Padma Vibhushan C R Rao
DoB: 10-09-1920   DOD: 22-08-2023

గణిత చంద్రిక

GANITHA CHANDRIKA

(July-December - 2023)

విషయ సూచిక

సంపాదకీయం

పాఠక మహాశయులకు నమస్కారం. ఈ సంచిక పద్మవిభూషణ్ డా॥ C.R. రావుగారి ముఖచిత్రంతో వెలువరిస్తున్నాము. వారు శతాధిక ఆయుష్మంతులు. గణిత, గణాంక శాస్త్రాలలో దిట్ట. ఎన్నో ఫలితాలను రాబట్టిన మహావ్యక్తి. వారి గణిత ప్రసంగాన్ని నేను ప్రత్యక్షంగా ఉస్మానియా యూనివర్శిటీలో విద్యార్థిగా ఉన్నప్పుడు వినడం, వీక్షించడం నా అదృష్టంగా భావిస్తాను. వారి గురించి ఇంతకు ముందు కూడా మన గణితచంద్రికలో వ్యాసాన్ని, ముఖచిత్రాన్ని ప్రచురించడం జరిగింది. మరలా ఇప్పుడు వారి మరణానంతరం ఈ సంచిక వారి జ్ఞాపకార్థం, జీవిత విశేషాలతో ముఖచిత్ర సహితంగా తీసుకురావడం జరుగుతున్నది. వారి విశేషాలు మననం చేసుకొనడం మన బాధ్యతగా, అదృష్టంగా అందరు తెలుగు వారికీ గర్వకారణంగా ఉంటుందనడం ఏ మాత్రం అతిశయోక్తి కాదు. విద్యార్థులకూ, ఉపాధ్యాయులకూ, గణిత ప్రియులందరకూ ఈ ప్రత్యేక సంచికలోని వ్యాసాలన్నీ ఆనందం కలిగిస్తాయని భావిస్తున్నాము. అనివార్య కారణాల వలన కొంత ఆలస్యంగా ఈ సంచిక విడుదలవుతున్నందుకు క్షంతవ్యులము. వ్యాసాలన్నీ సకాలంలో సేకరించినప్పటికీ సాంకేతికపరమైన కారణాల వలన జాప్యం జరిగినదని విన్రమంగా తెలుపుతున్నాము. ఆగామి కాలంలో తగు జాగ్రత్తలు తీసికొనగలమని తెలియచేయుచున్నాము. ఈ సంచిక కూడా online పద్ధతిలోనే విడుదల చేయుచున్నామని గమనించ ప్రార్థన. ఎప్పటివలనే అందరి సహాయ సహకారాలు అర్థిస్తున్నాము. రెండు పేజీలకు మించని చక్కటి గణిత వ్యాసాలను పాఠక మహాశయుల నుండి పాఠశాల విద్యార్థులకు ఉపయోగపడేలా ఆహ్వానిస్తున్నాము.

శుభాభివందనములతో

భవదీయుడు

Dr. B.B. రామశర్మ

Chief Editor

SOME EXAMPLES OF MATHS IN EVERYDAY LIFE - PART - 2

Dr.K. Pushpalatha,
M.Sc., M.Phil, M.Tech (CSE), PhD (Mathematics)

SPORTS

Maths improves the cognitive and decision-making skills of a person. Such skills are very important for a sportsperson because by this he can take the right decisions for his team. If a person lacks such abilities, he won't be able to make correct estimations. So, maths also forms an important part of the sports field.

APPLICATION:

- Probability
- Mathematical Operations and Algorithm
- Logical Reasoning
- Game Theory

MANAGEMENT OF TIME

Now managing time is one of the most difficult tasks which is faced by a lot of people. An individual wants to complete several assignments in a limited time. Not only the management, but some people also are not even able to read the timings on an analog clock. Such problems can be solved only by understanding the basic concepts of maths. Maths not only helps us to understand the management of time but also to value it.

APPLICATION:
- Logical Reasoning
- Basic Mathematical Operations
- Reasoning

DRIVING

'Speed, Time, and Distance' are all these three things that are studied in mathematical subjects, which are the basics of driving irrespective of any mode of transportation. Maths helps us to answer the following question:
- How much should be the speed to cover any particular distance?
- How much time would be taken?
- Whether to turn left or right?
- When to stop the car?
- When to increase or decrease the speed?

APPLICATION:
- Logical reasoning
- Numerical Reasoning
- Mathematical Operations

AUTOMOBILES INDUSTRY

The different car manufacturing companies produce cars based on the demands of the customers. Every company has its category of cars ranging from microcars to luxury SUVs. In such companies, basic mathematical operations are being applied to gain knowledge about the different demands of the customers.

APPLICATION:

- Mathematical Operations
- Ratios and Proportions
- Statistics
- Geometry
- Algorithm

COMPUTER APPLICATIONS

Ever wondered how a computer works? How easily it completes every task in a proper series of actions? The simple reason for this is the application of maths. The fields of mathematics and computing intersect both in computer science. The study of computer applications is next to impossible without maths. Concepts like computation, algorithms and many more forms the base for different computer applications like PowerPoint, word, excel, etc. are impossible to run without maths.

APPLICATION:

- Computation
- Algothirm
- Coding Methods
- Cryptography

2013 సంవత్సరంలో Vol 13 Issue 1 & 2 గణితచంద్రిక C.R. Rao గారి ముఖచిత్రంతో ముద్రించబడింది. ఆ పత్రికలో C.R. Rao గారి గురించిన వ్యాసాన్ని అప్పటి ప్రధాన సంపాదకులు ప్రఖ్యా. సత్యనారాయణశర్మ గారు వ్రాశారు.
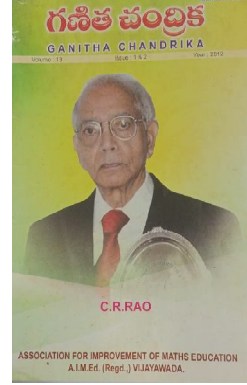
BRAHMAGUPTA
(Indian Mathematician)

PUVVADA DHARMEE,
VIII Std, Sri Chaitnya School, Patamata

CHILDHOOD OF BRAHMAGUPTA:

Brahmagupta, an ancient Indian mathematician and astronomer, was born around 598 CE in Bhinmal, present-day Rajasthan, India. Little is known about his early life, family background, and childhood, as historical records from that period are limited. Growing up in the Gupta Empire, he likely had access to the rich intellectual and cultural environment of the time. His curiosity and passion for mathematics might have started at an early age, setting the foundation for his later contributions. The specific details of his childhood remain elusive, and much of his life is pieced together from his works and historical accounts.

EDUCATION OF BRAHMAGUPTA:

Brahmagupta received his education in mathematics and astronomy in the ancient Indian educational system, possibly under the guidance of established scholars of his time. He might have studied the classical Indian mathematical texts

and astronomical treatises that were available during the Gupta period. The mathematical knowledge of ancient India, coupled with the mentorship he received, likely played a crucial role in shaping his intellectual development. His education would have involved a deep understanding of the mathematical concepts prevalent in ancient India, including geometry, algebra, and astronomy. Despite limited historical documentation, Brahmagupta's education laid the groundwork for his future contributions to mathematics and astronomy.

CONTRIBUTION TO MATHEMATICS:

Brahmagupta's major work, "Brahmasphutasiddhanta," is a comprehensive treatise covering a wide range of mathematical topics and astronomical calculations. He made significant contributions to algebra, providing solutions to quadratic equations and introducing rules for operations with zero and negative numbers. Brahmagupta's work on geometry included the area of cyclic quadrilaterals and a formula for the area of a cyclic quadrilateral (Brahmagupta's Formula). He made advancements in understanding the properties of Pell's equation and contributed to the study of indeterminate equations. His systematic approach to mathematical reasoning and problem-solving had a lasting impact on the development of mathematical thought in India.

SIGNIFICANT ACHIEVEMENTS:

One of Brahmagupta's notable achievements is his development of the concept of zero as a number and his rules for arithmetic operations involving zero. He contributed to the understanding of negative numbers, providing solutions to equations involving negative coefficients. Brahmagupta's work laid the foundation for future mathematicians, influencing Islamic scholars and later European mathematicians. His mathematical insights, particularly in algebra, had a profound impact on the evolution of mathematical knowledge in the Indian subcontinent. Brahmagupta's contributions to mathematics endure as a testament to the intellectual achievements of ancient India, influencing mathematical thought for centuries to come.

SUMMARY:

Brahmagupta, an ancient mathematician from the Gupta period, did not receive modern awards as we understand them today. However, his contributions to mathematics were highly esteemed in his time, and his legacy is recognized through the enduring impact of his work. Highly regarded as a scholar, Brahmagupta's profound understanding of mathematics and astronomy is evident in his major work,

"Brahmasphutasiddhanta." This treatise was considered a significant intellectual achievement, shaping mathematical thought in ancient India and becoming foundational in the education of subsequent generations of mathematicians and astronomers. Brahmagupta's teachings and writings influenced not only the Indian mathematical tradition but also had a profound impact on Islamic scholars during the Islamic Golden Age. Through translations into Arabic, his work contributed to the development of Islamic mathematics and later influenced European mathematicians during the Middle Ages. Specifically recognized for his contributions to algebra, such as solving quadratic equations and introducing innovative concepts, Brahmagupta also made advancements in geometry, notably with his formula for the area of cyclic quadrilaterals. His conceptualization and formalization of zero as a number were groundbreaking, earning him acknowledgment for his pioneering work. Moreover, his applications of mathematics to astronomy showcased the practical implications of his contributions. Brahmagupta's enduring legacy is evident in the continued study and appreciation of his mathematical insights, solidifying his status as a revered figure in the history of mathematics.

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RAMANUJAN'S PROBLEM

R. Pranav, 11th Class, Khammam

In the intriguing landscape of mathematics, the legacy of Srinivasa Ramanujan continues to reverberate, leaving behind a trail of unsolved mysteries and profound insights. One such mathematical marvel that bears the imprint of Ramanujan's genius is an infinite nested radical, a captivating expression that has fascinated mathematicians for over a century. Here it is.

$$x = \sqrt{1+2\sqrt{1+3\sqrt{1+4\sqrt{1+....}}}}$$

In 1911 Srinivasa Ramanujan Posed this problem. Remarkably the answer is exactly 3. Behold!

Solution

$$3 = \sqrt{9}$$

$$= \sqrt{1+8}$$

$$= \sqrt{1+2\cdot 4}$$

$$= 1+2\sqrt{16}$$

$$= \sqrt{1+2\sqrt{1+15}}$$

$$= 1+2\sqrt{1+3\cdot 5}$$

$$= \sqrt{1+2\sqrt{1+3\sqrt{25}}}$$

$$= 1+2\sqrt{1+3\sqrt{1+4\cdot 6}}$$

$$= \sqrt{1+2\sqrt{1+3\sqrt{1+4\sqrt{1+\ldots}}}}$$

Ramanujan's Infinite Radical Problem showcases the power of intuition and ingenuity in mathematics. It reminds us that sometimes, the simplest ideas can unlock the secrets of the most intricate structures. By venturing into the depths of these nested roots, we not only uncover a beautiful solution, but also appreciate the elegance and wonder inherent in the mathematical world.

This proof merely scratches the surface of Ramanujan's mathematical universe. Numerous extensions

and generalizations of this problem exist, offering further challenges and insights into the realm of infinite series and nested radicals. Explore these avenues to unravel the full depth and beauty of Ramanujan's legacy.

Ramanujan's legacy endures not only in the solutions he provided but in the doors he opened for future mathematical exploration. The nested radical, once a perplexing problem, now stands as a testament to the beauty and depth that can be uncovered through rigorous mathematical reasoning.

As mathematicians continue to navigate the vast landscape of unsolved problems and unexplored territories, Ramanujan's contributions serve as guiding lights, urging them to delve deeper, question further, and uncover the hidden gems that await in the realms of numbers, equations, and infinite expressions. The infinite nested radical, a testament to Ramanujan's brilliance, beckons future generations to partake in the endless adventure of mathematical discovery.

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NATIONAL MATHEMATICS DAY

D. Ananya, 11th Class, Khammam

INTRODUCTION:

The year 2012 marked a pivotal moment in India's recognition of mathematical brilliance, as the nation commemorated the extraordinary mind of Srinivasa Ramanujan through a commemorative stamp. This artistic representation was more than just a symbol; it laid the foundation for an annual celebration known as National Mathematics Day. Declared by Prime Minister Manmohan Singh on December 26, 2011, at Madras University, this day, observed on the 22nd of December each year, not only pays tribute to Ramanujan's birth anniversary but also serves as a beacon for promoting mathematical education and awareness. Let's delve into the evolution of National Mathematics Day and its significant impact on the mathematical landscape of India.

THE BIRTH OF NATIONAL MATHEMATICS DAY:

Srinivasa Ramanujan's legacy found a place of honor on the 2012 Indian stamp, immortalizing his contributions to the realm of mathematics. The Indian government, recognizing the importance of his work, officially declared the 22nd of December as National Mathematics Day. Prime Minister Manmohan Singh's announcement, made on the

125th birth anniversary of Ramanujan, not only designated a specific day but also declared the entire year of 2012 as the National Mathematics Year. This marked a commitment to fostering a nationwide appreciation for the beauty and significance of mathematics.

ANNUAL CELEBRATIONS AND EDUCATIONAL EVENTS:

Since the inception of National Mathematics Day, the 22nd of December has become a day of celebration and enlightenment across the nation. Educational institutions, from schools to universities, actively participate in numerous events aimed at promoting mathematical understanding and enthusiasm. Through workshops, seminars, and lectures, students are encouraged to explore the world of numbers, patterns, and equations, fostering a culture of curiosity and appreciation for the subject.

RAMANUJAN MATH PARK: A SYMBOL OF SIGNIFICANCE:

In 2017, National Mathematics Day took on additional significance with the inauguration of the Ramanujan Math Park in Kuppam, located in Chittoor, Andhra Pradesh. This park stands not only as a physical tribute to the mathematical prodigy but also as a symbol of the day's broader impact. The Ramanujan Math Park serves as a space where individuals can engage with mathematical concepts in a tangible and interactive manner, further emphasizing the practical applications and beauty of mathematics.

NATIONWIDE CELEBRATION:

The spirit of National Mathematics Day resonates across the length and breadth of India. Every year, on the 22nd of December, schools and universities come alive with a myriad of activities, from mathematical quizzes to problem-solving competitions. The day serves as a reminder that mathematics is not confined to textbooks but is a dynamic and integral part of our daily lives.

CONCLUSION:

National Mathematics Day in India has evolved into more than just an annual celebration; it is a testament to the enduring legacy of Srinivasa Ramanujan and a commitment to nurturing mathematical excellence. As the day's celebrations continue to unfold, it serves as an invitation for individuals of all ages to explore the wonders of mathematics, recognizing its importance in shaping our understanding of the world. Through initiatives like the Ramanujan Math Park and widespread educational events, the legacy of Ramanujan lives on, inspiring generations to come to embrace the beauty of numbers and the limitless possibilities they hold.

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THE ELEMENTS OF COORDINATE GEOMETRY PART - 1

Rida Samrin,
12th Class, Khammam
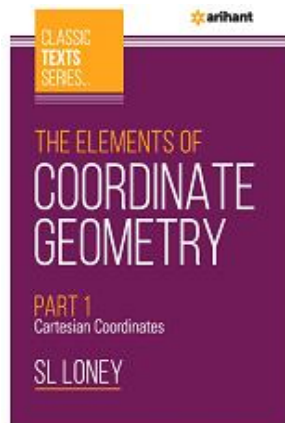
Production Detaions :

Publisher	:	**Arihant**
Publications	:	**Sixth Edition**
Language	:	**English**
Pages	:	**403**
Price	:	**156/NR**

Available on Amazon

Book on The Elements of Coordinate Geometry Part 1 Cartesian Coordinates has presented the elements of Coordinate Geometry in a manner suitable for beginners and junior students. The Part 1 of this book containing 1100 examples deals with only Cartesian and polar coordinates. The book has been divided into 17 chapters. Each chapter in the book begins with point wise introduction of the various concepts that are covered under a particular topic, followed by examples helping understand the concepts better. The

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solved examples have been provided topic-wise for effective comprehension. At the end of each chapter, unsolved practice exercises have been provided to help aspirants revise the concepts discussed in the chapter. Also miscellaneous propositions covering all the chapters and the concepts involved have been given at the end after the chapter wise study of the various concepts. At the end of the book, answers and solutions to the unsolved practice exercises provided in between the chapters have also been provided.

Key to MSET = 2022 Questions

Class	Questions														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
V	4	3	4	4	3	2	4	3	3	4	2	3	4	4	1
VI	3	1	4	1	3	1	2	4	2	3	2	4	2	3	1
VII	4	1	2	4	2	4	1	4	2	2	4	3	2	4	1
VIII	1	2	3	2	2	3	1	2	2	2	3	4	2	2	1
IX	3	2	1	2	4	1	1	2	1	2	4	3	1	2	1
X	1	1	3	2	2	2	2	2	3	2	1	3	4	4	1

MENSURATION QUESTIONS FOR COMPETITIVE EXAMS

G. Neeraj Reddy,
B.Tech 1st year, IIT Kanpur

1. **A rectangular box has dimensions in the ratio 2:3:5. If the volume of the box is 30,000 cm³, find the dimensions.**

A. Length = 50 cm, Width = 30 cm, Height =20 cm

2. **A cone and a cylinder have the same base radius and height. If the cone's volume is 100πcm³, find the cylinder's volume.**

A. Volume of Cylinder = 300π cm³

3. **A regular pyramid has a base area of 64 cm² and a height of 12 cm. Find its volume.**

A. Volume = 256 cm³

4. **A sphere and a cone have the same volume. If the cone's radius is 5 cm, height 2.5cm find the sphere's radius.**

A. Radius of Sphere = 2.5 cm

5. **A cylindrical tank is filled with water up to a height of 12 meters. If the diameter of the base is 6 meters, find the volume of water in the tank.**

A. Volume = 108πm³

6. **The perimeter of a rectangle is 50 cm. If the length is 3 times the width, find the area of the rectangle.**

A. Area = 117.19 cm²

7. **A circular flower bed has a diameter of 14 meters. Find the area of the largest square that can fit inside the flower bed.**

A. Area = 98 m²

8. **A triangular prism has a base area of 36 cm² and a height of 15 cm. Find its volume.**

A. Volume = 180 cm³

9. **A hexagonal prism has a side length of 8 cm and a height of 10 cm. Find its volume.**

A. Volume = $320\sqrt{3}$ cm³

10. **The side lengths of a right-angled triangle are in the ratio 3:4:5. If the hypotenuse is 15 cm, find the area of the triangle.**

A. Area = 54 cm²

11. **A cube has a sphere inscribed inside it. If the cube's volume is 216 cm³, find the volume of the sphere.**

A. Volume of Sphere = 36π cm³

12. **The diameter of a semicircular garden is 28 meters. Find its area.**

A. Area = 308 m²

13. **A regular tetrahedron has a side length of 9 cm. Find its volume.**

A. Volume = $60.75\sqrt{2}$ cm³

14. **A cylindrical tower has a slant height of 40 meters and a base radius of 10 meters. Find its lateral surface area.**

A. Lateral Surface Area = $400\sqrt{3}\pi$ m²

15. **The base radius of a cone is tripled, and its height is doubled. If the original cones volume is 100π cm³, find the volume of the new cone.**

A. Volume = 1800π cm³

16. **The surface area of a cube is 150 cm². Find its volume.**

A. Volume = 125 cm³

17. **A triangular pyramid has a base area of 25 cm², and its height is 10 cm. Find its volume.**

A. Volume = 83.33 cm³

18. **A sector of a circle with a central angle of 60 degrees has an area of 24π cm². Find the radius of the circle.**

A. Radius = 12 cm

19. **A rectangular tank is 12 meters long, 8 meters wide, and 6 meters deep. If it is filled to 80% of its capacity, find the volume of water in the tank.**

A. Volume = 460.8 m³

20. **A regular hexagonal pyramid has a base side length of 6 cm and a height of 10 cm. Find its volume.**

A. Volume = $180\sqrt{3}$ cm³

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EXPLORING THE FASCINATING WORLD OF GEOMETRY

M. Yeswanth,
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Geometry, a captivating branch of mathematics, delves into the study of shapes, sizes, and the properties of space. Beyond its foundational role in architecture, engineering, and art, geometry hides a treasure trove of intriguing facts that add a layer of fascination to this mathematical discipline. Let's embark on a journey to unveil some of these fun and enlightening facts about geometry.

1. Centuries of Geometry:

- The word "geometry" has graced the English language since the 14th century, attesting to its enduring significance.

2. Equilateral Triangles and Regularity:

- An equilateral triangle, with sides of equal length and angles measuring 60 degrees, is a symmetrical marvel. Such triangles are dubbed regular triangles.

3. Hexagon's Circumference Fit:

- The largest regular polygon that snugly fits inside a circle is the hexagon, dividing the circle into six equal parts using straight lines.

4. The Aesthetics of the Golden Ratio:

   - The Golden Ratio, an aesthetically pleasing mathematical ratio, graces geometric wonders like the Nautilus shell spiral and pineapple shape, influencing art and architecture.

5. Euclidean Distance:

  - The shortest distance between two points, a straight line, is known as Euclidean distance, paying homage to the Greek mathematician Euclid.

6. Infinite Symmetry of Circles:

   - Circles boast infinite lines of symmetry. A line through the center splits the circle into identical halves, exemplifying the beauty of circular symmetry.

7. Zero's Debut:

  - Geometry pioneered the concept of zero, symbolizing a point, line, or plane devoid of dimension – a revolutionary introduction to the mathematical realm.

8. Platonic Solids' Philosophical Connection:

   - The Platonic solids, five regular polyhedra named after philosopher Plato, exhibit regular polygons as faces, adding a philosophical touch to geometry.

9. Sierpinski's Fractal Marvel:

- The Sierpinski triangle, a mesmerizing fractal named after mathematician Waclaw Sierpinski, emerges from the recursive division of an equilateral triangle.

10. Trapezoid's Terminology Tale:

- The term "trapezoid," describing a four-sided figure with one pair of parallel sides, has been in use since 1583.

11. Pythagorean Legacy:

- The Pythagorean theorem, a cornerstone in geometry, states the relationship between the sides of a right-angled triangle. Named after Greek mathematician Pythagoras, it continues to shape geometric principles.

12. Fibonacci's Geometric Presence:

- The Fibonacci sequence, a series prevalent in nature, manifests in geometric shapes like seashell spirals and leaf arrangements on a stem.

13. The Humble Point:

- A point, the most elementary geometric shape, possesses no length, width, or height. Yet, it serves as the foundational building block for all other geometric constructs.

14. Pi's Ancient Origins:

- The concept of pi (π), denoting the ratio of a circle's circumference to its diameter, dates back to ancient Egyptians and Babylonians. Greek mathematician Archimedes calculated its value between 3.1408 and 3.1429.

15. Etymology and Earthly Measures:

- The term "geometry" finds its roots in the Greek words "geo" (earth) and "metron" (measure), reflecting its essence as the measurement of the earth.

Geometry, beyond its foundational role, offers a tapestry of facts that enrich our understanding of shapes and sizes. From ancient origins to modern applications, the Pythagorean theorem to the intricacies of fractals, geometry invites exploration. Whether you're a mathematics enthusiast or someone intrigued by the world of shapes, geometry continues to unveil its wonders, proving that there's always something new to discover in the realm of mathematical beauty.

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A MATHEMATICAL MAESTRO AND STATISTICAL VISIONARY

Dr. S.V.N.L. Lalitha

Professor C. R. Rao, the eminent statistician and mathematician, stands as a luminary whose groundbreaking contributions have left an indelible mark on the fields of statistics and mathematics. Born on September 10, 1920, in Hadagali, India, Calyampudi Radhakrishna Rao's journey has been characterized by unparalleled brilliance, scholarly rigor, and a relentless pursuit of excellence.

Early Life and Education: C. R. Rao's academic journey commenced at Andhra University, where he earned his Bachelor's and Master's degrees in mathematics. His early promise led him to Cambridge University, where he studied under the tutelage of the legendary statistician R. A. Fisher, obtaining a Ph.D. in Statistics in 1948. Fisher's influence profoundly shaped Rao's approach to statistics, instilling in him a commitment to rigorous methodology and innovative thinking.

Academic Career: Rao's illustrious academic career spans several prestigious institutions worldwide. He served as a faculty member at the Indian Statistical Institute,

Kolkata, and later held positions at institutions such as the University of Pittsburgh, the University of Cambridge, and Harvard University. His dedication to education and research inspired countless students and researchers who have continued his legacy.

Key Achievements and Contributions:

• Rao-Blackwell Theorem:

- One of Rao's early achievements was the development of the Rao-Blackwell theorem, a fundamental result in the field of mathematical statistics. This theorem provides a method for improving statistical estimators, enhancing their efficiency.

• Cramér-Rao Inequality:

- Collaborating with mathematician Harald Cramér, Rao contributed to the formulation of the Cramér-Rao inequality, a cornerstone in statistical theory. This inequality establishes a lower bound on the variance of an unbiased estimator, offering insights into the precision of statistical measurements.

• Multivariate Analysis:

- Rao's influential work in multivariate analysis has significantly advanced the understanding of

statistical methods for analyzing data with multiple variables. His contributions have become standard references in the field, influencing generations of statisticians.

- **Orthogonal Arrays and Combinatorial Design:**
  - Rao made pioneering contributions to the theory of orthogonal arrays and combinatorial design, critical in experimental design and industrial experimentation. His work has found applications in diverse fields, including telecommunications and manufacturing.

- **Econometrics and Time Series Analysis:**
  - Applying statistical methods to economics, Rao has contributed to econometrics and time series analysis. His insights have played a pivotal role in understanding economic phenomena and forecasting trends.

- **National and International Recognition:**
  - C. R. Rao's stellar contributions have earned him numerous awards and honors, including the Padma Vibhushan, India's second-highest civilian award, and the United States National Medal of Science. His election as a fellow to the Royal Society is a testament to his global impact.

- **Later Life and Legacy:**
  - Professor C. R. Rao passed away on 22-8-2023 leaving behind an unparalleled legacy. His intellectual rigor, innovative thinking, and transformative contributions have indelibly influenced the fields of mathematics and statistics.

Honours and Awards Conferred on C. R. Rao:

- **Fellow of the Royal Society (FRS):** Elected in 1967.
- **Padma Vibhushan:** Awarded by the Government of India in 2001.
- **United States National Medal of Science:** Conferred in 2002.
- **Copley Medal:** Awarded by the Royal Society in 2016 for his outstanding achievements in statistical theory and methodology.
- **Prize equal to Noble Prize :** Received prize equal to Noble Prize in the field of statistics from "International Prize in Statistics Foundation in July 2023.

In conclusion, Professor C. R. Rao's life and work exemplify the pinnacle of achievement in the realms of mathematics and statistics. His intellectual rigor, innovative thinking, and transformative contributions have indelibly influenced these fields, leaving an intellectual legacy that continues to inspire scholars and researchers globally. The world owes a debt of gratitude to this mathematical maestro whose brilliance has illuminated the path for generations to come.

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RMO PRACTICE PROBLEMS

B.Rithwik,

B.Tech 1st Year, IIT Mumbai

1. If '+' means '÷', '÷' means '–', '–' means '×', '×' means '+', then 12 + 6 ÷ 3 – 2 × 8 =

   (A) – 2   (B) 2   (C) 4   (D) 8

2. How many such pairs of letters are there in the given word each of which has as many letters between them in the word as in the English alphabet?

   ADVERTISEMENT

   (A) Three   (B) Four

   (C) Five   (D) More than five

3. Select the Venn diagram from the options which best illustrates the relationship amongst, "Teacher, Male and Player".
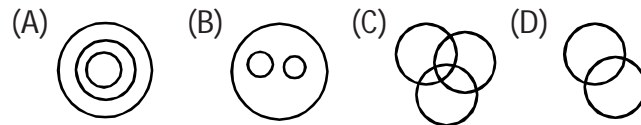
4. The sums of n terms of two arithmetic series are in the ratio of $7n + 1 : 4n + 27$. Find the ratio of their 11th terms.

   (A) 4 : 3   (B) 5 : 4   C) 7 : 4   (D) None of these

5. **Which of the following is true?**

   (A) Three points (1, –2), (3, 4) and (4, 7) form a straight line.

   (B) Any line parallel to *x*-axis is *y* = *b*.

   (C) The point (3, 4) is at a distance of 5 units from the origin.

   (D) All of these

6. **A number is chosen at random from 1 to 120. The probability of the number chosen being a multiple of 3 and 15 both is _____.**

   (A) 1/15   (B) 1/16

   (C) 1/17   (D) 1/19

7. **The average score of a player in 10 innings was 77 runs. In the 11th inning he had scored zero runs. The overall average score in all the 11 innings was**

   (A) 77 runs   (B) 27 runs

   (C) 11 runs   (D) 70 runs

8. **A kite is flown with a thread of 250 m length. If the thread is assumed to be stretched and makes an angle of 60° with the horizontal, then the height of the kite above the ground is (Use $\sqrt{3}$ = 1.73)**

   (A) 216.50 m   (B) 215.25 m

   (C) 212.25 m   (D) 210.25 m

9. Which of the following is incorrect

(A) For K = $\dfrac{9}{8}$ the equation $2x^2 + 3x + k = 0$ will have real and equal roots.

(B) For K = –1 the equation $x^2 + K(4x + k–1) + 2 = 0$ will have equal roots.

(C) For K = 2, the equation $x^2 – 2x(1 + 3k) + 7(3+2k) = 0$ will have equal roots.

(D) For k = –3, the equation $(K +1)x^2 – 2(K-1)x + 1 = 0$ will have equal roots.

10. The points *A* (–5, 5), *B*(1, –3) and *C*(4, –3) are shown in the given figure. A Find
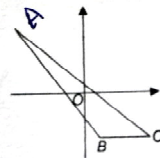
(a) the coordinates of the midpoint of *AC*.   and

(b) the length of *AB*.

a	b
(A) (–1/2, 1)	9 units
(B) (–1/2, 1)	10 units
(C) (1/2, –1)	9 units
(D) (1/2, –1)	10 units

ANSWERS

1. (C)	2.(D)	3.(C)	4.(A)	5.(D)
6.(A)	7.(D)	8.(A)	9.(D)	10.(B)

IIT CAPSULE - SEQUENCES & SERIES

Dr. B.B. Ramasarma

1. For three positive integers p,q,r, $x^{pq^2} = y^{qr} = z_z{}^{p^2r}$ and r = pq + 1 such that 3,3 $\log_y x$, 3$\log_z y$, 7$\log_x z$ are in A.P. with common difference $\dfrac{1}{2}$. Then r – p – q is equal to _____

2. The 4th term of GP is 500 and its common ratio is $\dfrac{1}{m}, m \in N$. Let S_n, denote the sum of the first n terms of the GP. If $S_6 > S_5 + 1$ and $S_7 < S_6 + \dfrac{1}{2}$, then the number of possible values of m is _____

3. If $\dfrac{1^3 + 2^3 + 3^3 + \dots \text{up to n terms}}{1 \cdot 3 + 2 \cdot 5 + 3 \cdot 7 + \dots \text{up to n terms}} = \dfrac{9}{5}$, then the value of n is

4. Let $\displaystyle\sum_{n=0}^{\infty} \dfrac{n^3 \left((2n)! \right) + (2n\text{-}1)(n!)}{\left((n!)(2n)! \right)} = ae + \dfrac{b}{e} + c$ where a,b,c $\in$ z and e = $\displaystyle\sum_{n=0}^{\infty} \dfrac{1}{n!}$ Then a^2–b + c is equal to _____

5. For the two positive numbers a,b, if a,b and $\dfrac{1}{18}$ are in geometric progression, while $\dfrac{1}{a}$, 10 and $\dfrac{1}{b}$ are in an arithmetic progression, then 16a + 12b is equal to _____

6. Let a_1, a_2, a_3, ... be a GP of increasing positive numbers. If the product of fourth and sixth terms 9 and the sum of fifth and seventh terms is 24, then $a_1 a_9 + a_1 a_9 + a_2 a_4 a_9 + a_5 + a_7$ is equal to _____

7. Let $\{a_k\}$ and $\{b_k\}$, $k \in \mathbb{N}$, be two G.P.s with common ratio r_1 and r_2 respectively such that $a_1 = b_1 = 4$ and $r_1 < r_2$. Let $c_k = a_k + b_k$, $k \in \mathbb{N}$. If $c_2 = 5$ and $c_3 = \dfrac{13}{4}$ then

$$\sum_{k=1}^{\infty} c_k - \left(12a_6 + 8b_4\right) \text{ is equal to } \_\_\_\_\_$$

8. Let $a_1 = b_1 = 1$ and $a_n = a_{n-1} + (n-1)$, $b_n = b_{n-1} + a_{n-1} \; \forall n \geq 2$. If $S = \sum_{n=1}^{10} \dfrac{b_n}{2^n}$ and $T = \sum_{n=1}^{10} \dfrac{n}{2^{n-1}}$, then $2^7(2S - T)$ is equal to _____

9. If $a_n = \dfrac{-2}{4n^2 - 16n + 15}$, then $a_1 + a_2 + \ldots a_{25}$ is equal to

_____

10. Let A_1, A_2, A_3 be the three series in A.P. with the same common difference d and having their first terms as A, $A+1$, $A+2$, respectively. Let a, b, c be the 7th, 9th, 17th terms of A_1, A_2, A_3, respectively such that

$$\begin{vmatrix} a & 7 & 1 \\ 2b & 17 & 1 \\ c & 17 & 1 \end{vmatrix} + 70 = 0$$

If $a = 29$ then the sum of first 20 terms of an AP whose first term is $c - a - b$ and common difference is $\dfrac{d}{12}$, is equal to

ANSWERS

1) 2   2) 12   3) 5   4) 26   5) 3

6) 60 7) 9   8) 461   9) $\dfrac{50}{141}$ 10) 495

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AMAZING FACTS ABOUT MATHS FOR SCHOOL STUDENTS

K. Varshith,
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Math is a fascinating subject that can be both stimulating and enjoyable. With math, you can develop problem-solving skills, explore different ways of thinking, and practice critical reasoning. Whether you're a student or a hobbyist, there are some amazing math facts that will surprise you.

From learning to count and adding numbers together to mastering complex equations, math can be a source of fun and satisfaction. In this article, we'll explore math facts that prove it's a fun subject and how to make the most of it. In addition to math facts, we will also learn some tricks to make maths more fun, know how to become a pro at maths using vedic maths, and know how to score good marks in maths.

Let's explore the top 10 interesting facts about maths:

1. Math facts can't begin without talking about zero. The number zero was first used in India over 5,000 years ago.
2. The ancient Egyptians and math facts go hand in hand. The ancient Egyptians used a set of numbers known as hieroglyphs to represent basic mathematical calculations.
3. The symbol for infinity was first used by the ancient Greeks in the 5th century BC.

4. The term "algebra" comes from the Arabic word "al-jabr", meaning "the reunion of broken parts".

5. Math facts are incomplete without the historic mathematician. The famous mathematician, Pythagoras, had a very strange belief: he believed that all numbers were made up of the same building blocks.

6. The number pi (3.14159...) is an irrational number, meaning it can never be written down as a finite decimal.

7. The symbol for pi has been used in mathematics since the 1700s.

8. The number 12 is the only number that is equal to the sum of its divisors, excluding itself.

9. The amount of time it would take to solve all the puzzles is estimated at 5 billion years.

10. The mathematician, Leonhard Euler, is credited with inventing graph theory.

A few interesting facts about mathematics in daily life:

11. The number of possible different Sudoku puzzles is 6,670,903,752,021,072,936,960. Math facts are incomplete without sudoku

12. The Egyptians were the first to use multiplication tables.

13. There are a number of math facts behind every equation. The most famous equation in mathematics is Euler's identity: $e^{i\pi} + 1 = 0$.

14. The oldest surviving mathematical text is the Rhind Papyrus, written in Egypt around 1650 BC.

15. One of the unknown maths facts is related to the Pythagorean theorem. The oldest surviving mathematical proof is the Pythagorean Theorem, first proved by the ancient Greeks in the 6th century BC.

16. The most famous unsolved problem in mathematics is the Riemann Hypothesis.

17. The number of possible combinations of a Rubik's Cube is 43,252,003,274,489,856,000.

18. Some interesting math facts for kids: The number of possible combinations of a Rubik's Cube is greater than the number of atoms in the universe.

19. The most common number used in mathematics is the number 3.

20. In the 17th century, Isaac Newton invented calculus.

21. The most famous formula in mathematics is the quadratic equation, $ax^2 + bx + c = 0$.

22. The most famous theorem in mathematics is Pythagoras' Theorem.

23. A typical soccer ball is constructed from pentagons and hexagons; it contains 12 pentagons and 20 hexagons.

24. 26 is the only natural number sandwiched between a perfect square number (25) and a perfect cube number (27).

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Some Problems from MSET- 2022

CLASS - V

1. **In a special devise if BOY $\longrightarrow$ YLB; GAME $\longrightarrow$ TZNV then DUST$\longrightarrow$ ....**
   1) VFHG   2) WFGH   3) VEGH   4) WFHG

2. **Ravi went to a furniture shop. He bought 4 chaires each at the rate of Rs.525 and two tables each at the rate of Rs.2500. The amount he has to pay to the shopkeeper ..**
   1) Rs.4500   2)Rs.5000   3) Rs.7100   4) Rs.7000

3. **28 laddoos weigh 1kg. 16 laddoes can be packed in a box. Number of boxes required to pack 12kg laddoos:**
   1) 22   2) 18   3) 16   4) 21

4. **1xy $\times$ 27 = 3645 then values of x and y in the same order**
   1) 5, 3   2) 4, 5   3) 5, 4   4) 3, 5

5. **In a code language AC x DE = EHE BD $\times$ CB = GFH then AF $\times$ EG =**
   1) FBE   2) GAC   3) IAB   4) IAS

6. **The numbers which are multiplied by the same number many times. The units place doesn't change. The number of such digits that can be kept in units place...**
   1) 2   2) 4   3) 6   4) 5

7. **A days collection for a charitable trust is 21ten rupee notes; 12 twenty rupee notes; 6 fifty notes; 5 hundred notes and 2 five hundred notes. Total amount collected on the day : Rs.____**
   1) 2150   2) 1350   3) 2230   4) 2250

8. **Observe the staements, select the correct one**
   (A) 25 + 32 − 16 =41 (B) 25 × 16 = 400 (C) 1632 ÷ 16 = 12
   1) A, B, C are true   2) A, C are true, B False
   3) A, B are true, C false   4) B,C are true, A false

9. **Imagin a number. Multiply it with 10; then divide it with 2 and sbtract 7 to get a number 28. Imagined number is ....**
   1) 3   2) 5   3) 7   4) 9

10. **Values of x and y to keep the number 2x5y to its least value**
    1) 0, 2   2) 1, 0   3) 2, 0   4) 0,1

11. **Some ducks are there at a pond. Half of them are swimming in the pond, one third are sleeping on the bank and the remaining 5 are playing. Total ducks at the pond**
    1) 24   2) 30   3) 60   4) 48

12. **5 ten crores +8 ten lakhs + 3 ten thousand + 7 hundred + 1 one =**
    1) 50,80,30,071   2) 50,08,03,071
    3) 50,80,30,701   4) 50,08,30,701

13. **Write the gratest and smallest 5 digit numbers using 0, 3, 5, 8. repeating allowed**
    1) 88350, 30508   2) 88530, 00358
    3) 88530, 30580   4) 88530, 30058

14. **By selling an artical for Rs.370, the shopkeeper got a loss Rs.30. At what price he must sell if he want a gain of Rs.50**
    1) Rs.390   2) Rs.420   3) Rs.440   4) Rs.450

15. **If $a \times p = a$, $\dfrac{b}{p} = b$, $p \times p = p$ then p =**
    1) 1   2) 0   3) 1 or 0   4) 1 and 0

CLASS - VI

1. If a and b are two co-primes, which of the following is true ?_____
   1) LCM (a, b) = a x b   2) HCF (a, b) = 1
   3) Both (1) and (2)   4) neither (1) nor (2)

2. The product of the successor and predecessor of 99 is_____
   1) 9800   2) 9900   3) 1099   4) 9700

3. The number of whole numbers between the smallest whole number and the greatest 2-digit number is_____
   1) 101   2) 100   3) 99   4) 98

4. The least number of 4-digits is exactly divisible by 9 is_____
   1) 1008   2) 1009   3) 1026   4) 1018

5. The value of 1735 x 1232 - 1735 x 232 is _____
   1) 17350   2) 173500   3) 1735000   4) 173505

6. The HCF of 91, 112, 49 is _____
   1) 7   2) 14   3) 11   4) 49

7. Calculate 1-2+3-4+5-6+7-8+............+49-50_____
   1) -20   2) -25   3) -30   4) 25

8. The ratio of two numbers is 3 : 4 and their HCF is 4. Then LCM is_____
   1) 12   2) 16   3) 24   4) 48

9. The successer of -79 is_____
   1) -80   2) -78   3) 80   4) 78

10. Simplity : (-145) + 97 + (-365) + (-71) + 8_____
    1) -466   2) -460   3) -476   4) -486

11. Every counting number has an infinite number of _____
    1) factors   2) multiples
    3) prime factors   4) none of these

12. Which of the following is not equal to zero _____

1) 0×0 2) $\dfrac{0}{2}$ 3) $\dfrac{(6-6)}{2}$ 4) $4 + 0$

13. Determine the greatest 3-digit number which is exactly divisible by 8, 10 and 12_____

1) 940   2) 960   3) 980   4) 970

14. An operation Δ is defined as $a \Delta b = a - b - 2$, for all integers a,b. Then $7\Delta(-4) =$ _____

1) 11   2) -9   3) 9   4) 1

15. In a particular problem bd × ce = 840, ac × bd = 312 then ce × bc =_____

1) 805   2) 710   3) 620   4) 840

CLASS - VII

1. The teacher tells the class that the highest mark obtained by a student in her class is twice the lowest mark plus 7. The highest score is 87. What is the lowest mark?

1) 80   2) 60   3) 20   4) 40

2. Who was popularly known as "Father of Statistics"?

1) R.A Fisher   2) A.R. Mohauty

3) S. Ramanjun   4) Eular

3. If the difference between the exterior angle of a triangle and its adjacent angle is equal to 120° then the adjacent angle is

1) 60°   2) 30°   3) 45°   4) 80°

4. **The date of birth of Srinivasa Ramanujan .....**
   1) 14th April   2) 22nd March
   3) 14th November   4) 22nd December

5. **A, B, C, D are four persons on a stright road. C is left of B, A is left of C and D is right to B. Then the order of the persons is**
   1) A, B, C, D   2) A, C, B, D
   3) D, C, A, B   4) B, D, C, A

6. **Sonu's father is thrice as old as Sonu. After 12 years he will be just twice his daughter. Then Sonu's present age is (in years)**
   1) 10   2) 15   3) 11   4) 12

7. **MONKEY is coded as XDJMNL, then code of TIGER is**
   1) QDFHS   2) SDFHS   3) SHFDS   4) QJFHS

8. **14% of a number is 35 then the number is**
   1) 135   2) 174   3) 182   4) 250

9. **In $\triangle PQR$, if $\angle P = 100°$ and $\angle Q = \angle R$ then $\angle P + \angle R =$**
   1) 100°   2) 140°   3) 40°   4) 180°

10. **$1^2 = 1$; $11^2 = 121$; $111^2 = 12321$; $1111^2 = 1234321$ using this pattern $11111^2 =$**
    1) 1234321   2) 123454321
    3) 12345654321   4) 1234564321

11. **If $a + \dfrac{1}{b + \dfrac{1}{c}} = \dfrac{37}{5}$ then a – b – c = _____**
    1) 5   2) 7   3) 4   4) 3

12. **How many primes less than 100 have 7 in the one's digit ?**
    1) 4   2) 5   3) 6   4) 7

13. If one angle of a triangle is greater than two angles by 30° then the angles of the triangle are

1) 40°, 40°, 100°   2) 50°, 50°, 80°

3) 30°, 30°, 120°   4) 35°, 35°, 110°

14. If $40 - \dfrac{1}{4} \times B = 0$ Then what is the value of B

1) 0   2) 100   3) 200   4) 160

15. Which of the following equation can be constructed with x = 2

1) 3x – 4 = 2   2) 3x + 4 = 2

3) 3x – 4 = 8   4) 3x + 4 = 8

CLASS - VIII

1. The sum of two numbers is 14 and their difference is 10. The product of the two numbers is_____.

1) 24   2) 34   3) 44   4) 64

2. If $x + \dfrac{1}{y} = 1$ and $y + \dfrac{1}{z} = 1$ then $z + \dfrac{1}{x} = $ _____

1) -1   2) 1   3) 2   4) -2

3. The value of $a^3 + b^3 + c^3 - 3abc$ when $a+b+c = 9$ and $a^2 + b^2 + c^2 = 29$ is ____.

1) 9   2) 3   3) 27   4) 81

4. If $x + y = 2z$ then the value of $\dfrac{x}{x-z} + \dfrac{z}{y-z} = $ _____

1) -1   2) 1   3) 0   4) None

5. If $x < 10$ then $\left| x\text{-}10 \right|$ = _____
   1) x-10   2) 10-x   3) x+10   4) -x+1

6. **Which of the following graph is used to display two sets of data on the same graph (one graph paper)**
   1) Bar graph   2) Pie chart
   3) Double bargraph   4) None

7. **If the number of observations=n is odd number then the median is ___ term**
   1) $\left(\dfrac{n+1}{2}\right)^{th}$ 2) $\left(\dfrac{n}{2}+1\right)^{th}$ 3) n^{th} 4) $(n+1)^{th}$

8. **The perpendicular line segment from any vertex of a triangle to it's opposite side is called _____**
   1) Median   2) Altitude
   3) Bisector   4) None

9. **D.R.Kaprekar was also known as _____**
   1) Anand Ganith   2) Ganith Anand
   3) Ganitha Sri   4) Sri Ganith

10. **A pair of adjacent angles whose sum is _____ are called linear pair of angles.**
    1) 90   2) 180   3) 270   4) 360

11. **The conjugate angle of 60° is _____**
    1) 30   2) 120   3) 300   4) 340

12. Choose the correct order of signs from the given alternative signs 34☐2☐17☐34

1) –,–,x   2) +,+,+   3) –,÷,×   4) ÷,+, =

13. $\left\{6 \text{ of } 145 \div (3+2)\right\} \div 2 - 4 \text{ of } 20 =$ _____

1) 6   2) 7   3) 8   4) 9

14. Next number in the series 3, 5, 8, 13, 21, _____

1) 27   2) 34   3) 31   4) 35

15. $4.347 \div 0.09 =$ _____

1) 48.3   2) 4.83   3) 0.483   4) 483

CLASS - IX

1. The point equidistant from (3, -4) (4, 3) (4, -3) (-4, 3) is_____
   1)(1, 1)   2)(0, 1)   3)(0, 0)   4)(-1, -1)

2. $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \ldots + 99^2 - 100^2 =$ _____
   1)4090   2)-5050   3)-8000   4)5010

3. $\sqrt{x\sqrt{x\sqrt{x\sqrt{\ldots.\infty}}}} = y$ Then $y^2 - xy =$ _____
   1)0   2) x^2 3) $\sqrt{x}$ 4) x + 1

4. " Every even number greater than 4 can be written as sum of two primes" is a Conjecture stated by ___
   1) Euclid   2)Gold Bach
   3)Pythagerous   4)Aryabhatta

5. Number of irrational numbers between 2021 and 2022 is _____
   1) zero   2)one   3)two   4)infinite

6. $6x° + 20°, 2x° – 40°, 3x° – 20°$ form angles of a triangle then $3x° – 50°,$ _____ degrees
   1)10°   2) 20°   3)12°   4)18°

7. Angle between diagonals of a rhombus is $θ°$. Then $2θ° – 150° =$_____degrees
   1) 30°   2) 20°   3) 40°   4)10°

8. Mean proportional of x^2y^3 and $x^{-3} y^{-2}$ is_____
   1) $x^{-1/2}y^{-1/2}$ 2) $x^{-1/2}y^{1/2}$ 3) xy 4) 1

9. Ends of a diameter of a circle are (3, 0) (0, 4). Its circumference is_____
   1) $5π$ 2) $2π$ 3)$π$ 4) $5π/2$

10. X % of (Y + 1) equals 2X % of 3Y then Y = _____
    1)1   2)0.1   3)0.2   4)0.8

11. Median of first 25 natural numbers is_____
    1)12   2)12.5   3)13.5   4)13

12. X + Y =8; X, Y > 0 then maximum value of XY = _____
    1)32   2)64   3)16   4)18

13. $(x–1)(x–2)(x–3) = ax^3 + bx^2 + cx + d$ then abcd = _____
    1)396   2)268   3)-108   4)-132

14. The remainder when $x^3 – 8x + 1$ is divided by x – 1 is _____
    1)-3   2)-6   3)11   4)0

15. Zero of a polynomial $6(x^2 – 8x + 15)$ is_____
    1)3   2)4   3)15   4)0

CLASS - X

1. Equation of angular bisector of lines x=3 and y=3 is_____
   1) x – y = 0   2) x + y = 0
   3) x = 0   4) y = 0

2. $A\left(at_1^2, 2at_1\right), B\left(at_2^2, 2at_2\right)$ are such that of AB is $\dfrac{1}{2}$.

   Then $t_1^2 + t_2\left(2t_1 + t_2\right)$ equals _____

   1) 16   2) 10   3) $\dfrac{1}{8}$ 4) $\dfrac{1}{4}$

3. For different values of a, b the line ax+(a +b) y+2a-b=0 always passes through the point _____
   1) (1, 1)   2) (2, -3)   3) (-3, 1)   4) (0,1)

4. Area of $\triangle$ formed by (2020, 2021) (2019, 2020) and (1889,1890) is_____
   1) 1   2) 0   3) 2021   4) 1010

5. Mid points of sides of a $\triangle$ are (1, 0) (2, 7) (3, 1) then area of original triangle is_____
   1) 12   2) 26   3) 18   4) 4.5

6. Tan1 Tan2 Tan3 ....Tan89 = _____

   1) 45   2) 1   3) $\dfrac{1}{90}$ 4) $\dfrac{1}{45}$

7. If $x^2 + y^2 = 1$ then $\sqrt{x^2\left(3 - 4x^2\right)^2 + y^2\left(4y^2 - 3\right)} = $ _____
   1) 0   2) 1   3) 3   4) 4

8. **The value of sinθ + cosθ lies between ____**

   1) 1 and -1   2) $-\sqrt{2}$ and $\sqrt{2}$

   3) 0 and 1   4) -1 and 0

9. $\log_{y^3} x^2 \, \log_{z^4} y^3 \, \log_{x^5} z^4 =$ _____

   1) 0.85   2) 0.75   3) 0.4   4) 0.25

10. **Number of positive integers n such that $\log_n 1024$ is also an integer is_____**

    1) 3   2) 4   3) 5   4) 1023

11. **Number of positive integer divisiors of 256×243 is _____**

    1) 54   2) 36   3) 24   4) 68

12. **The graph of $y - x^2 = x + 7$ represents _____**

    1) Circle   2) Straight line

    3) Parabola   4) Hyperbola

13. **Number of x values for which $\sin^2 x - 2x\sin x + 2x^2 - 4x + 4 = 0$ has atleast one solution is_____**

    1) 2   2) Infinite   3) 1   4) 0

14. **The last digit in the finite decimal representation of 5^{-2003} is _____**

    1) 2   2) 4   3) 6   4) 8

15. **When integers 1 to 1000 are written on a paper, total no. of zeros that appear will be_____**

    1) 192   2) 144   3) 200   4) 500

✳ ✳ ✳

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