

"Mathletes" Boot-Camp

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ABSTRACT

Six different months - Six different Activities: Goblins and ghost-themed problems in October, a NUMB3RS Scavenger Hunt in November, a Monopoly Tournament in December, a Calculator Trivia Contest in January, an "I LOVE MATH" contest in February, and a π -off competition on March 14th (3.14). Through a series of school-wide competitions and classroom activities, the students at Varela are involved in celebrations that teach them about enjoying Mathematics. The Math teachers, the administration, the TV-production class, and even the school chorus will get involved in the celebrations. Prizes are given to student winners, teachers, and class participants.

Some of the class activities include making π -mobiles and π -necklaces in March and folding Origami Hearts in February. Students' Math levels are not as important as their thirst for knowledge and the brain "workout" they'd have received by the end of this six-month long "Boot-Camp".

*For more information concerning IMPACT II opportunities,
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*The Education Fund
(305) 892-5099, Ext 18
e-mail: lvalle@educationfund.org*

OCTOBER MATH CAMP

Solving "Scary" Math Problems

Most students will enjoy solving a "mix" of Math word problems that have Ghosts and Gravediggers as the main characters! The attached problems range in difficulty level and in Mathematical content. I photocopy the problems for every teacher that will be participating. Every student must get the questions the same day at the same time (preferably at the end of the day). I have a Halloween-decorated box in my room where I will place the student solutions in order of arrival. I am in charge of scoring and of selecting the winners. There is an all-around winner as well as a top prize per teacher participant. An alternative to this activity is to have each participating teacher collect the solutions, grade them, and award the prizes.

Also, if a Bulletin Board or Display Case is available, the questions can be displayed. The TV production class in your school can also read one or two questions to entice student participation.

OCTOBER MATH CAMP

Solving "Scary" Math Problems

Problems come from the October 1994 Mathematics Teacher published by NCTM



1.) A bat, a cat, Dracula, and Igor line up for their annual Halloween portrait. If Igor & Dracula never stand beside each other, in how many different ways could the group line up?

2.) On the refreshment table are twenty-seven identical chocolate cupcakes, except that one has a skeleton key baked inside as a door prize. This cupcake will weigh more than the others. If a balance scale but no weights are used, can the door prize be found in only three weighings?

3.) In a haunted house, Freddy Frog sits on a stand with his mouth 5 feet 6 inches above the ground. It is dark, and as people round a corner, they pass 6 inches in front of his nose. Freddy sticks out his tongue and gets them on the nose. If the tallest person he can hit on target has his/her nose 6 feet 6 inches above the ground, how long is Freddy's tongue?

4.) Refer back to #3: At what height is the nose of the shortest person that Freddy can get right on target?

5.) Goblins hatch as do bees: males from unfertilized eggs and females from fertilized eggs. Thus, a male goblin has one female parent and a female goblin has two parents (one male and one female). Make a seven-generation family tree for the male goblin. How many goblins will each generation produce? (Math teachers, this is a neat one!)

6.) Refer back to #5: Without extending the tree, can you predict how many goblins will be in the tenth generation?

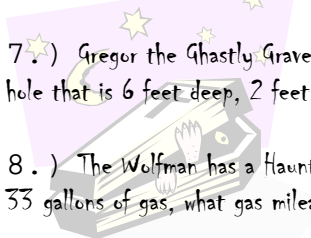
7.) Gregor the Ghastly Gravedigger has been asked to prepare a grave for Gretel the recently Gone Ghoul. How much dirt can Gregor remove from a hole that is 6 feet deep, 2 feet wide, and 8 feet long?

8.) The Wolfman has a Hauntmobile. The last time he filled it up, the odometer read 25,843. When he got gas it read 26,141. If he purchased 33 gallons of gas, what gas mileage does the Hauntmobile get?

9.) A set of stairs on a Haunted House is rigged. It is black inside the house, and each step collapses slightly, based on the weight placed on it. On the fifth step, for example, 40 pounds will cause the step to drop 6.2 cm, and 60 lbs. will drop the step 6.7 cm. If 90 lbs. are placed on the step, how far will it drop?

10.) An ancient Warlock named Munn, is twice as old as his son. Twenty-five years ago their age ratio strangely enough was three to one. When does Munn celebrate his centenary?

11.) Shrieks are broadcast over the intercom every hour on the hour. One shriek occurs for each hour; at 3:00, three shrieks are heard. This ritual began at 1:00 AM on Halloween morning. If the school clocks are on a 24-hour system, how many shrieks will be broadcast on October 31st?

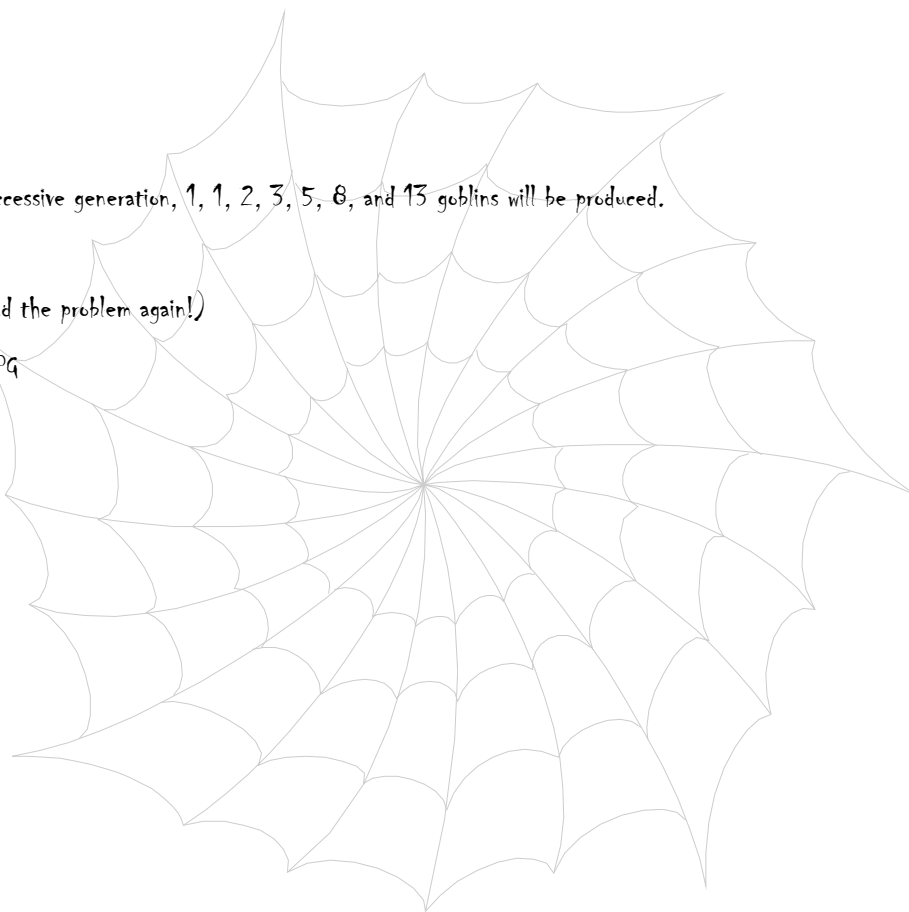


OCTOBER MATH CAMP

Solving "Scary" Math Problems

ANSWERS

- 1.) 12
- 2.) Yes!
- 3.) $\approx 13.42''$
- 4.) 4'6"
- 5.) At each successive generation, 1, 1, 2, 3, 5, 8, and 13 goblins will be produced.
- 6.) 55 goblins
- 7.) None! (Read the problem again!)
- 8.) ≈ 9.03 MPG
- 9.) 7.45 cm
- 10.) Now
- 11.) 276



NOVEMBER SCAVENGER HUNT

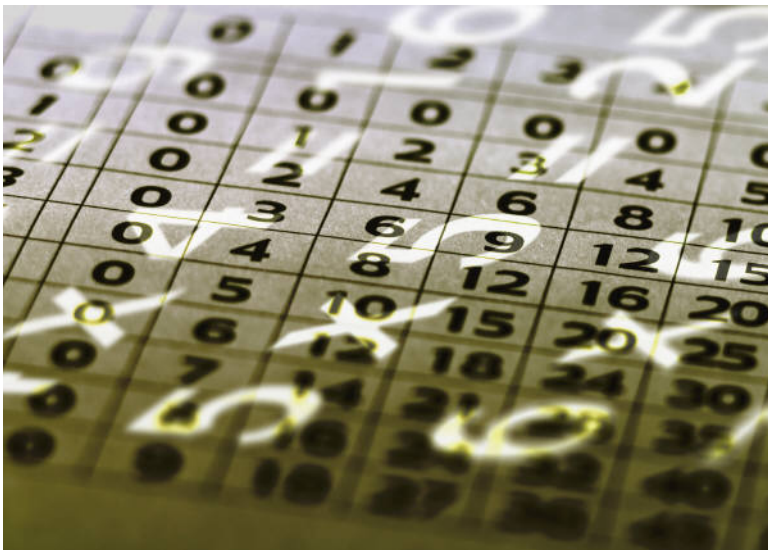
NUMB3RS

QUESTION # 1: *There is only one Math classroom in the school that has a PALINDROME as the room number. Get the teacher's initials to get credit for this question.*

QUESTION # 2: *The Varela ALGEBRA I HONORS teacher has question # 2 posted outside her door.*

QUESTION # 3: *What is the Dewey classification of Math books?*

Personalize your SCAVENGER HUNT with questions like the above. Make sure that you ask other teachers to support your endeavor and perhaps help with the questions themselves.



DECEMBER

Monopoly or Sudoku or Rubik's Cube Tournament

Host a Tournament with a minimum of 24 students.
Have several rounds of play to make it more fun!

MONOPOLY:

Have the winner be the wealthiest player after 90 minutes of play.
The top prize should include a MONOPOLY Game.

SUDOKU:

The winner must be the fastest to correctly solve 3 different SUDOKU puzzles.
The top prize should include a SUDOKU book.

RUBIK's CUBE:

Arrange all the competition cubes in the same manner (this takes a little time but it is the fairest. This competition is VERY fast if you have some good players.
The top prize should include a 4 x 4 x 4 or 5 x 5 x 5 RUBIK's CUBE.

JANUARY'S CALCULATOR TRIVIA CONTEST

STATION # 1:

Link your calculator to mine and copy the data in Lists 1 and 2

STATION # 2:

Have the calculator plot a Scatter plot of the data in lists 1 and 2.

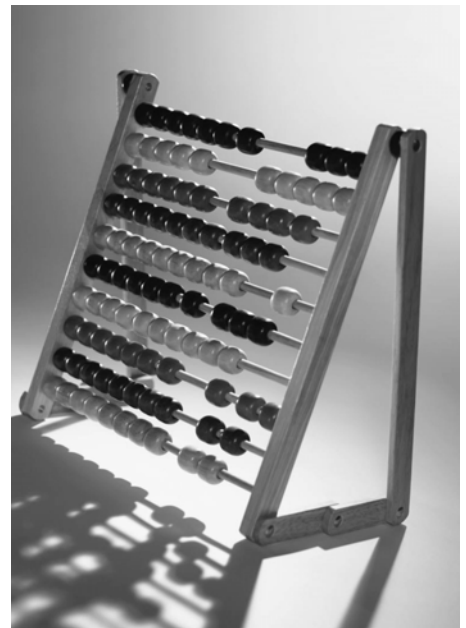
STATION # 3:

Enter a given matrix into the calculator

STATION # 4:

Have the calculator generate three random integers between a given interval.

The higher level students in your school love to show off their calculator knowledge. Questions like these can show off their Calculator knowledge. Play can include several rotating stations (students must get all the teacher initials to win) or they may only advance to one station iff they correctly passed the previous one. If you have two graphing calculators available for a prize, it is good to offer this competition as a TEAM contest (2 players).



FEBRUARY
I ♥ MATH CONTEST

STATION # 1:
Fold an ORIGAMI heart.

STATION # 2:
Solve the following problem:

Lovey got three presents on Valentine's Day. Their combined weight was 60 kg. The two heaviest weigh 50 kg together, and the two lightest weigh 25 kg together. What is the weight in Kg of the heaviest package?

(From the February 2000 Math League Contest)

STATION # 3:

$$\text{LOVE} + \text{MATH} = 2000$$

What is the greatest value that $|E - H|$ can be?

Follow the same suggestions as the January Calculator Contest.

MARCH

Celebrating the Number π

There are *MANY* ways to celebrate in March!

Option # 1:

Have a π -off competition on March 14th. Students are given 3 minutes 14 seconds to write as many digits of π as they can remember. You will notice that if you raffle off a graphing calculator the number of memorized digits will increase from year to year!

Option # 2:

Give your Math teachers π -related activities and lessons to complete on March 14th (see attached).

π

Option # 3:

Decorate the hallways and/or class doors with the digits of π .
Ask students to use school colors for the decorated digits!

Option # 4:

Send every Math teacher a π -themed postcard (or e-card) on March 14th.
Have kids make π -necklaces for every Math teacher.

Option # 5:

Have a π -eating contest during lunch.

Option # 6:

Have a chorus of students sing π -songs throughout the building
(Math classes, Main Office, etc.)

Option # 7:

Do all of the above!!!!!!



π Mobile

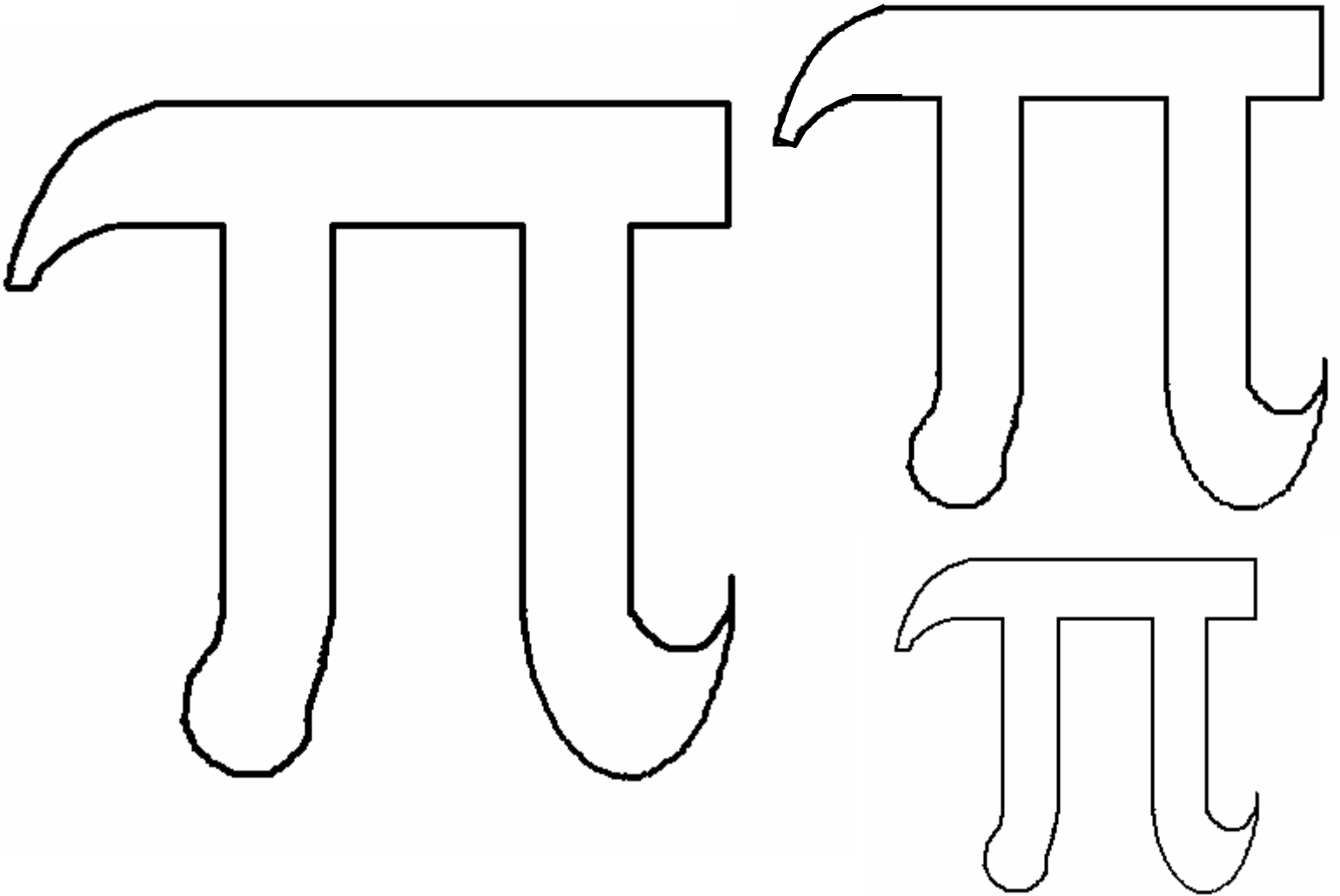
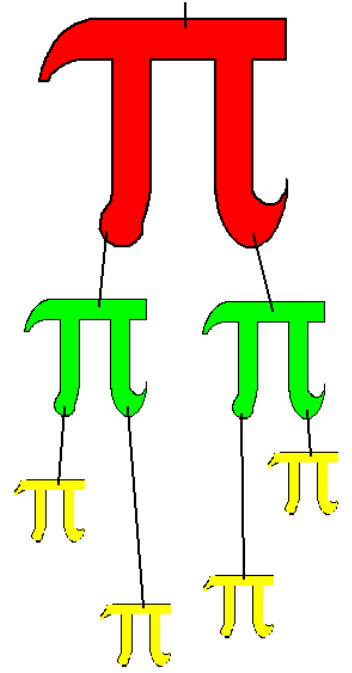
Idea came from mathwithmrherte.com/pi_mobile.htm

MATERIALS NEEDED:

Yarn
Construction paper of different colors
Hole puncher
“ π ” stencils

DIRECTIONS:

Use the π stencils below to cut out ONE large π , 2 medium π & 4 small π .
Attach the center top of each π symbol to the bottom of the π leg of the next larger one as shown to the right.






ALGEBRA I and GEOMETRY π -Week Questions

Some questions were taken from edHelper.com

Answer the following questions to the best of your knowledge.

Return your answer sheet to your teacher by Wednesday 3/16 at 7:30 AM for the chance to win a π -Week prize.

- 1.) Measure the circumference of a DVD and divide it by its diameter.
What do you get as an answer?
- 2.) Devin made seven pepperoni pizzas for a party. He cut the pepperoni himself from a sausage that was 13 inches long and $1\frac{3}{4}$ inches in diameter. The pizzas were each 14 inches in diameter. His friend Taylor is a real math whiz and took the opportunity to calculate what percent of the total pizza surface area was covered by pepperoni. The pepperoni was cut into slices $\frac{1}{4}$ of an inch thick. Each pizza has the same number of whole pepperoni slices (he ate any extra pepperoni!). What percent of the total pizza surface area was covered by the pepperoni? Round your answer to the nearest hundredth.
- 3.) A cylinder can approximate the shape of a snake. Which snake would have the most volume, one that is 48 cm long and 10 cm in diameter, or one that is 34 cm long and 13 cm in diameter?
- 4.) Simplify the following expression: $-2\frac{1}{2}\pi + 2(\pi - \frac{1}{2}) - \frac{1}{2}\pi + 14$
- 5.) 
- 6.) The world's biggest pizza was made in Norwood, South Africa in 1990. The diameter of the pizza was 37.3 meters. What was the area of the pizza?
- 7.) What is the 32nd decimal place of the number π ?
- 8.) Angles can be measured in degrees or in radians. $1^\circ = \frac{\pi}{180}$ radians.
Convert 45° to radian measure.
- 9.) Let $x = \frac{\pi}{2}$, $y = 3\pi x$, $z = \frac{2y}{\pi}$, and $w = \frac{1}{3}z$. What is w equal to?
- 10.) The Americans celebrate π -Day on March 14th (3/14). When do the Europeans celebrate it?

ALGEBRA I and GEOMETRY π -Week Answers

ANSWERS

- 1.) π
- 2.) There are 52 pepperoni slices to be divided evenly by 7 pizzas - Each pizza gets 7 pepperonis (he eats the remaining 3!). Each pizza has an area of 153.938 and each pepperoni has an area of 2.405. Since each pizza has 7 pepperonis, the percent of the area covered is $\frac{(7)(2.405)}{153.938}(100) = 10.94\%$
- 3.) The snake that is 34 cm long and 13 cm in diameter has more volume.
- 4.) $-\pi + 13$
- 5.) 1
- 6.) 1092.163 m^2
- 7.) 0
- 8.) $\frac{\pi}{4}$ radians
- 9.) π
- 10.) On July 22nd (7/22) ($\pi \approx \frac{22}{7}$)

WHAT DO YOU HAVE LEFT?

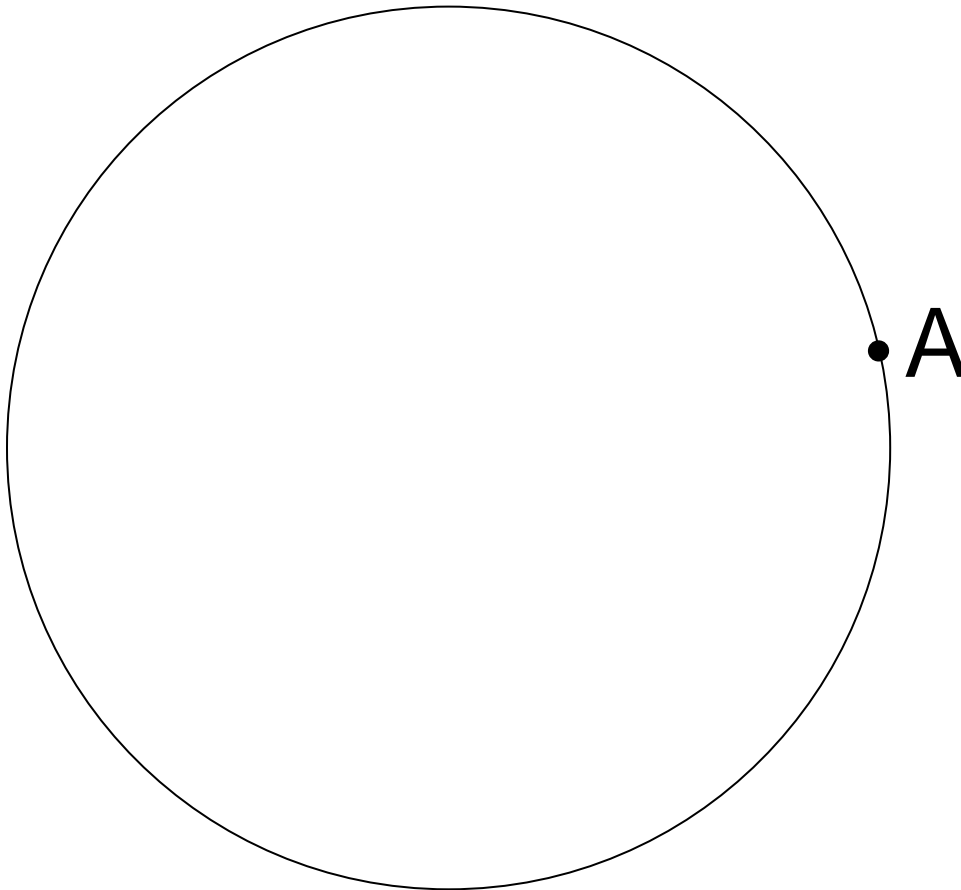
(Idea comes from "A Piece of PI")

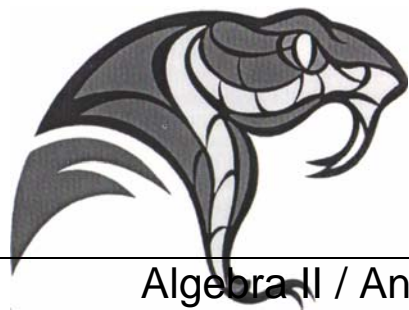
A letter has vertical symmetry if it can be divided into right and left halves that are reflections of each other.

Examples:



Write all the letters of the alphabet around a circle using capital block letters. Cross out the letters with vertical symmetry. What do you have left?





π -Week Trivia Quiz

Algebra II / Analysis Of Functions / Pacesetter / Pre-Calculus

Answer the following questions to the best of your knowledge.

Return your answer sheet to your teacher by Wednesday 3/16 at 7:30 AM for the chance to win a π Week prize.

- 1.) Who, in 1706, first gave the Greek letter π its current mathematical definition?
 - a.) Albert Einstein
 - b.) William Jones
 - c.) Attila the Hun
 - d.) Archimedes
 - e.) Napoleon Bonaparte
- 2.) π is *transcendental*. What does this mean in mathematics?
 - a.) it is equal to the ratio of two integers
 - b.) its square root is imaginary
 - c.) it cannot be expressed as an integer, or as a root, or as a quotient of integers
 - d.) it was Ralph Waldo Emerson's favorite number
- 3.) If you calculated the circumference of a circle the size of the known universe, requiring that the answer be accurate to within the radius of one proton, how many decimal places of π would you need to use?
 - a.) two million
 - b.) 39
 - c.) 48,000
 - d.) 6 billion
- 4.) What is the earliest known reference to π in history?
 - a.) The Rosetta Stone, approx. 200 BC
 - b.) The Bible
 - c.) An Egyptian papyrus scroll, written approximately 1650 BC by Ahmes the Scribe
 - d.) Euclid's *Elements*, written in the 3rd century BC
- 5.) What is the current world record for the memorization of the decimal places of π ?
 - a.) 1000 places, by Alexander Craig Aitkin
 - b.) 4096 places, by Simon Plouffe
 - c.) 31,811 places, by Rajan Mahadevan
 - d.) 42,000 places, by Alfred E. Neuman
 - e.) None of the above
- 6.) Among the digits of π currently known, the concentration of each of the digits 0 – 9 are pretty close to equal. However, in the first 30 places of π 's decimal expansion, which digit is completely missing?
 - a.) 7
 - b.) 2
 - c.) 0
 - d.) 8
- 7.) What is the "formal" definition of π ?
 - a.) the surface area of a sphere of diameter $\frac{22}{7}$
 - b.) 3.1415926

- c.) the radius of a circle
d.) the ratio of a circle's circumference to its diameter
- 8.) Imagine that you wrapped a rope tightly around the earth at the Equator. How much longer would you have to make the rope if you wanted to be exactly one foot above the surface all the way around? (Assume that the Equator is a perfect circle.)
a.) 2π feet
b.) $2\pi r$ feet, where r is the radius of the Earth
c.) πr^2 feet, where r is the radius of the Earth
d.) $2\pi + 1$ feet
- 9.) How many hours did it take a supercomputer to calculate π to 51.5 billion digits, in 1997?
a.) 3 hours
b.) 29 hours
c.) 50 hours
d.) 78 hours
- 10.) π is an *irrational* number. What does that really mean?
a.) If we divided π by the number of students enrolled at Varela today we will get no remainder
b.) π is a real number, but it cannot be expressed as a ratio of two integers
c.) π is not a real number because $e^{\pi i} = -1$
d.) a crazy mathematician was the first to compute π to 10,000 decimal places

“Probably no symbol in Mathematics has evoked as much mystery, romanticism, misconception, and human interest as the number π ”
- William L. Schaaf, *Nature and History of π*

π -Week Trivia Quiz Answers

Algebra II / Analysis Of Functions / Pacesetter / Pre-Calculus

ANSWERS

- 1.) b
- 2.) c
- 3.) b
- 4.) c
- 5.) e
- 6.) c
- 7.) d
- 8.) a
- 9.) b
- 10.) b

π -Week 2005 - Statistics

("Idea comes from PI Makes the World Go Around")

Linear Regression Activity / TEACHER NOTES

OBJECTIVE: Students will calculate π by finding the slope of the line $C = \pi d$. Students will discover the line of best fit (or regression line) is actually the formula for the circumference of a circle.

MATERIALS NEEDED: Circular objects, measuring tapes, rulers, graphing calculators.

METHOD: Divide students into groups. Each group will choose at least 5 circular objects and will measure the diameter and circumference of each. Each group will record their measurements in a table. Students will need to name their independent and dependent variables (explanatory & response variables). Next, students will enter the data into their graphing calculators and create a scatter plot of the data. Students will use the linear regression capability of the graphing calculator to find an equation of best fit.

EXTENSIONS: Construct a residual plot and examine if the relationship is really linear; combine the class data and do a regression on it. Look at r^2 and what it tells you about the strength of the association between the variables.

QUESTIONS TO ASK:

- 1.) What is the slope of the line that you found to represent your data?
- 2.) What does the slope represent?
- 3.) Does the equation of the line you found look familiar?
- 4.) If the diameter of a circle is d , what is the circumference of the circle? What is the circumference if the diameter is $d + 1$? What is the difference between the circumferences of these two circles?

CALCULUS

π Week 2005

(Idea comes from "PI Makes the World Go Around")

Come up with a definite integral that yields the number π , and turn it in to your teacher by Thursday March 17th.

The most creative and/or challenging definite integral will win a π week prize.

EXAMPLES:

$$\frac{3\pi}{152} \int_4^6 x^2 dx$$

$$\frac{3\pi}{2} \int_{\frac{\pi}{2}}^{\pi} (1 - \sin x) dx$$

$$2 \int_{\frac{\sqrt{2}}{2}}^{\frac{-\sqrt{2}}{2}} \frac{-1}{\sqrt{1-x^2}} dx$$

SOME PRINTED RESOURCES

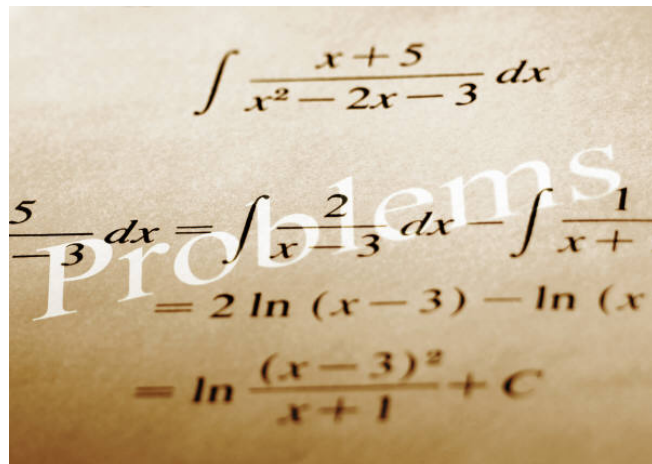
Beckman, Petr. *A History of π (PI)*. St. Martin's Press, 1971.

Bokhari, Naila. *Piece of Pi: Wit-Sharpening, Brain-Bruising, Number-Crunching*

Activities with Pi. Dandy Lion

Publications, 2001.

DeVoss, Angie. "PI Makes the World Go Around", 52nd FCTM Annual State Conference, Miami, Florida, October 2004.



The image shows a handwritten mathematical derivation on a piece of paper. At the top, the integral is written as $\int \frac{x+5}{x^2-2x-3} dx$. Below this, the numerator is decomposed into partial fractions: $\frac{5}{x-3} dx = \int \frac{2}{x-3} dx - \int \frac{1}{x+1}$. The next line shows the integration of these terms: $= 2 \ln(x-3) - \ln(x+1)$. The final line shows the simplified result: $= \ln \frac{(x-3)^2}{x+1} + C$. The word "Problems" is written in a large, light-colored font across the middle of the page, partially overlapping the equations.

The Mathematics Teacher, Monthly Calendar problems.

Neuschwander, Cindy. *Sir Circumference and the Dragon of Pi: a math adventure*.

Charlesbridge, 1999.

WEBSITES

www.123Greetings.com

<http://mathwithmrherte.com/pi>

<http://www.edhelper.com/PiDayMath1.htm>

www.exploratorium.edu/learning_studio/pi



CATALOG RESOURCES

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Instructional Images. (877) 221-4444

MindWare: brainy toys for kids of all ages. (800) 999-0398

Nasco. (800) 558-9595

NCTM Resources for the Mathematics Educator. (800) 235-7566

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