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The Mathematics

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Contemporary Mathematician : Kaneenika Sinha



Kaneenika Sinha is an eminent Indian mathematician known for her significant contributions to the field of analytic number theory, particularly the study of modular forms, arithmetic statistics and the distribution of mathematical sequences. She is an Associate Professor in the Department of Mathematics at the Indian Institute of Science Education and Research (IISER), Pune. Through her research, teaching and academic contributions, she has established herself as an important figure in contemporary Indian mathematics.

Kaneenika Sinha's interest in mathematics developed during her childhood. Her family frequently moved because her father served in the Indian Army. Consequently, she had to change schools several times and sometimes study independently to keep up with different educational systems. Mathematics initially attracted her because she considered it one of the most challenging subjects. Gradually, however, she developed a deep fascination for its patterns, logical reasoning and problem-solving techniques.

She pursued her undergraduate education at Lady Shri Ram College, University of Delhi, where she completed a Bachelor of Arts with Honours in Mathematics between 1997 and 2000. Her passion for the subject encouraged her to pursue higher studies in mathematics at Queen's University in Kingston, Canada. She obtained her Master's degree in Mathematics in 2002 and subsequently completed her PhD in Mathematics in June 2006 under the supervision of Professor M. Ram Murty. Her doctoral education provided her with a strong foundation in advanced mathematical research.

Following her PhD, Sinha began her professional research career through postdoctoral positions at prestigious international institutions. From 2006 to 2008, she worked at the University of Toronto in Canada. She subsequently joined the University of Alberta as a postdoctoral fellow associated with the Pacific Institute for the Mathematical Sciences, where she worked from 2008 to 2010. In 2011, she also held a postdoctoral fellowship at the Mathematical Sciences Research Institute (MSRI) in Berkeley, California, USA.

In July 2010, she joined the Indian Institute of Science Education and Research (IISER), Kolkata, as an Assistant Professor. In December 2012, she moved to IISER Pune, where she continued her academic and research activities. She was promoted to Associate Professor in 2020. Her career reflects a combination of international research experience and dedication to strengthening mathematical education and research in India.

Kaneenika Sinha's primary research interests lie in analytic number theory and the arithmetic statistics of modular forms. Her work explores the distribution of mathematical sequences, the behaviour of Fourier coefficients of modular forms, zeta functions and the statistical properties of certain mathematical structures.

One of her important areas of research is the study of equidistribution. This branch of mathematics investigates how numbers or mathematical objects are distributed across a particular interval or space. She has worked extensively on the Sato-Tate distribution, which describes patterns in the Fourier coefficients of certain modular forms.

Her research also connects number theory with probability, harmonic analysis, arithmetic geometry and graph theory. These connections help mathematicians understand complex patterns and statistical behaviour in mathematical systems.

Among her notable research publications are Effective Equidistribution of Eigenvalues of Hecke Operators (2009), written with M. Ram Murty, and Higher Mahler Measure for Cyclotomic Polynomials and Lehmer's Question (2011), co-authored with Matilde Lalín. She also co-authored the 2012 paper Distribution of Zeta Zeroes of Artin-Schreier Covers. These publications demonstrate the depth and range of her mathematical investigations.

Apart from research, Sinha is actively involved in teaching, mentoring and guiding young researchers. At IISER Pune, she contributes to the development of advanced mathematical knowledge and encourages students to explore challenging research problems. Her academic work also highlights the importance of collaboration and interdisciplinary approaches in mathematics.

She believes that mathematical research requires curiosity, patience, creativity and the willingness to learn from mistakes. Through her academic contributions and interactions with students, she helps inspire the next generation of mathematicians.

Kaneenika Sinha's journey from studying mathematics in Delhi to becoming an internationally recognised researcher demonstrates the importance of perseverance, dedication and intellectual curiosity. Her contributions to analytic number theory and modular forms have enriched contemporary mathematical research. As an Indian woman mathematician working at the forefront of advanced mathematics, she serves as an inspiring example for students, particularly young women aspiring to pursue careers in science and research. Her work continues to contribute to the understanding of complex mathematical patterns and the growth of mathematical scholarship in India.



EDITORIAL

The Mathematics

Application of Pure Mathematics in the Business World From Abstract Theorems to Market Strategies

For generations, pure mathematics has been admired for its elegance and intellectual depth. Number theory, abstract algebra, topology—these fields were once thought to exist far removed from everyday life. Yet, in today's global economy, some of the most abstract branches of mathematics quietly power the engines of business and finance. Consider cryptography. What began as pure number theory—explorations into prime numbers and modular arithmetic—now secures digital banking, online transactions, and global communications. Without these mathematical foundations, modern e-commerce would simply not exist. The algorithms that protect financial data rely on ideas once developed without any commercial intention. Optimization theory, another pillar of pure mathematics, drives logistics and supply chain management. Companies use advanced mathematical models to minimize costs, maximize profits, and allocate resources efficiently. From airline scheduling to warehouse management, mathematical precision translates directly into economic advantage. Even stock markets, often seen as unpredictable, depend heavily on mathematical modeling. Probability theory, stochastic calculus, and statistical analysis shape investment strategies and risk assessment. Hedge funds and financial institutions employ mathematicians—often called "quants"—to build predictive models that guide billion-dollar decisions. Data science, a modern buzzword, rests on deep mathematical roots. Linear algebra powers machine learning algorithms. Abstract structures in graph theory help businesses analyze networks—whether social media interactions or transportation systems. What was once pure theory has become practical necessity. This transformation challenges an old misconception: that pure mathematics is detached from reality. In truth, its value often reveals itself decades later. The business world thrives not only on innovation but on mathematical insight. The lesson is clear—supporting pure research is not indulgence; it is investment. In boardrooms and stock exchanges, behind spreadsheets and software, mathematics speaks. Quietly, precisely, and profitably.



Catch me if you can

MAJOR

1. Two brothers had a flock of sheep. They sold the flock and got as many rubles for every sheep as was the number of the sheep in the flock. The money was shared in the following way: first the elder brother took ten rubles from the cash, then the younger brother took ten rubles, after which the elder brother took ten rubles again and so on. Finally, it turned out that at the last stage when it was the younger brother's turn to take money there remained less than ten rubles. Therefore the younger brother took the rest of the money and the elder brother gave him his knife for the sharing to be fair. How much did the knife cost?

2. Let us write consecutively the powers of the number 2:

2; 4; 8; 16; 32; 64; 128; 256; 512; 1024; 2048; 4096;....

It can easily be noticed that the last digits of the numbers forming this sequence repeat periodically with period of length 4:

2; 4; 8; 6; 2; 4; 8; 6; 2; 4; 8; 6; ....

Prove that, beginning with some number belonging to the sequence of the powers of 2, the last 10 digits of the numbers forming that sequence also repeat periodically. Find the length of the period and the number in the sequence beginning with which this periodicity takes place.

3. Prove that there exists a power of the number 2 such that the last 1000 digits in its decimal representation are all ones and twos.

4. Prove that if a product of two polynomials with integral coefficients is equal to a polynomial with even coefficients which are not all divisible by 4 then all coefficients of one of the original polynomials are even whereas not all coefficients of the other polynomial are even.

5. Prove the law of reflection from the Lagrange multipliers theorem.

6. Prove that of all quadrilaterals that can be formed from four given sides, the one that is cyclic has the greatest area.

7. Show that each positive integer can be written as the difference of two positive integers having the same number of prime factors.

8. Find all composite positive integers n for which it is possible to arrange all divisors of n that are greater than 1 in a circle such that no two adjacent divisors are relatively prime.

9. Is it possible to place 1995 different positive integers around a circle so that for any two adjacent numbers, the ratio of the greater to the smaller is a prime?

10. Two hundred soldiers form a rectangular array with ten soldiers in each line and 20 soldiers in each file. From each line the smallest soldier is chosen, after which among the 20 soldiers thus taken the tallest one is chosen. Then from each file of the same array of 200 soldiers the tallest soldier is chosen, after which among the 10 soldiers thus taken the smallest one is chosen. Which of the two soldiers, that is the smallest among the tallest soldiers or the tallest among the smallest soldiers (provided that these are different persons), is taller?

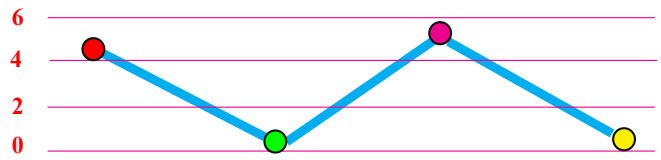
11. There were five friends one of whom had a monkey. Once they bought a bag of nuts and decided to share the nuts among themselves the next morning. At night one of them woke up. He divided the nuts into five equal parts, found that one extra nut remained after the division, gave it to the monkey, ate his part of the nuts and fell asleep again. After that another owner of the nuts woke up. He did not know that some of the nuts had been taken and therefore he divided all the nuts remaining in the bag into five equal parts. He also found that there remained one nut after the division which he gave to the monkey. He ate one of these five parts and fell asleep. Then the three remaining friends performed, in succession, the same operations, that is, each of them divided the rest of the nuts into five parts not knowing what his friends had done, found that there remained one nut after the division, gave it to the monkey and ate one of the five parts. Finally, in the morning all the five friends divided the remaining nuts into five parts, saw that there remained one nut after the sharing and gave it to the monkey. It is required to determine the least possible number of the nuts in the bag for such a sharing to be possible.

12. The students admitted to 50 speaking English, exactly 50 speaking French and exactly 50 a university include exactly speaking German. Of course, some of the students may speak two or three of the languages and therefore, in the general case, the total number of the students (each of whom speaks at least one of the languages) may be less than 3.50 = 150. Prove that all the students can be divided into 5 groups (generally consisting of a different number of students) so that each group contains exactly 10 people speaking English, exactly 10 people speaking French and exactly 10 people speaking German.

Catch me if you can

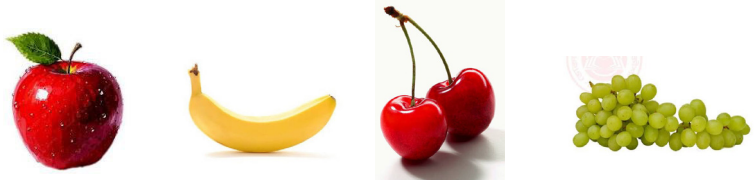
Classes (I - II)

Our Favorite Fruits Count



Apple Banana Cherry Grape

1. Based on the graph, which fruit did the moststudents like best?



(a) Apple (b) Banana (c) Cherry (d) Grape

2. Look at the data for Apples. Which shape group shows 5 circles?



(a) 3 circles (b) 4 circles (c) 5 circles (d) 6 circles

3. Look at Grapes (2) and Cherries (6).
How many more cherries are there?



(6) –  (2) = ?

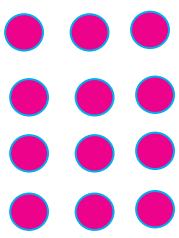
(a) 2 (b) 3 (c) 4 (d) 5

4. Solve the simple subtraction: What is 4 stars minus 1 star?



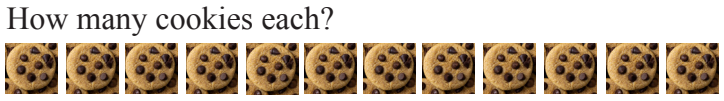
(a) 2 (b) 3 (c) 4 (d) 5

5. Which array represents 4 rows with 3 dots in each row?



(a) 12 total (b) 10 total (c) 8 total (d) 15 total

6. Share 12 cookies equally among 3 friends.
How many cookies each?

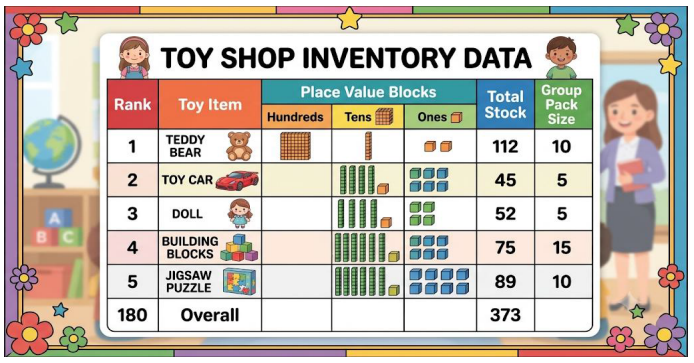


(a) 3 cookies (b) 4 cookies (c) 5 cookies (d) 6 cookies

7. Find the missing number in the skip-counting pattern (+2):

$2 \rightarrow 4 \rightarrow 6 \rightarrow 8 \rightarrow ?$

(a) 9 (b) 20 (c) 11 (d) 12



TOY SHOP INVENTORY DATA

Rank	Toy Item	Place Value Blocks			Total Stock	Group Pack Size
		Hundreds	Tens	Ones		
1	TEDDY BEAR				112	10
2	TOY CAR				45	5
3	DOLL				52	5
4	BUILDING BLOCKS				75	15
5	JIGSAW PUZZLE				89	10
180	Overall				373	

8. Formation of Number: Based on the Place Value Blocks in the chart, which toy's total stock is formed by 5 tens and 2 ones?

(a) Teddy Bear (112) (b) Toy Car (45)
(c) Building Blocks (75) (d) Doll (52)

9. Multiplication & Division: The Toy Car has a total stock of 45 pieces, and its group pack size is 5. How many packs can be made if all Toy Cars are packed equally with no leftovers?

(a) 7 packs (b) 8 packs
(c) 9 packs (d) 10 packs

10. Prime Numbers: Looking at the Total Stock column in the chart, which toy's stock number is a prime number (a number greater than 1 that has only two factors: 1 and itself)?

(a) Teddy Bear (112) (b)Toy Car (45)
(c) Building Blocks (75) (d) Jigsaw Puzzle (89)

11. Divisibility: The manager wants to distribute the total stock of Teddy bear equally among several groups of students. Which of the following group sizes will divide the stock equally with no remainder?

(a) 5 students (b) 7 students
(c) 3 students (d) 9 students



CLASS 2 ART SUPPLY SHOP INVENTORY DATA

Rank	Art Item	Place Value Representation	Total Stock	Group Pack Size
1.	Paint Brushes		60	Pack of 10
2.	Color Pencils		45	Pack of 12
3.	Sketchbooks		30	Each
4.	Erasers		24	Each

12. Fractions & Decimals: Looking at the inventory chart, the art shop has 60 Paint Brushes. If the teacher sells 1/3rd of the total stock of Paint Brushes, how many Paint Brushes are left?

(a) 20 Paint Brushes (b) 30 Paint Brushes
(c) 40 Paint Brushes (d) 50 Paint Brushes

13. Measurements & Units: Each Eraser has a length of 4 cm. If a student places 5 Erasers in a straight line end-to-end, what is their total combined length?

(a) 15 cm (b) 18 cm (c) 20 cm (d) 24 cm

Ans :

1. (c)	2. (c)	3. (c)	4. (b)	5. (a)	6.. (b)
7. (b)	8. (d)	9. (c)	10. (d)	11. (c)	12. (c)
13. (c)					



Catch me if you can

Classes (III-IV)

Statistical Reference Data: Class 3 School Fair Stall

Item Name	Category	Total Quantity Available	Price per Unit	Quantity Sold
Pencils	Stationery	60 pieces	₹10 per piece	40 pieces
Notebooks	Stationery	40 pieces	₹20 per piece	25 pieces
Apples	Fruit	30 kg	₹40 per kg	18 kg
Milk Packets	Dairy	50 litres	₹30 per litre	30 litres

1. Multi-Step Money & Profit If the stall manager bought all 30 kg of Apples at ₹25 per kg and sold 18 kg at ₹40 per kg, how much total profit/loss has the manager made so far on Apples?

(a) Loss of ₹30 (b) Profit of ₹30

(c) Profit of ₹270 (d) Loss of ₹150

2. Advanced Fractions & Comparison What fraction of Pencils were SOLD compared to the fraction of Milk Packets UNSOLD?

(a) Sold fraction of pencils is 2/3, Unsold fraction of milk is 2/5

(b) Sold fraction of pencils is 1/3, Unsold fraction of milk is 3/5

(c) Sold fraction of pencils is 2/3, Unsold fraction of milk is 3/5

(d) Sold fraction of pencils is 1/2, Unsold fraction of milk is 1/2

3. Combined Revenue & Average What is the AVERAGE money earned per category between Stationery (Pencils + Notebooks) and Dairy (Milk Packets)?

(a) ₹800 (b) ₹900 (c) ₹950 (d) ₹1800

4. Measurement Conversion & Word Problem A customer buys all the remaining Milk Packets. If each milk bottle holds 500 millilitres (mL), how many bottles can be filled with the unsold milk?

(a) 20 bottles (b) 30 bottles (c) 40 bottles (d) 50 bottles

5. Complex Addition & Subtraction (Total Items Sold) How many total units of items (pieces + kg + litres combined) remain UNSOLD in the entire stall?

(a) 52 units (b) 67 units (c) 77 units (d) 113 units

6. Division & Money Distribution The total revenue from selling all Pencils (₹400) and Notebooks (₹500) was divided equally among 6 student volunteers as prize money. How much money did each student receive?

(a) ₹130 (b) ₹140 (c) ₹150 (d) ₹160

7. Pattern & Reasoning (Time & Sales Rate) If 10 litres of Milk were sold every 2 hours, and the stall started selling milk at 9:00 AM, at what time were all 30 litres of milk sold?

(a) 11:00 AM (b) 1:00 PM (c) 3:00 PM (d) 5:00 PM

8. Higher Order Value Comparison Which item generated the highest total revenue (sales income) for the stall, and by how much did it beat the lowest revenue item?

(a) Milk generated highest (₹900); beat Pencils by ₹500

(b) Milk generated highest (₹900); beat Pencils by ₹100

(c) Apples generated highest (₹720); beat Notebooks by ₹220

(d) Milk generated highest (₹900); beat Notebooks by ₹400

Statistical Data: Annual School Sports Day Inventory & Sales Record

Read the dataset below carefully. All 10 questions must be answered using the exact details and figures provided in this table.

Item Name	Category	Unit Capacity / Weight	Cost Price (per unit)	Selling Price (per unit)	Initial Stock	Quantity Sold
Fruit Juice Packets	Beverage	0.25 litres (250 mL)	₹12.50	₹20.00	120 packets	90 packets
Energy Drinks	Beverage	0.50 litres (500 mL)	₹24.00 piece	₹35.00	80 bottles	60 bottles
Dry Fruit Boxes	Snack	0.75 kg (750 g)	₹120.00	₹180.00	40 boxes	24 boxes
Glucose Powder	Supplements	0.40 kg (400 g)	₹45.00	₹65.00	50 packs	35 packs

9. The unsold quantity of Fruit Juice Packets is 30 packets and Energy Drinks is 20 bottles. What is the Highest Common Factor (H.C.F.) of these two unsold quantities, and what is the maximum number of identical gift packs that can be formed using all unsold stock of these two beverages without leaving any item behind?

(a) H.C.F. = 5; 5 gift packs (b) H.C.F. = 10; 10 gift packs

(c) H.C.F. = 20; 20 gift packs (d) H.C.F. = 60; 60 gift packs

10. What is the TOTAL volume in litres of all the Fruit Juice Packets and Energy Drink bottles combined that were SOLD during the event?

(a) 42.5 litres (b) 52.5 litres (c) 62.5 litres (d) 70.0 litres

11. If a sponsor buys 12 Fruit Juice Packets and 8 Energy Drinks at their respective Selling Prices, but receives a discount of ₹2.50 on every single item purchased, what is the net total amount the sponsor pays?

(a) ₹420.00 (b) ₹470.00 (c) ₹520.00 (d) ₹540.00

12. Express the fraction of initial stock SOLD for Fruit Juice Packets and the fraction SOLD for Energy Drinks in their simplest forms. What is the sum of these two fractions?

(a) 1/2 (b) 5/4 or 1 1/4

(c) 3/2 or 1 1/2 (d) 7/4 or 1 3/4

13. Dry Fruit Boxes are sold in batches of 4, while Glucose Powder packs are sold in batches of 5. What is the Least Common Multiple (L.C.M.) of these batch sizes, and what is the minimum total number of items bought if a customer purchases equal numbers of both items in full batches?

(a) L.C.M. = 10; Total items = 20

(b) L.C.M. = 20; Total items = 40

(c) L.C.M. = 20; Total items = 20

(d) L.C.M. = 40; Total items = 80

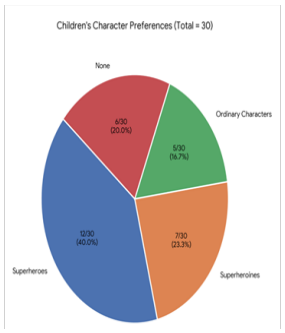
Ans :

1. (a)	2. (a)	3. (b)	4. (c)	5. (b)	6.. (c)
7. (c)	8. (a)	9. (b)	10. (b)	11. (b)	12. (c)
13. (b)					

Catch me if you can

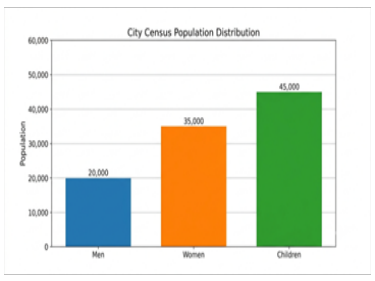
Classes (V-VI)

1. If from a group of 30 children, 12 children favour Superheroes, 7 favour Superheroines while 5 favour ordinary comic book characters, what's the fraction of students who favour none of them?



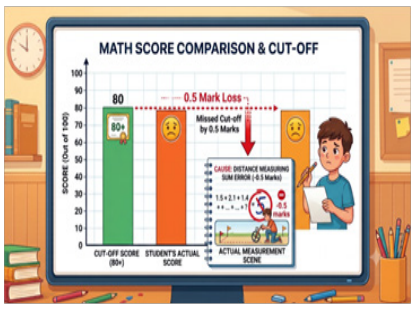
(a) 24/30 (b) 4/5 (c) 1/5 (d) None of the above

2. During a census (population calculation) in a city, the following data was recorded:



(a) 0.82 (b) 0.45 (c) 2.22 (d) 1.00

3. During a count of students who scored 80 or above in math in a school, a boy was not included in the list for scoring 0.5 marks less than the cut-off. This loss happened because of a sum of measuring distance where he wrote the final answer as 5.

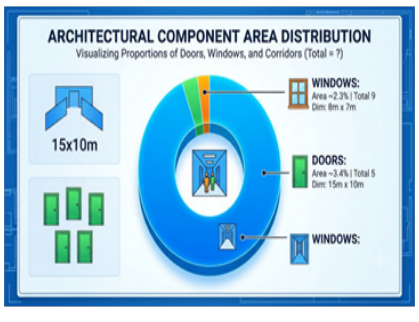


How much did the boy score in total and what should be the correct answer?

(a) 75, 5m or 5km (b) 75.5, 5g

(c) 79.5, 5m or 5km (d) 80.5, 5l

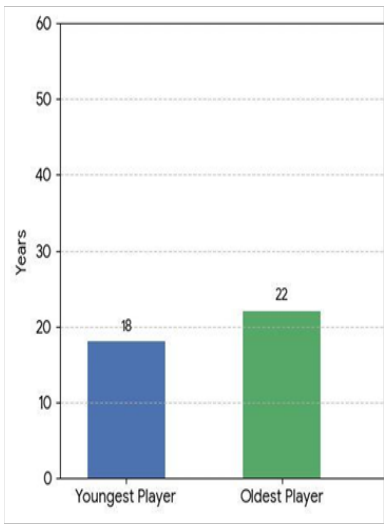
4. In a house, there are a total of 5 doors, 9 windows and 3 long corridors. The dimensions of each door is 15x10m, each window is 8 by 7m and each corridor is 100 by 70m. What's the total area taken up by the doors, windows and corridors?



(a) 22250m (b) 22000m

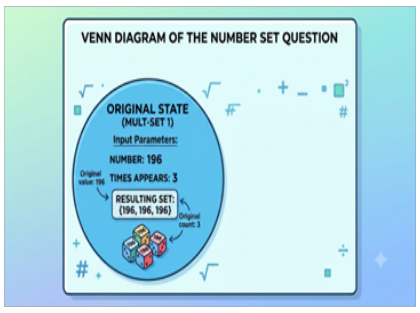
(c) 22255m (d) 22254m

5. In a team of footballers, the oldest one is 22 years old while the youngest player is 18. If their coach is aged 25 times the HCF of the maximum and minimum ages of the players, how old is the coach?



(a) 44 (b) 36 (c) 50 (d) 60

6. In a set of numbers, 196 comes 3 times. If we make a new set where the 'square root of 196' comes 'square of 3' times, the set will be

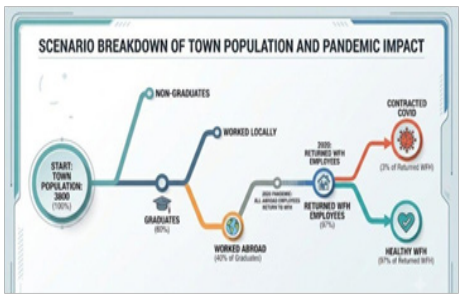


(a) 16,16,16,16,16,16 (b) 14,14,14,14,14,14

(c) 14,14,14,14,14,14,14,14,14

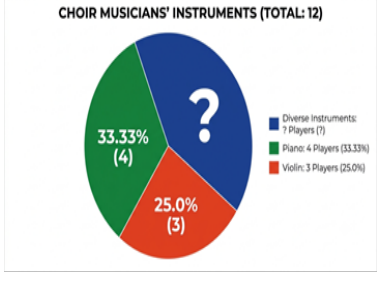
(d) 16,16,16,16,16,16,16,16,16

7. In a town, 60% of the population were graduates. Among them, 40% worked abroad. During the pandemic in 2020, all the people working abroad returned home and started working from home. 3% of the work-from- home employees contracted COVID. If the total population was 3800, how many were healthy?



(a) 886 (b) 884 (c) 887 (d) 885

8. In a set of numbers, 196 comes 3 times. If we make a new set where the 'square root of 196' comes 'square of 3' times, the set will be :



(a) 5:4 (b) 5:3 (c) 4:5 (d) 3:5

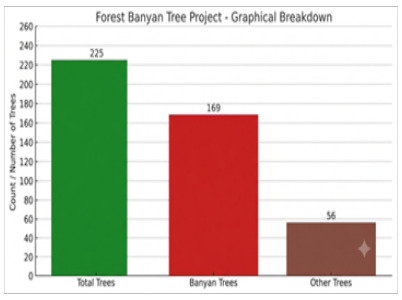
Ans :

1. (c)	2. (b)	3. (c)	4. (d)	5. (c)	6. (c)
7. (d)	8. (a)				

Catch me if you can

Classes (VII-VIII)

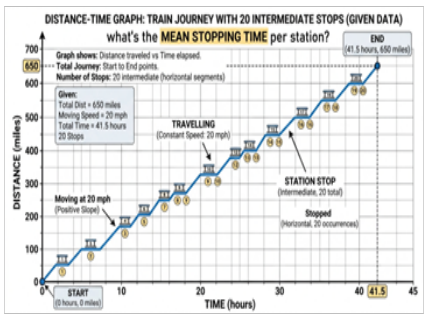
1. In a forest, 169 trees out of a total of 225 trees are Baniyan. The government starts a project where the Baniyan trees are to be marked as heritage vegetation and employs 13 workers to build boundaries around those trees. How many trees will be covered by each worker? If the forest was built following a square pattern of planting, what part of Banyan trees could possibly be in each row at the maximum?



(a) 15, 1/13 (b) 15, 1

(c) 13, 10/13 (d) 13, 1

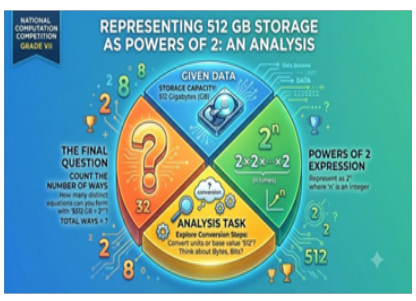
2. If a train travels 650 miles at a speed of 20miles/hr. in 41.5 hours and stops at 20 stations in between, what's the mean stopping time per station?



(a) 27 minutes (b) 26.6 minutes

(c) 27.6 minutes (d) 26 minutes

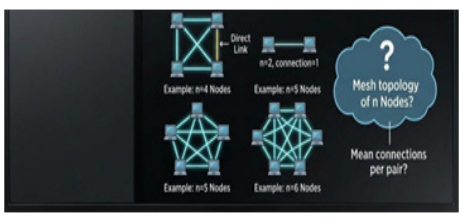
3. A hard disk installed in a particular computer system holds 512 gigabytes of information. In a national computation competition among the students of grade VII, they were asked to express the given storage as powers of 2. In how many ways can this be achieved?



(a) 2 (b) 3

(c) 1 (d) More than 3

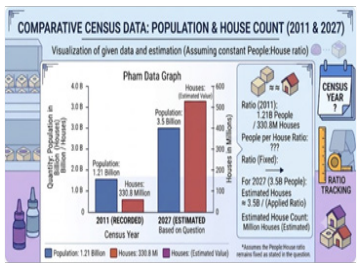
4. In a mesh topology of a computer network, what's the mean no. of connections between any two nodes if the total no. of nodes is n. (Mesh topology is where each node or device is connected to every other device in the network via direct line)



(a) n (b) Square of n

(c) n times n (d) 1

5. The census conducted by the Central Government of India in 2011 had recorded a population of 1.21 billion spread across 330.8 million houses. If the ongoing census of 2027 records a population count of 3.5 billion, what would be the house count? (Assume that the People : House ratio remains fixed).



(a) 950 million (b)956 million

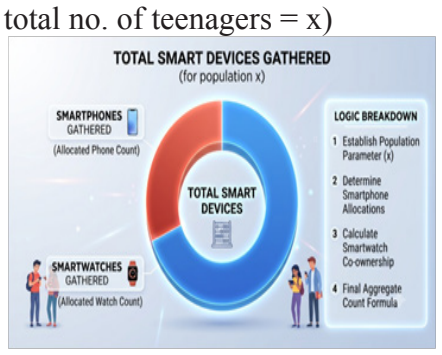
(c) 956.8 million (d) 956.85 million

6. If there are a total of 210 shops in a shopping mall, how many new shops are to be added at the least to make the shop count a perfect cube number that is exactly divisible by the cube of 3?



(a) 3 (b) 6 (c) 9 (d) Data insufficient

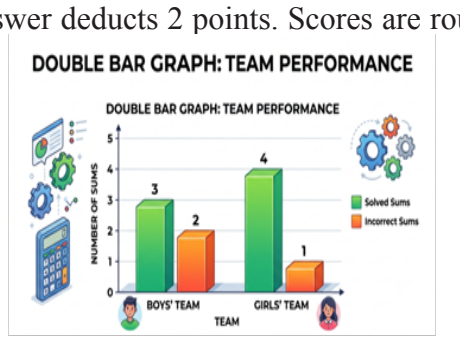
7. In our modern world, 95% of teenagers own smartphones while 45% among them own smartwatches as well. If one day all the smart devices are confiscated in their respective schools, what would be the total no. of devices gathered? (Assume a teenager owns only one piece of each kind of device and the total no. of teenagers = x)



(a) 9hrs./day (b) 6hrs./day

(c) 1.31hrs./day (d) 3hrs./day

8. In a mathematical aptitude competition, the boys' team solved 3 sums out of five while the girls' team solved four. If their scores are given out of 80, what will be the score of each team? (Each correct sum awards 3 points, each wrong answer deducts 2 points. Scores are rounded off for clarity.)



(a) Boys : 26.67, Girls : 53.33
(b) Boys : 26, Girls : 53
(c) Boys : 27, Girls : 54
(d) Boys : 27, Girls : 53

Ans :

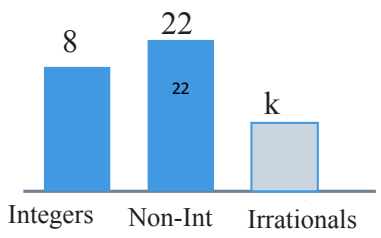
1. (d)	2. (a)	3. (d)	4. (d)	5. (d)	6. (b)
7. (c)	8. (b)				

Catch me if you can

Classes (IX-X)

1. Real Numbers

Distribution of 50 randomly sampled real numbers:

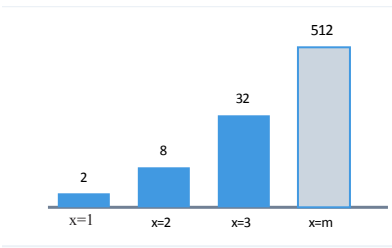


If all 50 entries are real numbers find k:

(a) 8 (b) 10 (c) 12 (d) 14

2. LawsofIndices :

Valuesgenerated $f(x) = 2^{2x-1}$:

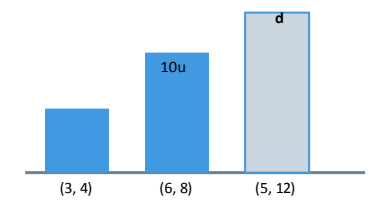


Find index step m where the value is 512 :

(a) 4 (b) 5 (c) 6 (d) 7

3. Coordinate Geometry : Distance Formula:

Distance of coordinate points from origin (0,0) :

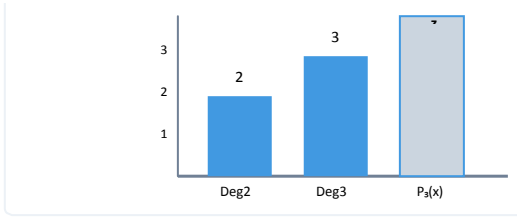


What is the distance d from origin to point (5,12)?

(a) 11 (b) 12 (c) 13 (d) 15

4. Polynomial:

Number of distinct real roots across polynomials:

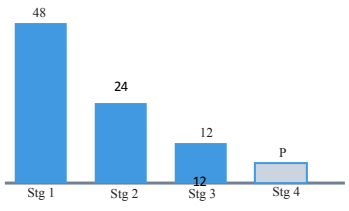


For $P_3(x) = x^4 - 5x^2 + 4$, find count of real roots z:

(a) 1 (b) 2 (c)3 (d) 4

5. Transversal & Mid-Point Theorem:

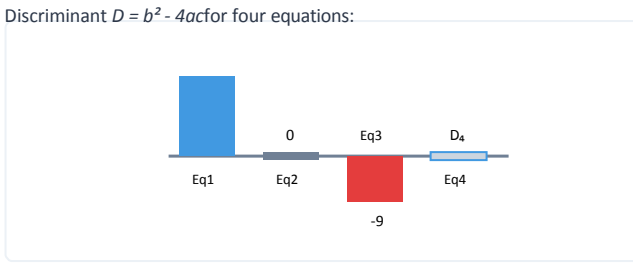
Perimeterofsuccessivelyformedmidpointtriangles:



PerimeterpoftriangleatStage4

(a) 1 (b) 2 (c) 3 (d) 4

6. Quadratic Equations :

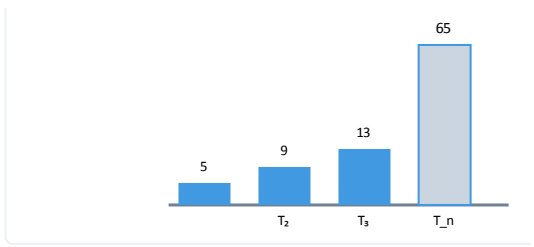


If $2x^2 - 6x + k = 0$ has equal roots ($D_4 = 0$), find k:

(a) 3 (b) 4.5 (c) 9 (d) 18

7. A. P. & G. P. —

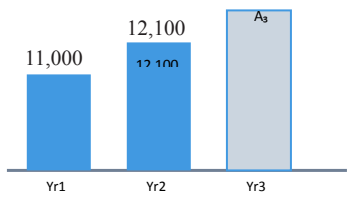
Termsofan Arithmetic Progression :



(a) 14 (b) 15 (c) 16 (d) 17

8. Compound Intersest:

Growth of 10,000 at 10% compound interest p.a:

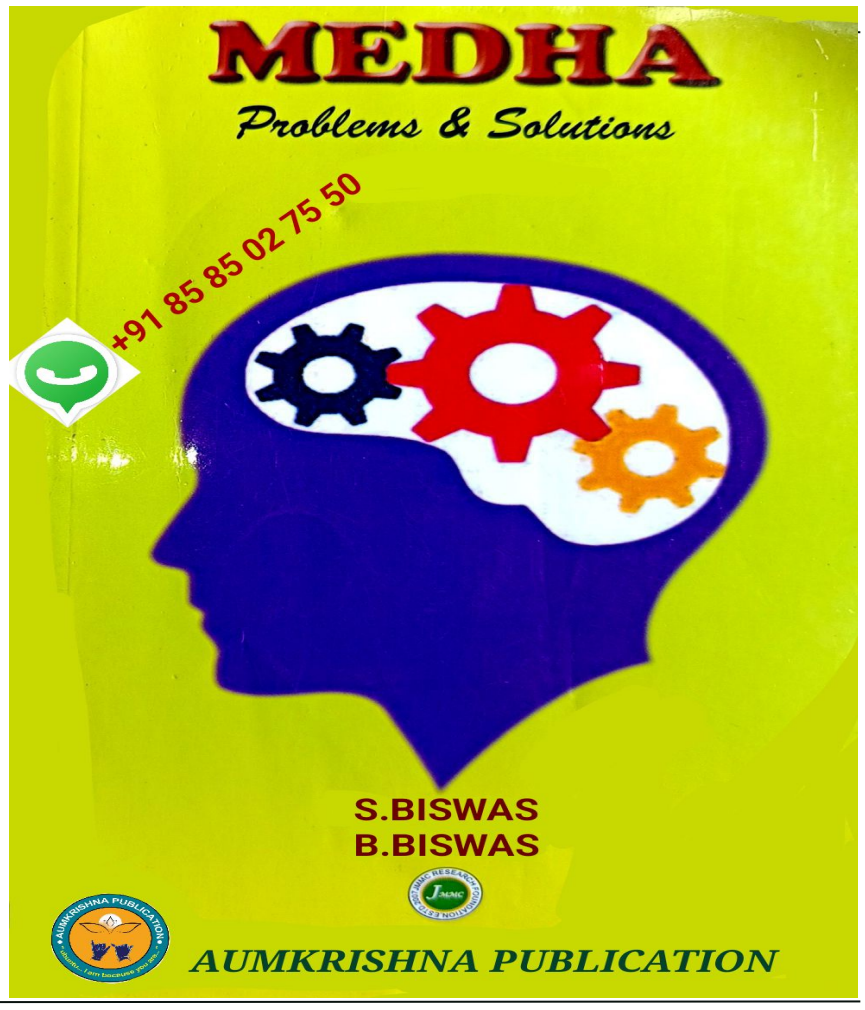


Total compound amount A_3 atendol Year 3 :

(a) ₹13,200 (b) ₹13,310 (c) ₹13,400 (d) ₹13,510

Ans :

1. (b)	2. (b)	3. (c)	4. (d)	5. (b)	6. (b)
7. (c)	8. (b)				

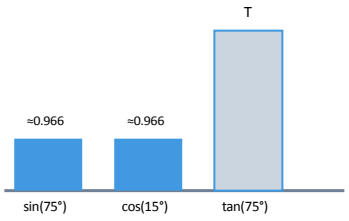


Catch me if you can

Classes (XI-XII)

1. Compound Angle :

Trigonometriccompoundformulavalues

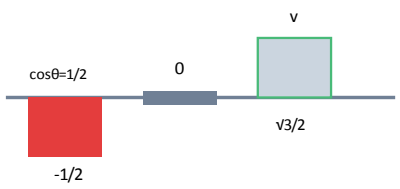


Exactvalue T = tan(45° + 30°):

(a) √3-1 (b)) 2-√3 (c) 2+√3 (d) (√3+1)/2

2. Multiple Angles :

Valuesofcos(2θ)=2cos²θ-1:

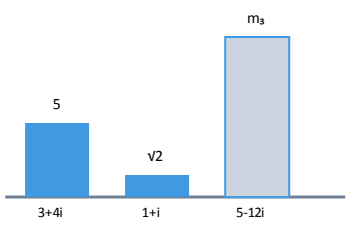


Valueofvwhencosθ=√3/2:

(a) 1/4 (b) 1/2 (c) √3/2 (d)1

3. Complex Numbers :

Modulus |z| of numbers on Argand plane:

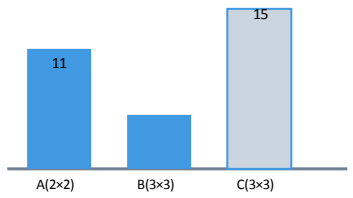


Modulus m_3 of complex number 5 - 12i

(a) 7 (b) 11 (c) 16 (d) 17

4. Matrix :

Trace(sumofdiagonalentries)ofsquare matrices:

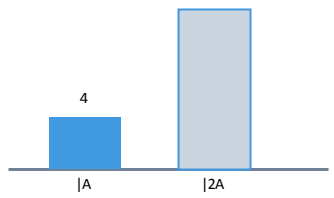


If C has diagonal (3, x, 4) and trace=15, find x

(a) 5 (b) 7 (c) 8 (d) 9

5. Determinants :

Determinant scaling for 3×3 matrix with |A| = 4:

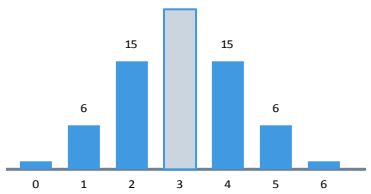


By property |kA| = k^n|A|, what is H^n = |2A|

(a) 8 (b) 16 (c) 32 (d) 64

6. Binomial Theorem:

Binomial expansion coefficients ^nC_r for n = 6:



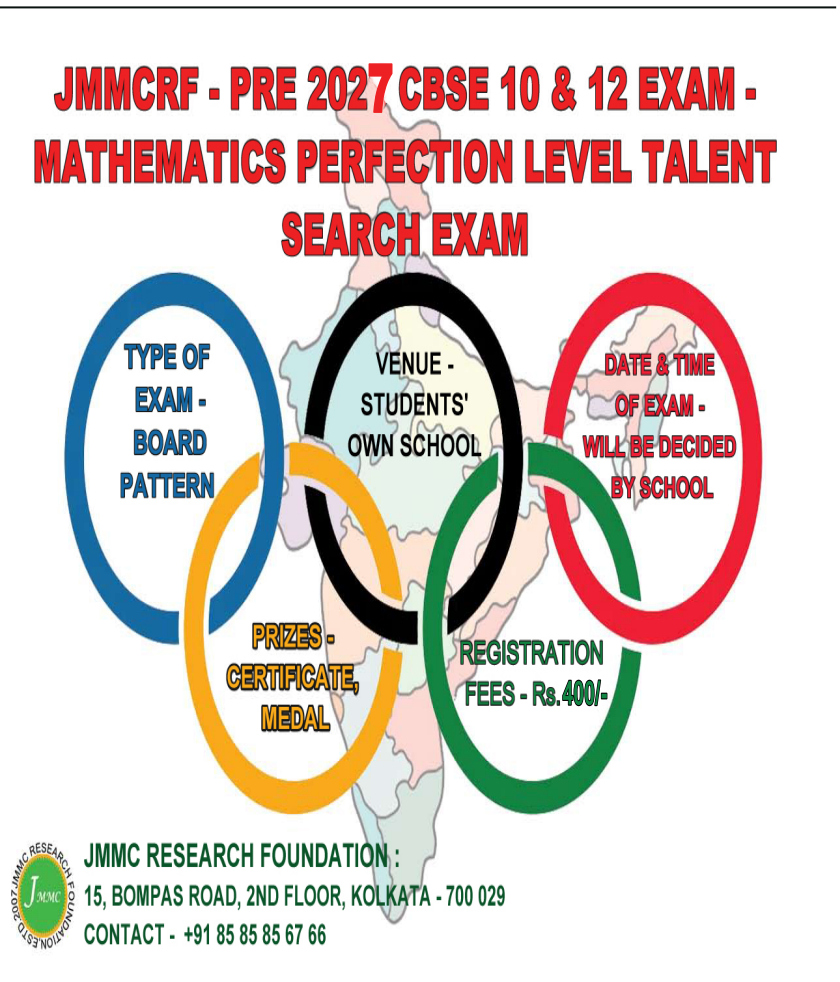
HeightofpeakcoefficientC^6_{ax}=$^6C_3$:

(a) 18 (b) 20 (c) 24 (d) 30

Ans :

1. (c)	2. (b)	3. (c)	4. (c)	5. (c)	6. (b)





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