Unification 9

54th International Physics Olympiad, ISFAHAN, IRAN

29 July 2024 - 8 Mordad 1403

بنی آدم اعضای یکدیگرند
که در آفرینش ز یک گوهرند
چو عضوی به درد آورد روزگار
دگر عضوها را نماند قرار

UNTIL THE NEXT OLYMPIAD

UNIFICATION
IPhO 2024 Isfahan, Iran
No. 9
IPHO 54th International Physics Olympiad Isfahan Iran 2024

THE TEAM BEHIND UNIFICATION

Editors-in-chief: Sima Ghassemi, Nader Heydari
Managing Editor: Nader Heydari
Editorial Team: Mobina Banddar, Forough Rastgar- Mehr, Roshanak Moradi, Haniye Alipour Varzaghani, Mohsen Boroughani, Shaghayegh Mohammadi
Art Director: Alireza Jarrah
Graphic Designer: Mani Shafiei Sabet
Technical Support: Elaheh Hessamian, Mohammad Meraji

Mohammad Meraji has also helped with the design of the programs and timetables, and the design of cerficates and medals.

Graphic Designers
Mani Shafiei Sabet
Alireza Jarrah

Photographers
Farzane Najafi
Alireza Tanha

From left to right: Mani Shafiei Sabet, Mohammad Meraji, Mobina Banddar, Elaheh Hessamian, Nader Heydari, Alireza Jarrah

RECOUNTING ANCIENT STORIES

In the tenth century book ***Al-Fihrist***, the author *Ibn al-Nadim*, says that the first person who started the tradition of telling stories at night was Alexander (the Great) who had a group of storytellers who would make him laugh and would recount to him legends. In the book ***Kelileh wa Demneh***, the Brahman ***Bidpaay*** recounts fables for ***Dabschelim***, the king of India. In ***One Thousand and One Nights***, the king's wife ***Scheherazade***, tells a tale each night and stops telling the story at a moment of suspense in the morning so that the king has to wait another day to hear the rest and keep Scheherazade alive one more day. Telling stories is a tradition common to many nations, and so it is in Iran. In fact, the aforementioned ***Ibn al-Nadim*** has claimed that "the Persians were the first to compose stories and make them into books and keep them in store". In fact, the Iranian epic ***Shahnameh*** is a collection of such ancient tales. Yet, a particular form of storytelling, included in UNESCO's list of Intangible Cultural Heritage, called ***Naqqali, Iranian dramatic storytelling***, goes back to the Safavid era and the 14th century. References exist to storytellers in historical texts before this era and storytellers were often classed with other itinerant entertainers such as tight-rope walkers, jugglers, etc. But the introduction of coffeehouses by the Safavids, provided the opportunity for a symbiosis between these storytellers who needed a fixed place to tell their stories to the same audience and the owners of these coffeehouses who needed an attraction to entice people into their places of business.

The storytelling in coffeehouses is practiced today in the same way that it was practiced in Isfahan in the fourteenth century (and later in Tehran when Tehran became the capital). Even today the masters of this art come from Isfahan. Storytellers mainly recount stories from ***Shahnameh*** interspersed with reciting of poems by Ferdowsi, and other famous Iranian poets. However, the stories are not restricted to ***Shahnameh*** and other popular stories are recounted such as ***Stories of Abu-Muslim***, ***the Secrets of Hamzeh, Samak Ayyar***, etc. ***Naqqāli*** requires good memory, improvisation and an ability to captivate the audience. The ***Naqqāls*** dress simply, but may wear local costumes or come on stage with a helmet and armor. A certain type of painting called coffeehouse painting is associated with this art. These paintings depict many scenes from the story the ***naqqāl*** is narrating and the ***naqqāl*** points to the relevant parts of the painting as the story is being told. With the declining popularity of coffee-houses, and the increasing popularity of modern forms of entertainment, the survival of this art is under threat, and its preservation depends on the efforts of those responsible for the cultural heritage of Iran.

CLOSING


IRAN
54th


54th


IRAN
54th
International Physics Olympiad
Iran | Isfahan | 2024


IRAN
Sarah Musaei
2024

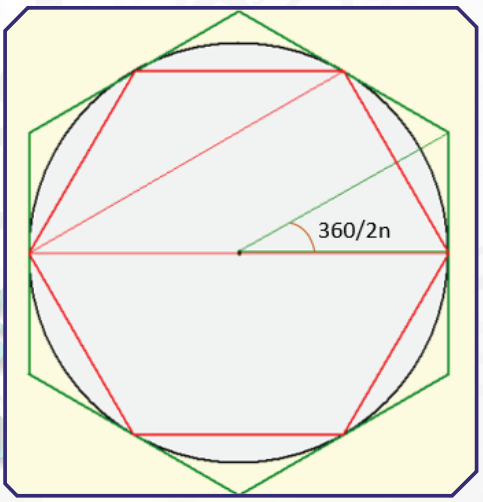

IRAN

CEREMONY

JAMSHID KASHANI AND PI

"In the name of God who knows the ratio of the circumference of a circle to its radius." This sentence is from ***Ghiyath al-Din Jamshid Mas'ud al-Kashi***, the author of ***Al-Risala al-muhitiyya*** (The treatise on the Circumference), a mathematician and astronomer who lived in the fifteenth century. He is most famous for calculating pi to 16 decimal places. The first calculation of pi goes back to the Babylonians in 2000 BCE which found the value of 3.125 for pi. After them, the Chinese, the Indians, and the Egyptians calculated pi with different precisions. Archimedes, the Greek mathematician, invented a method for calculating pi based on regular polygons. He would inscribe a regular polygon, say a hexagon, inside a circle, and inscribe the same circle inside a regular hexagon. The circumference of the circle has a value between the circumferences of these two polygons. Calculating the circumferences of these polygons provides bounds for the circumference of the circle and as we increase the number of sides of the polygons the bounds become more precise (see the figure below). To calculate the circumference of the inscribed (circumscribe) polygon, it is sufficient to know the sine (the tangent) of the angle $360^\circ/2n$, where n is the number of sides of the polygon.

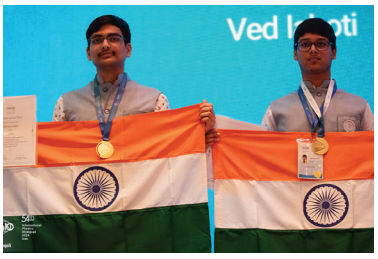
If we take the radius of the circle to be 1, the circumference of the circle gives us pi. Archimedes continued his calculations up to 3×2^5-sided polygon, i.e. a polygon with 96 sides. He found the value of pi to be $3.1408 < \pi < 3.1429$.



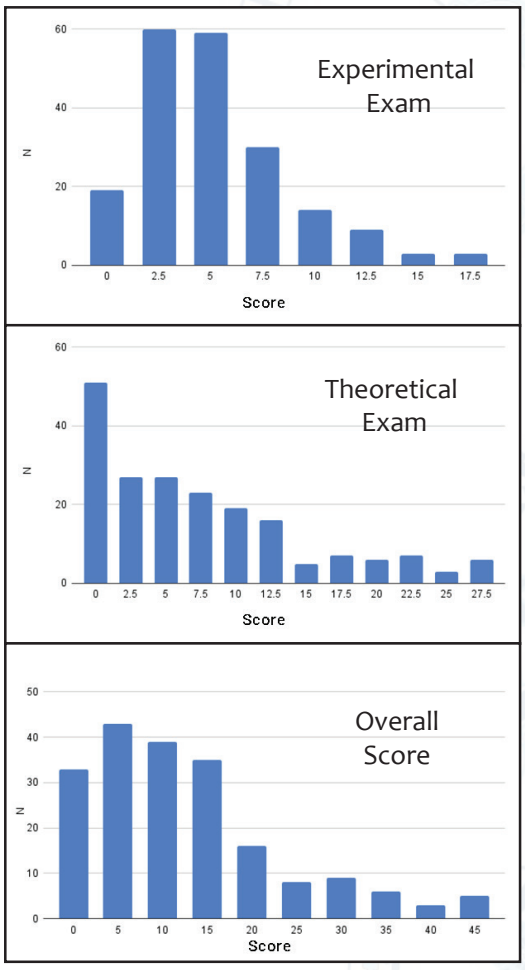
Jamshid Kashani (***al-Kashi***) intended to calculate the circumference of the ecliptic with a precision of the diameter of a hair. The ecliptic is a circle which traces the day-to-day motion of the Sun among the stars on the celestial sphere. In Ptolemaic astronomy, the radius of the universe, and therefore the radius of the ecliptic is a multiple of the radius of the Earth. To calculate the radius of the ecliptic with the precision he had in mind, al-Kashi needed to know π to 16 decimal places. He used the method of Archimedes, but increased the number of sides of the polygons to 3×2^{28} i.e. polygons with 805306368 sides. He did his calculations in base 60 (sexagesimal numbers) and then converted his result to basis 10. His result was:

$$\pi = 3.1415926535897325$$

which is accurate to 16 decimal places. Al-Kashi's record was not broken until 150 years later.

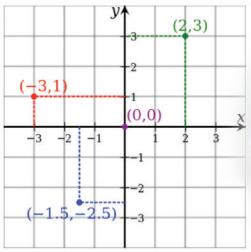


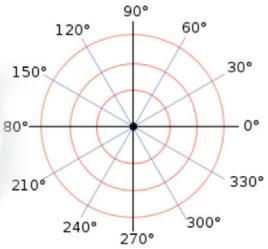
Distribution of the final scores in IPhO2024



What's a polar bear?

It's a Cartesian bear after a change of coordinates.



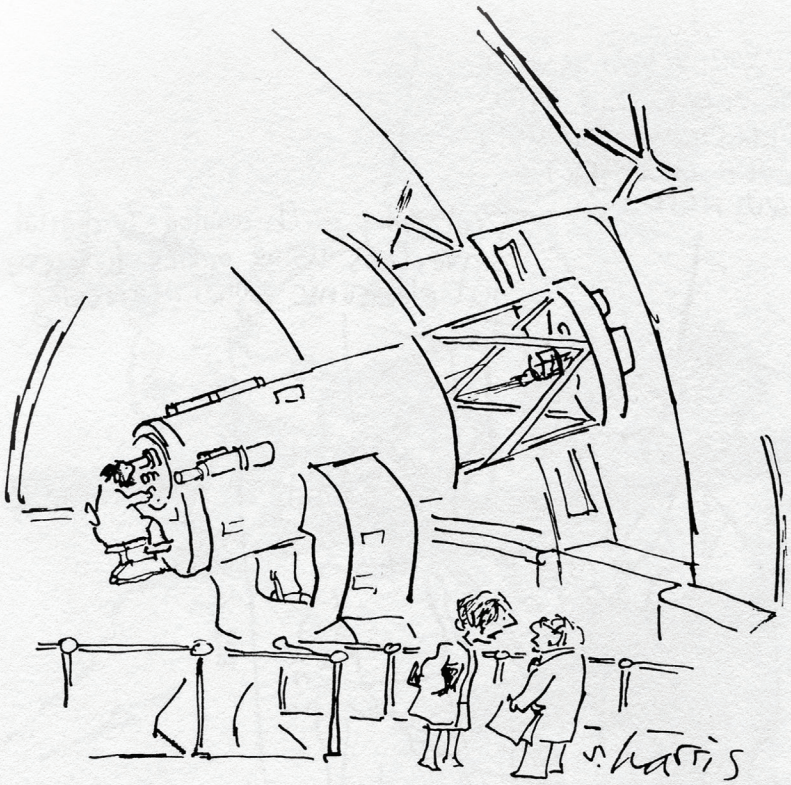


scan me!

www.ipho2024.ir

secretariat@ipho2024.ir

Ministry of Education | Isfahan University of Technology | Shahid Rajaee Teacher Training University | Young Scholars Club



Sidney Harris, Einstein Atomized (Copernicus Springer-Verlag, 1989)

"THE REASON HE'S NEVER SEEN A CONSTELLATION IS HE'S CONVINCED THERE REALLY ARE WHITE LINES CONNECTING THE STARS."