Zu Chongzhi (429–501), a brilliant Chinese mathematician and astronomer. Zu Chongzhi would not have been familiar with Archimedes' method—but because his book has been lost, little is known of his work. He calculated the value of the ratio of the circumference of a circle to its diameter to be 355/113. To compute this accuracy for pi, he must have started with an inscribed regular 24,576-agon and performed lengthy calculations involving hundreds of square roots carried out to 9 decimal places.

Mathematicians began using the Greek letter π in the 1700s. Introduced by William Jones in 1706, use of the symbol was popularized by Euler, who adopted it in 1737.

An 18th century French mathematician named Georges Buffon devised a way to calculate pi based on probability.

Pi day is traditionally held on March 14 (3.14) but there are two common alternatives

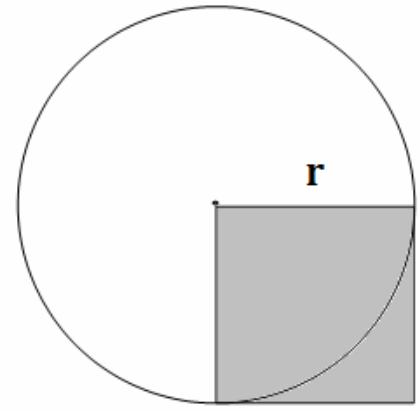
- Pi approximation day on 22 July (22/7)
- Alternate pi day on 10 November (314th day of a non-leap year)

Pi Activities

Squaring a Circle

The diagram shows a circle with a shaded square. The side of the square is the same as the radius of the circle. A square such as this is called a "radius-square."

Using centimeter graph paper to make your own circle (of any size), make 4-5 copies of a radius-square for your circle using another sheet of centimeter graph paper. Estimate how many radius-squares it takes to **fill in** the area of the circle (cut the radius-squares into parts and fit them into the circle). Repeat this activity using several different sized circles (or have other members of the class each do the activity with a different sized circle). What did you find? About how many radius-squares does it take to cover the area of a circle? Students will find that it takes a little more than 3 radius-squares to fill the circle. In fact, Area of a circle = π radius-squares or $\pi r^{2.}$



Are the Digits of π Random?

Mathematians are still trying to find a proof, but they very strongly suggest that they are random.
Give students a print out of the first 1,000 digits of pi.

Look at the digits of pi (first 50, second 50, third 50 etc).
Graph the frequencies of each number (0-9) in a histogram or similar
Then display results in a pi(e) (sector) graph (either by hand or using a spreadsheet, depending on ability)
Groups of students can take different sets of data and compare the frequencies with their classmates

Using their data students can contruct pi chains, necklaces, or braclets, with each digit assigned a different colour (students may find the Pi nation website a usefull tool for deciding on a colour scheme)

Using the pi graph and the pi chains, are any patterns identifiable?
What can the students conclude about the randomness of pi?

Digits of Pi

(groups of 10; 100 per line)

Pi ≈3.

1415926535 8979323846 2643383279 5028841971 6939937510 5820974944 5923078164 0628620899 8628034825 3421170679

8214808651 3282306647 0938446095 5058223172 5359408128 4811174502 8410270193 8521105559 6446229489 5493038196

4428810975 6659334461 2847564823 3786783165 2712019091 4564856692 3460348610 4543266482 1339360726 0249141273

7245870066 0631558817 4881520920 9628292540 9171536436 7892590360 0113305305 4882046652 1384146951 9415116094

3305727036 5759591953 0921861173 8193261179 3105118548 0744623799 6274956735 1885752724 8912279381 8301194912

(500 Digits)

9833673362 4406566430 8602139494 6395224737 1907021798 6094370277 0539217176 2931767523 8467481846 7669405132

0005681271 4526356082 7785771342 7577896091 7363717872 1468440901 2249534301 4654958537 1050792279 6892589235

4201995611 2129021960 8640344181 5981362977 4771309960 5187072113 4999999837 2978049951 0597317328 1609631859

5024459455 3469083026 4252230825 3344685035 2619311881 7101000313 7838752886 5875332083 8142061717 7669147303

5982534904 2875546873 1159562863 8823537875 9375195778 1857780532 1712268066 1300192787 6611195909 2164201989

(1,000 Digits)

Whole school approach to π day

Start a π reciting hall of fame!
The world record for reciting digits of pi was set in 1995 by Hiroyuki Goto who recited over 42,000 digits of pi.

Music -Write a pi song
-Compose music inspired by pi
-Perform the π symphony by Lars Erickson

History- Research Archimedes, William Jones and the history of π

English-Compose pi poems,
-Create a piece of constrained writing (a work of prose or poetry that obeys one or more artificially imposed rules eg Not using the letter "e", or encoding pi into the word lengths)
Eg How I want a drink, alcoholic of course, after the heavy lectures involving quantum mechanics. (Anon) Which encodes pi to 14 decimal places (3.14159265358979).
Michael Keith's *Poe E. Near A Raven* which encodes π to 740 digits based on Edgar Allen Poe's *The Raven*

Science-It's Einstein's birthday- what were some of his contributions to science and mathematics?

Textiles - Traditionally hat sizes were calculated using π, i.e. the circumerence of your head divided by pi (the average diameter of your head!).
-Create your own pi T-shirt

Food technology - bake an apple pi(e)
-bake some pi cookies

Art- Create a pi inspired artwork

Useful Books and Resource Materials

Blatner, D. (1997). *The joy of π*. New York: Walker and Co

Brutlag, D. (1994). Choice and chance in life: The game of "Skunk". *Mathematics Teaching in the Middle School*, 1(1), 28-33.

Burnett, J., Irons, C., & Turton, A. (2005). *Geo paperpolygons: Exploring 2D shapes through paper folding*. Brisbane, Qld.: Origo Publications.

Clarke, D. (1996). *The case of the mystery bone*. Sydney: MANSW.

Eastaway, R., & Wyndham, J. (1998). *Why do buses come in threes? The hidden mathematics of everyday life.* London: Robson Books.

Gould, P. (2005). *Problem of the week*. Sydney: MANSW.

Gullberg, J. (1997). *Mathematics: From the birth of numbers*. New York: W. W. Norton & Co.

Gutstein, E., & Peterson, B. (2006). Rethinking mathematics: Teaching social justice by the numbers. Milwaukee, WI: Rethinking Schools Publication.

Haddon, M. (2004). *The curious incident of the dog in the night-time*. London: Vintage.

Henry, B., et al. (2005). *Problems to solve in middle school mathematics*. Canberra: AMT Publishing.

Holton, D. (1998). *Lighting mathematical fires*. Carlton, Vic.: Curriculum Corporation.

Janes, N. S. (1994). *Problem solving with polyhedra dice*. New York: Cuisenaire Co.

Leeson, N. (1996). *Maths challenges: 500 maths questions and solutions for able pupils.* Burwood, Vic.: Dellasta.

Lovitt, C. & Clarke, D. (1988). *Mathematics curriculum and teaching program - Activity Banks 1 and 2,* Carlton : Curriculum Corporation.

Lovitt, C., & Lowe, I. (1993). *Chance and data investigations, Volumes 1 and 2,* Melbourne: Curriculum Corporation.

Murchison, J. 1996). *Maths problems for gifted and talented students*. Albert Park, Vic.: Phoenix Education.

Phillips, R. (2004). *Facts, figures and fiction*. London: Badsey.

Posamentier, A. S. (2004). *π: a biography of the world's most mysterious number.* Amherst, N.Y.: Prometheus Books,

Scieszka, J., & Smith, L. (1995). *Math curse*. New York: Penguin Books.

Spencer, A. (2000). *Book of numbers*. Ringwood, Vic.: Penguin Books.

Smith, D. J. (2006). *If the world were a village*. Crows Nest, NSW: Allen & Unwin.

Swan, P. (1997). *Dice dilemmas*. WA: A-Z Type.

Swan, P. (2002). *Maths investigations*. Sydney, NSW: RIC Publications.

Tammet, D. (2006). *Born on a blue day*. London: Hodder & Stoughton.

Sources of Resources:

AAMT – www.aamt.edu.au

OLM – www.lat-olm.com.au

Useful Websites

Pi Day

Teach π-resources, history, pi shop and more

http://www.teachpi.org/

Pi Day resources from the Mathematics Educators of Greater St. Louis

http://www.mobot.org/education/megsl/pi.html

Pi day resources from Math with Mr Hert

http://www.mathwithmrherte.com/pi_day.htm

Pi nation- create patterns by colour coding the digits of pi

http://www.pination.com/index.php

Poe, E: Near a Raven (pi encoded to 740 digits)

http://users.aol.com/s6sj7gt/mikerav.htm

The pi symphony

http://www.pisymphony.com/

Hat sizes

http://www.exploratorium.com/pi/pi_activities/cutting_pi/index.html

National Mathematics Day

Australian Association of Mathematics Teachers (AAMT)

http://www.aamt.edu.au

National Literacy and Numeracy Week

Australian Government Department of Education Science and Training

http://www.literacyandnumeracy.gov.au/forteachers

NSW National Literacy and Numeracy Week website

http://www.nlnw.nsw.edu.au/

AAMT National Literacy and Numeracy week website

http://nlnw.aamt.edu.au/

Sites with a Range of Resources and Ideas

Puzzles and Games

The puzzling world of polyhedral dissections

http://www.johnrausch.com/PuzzlingWorld/contents.htm

Maths is Fun – games, puzzles and quizes

http://www.mathisfun.com/games/index.html

http://www.mathisfun.com/puzzle.html

Lancashire Mathematics Week – Resource Pack for 2006 – Murder Mystery Game

http://lancsngfl.ac.uk/curriculum/math/index/php?category_id=303

AAA Sudoku puzzles

http://www.aaamath.com/sudoku.htm

Problems

NRICH Mathematics Enrichment
http://nrich.maths.org/
Mathmodels – a free modelling forum, with problems from a modelling database
http://www.mathmodels.org
Australian Mathematics Trust
http://www.amt.canberra.edu.au/
Maths on the Net – NSW DET site for primary students
http://www.cap.nsw.edu.au/motn/index.htm

General

This Week in Mathematics – Vanderbilt University
http://www.math.vanderbilt.edu/links/thisweek/