

A Piece of Pi-E:
The History of pi and e (OPEN)
FAMAT State Convention 2004

For all questions, E. NOTA means none of the above answers is correct

1. The number e serves as the base of the system of natural logarithms. What Scottish mathematician invented logarithms in 1617, but only included a list of natural logarithms in an addendum to his report?
a) Napier b) Cartwell c) Goldiez d) Witte e) Nota
2. What mathematician proved pi was transcendental in 1882, which therefore supported the claim, “The circle cannot be squared”?
a) Newton b) Lamarck c) Lindemann d) Powell e) Nota
3. Bryan is planning a winter ski vacation to visit the birthplace of Euler, the man who introduced e to mathematics. What country will Bryan be visiting on his vacation?
a) Spain b) France c) Italy d) Switzerland e) Nota
4. Which of the following statements about pi is FALSE?
 - a) The digits of pi have been coded in the binary system and have been sent in the form of radio signals into outer space in order to contact intelligent life
 - b) The State Legislature of Indiana unanimously passed a bill in 1897 that made pi equal to 3
 - c) Liu Hui’s calculation of pi lasted for 1000 years before mathematicians introduced a more precise calculation of pi
 - d) Emily Dickinson alludes to the phenomena of pi in her poem, “The Bobolink at Dusk”
 - e) Nota
5. In 1789 this Slovenian mathematician calculated pi to 140 places—a record which stood for over 50 years. More than a mathematician, he commanded gun positions against the Turks in 1788 at a battle near Belgrade, and he also battled the French during the continental wars of the 1790s. He was reported missing in 1802, and his dead body was found in the Danube near Vienna. Name this mathematician who appears on the Slovenian 50 Tolar bank note.
a) Vega b) Lucic c) Klaus d) Gabcikovo e) Nota
6. What seventeenth-century Japanese mathematician introduced determinants and calculated pi as 3.14159265359?
a) Yoko Tjurki b) Seki Kowa c) Tsu Chin d) Huiyin Yokin e) Nota
7. What fourteenth-century Indian mathematician was the first to discover Leibniz’s series for pi and the power series for sine x and cosine x , all which are usually attributed to Newton?
a) Madhava b) Ramanji c) Imran d) Ghandi e) Nota

8. “May I have a large container of coffee?” is a memory device designed by American educators to enable students to remember the first eight digits of what number?

- a) Pi b) e c) The square-root of 2 d) i e) Nota

9. The following passage calculates pi as 3: “Also he made a molten sea of 10 cubits from brim to brim, round in compass, and 5 cubits the height thereof; and a line of 30 cubits did compass it round about.” This passage is taken from what document?

- a) Inferno b) The Odyssey c) The Old Testament d) Paradise Lost e) Nota

10. What ancient civilization was the first to calculate pi as 355/113?

- a) Sumerian b) Germanic c) Assyrian d) Chinese e) Nota

11. What Greek mathematician authored the famous work The Almagest, which supported a geocentric model of the universe, and calculated pi as 3.1416?

- a) Plato b) Euclid c) Aristotle d) Archimedes e) Nota

12. Euler formally introduced e into the world of mathematics in what year?

- a) 1534 b) 1495 c) 1887 d) 1748 e) Nota

13. Pi and e both belong to what subclass of irrational numbers?

- a) Tangential numbers b) Complex numbers c) Transcendental numbers
d) Oligarchical numbers e) Nota

14. The following is a conversation between two students:

Ella: “Given a smooth table on whose surface a system of equidistant parallel lines is ruled, with d the separation between any two neighboring lines, what is the probability that a needle of length L less than d will intersect one of the lines if the needle is thrown randomly on the table?”

Christopher: “That is a tough question, but the probability is $(2L)/(\pi d)$.”

Ella: “You know what, by counting the frequency with which the needle cuts one of the lines, we can calculate a value of pi!”

Christopher: “Score!”

This conversation concerns what mathematical problem?

- a) The Buffon Needle Problem b) Zeno’s Paradox c) Needle in a Haystack Dilemma
d) The Thread and Needle Problem e) Nota

15. Although the number e was not yet formally introduced into the world of mathematics, what mathematician estimated the number e to be between 2 and 3 when he used the binomial theorem when studying compound interest problems?

- a) Franklin b) Krompkov c) Bernoulli d) Ptolemy e) Nota

16. Super computers used algorithms based on what Indian mathematician's approximation of pi in order to calculate pi to a billion decimal places in the late 1980's?

- a) Ramanujan b) Emanahi c) Rhumania d) Stujmana e) Nota

17. Like pi and e , this number introduced in 1975 cannot be expressed as a fraction or repeating decimal. This number is associated with the period-doubling cascade and is represented by the Greek letter delta. Name this number that tells us how the period of the drip relates to the rate of the flow of the water.

- a) Galipeau Number b) Anagnostou Number c) Feigenbaum Number
d) Favors Number e) Nota

18. This Greek mathematician used the method of exhaustions in order to calculate pi. He inscribed in a circle a series of polygons, and he calculated pi by equating the area of the circle as πr^2 in terms of ρ and the radius r of the circle to the polygon area given in terms of the square of the radius of the circle and the number of sides of the polygon, n . Name this Greek mathematician famous for exclaiming, "Eureka!"

- a) Exodus b) Archimedes c) Aristotle d) Socrates e) Nota

19. In his early studies, Euler wrote a letter to a certain mathematician and informally made reference to the number e . Name Euler's correspondence who has a rule named after him that states, "Every even integer greater than 2 can be represented as the sum of 2 primes."

- a) Branchard b) Lewis c) Goldbach d) Zvonera e) Nota

20. What French mathematician proved e was not an algebraic number in 1873?

- a) Hermite b) Blackwelder c) Dechy d) Tauziat e) Nota

21. Fill in the blank: Euler approximated the first _____ digits of e without giving any explanation on how he reached that calculation.

- a) 3 b) 7 c) 13 d) 18 e) Nota

22. Sarah is at the library looking for the book in which Euler formally introduced the number e . What book will Sarah be checking out of the library?

- a) Principia Mathematica b) Nova Mare c) Introductio in Analysin infinitorum
d) Equations of the Mind e) Nota

23. Which of the following computers was NOT used in the 1980's to calculate the digits of pi?

- a) NEC SX-2 b) FACOM M-200 c) MELCOM 900II d) CRAY-2 e) Nota

24. Pi Day is now a very popular date amongst students, teachers, and mathematicians. In fact, the San Francisco Exploratorium launches a huge celebration each year in honor of pi. In which month is Pi Day celebrated?

- a) January b) March c) August d) November e) Nota

25. In 1873, what Englishman used Machin's formula to calculate pi to 707 places?

- a) Whetter b) Smither c) Paige d) Shanks e) Nota

For number 26, please use the information provided in question 25.

26. The English mathematician from question number 25 performed a great feat in calculating pi to 707 places. However, in 1945, it was discovered that there was an error with digit 528, thus all the remaining digits were incorrect as well. Name the mathematician that discovered this error.

- a) Ferguson b) Branson c) Youngman d) Abrams e) Nota

27. In c.800, this Middle Eastern mathematician calculate pi as 3.1416. Name this man whose book title containing the word "aljabr" gave rise to the word "algebra."

- a) Kuwazi b) Hussein c) al-Khwarizmi d) Yetinhawa e) Nota

28. The Rhynd Papyrus dating to 2000 BC from Egypt calculates pi as:

- a) 3.5 b) $(27/8)$ c) $(16/9)^2$ d) 3.8 e) Nota

29. Let A = the fourth digit of pi
Let B = the fourth digit of e

Calculate: A*B

- a) 2 b) 8 c) 0 d) 72 e) Nota

30. Which of the following statements is TRUE?

- a) Pi was first discovered by the Aztecs in what is now modern-day Belize
b) The letter "e" was selected by Euler in order to represent the word "electricity"
c) The symbol for pi is a letter from the German alphabet
d) Currently, computers can only calculate the number e to 638 decimal places
e) Nota