MENTAL MATHS

QUESTION BANK

CLASS 8

DIRECTORATE OF EDUCATION GOVT.OF N.C.T.OF DELHI

MENTAL MATHS CLASS

VIII

2024-25

DIRECTORATE OF EDUCATION

GOVT. OF NCT OF DELHI

ASHOK KUMAR
IAS

सत्यमेव जयते

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MESSAGE

The eloquent words of Galileo Galilei resonate: 'The laws of nature are written by the hand of God in the language of mathematics.' In this profound observation, the great astronomer awakened humanity to the paramount importance of mathematics. Within our school education system, mathematics holds a pivotal role, with a dedicated focus on foundational numeracy and literacy.

This year marks a significant milestone, as the project extends its reach to Government-Aided schools and introduces Level IV for classes 11th and 12th as well.

In the competitive arena, where time is of the essence, a strong command over mathematics is indispensable. These skills are not only prized in competitive exams but also wield significant influence in the realms of entrepreneurship and innovation. Mental Maths, with its transformative impact, enhances students' number sense, fosters an understanding of relationships between quantities, and cultivates logical thinking for problem-solving.

The meticulously crafted Mental Maths Question Banks recognize the diverse abilities, needs, and interests of students. As the saying goes, 'Nothing great can be achieved without consistent and persistent hard work'. Heartfelt congratulations to the State Core Team members, District Cordinators and Subject Experts for their silent and steadfast dedication to bring forth these impactful publications.

(Ashok Kumar)

BHUPESH CHAUDHARY, IAS
DIRECTOR (EDUCATION & SPORTS)

सत्यमेव जयते

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MESSAGE

Beyond mere numbers and equations, Mathematics serves as a foundational language, intricately woven into the fabric of everything from the technology we rely on to the scientific principles shaping our understanding of the cosmos.

Enter Mental Maths – a captivating art of calculation sans paper or tools, a dance of numbers performed within the confines of the mind. It's not just about crunching numbers; it's about empowerment. Mental Maths nurtures the comprehension of place value, fortifies basic operations, and establishes a robust foundation for grappling with more complex mathematical concepts in the future.

Engaging in Mental Maths includes exercising multiple cognitive processes – memory, attention, and critical thinking. Studies reveal that regular Mental Maths exercises contribute to maintaining cognitive reserve, postponing the onset of age-related memory loss, and fending off other cognitive declines. In essence, Mental Maths keeps our minds agile and adaptable, akin to the benefits of physical activity for our bodies. It becomes the catalyst for swift decision-making and adept situational adaptation.

A heartfelt commendation goes to the dedicated State Core Team members and subject experts who meticulously crafted the Mental Maths Question Banks. These resources, tailored for students in Government and Government-Aided Schools of the Directorate of Education are a testament to their sincere efforts and the wise guidance of the Project Director of Mental Maths. It brings me immense pleasure to present this Mental Maths Question Bank to students, encouraging them to weave the magic of Mental Maths into the tapestry of their daily lives.

(BHUPESH CHAUDHARY)

विकास कालिया
क्षेत्रीय शिक्षा निदेशक
उत्तर एवं मध्य क्षेत्र,
पुरस्कार एवं कल्याण शाखाएँ,
पत्राचार विद्यालय एवं
रा. मुक्त विद्यालयी शिक्षा शाखाएँ
परियोजना निदेशक: मेंटल मैथ्स

सत्यमेव जयते

VIKAS KALIA
Regional Director of Education
Central & North,
Awards & Welfare Branches,
Patrachar Vidyalaya &
NIOS (Branches)
Project Director: Mental Maths

MESSAGE

At the tender age of 16, RPraggnanandhaa, the prodigious talent in Indian chess, sent waves through the global chess community by outsmarting Chess Grandmaster Magnus Carlsen in a lightning-fast game at the Airthings Masters Rapid Chess Tournament. His secret weapon was the remarkable ability for mental calculations. This young genius effortlessly combines his exceptional talent with lightning-quick numerical intuition, fortifying his strategic thinking skills.

At the age of 20, Neelakanta Bhanu Prakash of Hyderabad secures his place as the fastest human calculator on the planet, clinching India's first gold in the Mental Calculation World Championship at the Mind Sports Olympiad in London. Holding an impressive tally of 4 world records and 50 Limca records for speed calculation, his journey is even more remarkable considering a childhood setback. A skull fracture at the age of 5 kept him away from school for a year, but he turned adversity into opportunity, delving into puzzle-solving and mathematics games to hone his cognitive skills.

Mental Mathematics isn't just about acing exams; it's a cognitive superpower that equips the brain to think strategically, break down challenges into manageable steps, and devise creative solutions. This skill transcends academic boundaries, proving invaluable when estimating shopping costs, calculating expenses, or planning a trip. Imagine confidently tallying a shopping bill without reaching for any gadgets.

Recognizing that each student has a unique learning style, Mental Maths Question Banks cater to diverse needs, offering a plethora of materials. Through collaborative efforts, students engage in exhilarating Mental Maths competitions, learning from one another and building self-confidence.

A heartfelt acknowledgment goes to the Mental Maths State Core Team, District and Zonal Coordinators, and HOSs for their unwavering dedication to bringing the Mental Maths superpower to students across all Government and government-aided schools of the Directorate of Education. Gratitude extends to the esteemed Secretary Education and the Director of Education for their guidance and constructive feedback, steering the Mental Maths Project toward continuous improvement.

(VIKAS KALIA)
PROJECT DIRECTOR (MMP)

ACKNOWLEDGEMENT

SUBJECT EXPERTS & CONTENT DEVELOPMENT TEAM

SESSION 2024-2025 (Class- 8)

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STATE LEVEL MENTAL MATH QUIZ COMPETITION RESULT 2022-2023
LEVEL-2
REGION EAST (1st POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	AYUSH	RAM BAHADUR	20150342631	GBSSS SONIA VIHAR	1104336	DAYANAND TIWARI
2	VIII	AARAV NAGPAL	LT. KISHORE NAGPAL	20220248303	RSBV SURAJMAL VIHAR	1001006	DEEPAK TYAGI
3	VIII	AYUSH	JABAR SIGH	20160354822	GBSS HARSH VIHAR	1106258	NEMICHAND SAINI

REGION NORTH(1ST RUNNER UP)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	JATIN SHARMA	GAJENDER SHARMA	20200103916	GSBV POOTH KALAN	1412007	RAJU
2	VIII	KAPIL PRAJAPATI	RAM KISHAN	20210142057	SBV TIKRI KHURD	1310458	MANISH GUPTA
3	VIII	NITIN KUMAR	DHRUV KUMAR	20140197957	G COED SV RAMPURA	1411032	MEENAKSHI

REGION WEST(2ND RUNNER UP)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	GAUTAM CHOUDHARY	LALAN CHOUDHARY	20140045124	SCAN SBV NO-2 B BLOCK JANAKPURI	1514008	ANAND KUMAR
2	VIII	ANJALI	KAMAL SINGH	20140152848	GSKV AMALWAS JWALAPURI	1617036	ABHA CHAUHAN
3	VIII	MUKESH KUMAR JHA	RAKESH RANJAN	20210237623	GBSSS NO-1 MOHAN GARDEN	1618072	BABITA KUMARI

REGION CENTRAL (4TH POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	NATIK KUMAR GUPTA	NANHE LAL GUPTA	20140222901	SBV BURARI	1207009	V.K. MISHRA
2	VIII	RUDRA MISHRA	SUDHIR KUMAR MISHRA	20200003226	GSV COED NO-1 SHAKTI NAGAR	1207037	PARIKSHA
3	VIII	SUMIT KUMAR	RAMDEV ARYA	20200036828	GBSSS SARAI ROHILLA	1208004	BAIDHNATH DUBEY

REGION SOUTH (5TH POSITION)

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1	VIII	SNEHA	ANIL KUMAR MISHRA	202500009018	SKV SAMALKA	1821022	VINTI SINGLA
2	VIII	ANSHU	SANJAY CHAUDHARY	20200131233	G COED SSV SEC 22 DWARKA	1821204	SATPAL
3	VIII	PALAK SHARMA	ARUN KUMAR SHARMA	2020009248	GPD SKV FATEHPUR BERI	1923059	SUDHA YADAV

STATE LEVEL MENTAL MATH QUIZ COMPETITION RESULT 2023-2024
LEVEL-2
REGION EAST (1st POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	DEVARSH	PAWAN KUMAR	20190210031	RSBV KIRAN VIHAR	1001109	SHUBHAM SHRIVASTAV
2	VIII	VAIBAHV RAJ	MAHESH KUMAR	20210053252	RSBV KALYAN VAS	1002003	AJAY KUMAR SHARMA
3	VIII	HARSH SINGH	SUNIL KUMAR SINGH	20210324888	GBSSS NO 2, BADARPUR	1925051	JASBIR SINGH

REGION WEST (2nd POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	GUDDI	KAUSHAL KUMAR	20190193215	SKV PEERAGARHI VILLAGE	1617028	POONAM KHANNA
2	VIII	NAMAN	SURENDER KUMAR	20210049459	GBSSS RAJORI GARDEN EXTN.	1515018	NAMIKA KAINTH
3	VIII	TOSHIF AHAMAD	MOHAMMAD AFTAB ALAM	20210189348	GBSSS NO -2, UTTAM NAGAR	1618004	RAVI RANJAN SINHA

REGION SOUTH (3rd POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
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2	VIII	AYAN	MOHD. SAFI	20210342321	S. CO-ED. VIDYALAYA BEGUMPUR	1923057	MANSHREE SHRIVASTAV
3	VIII	ANKUSH PANDEY	LATE NAGENDER PANDEY	20200143130	GBSSS C-BLOCK SANGAM VIHAR	1923027	MUKESH NIRMAT

REGION NORTH (4th POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	SUBHASH KUMAR	LAXMAN BHAGAT	20160376013	GBSSS NO 1, ADARSH NAGAR	1309013	JITENDRA MISHRA
2	VIII	ANKIT KUMAR PATEL	RISHIKESH KUMAR	20200325273	GBSSS NITHARI	1412259	RAJESH SHARMA
3	VIII	MANISH	KASHMIRI LAL	20210150159	GBSSS NITHARI	1412259	AMIT KUMAR

REGION CENTRAL (5th POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VIII	ADITYA MAURYA	LALLAN MAURYA	20220366293	GSV LANCER ROAD	1207032	DEBI CHARAN
2	VIII	MD SADIQ ALI	MD ALI	20220340745	GSBV BURARI	1207009	MANOJ KUMAR
3	VIII	HIMANSHU	PRAMOD SAHANI	20210177198	GBSSS MUKUNDPUR	1207236	SUNIL KUMAR

CONSTITUTION OF INDIA

[1][PART IV A

FUNDAMENTAL DUTIES

Article 51A. Fundamental duties. — It shall be the duty of every citizen of India—

a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
c) to uphold and protect the sovereignty, unity and integrity of India;
d) to defend the country and render national service when called upon to do so;
e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
f) to value and preserve the rich heritage of our composite culture;
g) to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures;
h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
i) to safeguard public property and to abjure violence;
j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;]

[2][(k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between the age of six and fourteen years.]

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1. Ins. by the Constitution (Forty-second Amendment) Act, 1976, Sec. 11 (w.e.f. 3-1-1977).
2. Ins. by the Constitution (Eighty-sixth Amendment) Act, 2002, Sec. 4 (w.e.f. 1-4-2010).

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [1]**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity;

and to promote among them all

FRATERNITY assuring the dignity of the individual and the [2][unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty- sixth day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

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1. Subs. by the Constitution (Forty-second Amendment Act,1976, Sec. 2, for "SOVEREIGN DEMOCRATIC REPUBLIC" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment Act,1976, Sec. 2, for "Unity of the Nation" (w.e.f. 3.1.1977)

SCHEDULE OF MENTAL MATHS QUIZ COMPETITIONS

FOR THE YEAR 2024-2025

DIRECTORATE OF EDUCATION

GOVT OF NCT OF DELHI

❖ **Practice to students from Question Bank**	:	01.04.2024 to 19.10.2024
❖ **School Level Quiz Competitions**	:	21.10.2024 to 30.10.2024
❖ **Cluster Level Quiz Competition**	:	14.11.2024 to 20.11.2024
❖ **Zonal Level Quiz Competition**	:	25.11.2024 to 30.11.2024
❖ **District Level Quiz Competition**	:	07.12.2024 to 13.12.2024
❖ **Regional Level Quiz Competition**	:	26.12.2024 to 31.12.2024
❖ **State Level Quiz Competition**	:	18.01.2025 to 31.01.2025

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CHAPTER – 1

RATIONAL NUMBERS

Points to Remember

- A number of the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is called a rational number. e.g. $-\frac{1}{7}, \frac{3}{4}, 0, -\frac{7}{11}$ etc.
- All natural numbers, whole numbers, integers and fractions are rational numbers.
- 0 is the identity for addition of rational numbers. That means if we add 0 to a rational number we get the same rational number.

  For e.g. $2 + 0 = 2$, $\frac{3}{7} + 0 = \frac{3}{7}, -\frac{5}{13} + 0 = -\frac{5}{13}$
- The additive inverse of a rational number $\frac{a}{b}, (b \neq 0)$ is $-\frac{a}{b}$. That means if we add a number of same numerical value but opposite in sign to the given rational number it yields 0.

  e.g. $7 + (-7) = 0$ (The additive inverse of 7 is –7)

  $(-7) + 7 = 0$ (The additive inverse of –7 is 7)

  $-\frac{2}{3} + \frac{2}{3} = 0$ (The additive inverse of $-\frac{2}{3}$ is $\frac{2}{3}$ and vice versa)
- Multiplicative inverse of a rational number $\frac{a}{b}$ is $\frac{b}{a}$, where a and b are non-zero integers. That means the multiplicative inverse of a rational number is a rational number which when multiplied by the given rational number gives result 1.

  For e.g. $\frac{2}{3} \times \frac{3}{2} = 1$ (The multiplicative inverse of $\frac{2}{3}$ is $\frac{3}{2}$)

  $-\frac{1}{7} \times (-7) = 1$ (The multiplicative inverse of $-\frac{1}{7}$ is -7)

  In other words, multiplicative inverse means reciprocal of a number.
- 1 is the identity for multiplication of rational numbers. That means if we multiply a rational number by 1 we get the same rational number.

  For e.g. $\frac{3}{4} \times 1 = \frac{3}{4}, -\frac{7}{11} \times 1 = -\frac{7}{11}, \frac{p}{q} \times 1 = \frac{p}{q} (q \neq 0)$
- Each rational number represents a unique point on a number line.
- Division of any rational number by 0 is not defined.

$7 \div 0 = \frac{7}{0}$ is not defined ; $-\frac{2}{7} \div 0$ is not defined

- The rational number 0 has no reciprocal.
- The reciprocal of 1 is 1.
- The reciprocal of –1 is –1.

QUESTIONS

1. Find the value of $\frac{19 \div 7}{17 \div 7}$
2. Find the value of $\frac{2}{6} + \frac{3}{9}$
3. Find the value of $\frac{1}{2}\left[\frac{1}{4} - \frac{1}{5}\right]$
4. Find the value of $\frac{1}{7} + \frac{6}{7} - \frac{3}{7} - \frac{4}{7}$
5. Find the value of $-\frac{7}{12} - \frac{5}{6}$
6. Find the value of $-\frac{5}{18} - \left(-\frac{5}{9}\right)$
7. Find the value of $-\left(\frac{-11}{-8}\right) + \left(\frac{13}{12}\right)$
8. Find the value of $\frac{-29}{27} \div \left(-\frac{58}{87}\right)$
9. Find the value of $\frac{1}{2} - \frac{1}{3} + \frac{1}{4} - \frac{1}{5}$
10. Find the value of $\frac{1}{3} \div \left(\frac{1}{5} \div \frac{1}{7}\right)$
11. Find the value of $\frac{(-4)}{5} \times \frac{3}{10} \times \frac{110}{144}$
12. Find the value of $\frac{-11}{21} \times \frac{4}{7} \times \frac{14}{33}$
13. Find the value of $\frac{11}{15} \div \left(\frac{33}{-5}\right)$
14. Find the additive inverse of $\left(\frac{-8}{-7} - 1\right)$
15. Find the multiplicative inverse of $\left(-\frac{7}{24} + \frac{1}{3}\right)$
16. Find the multiplicative inverse of $\left(\frac{-5}{11} \div \frac{11}{-5}\right)$

17. Find the value of $\left(\frac{-1}{4} \times \frac{4}{7} + \frac{7}{2} - \frac{3}{7} \times \frac{1}{6}\right)$

18. Find the value of $\left[\frac{3}{4} \div \left(\frac{5}{4} \div \frac{3}{4}\right)\right] \div \frac{9}{4}$

19. The sum of two rational numbers is $-\frac{17}{27}$. If one of them is $-\frac{11}{27}$, find the other.

20. What number should be subtracted from $-\frac{5}{8}$ to get $\frac{3}{4}$?

21. What number should be added to $\left(\frac{1}{2} + \frac{1}{3}\right)$ to get 1?

22. What number should be added to –1 to get $\frac{5}{7}$?

23. Divide the sum of $\frac{5}{9}$ and $\frac{3}{7}$ by the product of $\frac{9}{5}$ and $\frac{5}{7}$

24. What number should be multiplied by $-\frac{8}{39}$ to obtain $\frac{1}{78}$?

25. The product of two rational numbers is -10. If one number is 7, then find the multiplicative inverse of the other number.

26. Find the product of additive inverse and multiplicative inverse of $-\frac{1}{2}$

27. Find three rational numbers between $\frac{2}{3}$ and $\frac{3}{4}$

28. Find the product of $\left(1 + \frac{1}{12}\right)\left(1 + \frac{1}{13}\right)\left(1 + \frac{1}{14}\right)\left(1 + \frac{1}{15}\right)\ldots\left(1 + \frac{1}{20}\right)$

29. If $a \Delta b = a \div b, a \blacksquare b = a \times b, a \nabla b = a + b$ and $a * b = a - b$ then find the value of $\frac{3}{5} \Delta \left(1\frac{1}{2} \nabla \frac{3}{4} \blacksquare \frac{4}{5} * \frac{1}{5}\right)$

30. Find the difference between the greatest and the smallest numbers from the following: $\frac{1}{3}, \frac{7}{4}, \frac{4}{9}, \frac{2}{7}$

31. Divide the sum of $\frac{18}{5}$ and $-\frac{7}{15}$ by their difference.

32. Find the value of $\frac{4}{5}\left[\frac{4}{5}\left(\frac{4}{5} + \frac{4}{5}\right) + \frac{4}{5}\left(\frac{4}{5} + \frac{4}{5}\right)\right]$

33. Find the value of x, if $\frac{9}{8} \div x = -\frac{3}{2}$

34. Find the value of x, if $(-12) \div x = -\frac{6}{5}$

35. Amit has ₹ 1400 with him. He spent $\frac{1}{2}$ of his money on notebooks and $\frac{1}{4}$ of his money on stationery. How much money is left with him?

36. If 6 shirts of equal sizes can be made out of 15 metres of cloth, how much cloth is needed for making one shirt?

37. $5\frac{1}{2}$ metres long rope is cut into 11 equal pieces. What is the length of each piece?

38. At a football match, $\frac{3}{7}$ of the spectators were in covered place while remaining 12000 were in open. Find the total number of spectators.

39. A drum full of sugar weighs $30\frac{2}{5}$ kilograms. If the empty drum weighs $\frac{72}{5}$ kilograms, then find the weight of sugar.

40. An aeroplane covers 780 kilometres in an hour. How much distance will it cover in $2\frac{1}{2}$ hours?

41. In a school, $\frac{5}{8}$ of the students are girls. If there are 240 boys, find the number of girls in the school.

42. Find the area of a triangle having base $1\frac{2}{13}$ metres and the height $17\frac{1}{3}$ metres.

43. Lata travelled $2\frac{1}{5}$ kilometres from home to temple, $\frac{7}{6}$ kilometres from temple to work, $\frac{1}{4}$ kilometre from work to gym and $\frac{2}{5}$ kilometres from gym to her home. How many kilometres did Lata travel?

44. Let 'a' be the average of $-\frac{3}{7}$ and $-\frac{4}{7}$ and 'b' be the average of 'a' and $-\frac{3}{7}$, then find the value 'b'.

45. Ramesh bakes muffins. He uses $\frac{3}{4}$ spoon of choco powder for one muffin. He has 15 spoons of choco powder. How many muffins can he bake?

ANSWERS

Q. No.	Answer	Q. No.	Answer
1	$\frac{19}{17}$	24	$-\frac{1}{16}$
2	$\frac{2}{3}$	25	$-\frac{7}{10}$
3	$\frac{1}{40}$	26	–1
4	0	27	$\frac{33}{48}, \frac{34}{48}, \frac{35}{48}$ or any other suitable answer
5	$-1\frac{5}{12}$	28	$1\frac{3}{4}$
6	$\frac{5}{18}$	29	$\frac{6}{19}$
7	$-\frac{7}{24}$	30	$1\frac{13}{28}$
8	$1\frac{11}{18}$	31	$\frac{47}{61}$
9	$\frac{13}{60}$	32	$2\frac{6}{125}$
10	$\frac{5}{21}$	33	$-\frac{3}{4}$
11	$-\frac{11}{60}$	34	10
12	$-\frac{8}{63}$	35	₹ 350
13	$-\frac{1}{9}$	36	2.5 m or $2\frac{1}{2}$ m
14	$-\frac{1}{7}$	37	0.5 m or 50 cm, $\frac{1}{2}$ m
15	24	38	21000
16	$4\frac{21}{25}$	39	16 kg
17	$3\frac{2}{7}$	40	1950 km
18	$\frac{1}{5}$	41	400 girls
19	$-\frac{2}{9}$	42	10 sq m
20	$-1\frac{3}{8}$	43	$4\frac{1}{60}$ km
21	$\frac{1}{6}$	44	$-\frac{13}{28}$
22	$1\frac{5}{7}$	45	20
23	$\frac{62}{81}$		

CHAPTER – 2

LINEAR EQUATIONS IN ONE VARIABLE

Points to Remember

- An equation involving only linear polynomials is called a linear equation. Degree of a linear equation is one.

  Examples of linear equations: $\frac{5}{2}x - 7 = 4$, $\frac{y}{3} + 4 = 6$, $3t + 7 = 12$

- Rules for solving a linear equation:

  Rule 1: Same quantity (number) can be added to both sides of an equation without changing the equality.

  Rule 2: Same quantity can be subtracted from both sides of an equation without changing the equality.

  Rule 3: Both sides of an equation may be multiplied by the same non zero number without changing the equality.

  Rule 4: Both sides of an equation may be divided by the same non zero number without changing the equality.

  Rule 5: Transposition

  Any term of an equation may be taken to the other side with the sign changed. This process is called transposition.

  e.g. $2x + 2 = x + 7$

  $\Rightarrow 2x - x = 7 - 2$

  $\Rightarrow x = 5$

- It should be noted that some complicated equations can be solved by using two or more of the above mentioned rules together.

- If $\frac{ax+b}{cx+d} = \frac{m}{n}$, then $n(ax + b) = m(cx + d)$ is a linear equation. The process of obtaining the above linear equation from $\frac{ax+b}{cx+d} = \frac{m}{n}$ is called cross multiplication.

QUESTIONS

1. Find the value of x : $7x - (2 + 5x) = 18$.
2. If $\frac{5}{3}x + \frac{1}{3} = 1$, then find the value of 'x'.
3. Find the value of y , if $\frac{2y-4}{3} = 8$.
4. If $(3t + 4t) + 3(t + 4t) = 88$, then find the value of 't'.
5. If $(z + 8) + \frac{4z}{5} = -1$, then find the value of 'z'.
6. Find the value of 'a', if $\frac{a}{3} - \frac{a}{4} = \frac{7}{12}$
7. Find the value of s, if $\frac{2s-1}{2s+5} - 2 = 1$.
8. If $x\ (5 - 3x) = 10 - 3x^2$, then find the value of x.
9. Solve for x : $0.16\ (5x + 1) = 0.4x + 0.16$
10. Solve for x : $x^2 - (x + 1)(x - 2) = 0$
11. What is the number which when added to 15 times of itself gives 208?
12. A number is as much greater than 84 as it is less than 108. Find the number.
13. A number consists of two digits whose sum is 9. If 27 is added to the number, its digits are reversed. Find the number.
14. Three fourth of a number exceeds its one third by 60. Find the number.
15. The ratio of two numbers is 3:4. If 7 is added to both the numbers the ratio becomes 4:5. Find the smaller number.
16. The sum of three consecutive natural numbers is 48. Find the largest number among them.
17. Sum of three consecutive multiples of 4 is 108. Find the largest number.
18. Find the largest of the three consecutive odd natural numbers whose sum is 147.
19. Find the smallest of the three consecutive even natural numbers whose sum is 234.
20. Sum of three alternate multiples of 11 is 132. Find the value of middle multiple.
21. Find the number whose fifth part increased by 5 is equal to its fourth part decreased by 5.

22. If 10 is added to four times a certain number, the result is 5 less than five times the number. Find the number.
23. Find a number whose double is 45 greater than its half.
24. Sum of two natural numbers is 90 and their difference is 40. What is the smaller number?
25. A rational number is such that when 10 and 10 times of the number, both added to 100 times of that number, the result is 340. Find the number.
26. Sides of a triangle are in the ratio 2:3:4. If its perimeter is 225 metres, then find the length of smallest side.
27. The base of an isosceles triangle is 8 centimetres and its perimeter is 20 centimetres. Find the length of equal sides.
28. One of the angles of a triangle is equal to the sum of the other two angles. If the ratio of the other two angles is 2:3, then find the smallest angle of the triangle.
29. Two consecutive sides of a rectangle are in the ratio 3:2. If its perimeter is 150 centimetres, then find its area.
30. The perimeter of a rectangle is numerically equal to the area of the rectangle. If the width of the rectangle is 3 centimetres, then find its length.
31. An angle is double of its supplementary angle. Find the complementary angle of its supplementary angle.
32. The average age of 3 girls is 20 years and their ages are in the ratio 3:5:7. Find the age of the eldest girl.
33. Divide 180 into three parts such that half of the first part, one third of the second part and one fourth of the third part are equal. Find the difference between the smallest and the largest part.
34. The numerator of a rational number is less than its denominator by 3. If numerator becomes 2 times and the denominator is increased by 6 then fraction becomes $\frac{1}{5}$. Find the original number.
35. The number of boys and girls in a class are in the ratio 4:7. If the number of boys is 6 less than the number of girls, then find the number of students in the class.

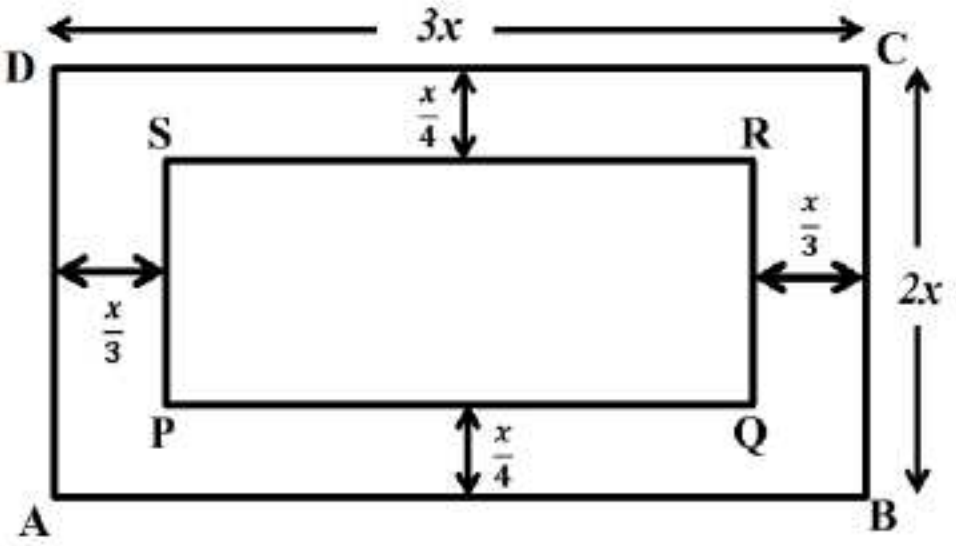
36. After 4 years, 'A' will be 3 times as old as he was 4 years ago. Find his present age.

37. 'A' is 20 years older than 'B', he is also 6 times as old as 'B'. What is the sum of their ages?

38. In an examination a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts 75 questions and scores 125 marks, then find the number of correct questions he answered.

39. Divide ₹ 460 among R, S and T so that the amount received by R is 5 times as much as S's share and three times as T's share. Find the share of R.

40. A field is in the shape of a rectangle as shown in the figure. If the rate of fencing is ₹ $\frac{6}{x}$ per meter, then find the cost of fencing the inner rectangle PQRS.



ANSWERS

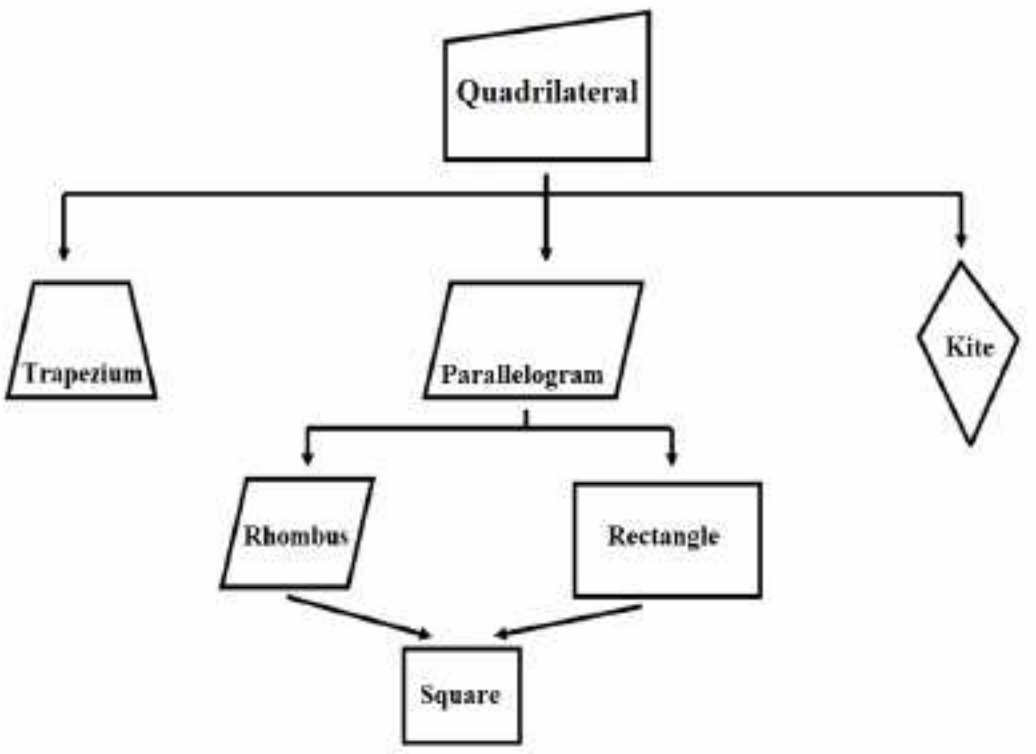
Q. No.	Answer	Q. No.	Answer
1	10	21	200
2	$\frac{2}{5}$	22	15
3	14	23	30
4	4	24	25
5	–5	25	3
6	7	26	50 m
7	–4	27	6 cm
8	2	28	36°
9	0	29	1350 sq cm
10	–2	30	6 cm
11	13	31	30°
12	96	32	28 years
13	36	33	40
14	144	34	$\frac{1}{4}$
15	21	35	22
16	17	36	8 years
17	40	37	28 years
18	51	38	40
19	76	39	₹ 300
20	44	40	₹ 46

CHAPTER – 3

UNDERSTANDING QUADRILATERALS

Points to Remember

- When we join a number of points without lifting a pen/pencil from the paper we get a plane curve.
- A simple closed curve made up of only line segments is called a polygon e.g. triangle, quadrilateral, pentagon etc.
- Sum of interior angles of a polygon of n sides = $(n-2)\times 180°$.
- Sum of all exterior angles of a polygon = 360°.
- Number of sides of a regular polygon × measure of each exterior angle = 360°.
- A parallelogram is a quadrilateral whose opposite sides are parallel.
- The adjacent angles of a parallelogram are supplementary.
- The diagonals of a parallelogram bisect each other.
- The diagonals of a rhombus bisect each other at right angle.
- The diagonals of a square are equal and bisect each other at right angle.
- The diagonals of a rectangle are equal and bisect each other.
- Number of diagonals in an n-sided polygon= $\frac{n(n-3)}{2}$

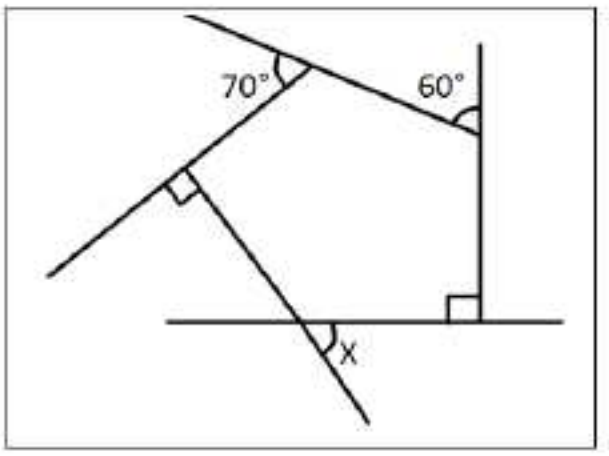


(Square is a rhombus and rectangle both but the converse is not true)

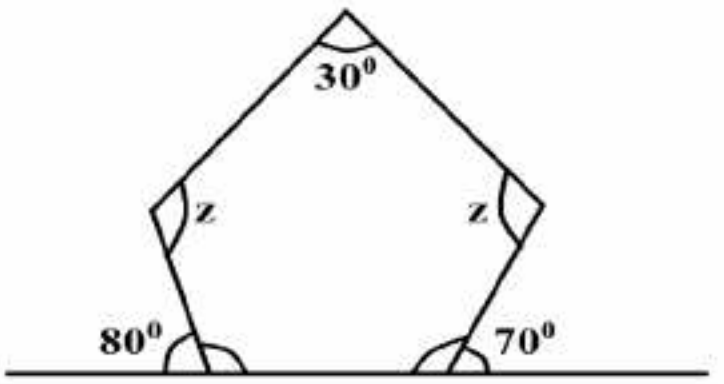
QUESTIONS

1. Each interior angle of a regular polygon of 'n' sides is equal to _____.
2. Each exterior angle of a regular polygon of 'n' sides is equal to _____.
3. How many sides does a regular polygon has if each interior angle measures 108 °?
4. If the sum of all interior angles of a polygon is 1080°, then how many sides does the polygon have?
5. What is the measure of each interior angle of a regular polygon having 12 sides?
6. How many parallelograms are there in a regular hexagon?
7. How many diagonals does a regular septagon have?
8. A polygon has 27 diagonals. How many sides does it have?
9. A square is a _____ with a pair of adjacent sides equal.
10. How many non-overlapping triangles can be made by joining the vertices of a polygon having 'n' sides?
11. If two adjacent angles of a parallelogram are $(5x - 5°)$ and $(10x + 35°)$, then find the ratio of these angles.
12. The angles of a quadrilateral are in the ratio 1:2:3:4. Find the difference between the largest and the smallest angle.
13. If PQRS is a parallelogram, then find $\angle Q - \angle S$.
14. In parallelogram ABCD, $\angle A$ is greater than $\angle B$ by 5°. What is the measure of $\angle D$?
15. If the interior angles of a triangle are in the ratio 3:2:1, then what is the ratio of its exterior angles?
16. The ratio of each exterior angle to each interior angle of a regular polygon is 2:3. What is the number of sides of this polygon?
17. In a regular polygon, each interior angle is thrice the exterior angle. What is the number of sides of a polygon?
18. The interior angle of a regular polygon is 100° more than its exterior angle. What is the number of sides of this polygon?

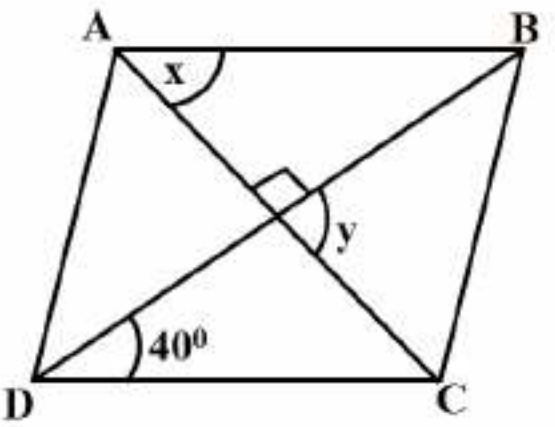
19. **In the given figure, find the value of x.**



20. **In the given figure, find the value of z.**

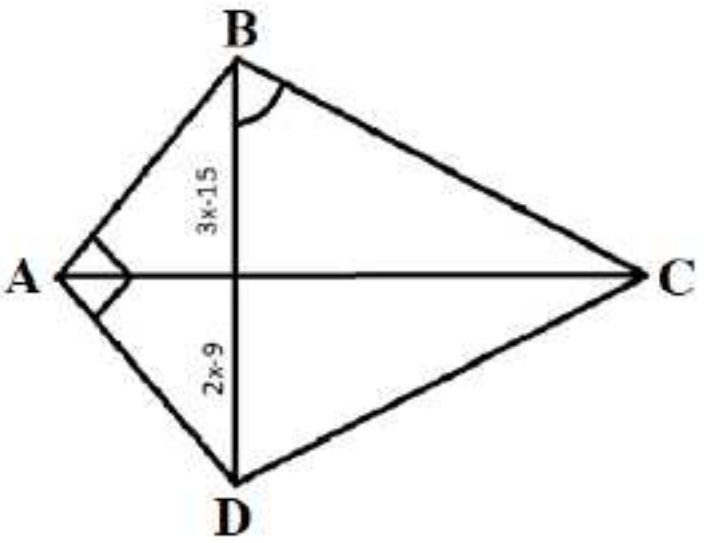


21. **ABCD is a rhombus, find the value of y-x.**

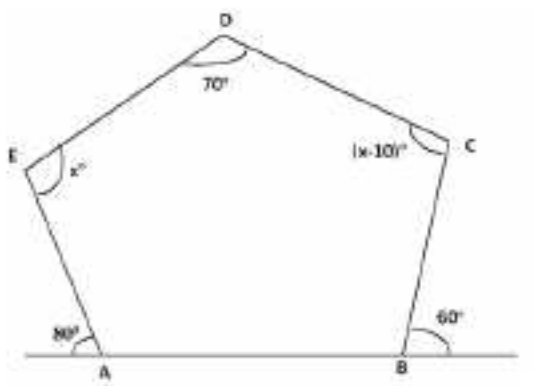


22. **If the area of a square is 289 square centimetres, then find the length of its diagonal.**
23. **If a square has a diagonal of length $12\sqrt{12}$ centimetres, then find its area.**
24. **The length of two diagonals of a rectangle are (x + 3) centimetres and (2x – 7) centimetres. Find the value of x.**
25. **The lengths of the diagonals of a rhombus are 16 centimetres and 12 centimetres. Find the perimeter of the rhombus.**

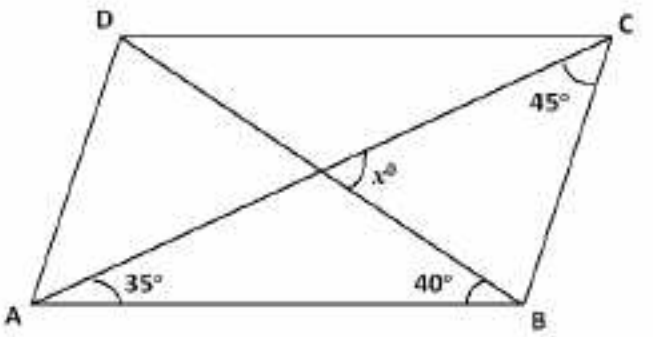
26. ABCD is a kite with diagonals AC and BD. Find the value of x.



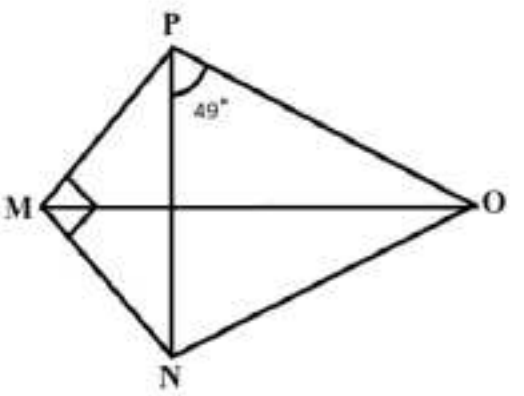
27. Find the value of x.



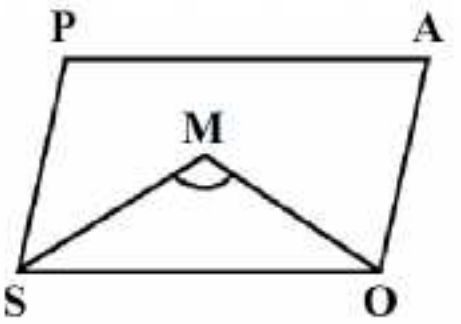
28. ABCD is a parallelogram. Find the value of x.



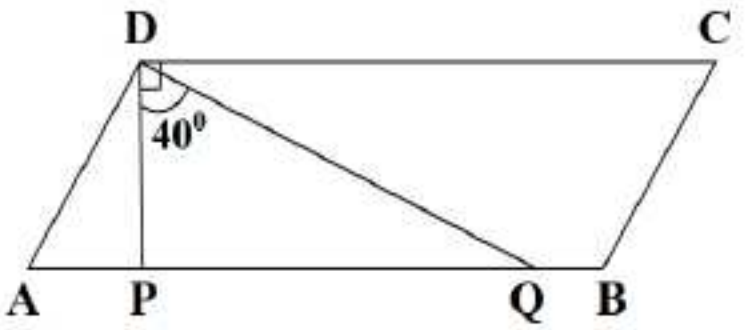
29. MNOP is a kite. If ∠ NPO = 49°, then find the measure of ∠NOP.



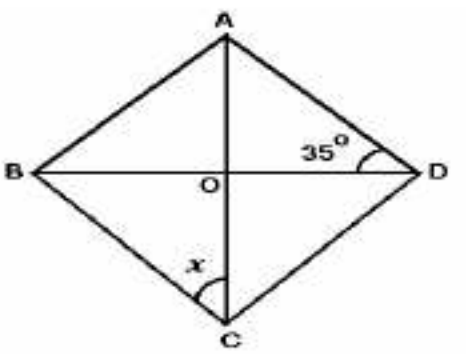
30. In parallelogram SOAP, SM and OM are internal bisectors of ∠PSO and ∠SOA respectively. Find the measure of ∠SMO.



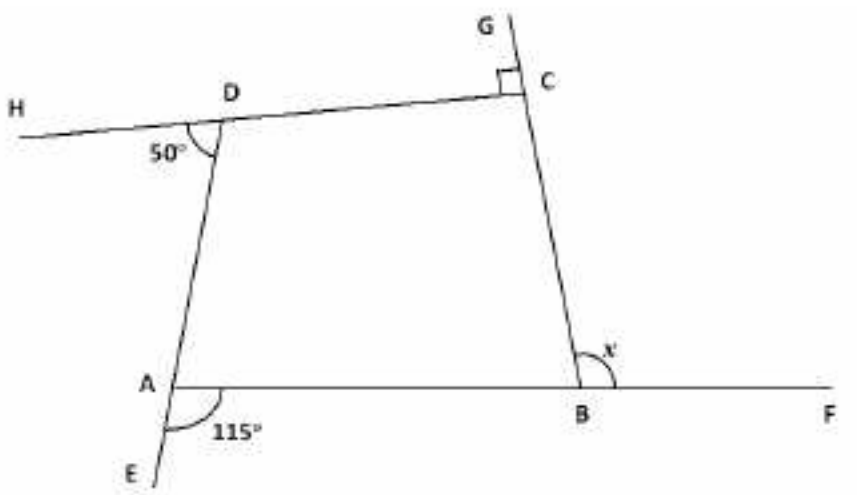
31. ∠D of the parallelogram ABCD is an obtuse angle. PD ⊥ CD and QD ⊥ AD where P and Q are points on AB. If ∠PDQ = 40°, then find the smaller angle of the parallelogram.



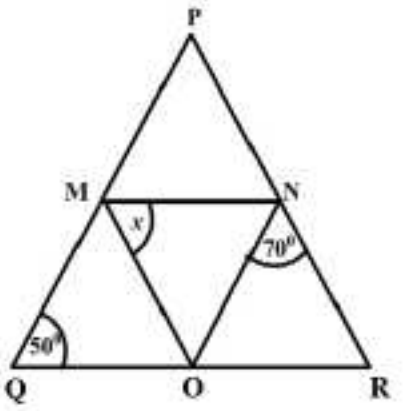
32. ABCD is a rhombus. If ∠ADB = 35°, then find the value of x.



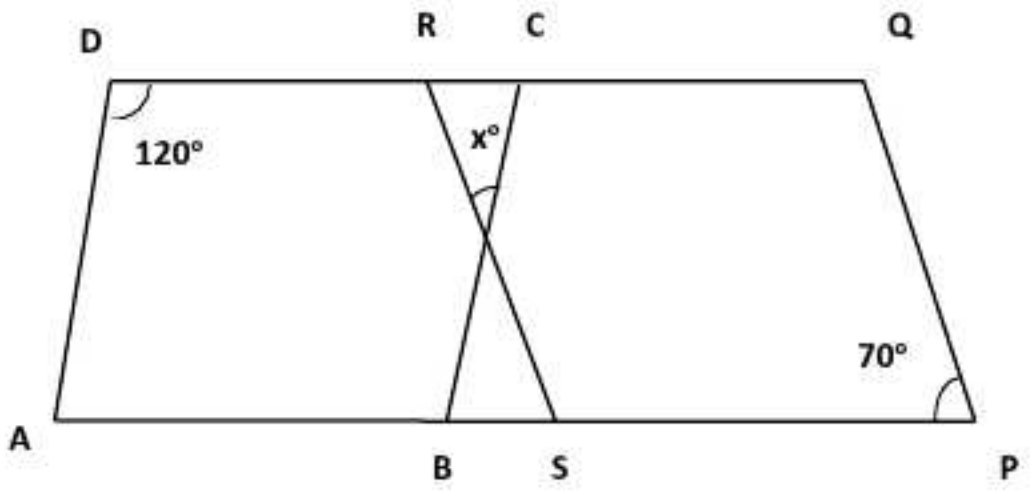
33. Find the value of x.



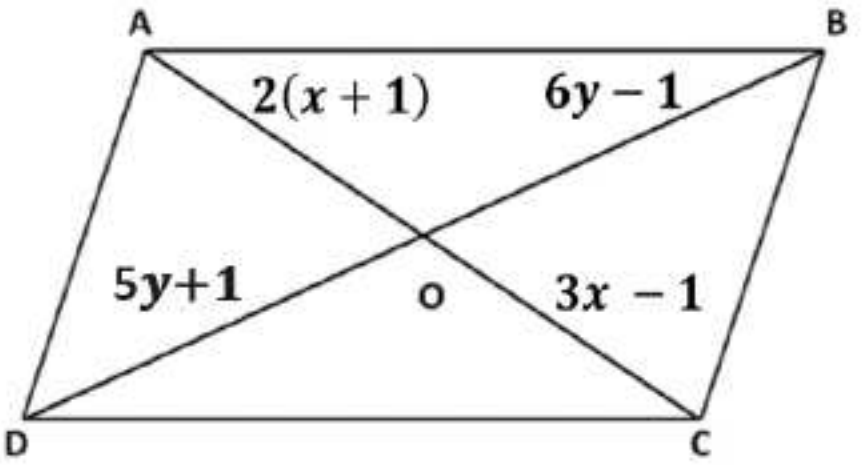
34. In triangle PQR, if MN ∥ QR, ON ∥ QP and OM ∥ RP, then find the value of x.



35. Find x, if ABCD and PQRS are parallelograms.

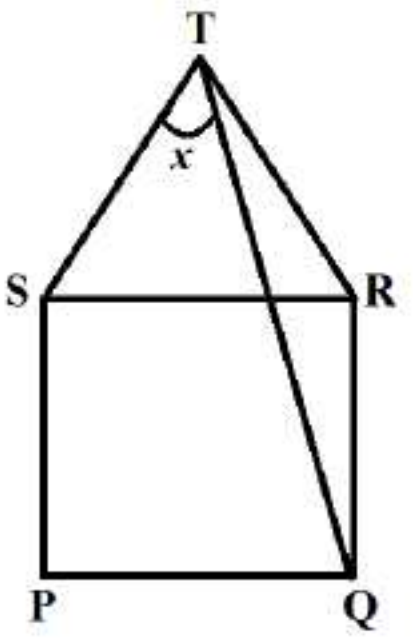


36. ABCD is a parallelogram. Find the value of $(x + y)$.

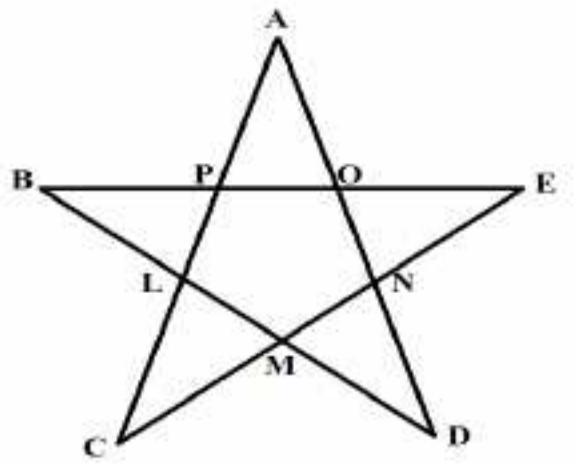


37. If the sum of the diagonals of a rectangle is 26 centimetres and one of its sides is 5 centimetres, then find the sum of the lengths of other three sides of the rectangle.

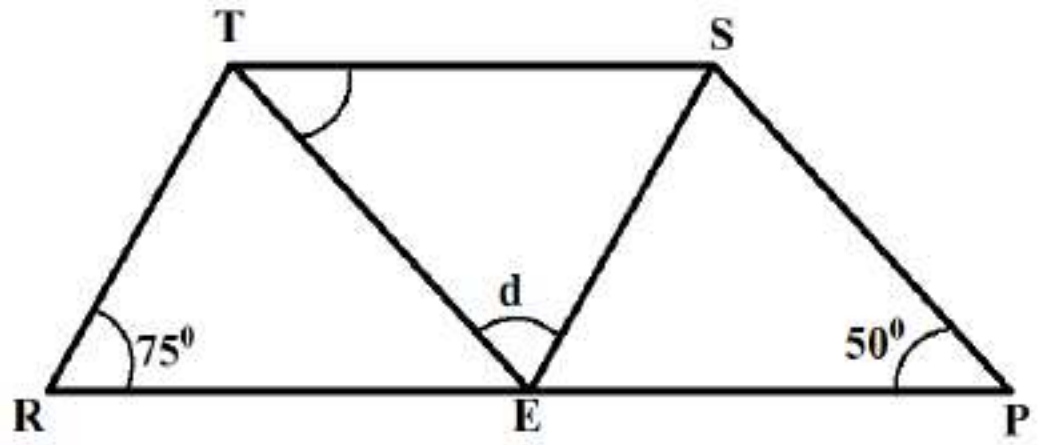
38. In the figure, PQRS is a square and ΔTSR is an equilateral triangle. Find the value of x.



39. LMNOP is a regular pentagon. Find the value of ∠A + ∠B + ∠C + ∠D +∠E.



40. REST and EPST are two parallelograms with ∠EPS = 50° and ∠TRE = 75°. Find the value of 'd'.



ANSWERS

Q. No.	Answer	Q. No.	Answer
1	$\left(\frac{n-2}{n}\right)180°$	21	40°
2	$\frac{360°}{n}$	22	$17\sqrt{2}$ cm
3	5	23	864 sq cm
4	8	24	x = 10
5	150°	25	40 cm
6	3	26	6
7	14	27	x = 130
8	9	28	$x = 75$
9	Rectangle	29	82°
10	n – 2	30	90°
11	1:3	31	40°
12	108°	32	55°
13	0°	33	105°
14	87.5°	34	60°
15	3:4:5	35	x = 50
16	5	36	5 units
17	8	37	29 cm
18	9	38	45°
19	50°	39	180°
20	150°	40	55°

CHAPTER – 4

DATA HANDLING

Points to Remember

- Data in an unorganized form is called raw data.
- Frequency gives the number of times that a particular entry occurs in the data.
- The difference of highest value and the lowest value of observation is known as range.
- Each entry collected as a numerical fact in the given data is known as observation.
- Grouped data can be represented using histogram.
- Histogram is a type of bar diagram with class intervals shown on horizontal axis and height of the bar shows the frequency of the class interval. Also, there is no gap between the bars.
- A pie chart is also called a circle graph that shows the relationship between a whole and its parts.

$$\text{Central angle of a component} = \frac{\text{Value of the component}}{\text{Sum of all component values}} \times 360°$$

- A random experiment is one whose outcome cannot be predicted exactly in advance.
- An operation which can produce some well-defined outcomes is called an Experiment.
- Each outcome of the experiment is called an event.
- Outcomes of an experiment are called "Equally likely" if each has the same chance of occurring.
- When the outcomes are equally likely:

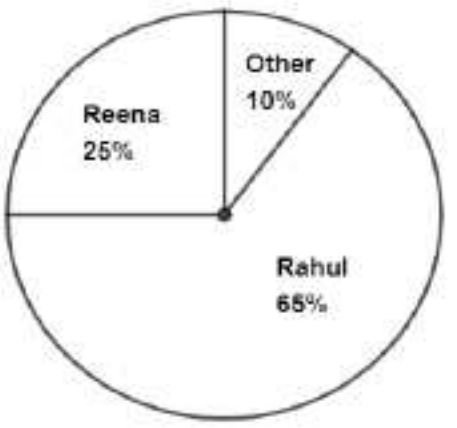
$$\text{Probability of an event} = \frac{\text{Number of favourable outcomes}}{\text{Total Number of possible outcomes}}$$

QUESTIONS

Numbers from 1 to 15 are written on slips, one number on one slip. These slips are then put into a box. One slip is chosen from the box without looking into it.

Based on this information, answer Q1 to Q5:

1. Find the probability of getting a prime number.
2. Find the probability of getting a perfect square number.
3. Find the probability of getting multiple of 3.
4. Find the probability of getting a number less than 10.
5. Find the probability of getting a number greater than 10.
6. A dice is thrown once. Find the probability of getting a multiple of 2 or 3.
7. A family plays a game with a dice. In a single throw of dice, getting a prime number means father wins and getting an even number means son wins. Find the probability that both will win simultaneously.
8. Find the range of the data 8, 15, 51, 62, 8, 72, 0 ,35.
9. A bag contains 80 red balls, 30 white balls and few blue balls. Find the number of blue balls in the bag if the probability of getting a red ball is $\frac{2}{3}$.
10. The given pie chart shows a percentage breakdown of 800 votes in student's elections. How many votes did Reena receive?



11. A card is drawn from a well shuffled pack of 52 cards. Find the probability of getting neither a red card nor a queen.
12. Cards are marked from 10 to 100. A card is chosen at random. Find the probability of getting a perfect number?
13. Two coins are thrown simultaneously. Find the probability of getting atmost one head.
14. Two dice are thrown simultaneously. Find the probability of getting the same number on both dice.
15. Ravi scored 12, 92, 0 and 16 runs in the four innings. Find the average runs scored by him.

16. Find the class mark of class Interval 1000-1100.

Wages (in ₹)	Number of workers
800-900	7
900-1000	13
1000-1100	2
1100-1200	8
1200-1300	10

17. In a multiple-choice question with 5 options, Ranjeet randomly marked one of the options. Find the probability that he answered it correctly.

18. In a hostel, the following number of students speak different languages. If a pie chart is formed, then find the central angle made by Bengali speaking students.

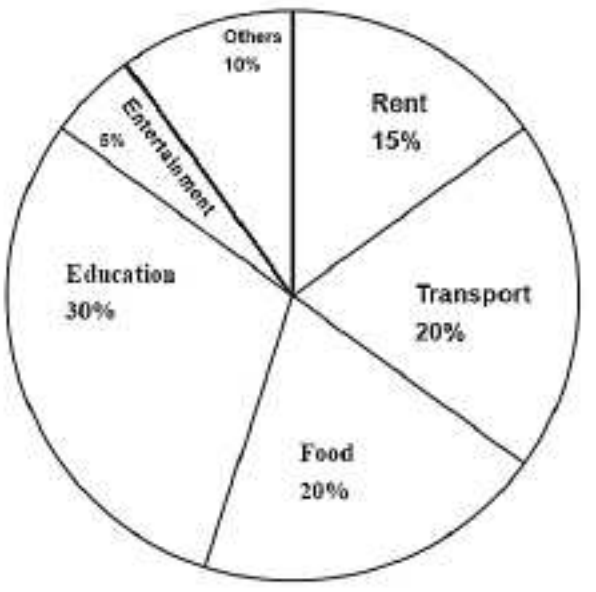
Language spoken	English	Hindi	Marathi	Bengali
Number of students	34	12	16	10

19. Find the probability that a leap year selected at random will have 53 Tuesdays.

20. Find the probability that a number selected from the numbers 1, 2, 3, 4, ..., 30 is a perfect square number.

21. In a box of 600 electric bulbs, 15 bulbs are defective. One bulb is taken out randomly. Find the probability that it is a non-defective bulb.

The following pie chart shows the expenditure incurred by a family in different heads as percentage of its income.



Based on this information, answer Q22 to Q27:

22. On which item, the expenditure is double than the expenditure on rent?

23. In which head, the expenditure is least?

24. If expenditure on food items is ₹ 5000, then find the expenditure done by the family on entertainment.

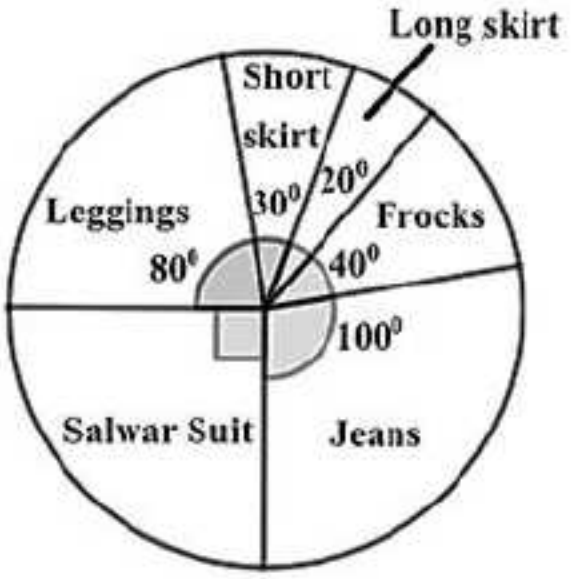
25. Find the ratio of the amount spent on education to that on the others?

26. Expenditure on which two heads are equal?

27. Find the difference of expenditures done on education and transport, if the expenditure on rent is ₹ 4500.

The following pie chart represents the data of dresses liked by 72 girls as daily wear.

Answer Q28 to Q33 on the basis of given pie chart:



28. How many girls like wearing leggings?

29. How many girls like wearing salwar suit?

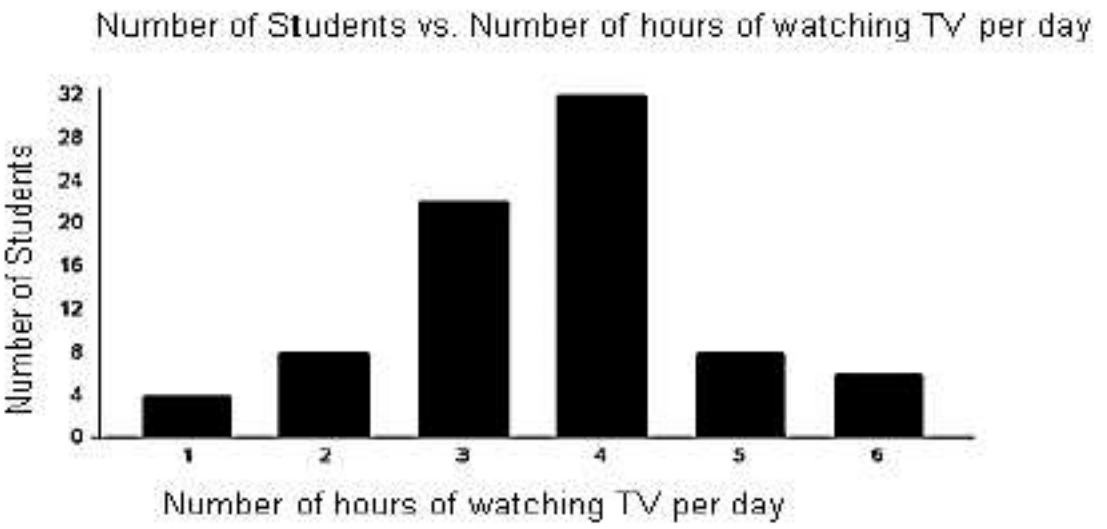
30. How many girls like wearing long skirt and short skirts?

31. How many girls like wearing jeans?

32. Which dress is least liked by girls?

33. How many girls like wearing leggings and frocks?

Study the given bar graph and answer Q34 to Q36:



34. For how many hours the least number of students watch T.V.?

35. How many students watch T.V. for less than 4 hours?

36. How many students spend more than 4 hours watching T.V.?

Study the following frequency distribution table and answer Q37 to Q41:

Daily Income (in ₹)	Number of workers
100 – 150	40
150 – 200	25
200 – 250	50
250 – 300	120
300 – 350	130
350 – 400	50
400 – 450	55
450 – 500	30

37. Find the class size of the distribution.

38. Find the lower-class limit of the second class.

39. Find the upper-class limit of the fifth class.

40. Which class has the highest frequency?

41. Find the class mark of the seventh class.

Weight (in kg) of 40 students is given in the following frequency distribution table. Answer Q42 to Q46:

Weight (in kilogram)	Number of students
35 – 40	8
40 – 45	12
45 – 50	13
50 – 55	4
55 – 60	3

42. Find the class size of each class interval.

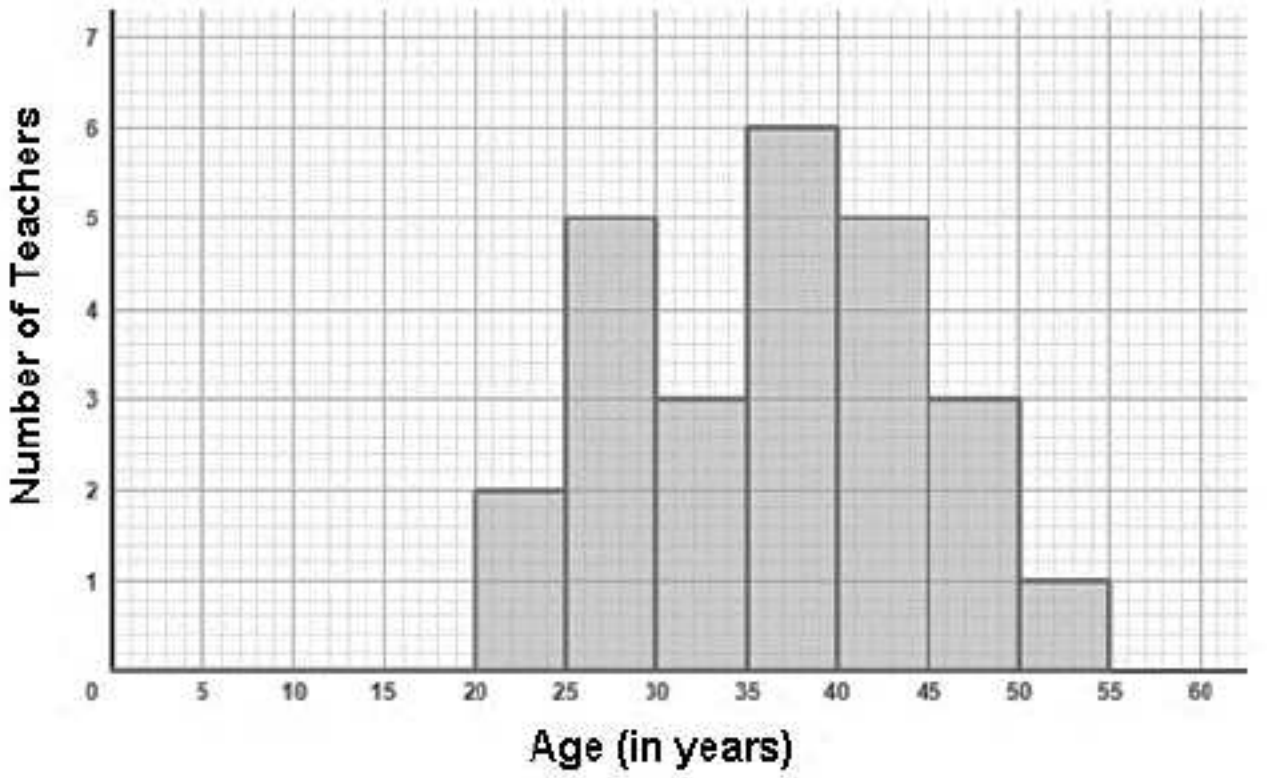
43. How many students weighs 50 kilogram or above?

44. Which class interval has frequency 13?

45. Which class interval has lowest frequency?

46. Find the class mark of second class.

The following histogram shows the frequency distribution of ages of 25 teachers in a school. Answer Q47 to Q50:



47. How many teachers have age from 25 years to 45 years?

48. Find the class size.

49. How many teachers are in the age group 40-45?

50. How many teachers are in the age group 30-45?

ANSWERS

Q. No.	Answer	Q. No.	Answer
1	$\frac{2}{5}$	26	Food & Transport
2	$\frac{1}{5}$	27	₹ 3000
3	$\frac{1}{3}$	28	16
4	$\frac{3}{5}$	29	18
5	$\frac{1}{3}$	30	10
6	$\frac{2}{3}$	31	20
7	$\frac{1}{6}$	32	Long skirt
8	72	33	24
9	10	34	1 hour
10	200	35	34 students
11	$\frac{6}{13}$	36	14 students
12	$\frac{1}{91}$	37	50
13	$\frac{3}{4}$	38	150
14	$\frac{1}{6}$	39	350
15	30	40	300 – 350
16	₹ 1050	41	425
17	$\frac{1}{5}$	42	5
18	50°	43	7
19	$\frac{2}{7}$	44	45 – 50
20	$\frac{1}{6}$	45	55 – 60
21	$\frac{39}{40}$	46	42.5
22	Education	47	19
23	Entertainment	48	5
24	₹ 1250	49	5
25	3:1	50	14

CHAPTER – 5

SQUARES AND SQUARE ROOTS

Points to Remember

- A Natural number x is a perfect square if there exists a natural number y such that $x = y^2$ or $y = \sqrt{x}$
- A number ending in 2, 3, 7 or 8 is never a perfect square.
- The number of zeros in the end of a perfect square is never odd.
- Square of even numbers are always even.
- Square of odd numbers are always odd.
- Sum of first n natural numbers $= \frac{n(n+1)}{2}$
- Sum of first n natural even numbers $= n(n+1)$
- Sum of first n natural odd numbers $= n^2$
- The square of a natural number other than 1 is either a multiple of 4 or exceeds a multiple of 4 by 1.
- The square of a natural number other than 1 is either a multiple of 3 or exceeds a multiple of 3 by 1.
- For any number n greater than 1, $(2n, n^2 - 1, n^2 + 1)$is a Pythagorean triplet.

QUESTIONS

1. Simplify: $\frac{(\sqrt{32}+\sqrt{48})}{(\sqrt{8}+\sqrt{12})}$
2. If $3(5-y)^2 = 675$, then find the sum of the two values of y.
3. Find the square root of $\left[1\frac{48}{121}\right] \times \left[7\frac{9}{16}\right]$
4. Find the value of $\frac{(2.644)^2 - (2.356)^2}{0.288}$
5. The sum two consecutive numbers is equal to the square of 15. Find double of the smaller number.
6. Simplify: $\sqrt{320 + \sqrt{9 + \sqrt{49}}}$
7. Simplify: $\sqrt{1000} \times \sqrt{\frac{4410}{441}}$

8. Find the value of $(502)^2 - (499)^2$

9. Simplify: $5^2 - 4^2 + 3^2 - 2^2 + 1^2$

10. Find the greatest four-digit perfect square number.

11. Simplify: $\frac{(3.63)^2 - (2.37)^2}{3.63+2.37}$

12. Simplify: $\frac{\sqrt{24} + \sqrt{216}}{\sqrt{96}}$

13. How many 2's are there in the prime factorization of 4000?

14. Find the least number that should be added to 221 to get a perfect square.

15. If 31*6 is a perfect square, then the digit at * is _____

16. How many non-perfect square numbers lie between the squares of 101 and 102?

17. Find the value of $(12 + 7 + 3 + 2 + 1 + 0)^2$

18. The area of a square field is $1\frac{1725}{2500}$ square metres. Find its perimeter.

19. How many digits are there in the square root of 15625?

20. Find the negative value of x if $5(x - 1)^2 = 180$.

21. Find the square root of $\frac{0.144}{2.5} \times \frac{25}{0.36} \times \frac{2.89}{0.04}$.

22. Find the value of $\sqrt{54 - \sqrt{21 + \sqrt{18 - \sqrt{4}}}}$

23. Find the value of $3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23$

24. Find the value of x, if $(6)^2 + (7)^2 + (42)^2 = (x)^2$

25. Find the value of $2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 + 20$

26. If two sides of a right triangle are 8 centimetres and 15 centimetres long, then find the length of its hypotenuse.

27. Find the value of $(1 \times 2) + (2 \times 3) + (3 \times 4) + (4 \times 5)$

28. Simplify: $\sqrt{0.01 + \sqrt{0.0064}}$

29. Find the value of $\sqrt{99} \times \sqrt{44}$

30. What is the sum of first 14 odd natural numbers?

31. Find the value of $x - y$, if $(x)^y = 441$ such that $x > y$, where x and y are positive integers.

32. Length of a rectangular park is 80 metres and its breadth is 60 metres. Find the sum of length of its diagonals.

33. Evaluate: $\left(2+\sqrt{3}\right)^2+(2-\sqrt{3})^2$

34. Find the least number that should be subtracted from 537 to get a perfect square.

35. Find the number whose square is equal to the difference of the squares of the number 68 and 32.

36. Find the least number by which 288 must be multiplied so that it becomes a perfect square.

37. Find the least number by which 147 must be divided so that it becomes a perfect square.

38. Kusum walks 12 kilometres to East and turns South and walks 35 kilometres. Again, she turns West and walks 24 kilometres. How far is she from the starting point?

39. Find the length of a side of a square playground whose area is equal to the area of rectangular field of dimensions 72 metres and 50 metres.

40. Find the value of $\left(\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+\sqrt{225}}}}}\right)\div\sqrt{\frac{16}{81}}$

41. A hall has a capacity of 2704 seats. If the number of rows is equal to the number of seats in each row, then find the number of seats in each row.

42. How many perfect squares numbers lie between 0 and 550?

43. Find the value of $\sqrt{\sqrt{\frac{1296}{2401}}}$

44. If the sum of the squares of three consecutive natural number is 110, then the smallest natural number is ____ .

45. Find the value of $(\sqrt{441}-\sqrt{196}+\sqrt{121}-\sqrt{64})$

46. Find the missing number: $175\times$ _____ $=(35)^2$

47. Find the largest number of the Pythagorean triplet whose smallest number is 12.

48. Find x, if $5x = (49)^2 - (44)^2$

49. Find x, if $x = \sqrt{0.01 + 0.03 + 0.08 + 0.11 + 0.13}$

50. Find the value of $\sqrt{1 + 23\sqrt{1 + 24\sqrt{1 + 25\sqrt{26 \times 28 + 1}}}}$

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	2	26.	17 cm
2.	10	27.	40
3.	$\frac{13}{4}$	28.	0.3
4.	5	29.	66
5.	224	30.	196
6.	18	31.	19
7.	1000	32.	200 m
8.	3003	33.	14
9.	15	34.	8
10.	9801	35.	60
11.	1.26	36.	2
12.	2	37.	3
13.	5	38.	37 km
14.	4	39.	60 m
15.	3	40.	9
16.	202	41.	52
17.	625	42.	23
18.	5.2 m	43.	$\frac{6}{7}$
19.	3	44.	5
20.	– 5	45.	10
21.	17	46.	7
22.	7	47.	37
23.	143	48.	93
24.	43	49.	0.6
25.	110	50.	24

CHAPTER – 6

CUBES AND CUBE ROOTS

Points to Remember

- A natural number n is a perfect cube if there exists a natural number m whose cube is n such that $n = m^3$ or $m = \sqrt[3]{n}$.
- Symbol $\sqrt[3]{\ }$ represents cube root. e.g. $2^3 = 8$ *or* $2 = \sqrt[3]{8}$
- Numbers 1729, 4104, 13832 etc. are called Hardy-Ramanujan numbers. They can be expressed as the sum of two cubes in two different ways.

  $$1729 = 1^3 + 12^3 \text{ or } 9^3 + 10^3$$
- Cube of a number having 1, 4, 6 or 9 as one's digit has the same digit at one's place.

  As $1^3 = 1$ (1^3 has 1 at its unit place)

  $4^3 = 64$ (4^3 has 4 at its unit place)

  $9^3 = 729$ (9^3 has 9 at its unit place)
- If a number has 3 at its one's place, then its cube has 7 at its one's place, also if a number has 7 at one's place, then its cube has 3 at one's place.

  As $3^3 = 27$ (3^3 has 7 at its unit place)

  $7^3 = 343$ (7^3 has 3 at its unit place)
- If a number has 2 at one's place, then its cube has 8 at one's place, also if a number has 8 at one's place, then its cube has 2 at one's place.

  As $2^3 = 8$ (2^3has 8 at its unit place)

  $8^3 = 512$ (8^3has 2 at its unit place)
- For two consecutive natural numbers p and q (p > q).

  $$p^3 - q^3 = 3pq + 1$$

  e.g $5^3 - 4^3 = 125 - 64 = 61 = 3(5 \times 4) + 1$
- For any positive integer 'n', we have

  $$\sqrt[3]{-n} = -\sqrt[3]{n}$$
- The sum of the cubes of first n natural numbers is equal to the square of their sum

  i.e $1^3 + 2^3 + 3^3 + \ldots + n^3 = (1 + 2 + 3 + \ldots + n)^2$
- For any two integers a and b we have

  i. $\sqrt[3]{ab} = \sqrt[3]{a} \times \sqrt[3]{b}$ ii. $\sqrt[3]{\frac{a}{b}} = \frac{\sqrt[3]{a}}{\sqrt[3]{b}}, b \neq 0$

QUESTIONS

1. Find the cube root of $216 \times (-32) \times 54$
2. Find the value of m, if m = $\sqrt[3]{-3375} + \sqrt[3]{0.008}$
3. If $72 \times k$ is a perfect cube, then find the smallest possible value of k.
4. Find the value of p, if p = $\sqrt[3]{\sqrt[3]{5^9}}$
5. A cuboidal tank holds 125000 litres of water. How many litres of water will it hold, if its dimensions are doubled?
6. Simplify: $\sqrt{\sqrt[3]{0.004096}}$
7. If $64b = b^4$, then find the value of b^2 ($b \neq 0$).
8. The original reading of liquid in a measuring jar is 600 cubic centimetres. A cube of side 8 centimetres is immersed in a liquid. What is the new reading on the measuring jar in litres?
9. Write the unit digit of $\sqrt[3]{216 \times 1728}$
10. Find the value of $\sqrt[3]{\frac{729}{5832}} \div \sqrt[3]{\frac{216}{27}}$
11. Evaluate: $\left(\frac{3}{5}\right)^3 + \left(\frac{2}{5}\right)^3$
12. Simplify: $\sqrt[6]{\left(\frac{91125}{216}\right)^2}$
13. Simplify: $\sqrt[3]{4\frac{12}{125}} - \sqrt[3]{5\frac{104}{125}}$
14. Simplify: $12^3 + 12^3 + 12^3 + 12^3 + 12^3$
15. Simplify: $7^{32} \times 7^{-34} \times 7^4$
16. If $9^x + 9^x + 9^x = \frac{1}{243}$, then find the value of x.
17. How many perfect cubes are there between 1 and 1000?
18. Volume of a cube is 729 cubic centimetres. Find the area of its one face.
19. A metallic cuboid of side 16 centimetres $\times$ 12 centimetres $\times$ 9 centimetres was melted and recast into a cube. Find the length of the edge of the cube.
20. Evaluate: $\left\{50^0 + (10^4)^{\frac{1}{4}}\right\}^3$
21. Evaluate: $\left\{(24^2 + 7^2)^{\frac{1}{2}}\right\}^3$

22. Find the value of $\sqrt[3]{\sqrt{(5^3+15^3)+100}+2^2}$

23. Find the natural number whose square when subtracted from its cube gives 100.

24. The volume of two cubes are in the ratio 1:64. Find the ratio of the area of their faces.

25. If $392 = 2 \times 2 \times 2 \times 7 \times 7$, $28 = 2 \times 2 \times 7$ and $81 = 3 \times 3 \times 3 \times 3$, then find the least number by which $392 \times 28 \times 81$ should be multiplied to get a perfect cube.

26. Area of one face of cube is 121 square centimetres. Find the volume of the cube.

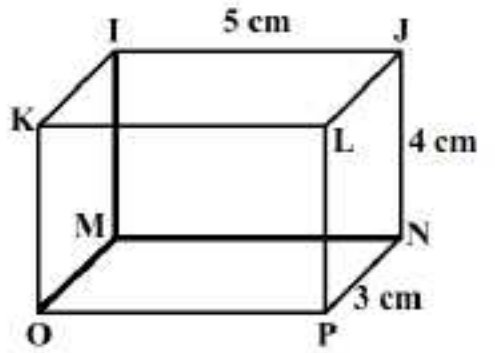
27. Find the value of $20^3 - 17^3$, if $20^2 + 17^2 + 20 \times 17 = 1029$.

28. If $(4913)^{\frac{1}{3}} = 2m + 3$, then find the value of m.

29. Simplify: $\sqrt[3]{\frac{8}{343}} \div \sqrt{\frac{100}{49}} \times \sqrt[3]{125}$

30. Evaluate: $\sqrt[3]{\frac{40000}{512}} \div \sqrt[3]{\frac{5}{512}}$

31. Find the number of unit cubes in the given figure:



32. Find the least number that should be added to 2714 to get a perfect cube.

33. Difference of two perfect cube is 279. If the cube root of the smaller number is 4, then find the cube root of the larger number.

34. Simplify: $70^3 + 20^3 - 90^3$

35. 1729 is called the Hardy-Ramanujan number because it is the smallest number expressible as the sum of two cubes in two different ways. Which two pairs will give this number?

36. Simplify: $\sqrt[3]{32768} + \sqrt[3]{91125} - \sqrt[3]{456533}$

37. Find the number of thousands in $24 \times 2^4 \times 5^4$

38. Find the number of hundreds in $14 \times 2^4 \times 5^2$

39. Two cubes have volumes in the ratio 1:8. If volume of the smaller cube is 125 cubic centimetres, then find side of the other cube.

40. Find the side of a cubical box whose volume is 474.552 cubic decimetres.

41. Evaluate: $10^3 - 9^3$

42. Evaluate: $\sqrt[3]{15624 + \sqrt[1]{0.8 + \sqrt[3]{0.008}}}$

43. How many smallest consecutive odd numbers will be needed to obtain the sum as 4^3?

44. Find x, if $7^{2x-1} = 343$

45. Simplify: $\sqrt[3]{64\sqrt[3]{64\sqrt[3]{64 \ldots \ldots \ldots \infty}}}$

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	-72	23.	5
2.	-14.8	24.	1:16
3.	3	25.	18
4.	5	26.	1331 cu cm
5.	10,00,000 litres	27.	3087
6.	0.4	28.	7
7.	16	29.	1
8.	1.112 litres	30.	20
9.	2	31.	60
10.	$\frac{1}{4}$	32.	30
11.	$\frac{7}{25}$	33.	7
12.	$\frac{15}{2}$	34.	-378000
13.	$-\frac{1}{5}$	35.	$(1^3 + 12^3), (9^3 + 10^3)$
14.	8640	36.	0
15.	49	37.	240
16.	-3	38.	56
17.	8	39.	10 cm
18.	81 sq cm	40.	7.8 dm
19.	12 cm	41.	271
20.	1331	42.	25
21.	15625	43.	8
22.	4	44.	2
		45.	8

CHAPTER – 7

COMPARING QUANTITIES

Points to Remember

- Gain and loss are always calculated on the cost price (CP).
- A decimal can be converted into a percent by shifting the decimal two places to the right.
- If $S.P. > C.P.$ (in case of profit)

$$\boxed{Profit = S.P. - C.P.}$$

$$\boxed{S.P. = C.P.\left(\frac{100 + profit\ \%}{100}\right)}$$

$$\boxed{C.P. = S.P.\left(\frac{100}{100 + profit\ \%}\right)}$$

- If $C.P. > S.P.$ (in case of loss)

$$\boxed{Loss = C.P. - S.P.}$$

$$\boxed{S.P. = C.P.\left(\frac{100 - loss\ \%}{100}\right)}$$

$$\boxed{C.P. = S.P.\left(\frac{100}{100 - loss\ \%}\right)}$$

- $Discount = Marked\ Price - Selling\ Price$

$$\boxed{Discount\ \% = \frac{Discount}{\text{Marked Price}} \times 100}$$

- If Principal = ₹ P, Rate of Interest = R % per annum, Time = T years

$$\text{Simple Interest, } \boxed{SI = \frac{P \times R \times T}{100}}$$

- Compound Interest :

$$\boxed{CI = P\left(1 + \frac{R}{100}\right)^T - P}$$

Amount: $\boxed{A = P\left(1 + \frac{R}{100}\right)^T}$

QUESTIONS

1. Find half of 1% in decimal form.
2. Evaluate: $7 \times 71\frac{3}{7}\%$
3. Convert $566\frac{2}{3}$ % into fraction.
4. Express 2.5% as a ratio.
5. Convert $\frac{11}{7}$ into percentage.
6. Express 7:8 in percentage.
7. Convert (0.123 + 0.025) into percentage.
8. In a gathering $87\frac{1}{2}\%$ people are standing. Find the percentage of people not standing.
9. Find the value of x, if $x\%$ of $24 = 144$.
10. If 40% of $m + 180 = 564$, then find the value of m.
11. Find x, if 25% of $x + x\%$ of $45 + 90 = x$.
12. Find the value of p, if p% of $150 + 25\%$ of $p + 25 = 200$.
13. Find 15% of 300 + 20% of 400
14. Find the value of p, if p% of p is 25
15. Evaluate: 90% of ₹ 5000 + 80% of ₹ 1000 – 25% of ₹ 6000.
16. Amisha got 70 marks in her exams which is 56% of the total marks. Find the maximum marks.
17. Find the difference between a paisa and 1% of a rupee.
18. How much is 2% of 300 kilograms?
19. Find 12% of ₹ 1200.
20. What percent of 6 litres is 150 millilitres?
21. What percent is 75 minutes of 2 hours?
22. In a class of 60 children, 30% children can speak only English, 20% only Hindi and the rest of the children can speak both the languages. How many children can speak Hindi?
23. In an examination, a student has to score 40% marks to pass. He gets 65 marks and fails by 15 marks. Find the maximum number of marks.

24. What is the resultant discount which is equal to (50% + 20%)?
25. Pushpa bought a shirt for ₹ 250, a frock for ₹ 350 and a pair of jeans for ₹ 650. She paid ₹ 1000 for all. How much discount did she get?
26. The price of a computer is ₹ 25000. The sales tax charged is 12%. Find the amount to be paid to buy it.
27. The present value of a machine is ₹ 1000. Its value depreciates every year by 10%. What will be its value after 2 years?
28. Find the simple interest on ₹ 7000 for 3 years at the rate of 10% per annum.
29. By selling a chair for ₹ 880, Rohan loses 20%. Find the cost price of the chair.
30. Sonam's present salary is ₹ 35000. She gets an increment of 10%. Find her new salary.
31. An umbrella is sold at ₹ 375, with a loss of 25%, what is its cost price?
32. A shopkeeper buys a toy for ₹ 2500 and sells it for ₹ 3000. Find his gain percent.
33. Find the difference between compound interest and simple interest for the sum of ₹ 2000 at the rate of 10% p.a. for 2 years.
34. A watch is bought for ₹ 2700 including 8% VAT. Find its cost before VAT is added.
35. An article was sold for ₹ 93, after a discount of ₹ 23.75. Find its marked price.
36. Aman sells 500 mangoes at the cost price of 550 mangoes. Find his gain percentage.
37. The cost of 15 articles is equal to the selling price of 12 articles. Find the profit percent.
38. If the selling price of 4 articles is equals to the cost price of 5 articles of same kind, then what will be the total profit percent?
39. A vendor bought 6 oranges for ₹ 10 and sold them at 4 for ₹ 6. Find loss or gain percentage.
40. A store has an offer "buy 3 get 3 free". What is the net percentage of discount?
41. A number is increased by 50% and then it is decreased by 50%. Find the net increase or decrease percentage.
42. Naman buys a bike at 20% discount of its value and sells it for 20% more than its value. What will be his profit percentage?
43. If a certain sum of money becomes 3 times itself in 8 years compounded annually, then in how much time will it be 243 times of itself ?

44. A man bought cookies at 3 for a rupee. How many for a rupee should he sell to make a profit of 50%?

45. If 120% of b is equals to 60% of a, then find the value of $\frac{a+b}{a-b}$.

46. 40% of a number is added to the number itself, it becomes 560. Find the number.

47. If 120 is 20% of a number, then find 120% of that number.

48. 65% of a number is 21 less than $\left(\frac{4}{5}\right)^{th}$ of that number. Find the number.

49. If 20% of 20% of $x = 20$, then find x.

50. 20% of a number when added to 20 becomes the number itself. Identify the number.

ANSWERS

Q. No.	Answer	Q. No.	Answer
1	0.005	26	₹ 28000
2	5	27	₹ 810
3	$\frac{17}{3}$	28	₹ 2100
4	1:40	29	₹ 1100
5	157.14%	30	₹ 38500
6	87.5	31	₹ 500
7	14.8%	32	Gain% = 20%
8	12.5%	33	₹ 20
9	600	34	₹ 2500
10	960	35	₹ 116.75
11	300	36	10%
12	100	37	25%
13	125	38	25%
14	50	39	Loss% = 10%
15	₹ 3800	40	50%
16	125	41	25% decrease
17	0	42	50%
18	6 kg	43	40 years
19	₹ 144	44	2
20	2.5%	45	3
21	62.5%	46	400
22	42	47	720
23	200	48	140
24	60%	49	500
25	₹ 250	50	25

CHAPTER – 8

ALGEBRAIC EXPRESSIONS AND IDENTITIES

Points to Remember

Standard Algebraic Identities

- $(a+b)^2 = a^2 + 2ab + b^2$
- $(a-b)^2 = a^2 - 2ab + b^2$
- $(a+b)^2 = (a-b)^2 + 4ab$
- $(a-b)^2 = (a+b)^2 - 4ab$
- $(a+b)(a-b) = a^2 - b^2$
- $(x+a)(x+b) = x^2 + (a+b)x + ab$
- $(x-a)(x+b) = x^2 + (-a+b)x - ab$
- $(x+a)(x-b) = x^2 + (a-b)x - ab$
- $(x-a)(x-b) = x^2 - (a+b)x + ab$
- $(a+b)^3 = a^3 + b^3 + 3ab(a+b)$
- $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$
- $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
- $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

QUESTIONS

1. Simplify: $(a+1)(a-1)(a^2+1)$
2. Find the value of (a^2+b^2), if $(a+b) = 12$ and $(ab) = 14$
3. Find the value $\frac{198 \times 198 - 102 \times 102}{96}$
4. Find the value 197×203
5. Simplify: $(x^2y - yz^2)^2$
6. If $\left(x + \frac{1}{x}\right) = 5$, then find the value of $\left(x^2 + \frac{1}{x^2}\right)$.
7. If $\left(x - \frac{1}{x}\right) = 6$, then find the value of $\left(x^2 + \frac{1}{x^2}\right)$.

8. Simplify: $(7x+4y)^2-49x^2-16y^2$

9. If $x=10$, then find the value of $(4x^2+20x+25)$.

10. Find the value of $(64x^2+81y^2+144xy)$, when $x=11$ and $y=\frac{4}{3}$

11. Simplify: $(m^2+mn+n^2)(m-n)$

12. Find the value of the product of $\left(2+\frac{1}{x}\right)$ and $\left(2-\frac{11}{x}+\frac{15}{x^1}\right)$, when $x=1$.

13. If $m=-5, n=7, a=3, b=3$, then find the value of $(a-b)^3+(m+n)^2$

14. If $p=7, q=-5$, then find the value of $(q+p)^2-qp$

15. If $5x-4y=8$ and $xy=0$, then find the value of $25x^2+16y^2$.

16. If $p=1.5, q=0.5$, then find the value of $(p+q)^2-(2)^3$

17. If $a=10, b=-5, c=2$, then find the value of $(a+b+c)^3$

18. If $x=\frac{100}{\sqrt{25}+(1^0\times 0)}$, then find the value of x^2.

19. The perimeter of a triangle is $6p^2-4p+9$ and two of its sides are p^2-2p+1 and $3p^2-5p+3$. Find the third side of triangle.

20. Two adjacent sides of rectangle are $4x^2-3y^2$ and x^2+3xy. Find its perimeter.

21. If $a=100$ and $b=98$, then find the value of $(a-b)^2+(a+b)$

22. Find the Value of : $(\sqrt{25}-\sqrt{16})(\sqrt{16}-\sqrt{9})+\sqrt{36}-\sqrt{16}$

23. Simplify: $(2a-b)^2-(a+2b)^2+3b^2+ab$

24. Find the factors of $(g+h)^2-4gh$.

25. If $(x+y)=10$ and $xy=9$, then find the value of x^2-y^2.

26. Find the value $\frac{8.37\times 8.37-1.63\times 1.63}{0.674}$.

27. If $(a+b)^2=7+4\sqrt{3}$, then find the value of (a – b).

28. Simplify: $(x+y)^2-(x-y)^2+x-y$

29. What should be subtracted from $(a+b)^2$ to make it $(a-b)^2$?

30. What should be added in $25x^2+16y^2$ to make it $(5x+4y)^2$?

31. $121m^2-100n^2$ should be divided by which expression to get $11m+10n$?

32. If one of the factors of $25(x+y)^2-36(x-2y)^2$ is $(17y-x)$, then find the other factor.

33. If $4x^2+y^2=40$ and $xy=6$, then find the value of $(2x+y)$.

34. Simplify: $(2.5m - 0.5n)^2 + 2.5mn + 3.5mn$.

35. What should be subtracted from $(x + y)^2$ to get $x^2 + y^2$?

36. Find the number which should be added to $(9x^2 - 24x + 10)$ to make it a whole square.

37. Find the value of 7.1×6.9

38. Find the value of 205×195

39. If $x = 2 + \sqrt{3}$ and $y = 2 - \sqrt{3}$, then find the value of $(x - y)^2$.

40. Find the square root of $8 + 2\sqrt{15}$

41. If $x = 6$ and $y = 3.5$, then find the value of $x^2 + y^2 - xy$.

42. If $(53)^2 = (48)^2 + 5x$, then find the value of x.

43. If $a = 0.8$ and $b = 0.5$, then find the value of $a^2 + b^2 + ab$.

44. If $x = 5$ and y $= 3.2$, then find the value of $x^2 + y^2 - xy$.

45. If $x = 3 + 2\sqrt{2}$ and $y = 17 + 12\sqrt{2}$, then find the value of $\sqrt{y} - \sqrt{x}$.

46. Find the H.C.F. of the terms of the expression

$$4p^2q^2r - 12pq^2r^2 + 16p^3q^2r^2.$$

47. Factorise:

i. $x^2 + x - 56$

ii. $x^2 - 11x + 30$

48. If $\left(x^4 + \frac{1}{x^4}\right) = 2$, then find the value of $\left(x + \frac{1}{x}\right)$.

49. Factorise the following expression:

$$(x + y)(2x + 3y) - (x + y)(x + 1)$$

50. Find the value of 'a' for which the expression $2x^2 - 5x + 15$ and $2x^2 - ax + 3a$ are equal.Type equation here.

ANSWERS

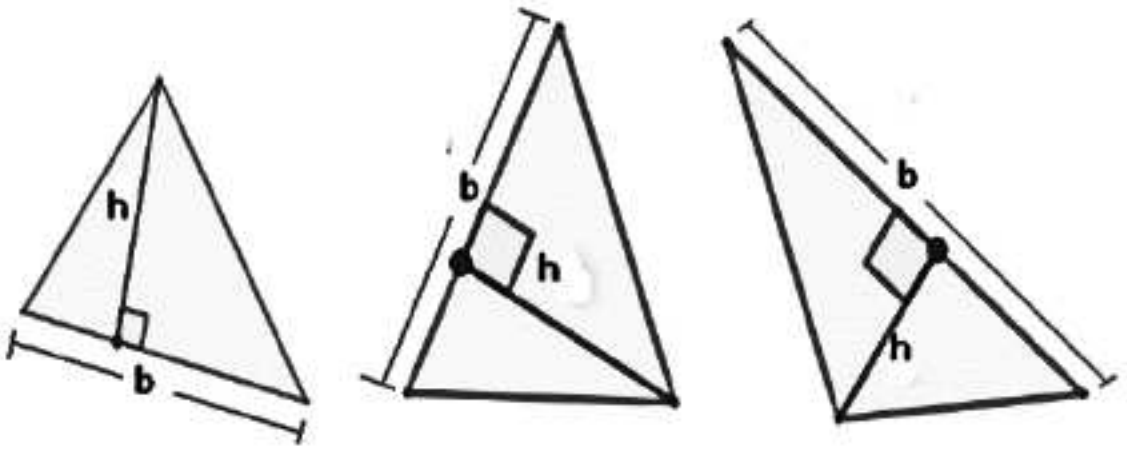
Q. No.	Answer	Q. No.	Answer
1.	$a^4 - 1$	26.	100
2.	116	27.	$2 - \sqrt{3}$
3.	300	28.	$4xy + x - y$
4.	39991	29.	$4ab$
5.	$x^4y^2 + y^2z^4 - 2x^2y^2z^2$	30.	$40xy$
6.	23	31.	$11m - 10n$
7.	38	32.	$(11x - 7y)$
8.	$56xy$	33.	± 8
9.	625	34.	$6.25m^2 + 0.25n^2 + 3.5\,mn$
10.	10000	35.	$2xy$
11.	$m^3 - n^3$	36.	6
12.	18	37.	48.99
13.	4	38.	39975
14.	39	39.	12
15.	64	40.	$\sqrt{3} + \sqrt{5}$
16.	-4	41.	27.25
17.	343	42.	$x = 101$
18.	400	43.	1.29
19.	$2p^2 + 3p + 5$	44.	19.24
20.	$10x^2 - 6y^2 + 6xy$	45.	$2 + \sqrt{2}$
21.	202	46.	$4pq^2r$
22.	3	47.	i. $(x + 8)\,(x - 7)$ ii. $(x - 6)\,(x - 5)$
23.	$3a^2 - 7ab$	48.	2
24.	(g – h) (g – h)	49.	$(x + y)\,(x + 3y - 1)$
25.	80	50.	5

CHAPTER – 9

MENSURATION

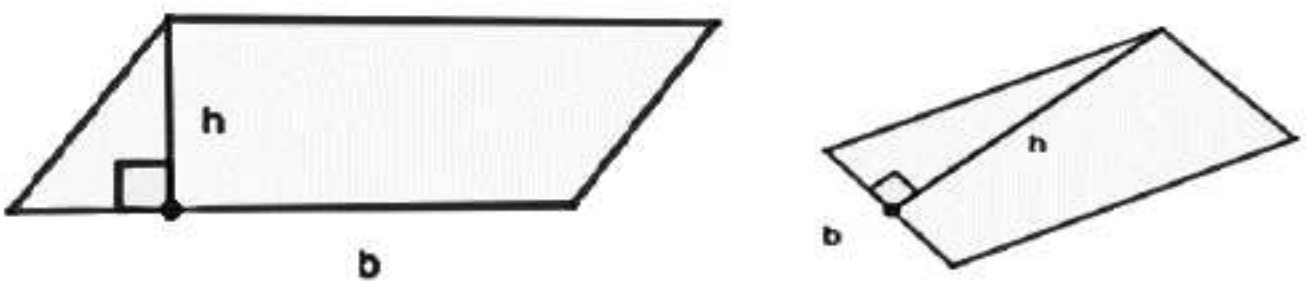
Points to Remember

- **TRIANGLE:**



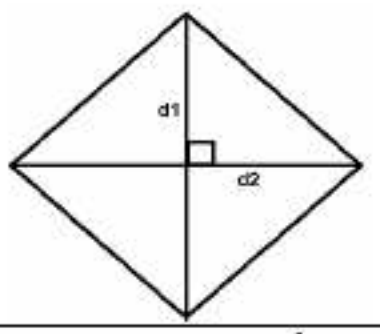
$$Area\ of\ a\ Triangle = \frac{1}{2} \times b \times h$$

- **PARALLELOGRAM:**



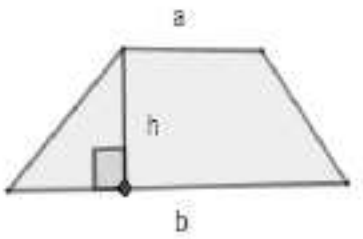
$$Area\ of\ a\ Parallelogram = b \times h$$

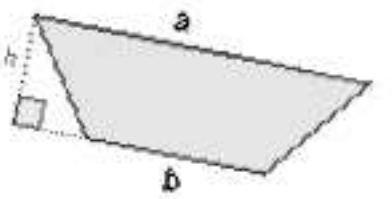
- **RHOMBUS:**



$$Area\ of\ a\ Rhombus = \frac{1}{2} \times d_1 \times d_2$$

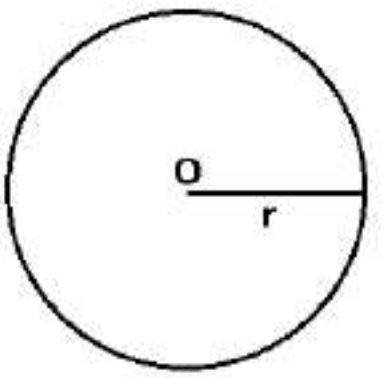
- **TRAPEZIUM:**





$$\boldsymbol{Area\ of\ a\ Trapezium = \frac{1}{2} \times (a + b) \times h}$$

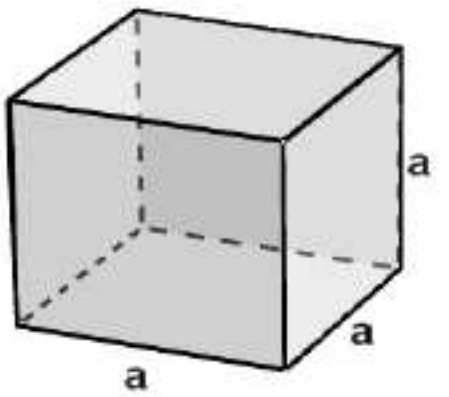
- **CIRCLE:**



$$\boldsymbol{Area\ of\ a\ Circle = \pi r^2}$$

$$\boldsymbol{Perimeter\ or\ circumference\ of\ a\ Circle = 2\pi r}$$

- **CUBE:**

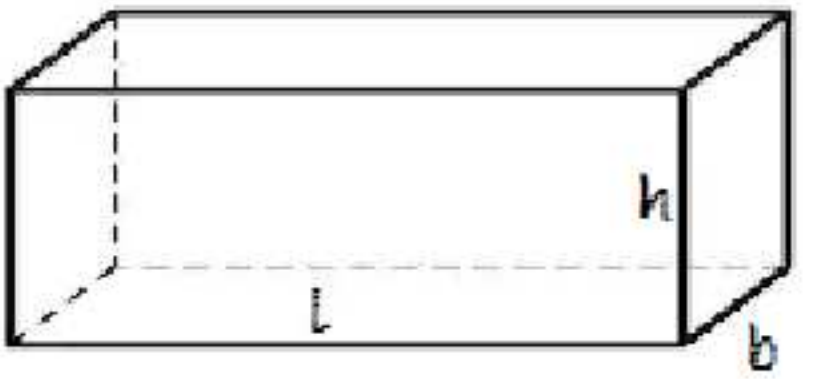


$$\boldsymbol{Volume\ of\ a\ cube = a^3}$$

$$\boldsymbol{Lateral\ surface\ area\ of\ a\ cube = 4a^2}$$

$$\boldsymbol{Total\ surface\ area\ of\ a\ cube = 6a^2}$$

- **CUBOID:**



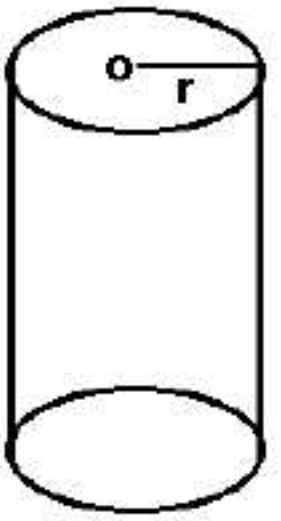
$$\boxed{Volume\ of\ a\ cuboid = l \times b \times h}$$

$$\boxed{Lateral\ surface\ area\ of\ a\ cuboid = 2(l+b)h}$$

$$\boxed{Total\ surface\ area\ of\ a\ cuboid = 2(lb+bh+hl)}$$

$$\boxed{Length\ of\ the\ diagonal\ of\ the\ cuboid = \sqrt{l^2+b^2+h^2}}$$

- **CYLINDER:**



$$\boxed{Volume\ of\ a\ cylinder = \pi r^2 h}$$

$$\boxed{Lateral\ surface\ area\ of\ a\ cylinder = 2\pi rh}$$

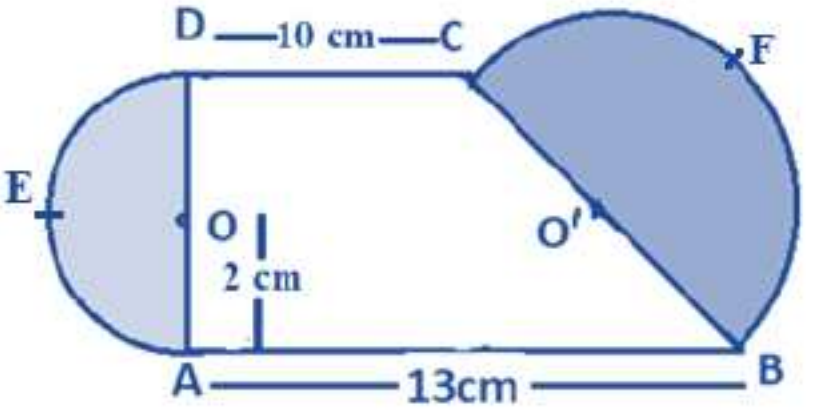
$$\boxed{Total\ surface\ area\ of\ a\ cylinder = 2\pi rh + 2\pi r^2 = 2\pi r(h+r)}$$

- $1\ cm^3 = 1\ ml$
- $1\ litre = 1000\ cm^3$
- $1\ m^3 = 1000\ litre = 1\ kilo\ litre$

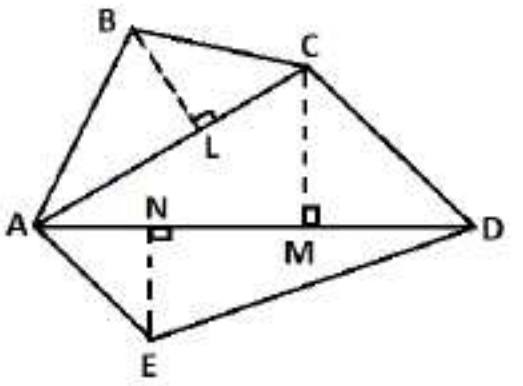
QUESTIONS

(NOTE: use $\pi = \frac{22}{7}$ unless stated)

1. In the given figure, AB ∥ DC and DA ⊥ AB. Find the ratio of area of semicircle AODE to the area of semicircle BO'CF.

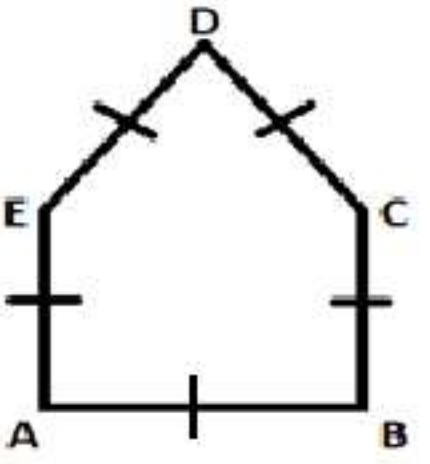


2. Find the area of figure ABCDE in which BL ⊥ AC, CM ⊥ AD and EN ⊥ AD such that AC = 10 centimetres, AD = 12 centimetres, BL = 3 centimetres, CM = 7 centimetres and EN = 5 centimetres.

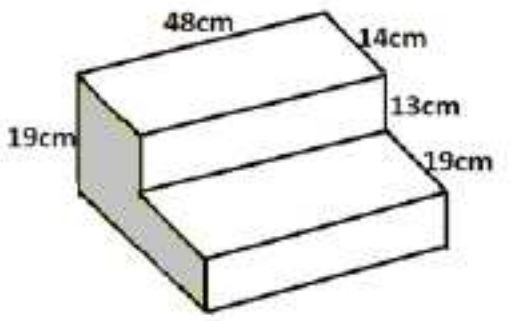


3. The parallel sides of a trapezium are in the ratio 3:4 and the perpendicular distance between them is 12 centimetres. If the area of a trapezium is 630 square centimetres, then find the length of shorter parallel side.

4. Find the area of given figure ABCDE, in which AB = BC = DC = DE = EA = EC = 25 metres.



5. What is the perimeter of the shaded face of given figure?



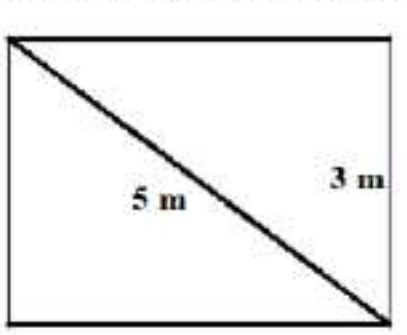
6. Find the area of the rhombus whose diagonals are 16 centimetres and 12 centimetres.

7. If the radius of the circle is 14 centimetres, then find the diameter of the circle.

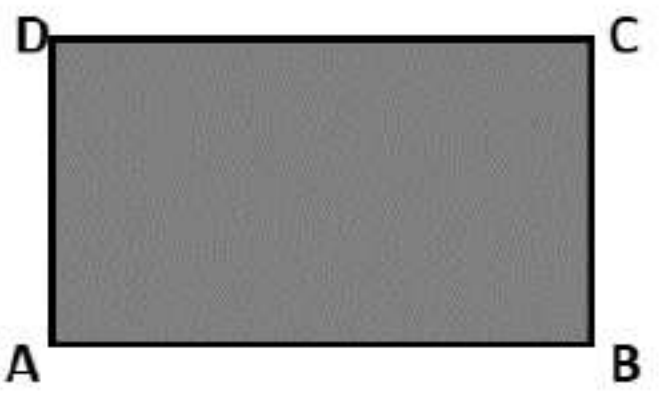
8. If a wire is bent into the shape of a square, then the area of the square is 81 square centimetres. When the wire is bent into a closed semi-circular shape, then find the area of semicircle.

9. The area of a rhombus is 28 square centimetres and one of its diagonals is 4 centimetres. Find its other diagonal.

10. In the given figure, the breadth of the rectangle is 3 metres and the length of diagonal is 5 metres. Find the perimeter of the rectangle.



11. ABCD is a rectangle. If the length AB is increased by 20% and breadth BC is decreased by 10% then what will be the percentage change in its area.



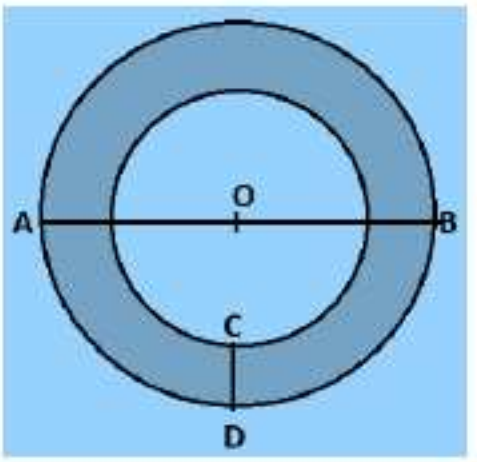
12. The side of a cube is 4 centimetres. Find its lateral surface area.

13. Find the total surface area of a cube of side 6 centimetres.

14. If the diameters of two circles are 14 centimetres and 7 centimetres, then find the ratio of their areas.

15. The height of a cylinder is 14 centimetres and its radius is 7 centimetres. Find the total surface area of the cylinder.

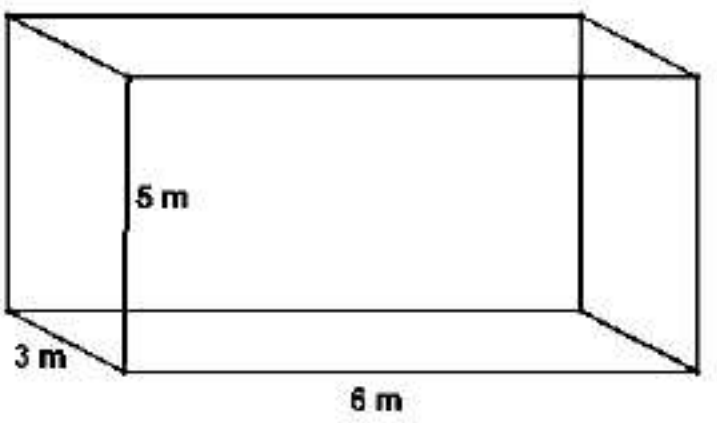
16. If AB = 120 centimetres, CD = 20 centimetres, then find the area of shaded portion. (Use $\pi = 3.14$)



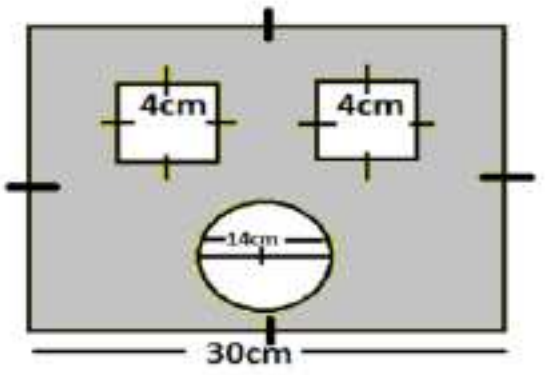
17. Find the side of the cube whose total surface area is 9600 square metres.

18. Find the volume of the cube given in question 17.

19. Find the total surface area of the cuboid shown in the figure.



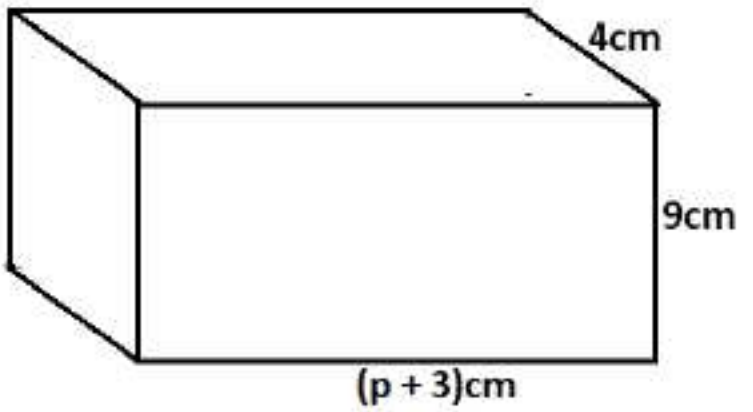
20. In the given figure, find the area of the shaded region.



21. Find the height of the cuboid whose base area and volume are 800 square metres and 6400 cubic metres respectively.

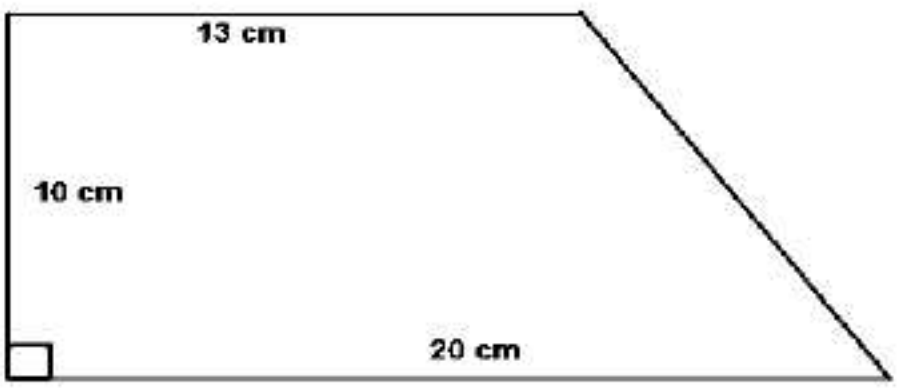
22. The dimensions of a cuboid are 60 centimetres × 54 centimetres × 30 centimetres. How many maximum cubes with side 6 centimetres each can be placed in this cuboid?

23. If volume of the given figure is 1800 cubic centimetres, then find the value of p.



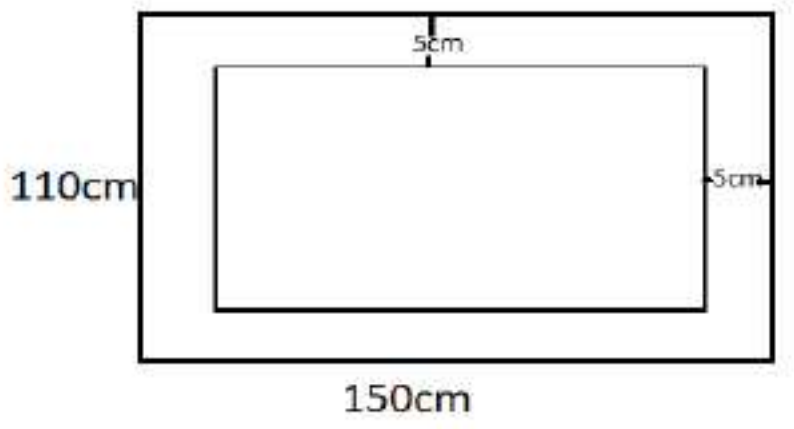
24. Volume of a cube is 3375 cubic centimetres. What is the length of the side of the cube?

25. Find the area of the given figure.

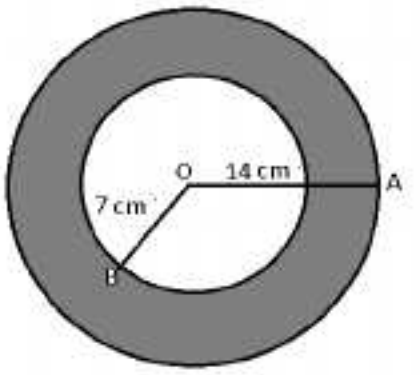


26. The sides of a room are in the ratio 3:2:4. The volume of the room is 24000 cubic metres. Find the length of the longest side of the room.

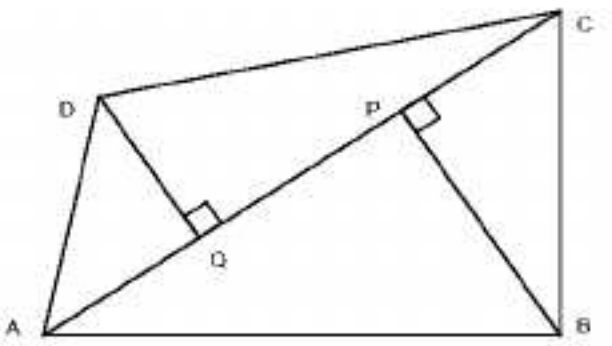
27. In the given figure, find the area of the path.



28. As shown in the given figure, two concentric circles having centre O, OA = 14 centimetres and OB = 7 centimetres. Find the area of the shaded portion.



29. As shown in the given figure, AC = 15 centimetres, DQ = 8 centimetres, BP = 10 centimetres. Find the area of the figure.



30. If the radius of circle is doubled, then by how much percent its area will increase?

31. The area of four walls of a room is 48 square metres. If perimeter of the floor is 16 metres, then find the height of the room.

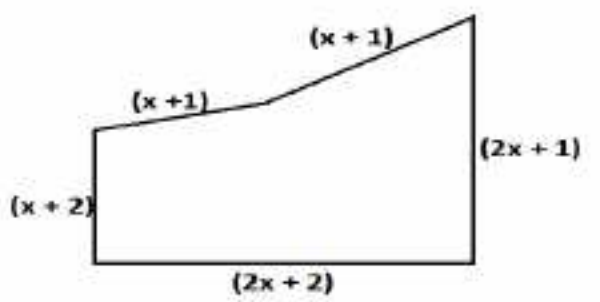
32. Find the area of a trapezium shaped field whose parallel sides are 132.7 metres and 67.3 metres respectively and distance between parallel sides is 23.75 metres.

33. The capacity of a cylindrical tank, whose base diameter is 4 metres is 44000 litres. Find its height.

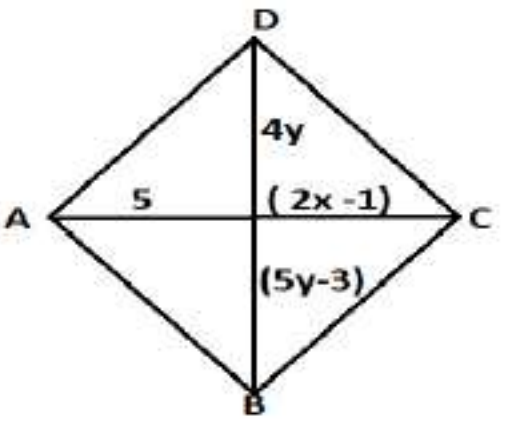
34. If the radius of a cylindrical tank is reduced to half of original radius, then what will be the change in its height if the volume of the cylinder remains same?

35. The area of the circular base of a cylindrical tank is 220 square centimetres. Find its volume if its height is 40 centimetres.

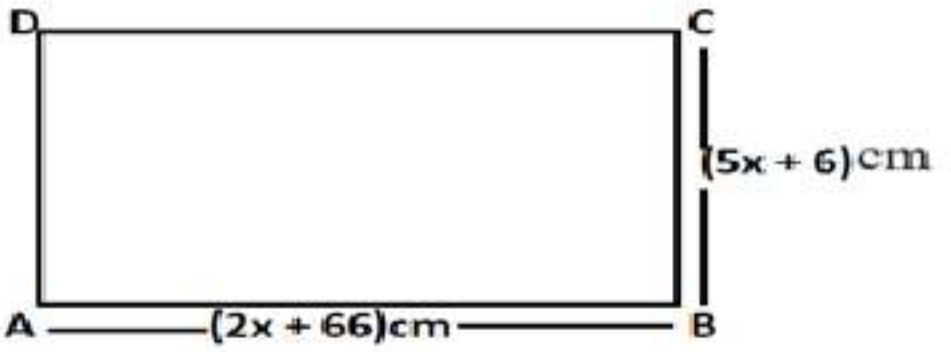
36. If the perimeter of given figure is 77 units, then find 'x'.



37. In the given figure, if ABCD is a rhombus, then find its perimeter.



38. If the perimeter of a rectangle is 186 centimetres, then find the value of x.



39. The volume of a reservoir is 108 cubic metres. Water is poured into it at the rate of 60 litres per minute. How many hours will it take to fill the reservoir?

40. The surface area of a cube is 1176 square centimetres. Find its volume.

41. The circumference of a base of cylinder is 176 centimetres and its height is 65 centimetres. Find its lateral surface area.

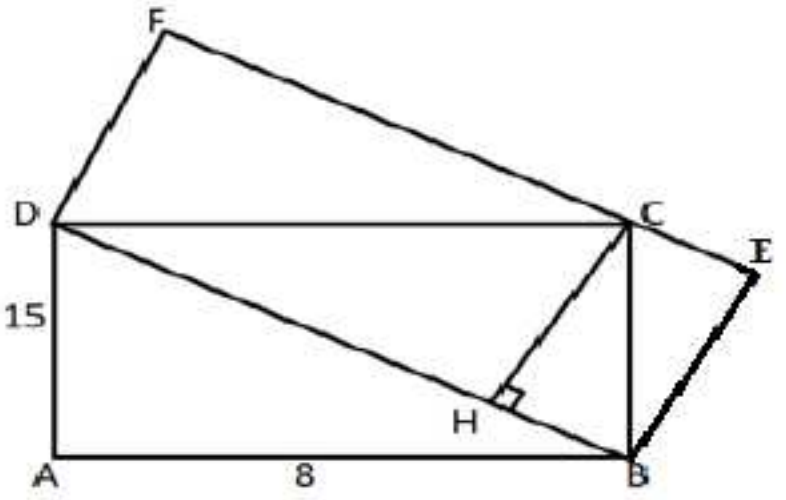
42. The edges of a cuboid are in the ratio 1:2:3 and its total surface area is 88 square centimetres. Find the volume of the cuboid.

43. Find the area of cardboard that will be needed to make a closed box with dimensions 25 centimetres × 15 centimetres × 8 centimetres.

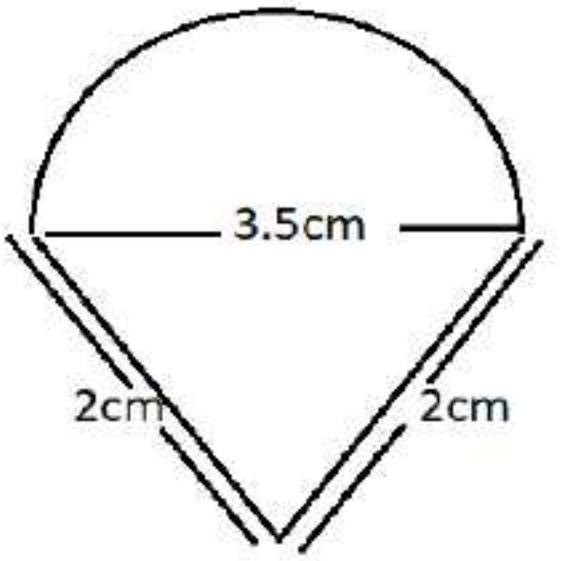
44. Three cubes of iron whose edges are 6 centimetres, 8 centimetres and 10 centimetres respectively are melted and formed into a single cube. Find the edge of the new cube formed.

45. The length, breadth and height of a cuboid are in the ratio 3:4:6 and its volume is 576 cubic centimetres. Find the whole surface area of a cuboid.

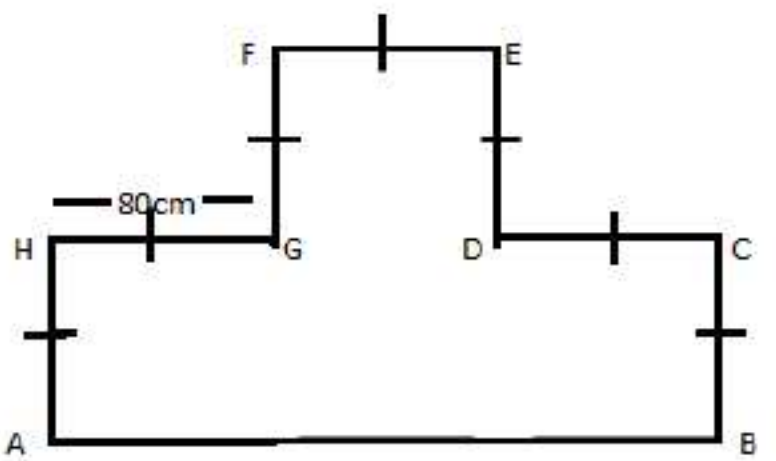
46. **Find the area of rectangle DBEF in square units, if two rectangles ABCD and DBEF are as shown in figure:**



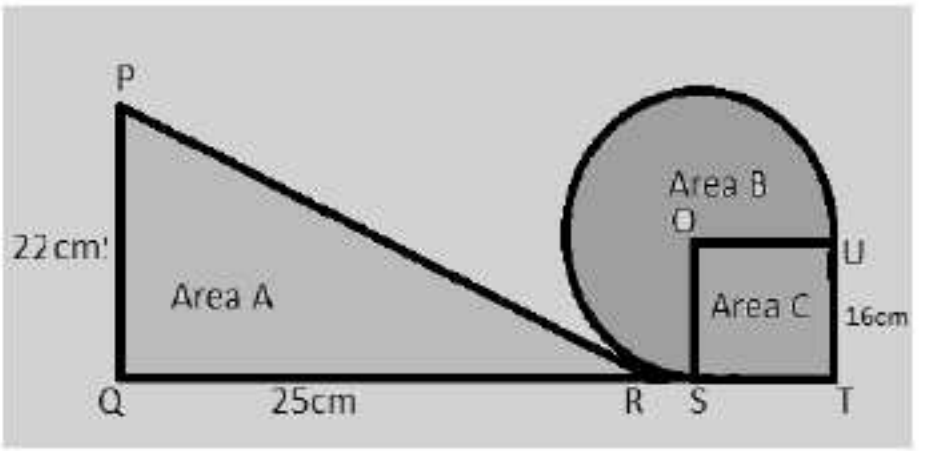
47. **Find the perimeter of the given figure.**



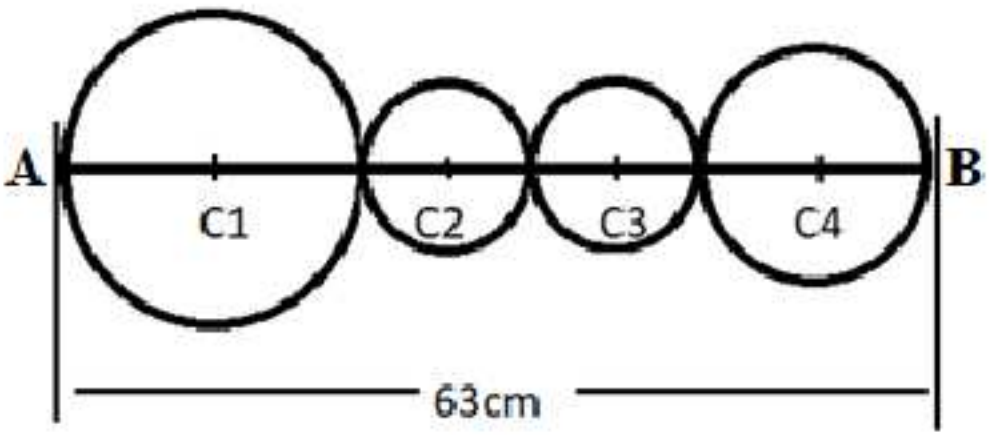
48. **The figure given below is made up of four identical square. Find its perimeter.**



49. **The figure below shows a right-angled triangle marked by Area A, a square of side 16 cm marked by area C overlapping a circle with centre O. The remaining area marked by Area B. Find the sum of area A and area B. (in terms of π)**



50. **The given figure is not drawn to scale. Line AB is 63 centimetres and it cuts through the centre of all the four circles. Find the perimeter of figure.**



ANSWERS

Q. No.	Answer	Q. No.	Answer
1	$\frac{16}{25}$	26	40 m
2	87 sq cm	27	2500 sq cm
3	45 cm	28	462 sq cm
4	$625\left(1+\frac{\sqrt{3}}{4}\right)$ sq m	29	135 sq cm
5	104 cm	30	300%
6	96 sq cm	31	3 m
7	28 cm	32	2375 sq m
8	77 sq cm	33	3.5 m
9	14 cm	34	4 times
10	14 m	35	8800 cu cm
11	8% increased	36	$x = 10$ units
12	64 sq cm	37	52 units
13	216 sq cm	38	$x = 3$
14	4:1	39	30 hours
15	924 sq cm	40	2744 cu cm
16	462 sq cm	41	11440 sq cm
17	40 m	42	48 cu cm
18	64000 cu m	43	1390 sq cm
19	126 sq m	44	12 cm
20	714 sq cm	45	432 sq cm
21	8 m	46	120 sq units
22	450	47	9.5 cm
23	p = 47	48	800 cm
24	15 cm	49	$(275 + 192\pi)$ sq cm
25	165 sq cm	50	198 cm

Chapter – 10

Exponents and Powers

Points to Remember

- **Exponent is used to express very large and very small numbers in standard form.**
- **Laws of exponents:**

If 'a' and 'b' are non-zero integers, 'm' and 'n' are the power of 'a' and 'b' respectively

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(a^m)^n = a^{mn}$$

$$a^m \times b^m = (ab)^m$$

$$a^0 = 1, a \neq 0 \left[a^0 = a^{x-x} = \frac{a^x}{a^x} = 1\right]$$

$$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$

- $(-1)^{even\ no.} = 1$
- $(-1)^{odd\ no.} = -1$
- $\sqrt[n]{a} = a^{\frac{1}{n}}$
- **We can use power of 10 to express very large number and very small number in standard form.**
- **Examples:-**

i. **Speed of light = 30,00,00,000 metres per second or 3.0×10^8 metres per second.**

ii. **The average diameter of red blood cell is 0.000007 millimetres or 7.0×10^6 millimetres.**

QUESTIONS

1. **Simplify:**

a) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$

b) $\left\{\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right\} \div \left(\frac{1}{4}\right)^{-3}$

2. **Simplify:**

   a) $(2^{-1} \times 5^{-1})^{-1} \div 4^{-1}$

   b) $(4^{-1} \times 8^{-1}) \div \left(\frac{2}{3}\right)^{-1}$

3. **Evaluate the following:**

   a) $(3^2)^3 + \left(\frac{2}{3}\right)^0 + 3^5 \times \left(\frac{1}{3}\right)^4$

   b) $(9)^{\frac{3}{1}} - 3 \times (5)^0 - \left(\frac{1}{81}\right)^{-\frac{1}{1}}$

4. **Express the following in standard form:**

   a) 0.00000000000015

   b) 0.000000000000001425

   c) 1020000000000000000

5. **Express the following in usual form:**

   a) 34.02×10^{-5}

   b) 9.5×10^5

   c) 2.0001×10^8

6. **Simplify:** $[(-6)^2 \times (-5)^3] \div (2)^3$

7. **Find the value of a, if** $(7)^a = (49)^5$

8. **By what number should** $\left(-\frac{3}{2}\right)^{-3}$ **be divided so that the quotient is** $\left(\frac{9}{4}\right)^{-2}$.

9. **Simplify:** $\left[\left\{\left(-\frac{1}{2}\right)^2\right\}^{-2}\right]^{-1}$

10. **Find the value of m, if** $\left(\frac{5}{7}\right)^m = \frac{125}{343}$

11. **Find the value of** $\frac{a}{b}$, **if** $\left(\frac{2}{5}\right)^3 \times \left(\frac{4}{25}\right)^{-2} = \frac{a}{b}$

12. **Simplify:** $(3)^{-5} \times (5)^{-4} \times 125 \times (3)^2$

13. **Simplify:** $(x^{-1} + y^{-1}) \div (x + y)$

14. **Simplify:**

   a) $\{(2^3)^2 + 3^2 \times 5^2\}^{\frac{1}{1}}$

   b) $(64)^{-\frac{1}{1}} - (32)^{-\frac{4}{5}}$

15. **Find the value of x for which** $\left\{\left(\frac{7}{12}\right)^{-4} \times \left(\frac{7}{12}\right)^{3x}\right\} = \left(\frac{7}{12}\right)^5$.

16. Simplify: $(4^{-1} + 29^{0}) \div (2)^{-2}$

17. Find the value of $(2p \times 3^{p})$, if $p = 2$.

18. If $(729)^{\frac{1}{5}} \times (4125)^{\frac{3}{5}} \times (605)^{\frac{1}{5}} = 3^{a} \times 5^{b} \times 11^{c}$, then find the value of (a + b + c).

19. If $\frac{8}{7^{1}} \times 7^{x} - 2 \times 7^{(x-2)} = 42$, then find the value of x.

20. If $5^{m} \times 125^{m} = (25)^{2}$, then find the value of m.

21. If $7^{n} \div 7^{2n} = \frac{1}{7}$, then find the value of n.

22. If $(x^{3} \times x^{-2})^{2} = 121$, then find the value of x.

23. Mass of the earth is 5.97×10^{24} kilograms and the mass of the moon is 7.35×10^{22} kilograms. What is the total mass of the two?

24. If $\left(\frac{x}{y}\right) = \left(\frac{3}{2}\right)^{-2} \div \left(\frac{3}{7}\right)^{0}$, then find the value of $\left(\frac{x}{y}\right)^{-3}$.

25. If $5^{2x} = 625$, then find the value of x.

26. If $\left(\frac{7}{2}\right)^{13} \div \left(\frac{7}{2}\right)^{3} = \left(\frac{7}{2}\right)^{4x+2}$, then find the value of x.

27. Find the value of $(a^{3} \times b^{2}) \div ab$, if $a = 2$ and $b = 3$.

28. Simplify: $(\sqrt{5})^{5} \div (\sqrt{5})^{3}$

29. Find the value of $(-\frac{70}{x})$, if $(81)^{-4} \div (729)^{2-x} = 9^{4x}$

30. Simplify: $\frac{(x^{m+n})^{1} \times (x^{n+p})^{1} \times (x^{p+m})^{1}}{(x^{m} \times x^{n} \times x^{p})^{1}} \times \frac{1}{(x^{1})^{p} \times (x^{1})^{m} \times (x^{1})^{n}}$

31. If $x = \left(\frac{3}{2}\right)^{3} \times \left(\frac{2}{3}\right)^{4}$, then find the value of x^{2}.

32. If $7^{x+y} = 343$ and $49^{x} = 2401$, then find the value of y.

33. Simplify:

    (a) $\frac{9^{15} \times 15^{11} \times 2^{13}}{30^{10}}$

    (b) $\left(\frac{4^{-3} a^{-5} b^{-4}}{4^{-5} a^{-8} b^{3}}\right) \div \frac{a^{3}}{b^{7}}$

34. Find the value of $(125)^{-\frac{1}{3}}$.

35. Simplify:

    a) $1 + \left[\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right] \div 38$

    b) $\frac{1}{1+p^{a-b}} + \frac{1}{1+p^{b-a}}$

36. If $9^x = \frac{1}{27}$, then find the value of x.

37. If $\frac{x}{y} = \frac{3}{2}$, then find the value of $\frac{x^2-y^2}{x^2+y^2}$.

38. Find the value of $[6^3 + 8^3 + 10^3]^{\frac{1}{3}}$.

39. Simplify: $(x)^{a^2-b^2}.(x)^{b^2-c^2}.(x)^{c^2-a^2}$.

40. If a + b + c = 0, then find the value of $\frac{(x)^{a+b}.(x)^{b+c}.(x)^{c+a}}{(x)^a.(x)^b.(x)^c}$

41. If $2^{1998} - 2^{1997} - 2^{1996} + 2^{1995} = K \times 2^{1995}$, then find the value of K.

42. Find the value of $[(1)^1 + (2)^2 + (3)^3]^{\frac{1}{5}}$

43. In the standard form, 72105.4 is written as 7.21054 x 10^n. Find the value of n.

44. Simplify: $\sqrt[4]{\sqrt[3]{x^{36}}}$

45. If $\left(\frac{\sqrt{5}}{3}\right)^m = 1 - \left(\frac{2}{3}\right)^2$, then find the value of m.

46. Find the value of x when

$$\left(-\frac{3}{11}\right)^{x+5} \div \left(-\frac{3}{11}\right)^{-2x+3} = \left(-\frac{3}{11}\right)^{2x+5} \times \left[\left(-\frac{3}{11}\right)^{-2}\right]^{(x+4)}$$

47. If $\left(-\frac{4}{15}\right)^3 \times \left(-\frac{4}{15}\right)^{-6} = \left(-\frac{4}{15}\right)^{2x+1}$, then find the value of $x^2 + 2x + 1$.

48. If $5^{2p} + 5^p + 5^0 = 651$, then find the value of p.

49. If $\frac{\left(\frac{1}{3}\right)^3 \times \left(\frac{1}{3}\right)^{-1} \times \left[\left(\frac{1}{3}\right)^1\right]^{-1} \times \frac{1}{14}}{\left(\frac{1}{3}\right)^{-5} \times \left(\frac{3}{1}\right)^{-11}} = \frac{2^a}{3^b}$, then find the value of (a × b).

50. If $\frac{128}{1458} = \left(\frac{2}{x}\right)^6$, then find the value of x.

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	a) 29 b) $\frac{19}{64}$	25.	$x = 2$
2.	a) 40 b) $\frac{1}{48}$	26.	$x = 2$
3.	a) 733 b) 15	27.	12
4.	a) 1.5×10^{-13} b) 1.425×10^{-15} c) 1.02×10^{19}	28.	5
		29.	5
5.	a) 0.0003402 b) 950000 c) 200010000	30.	1
		31.	$\frac{4}{9}$
6.	$-\frac{1125}{2}$	32.	$y = 1$
7.	$a = 10$	33.	a) $3^{51} \times 40$ b)16
8.	$-\frac{3}{2}$	34.	$\frac{1}{25}$
9.	$\frac{1}{16}$	35.	a) $1\frac{1}{2}$ b) 1
10.	$m = 3$	36.	$-\frac{3}{2}$
11.	$\frac{5}{2}$	37.	$\frac{5}{13}$
12.	$\frac{1}{135}$	38.	12
13.	$\frac{1}{xy}$	39.	1
14.	a) 17 (b) $\frac{1}{16}$	40.	1
15.	$x = 3$	41.	K = 3
16.	5	42.	2
17.	36	43.	$n = 4$
18.	6	44.	x^3
19.	$x = 3$	45.	$m = 2$
20.	$m = 1$	46.	$x = -\frac{5}{3}$
21.	$n = 1$	47.	1
22.	$x = 11$	48.	p = 2
23.	6.0435×10^{24} kg	49.	117
24.	$\frac{729}{64}$	50.	$x = 3$

CHAPTER – 11

DIRECT AND INVERSE PROPORTIONS

Points to Remember

- In direct proportion, two quantities 'x' and 'y' increase or decrease together, the ratio of their corresponding values remains constant.

  i.e. $\frac{x_1}{y_1} = \frac{x_1}{y_1} = k$

  or $\frac{x_1}{x_1} = \frac{y_1}{y_1} = k$, where k is a positive number.

  e.g. Ramesh covers a distance of 4 kilometres in 2 hours and with same speed he can cover 8 kilometres in 4 hours. We can say that when time is increased, distance also increases. So, it is a case of direct proportion.

- In inverse proportion, increase in a quantity 'x', causes a proportional decrease in quantity 'y' or increase in a quantity 'y', causes a proportional decrease in quantity 'x', the product of their corresponding values remains constant.

  i.e. $x_1 y_1 = x_2 y_2 = k$

  or $\frac{x_1}{x_1} = \frac{y_1}{y_1} = k$, where k is a positive number.

  e.g. Four men complete a construction work in 10 days and 5 men complete the same work in 8 days. When the number of workers is increased, the number of days to complete the same work decreases. So, it is a case of inverse proportion.

QUESTIONS

1. If 15 oranges cost ₹ 70, then find the cost of 39 oranges.
2. If the cost of 9 toys is ₹ 333, then find the cost of 16 such toys.
3. If 12 metres of a uniform iron rod weighs 42 kilograms, then find the weight of 8 metres of same rod.
4. A worker is paid ₹ 200 for 8 days. If he works for 20 days, then find the amount he will get.
5. A train covers a distance of 51 kilometres in 45 minutes. How long will it take to cover 221 kilometres?

6. The scale of a map is 1:200000. Points A and B are 5 centimetres apart on map. Find the actual distance between A and B.
7. Four pipes can fill a tank in 1 hour 20 minutes. How long will it take to fill the tank if 8 pipes are used?
8. If 15 tailors can stitch a dress in 24 days, then how long will 9 tailors take to stitch the same dress.?
9. A bus is travelling at an average speed of 55 kilometres per hour. How much distance would it cover in 12 minutes?
10. 20 women can whitewash a building in 26 days. In how many days can 52 women whitewash the same building?
11. 72 chocolates are packed in 8 boxes of same size. How many boxes are required for 360 chocolates?
12. 6 men can construct a wall in 5 days. If 10 men are employed, then find the number of days in which the similar wall can be constructed.
13. A carpenter prepares 36 tables in 8 days. In how many days would he prepare 27 such tables?
14. If 560 notebooks cost ₹ 3920, then find the cost of 6 dozen notebooks.
15. 10 women can do a job in 20 days. In how many days can 20 women do the same job?
16. What will happen to the area of a square if the length of each side is doubled?
17. A scooter travels 44 kilometres in 4 litres of petrol. How far will it go in 13 litres of petrol?
18. In a fort, there is food for 240 soldiers that is enough for 10 days. If 40 soldiers left the fort, then for how many days the food will last?
19. Nine bags of fertilizers weigh 639 kilograms. What is the weight of four bags?
20. Ravi takes 40 minutes to reach the school with a speed of 4 kilometres per hour. If he walks with a speed of 5 kilometres per hour, then how much time will he now take to reach the school?
21. If the cost of 20 metres cloth is ₹ 420, then how much cloth can be bought for ₹ 105?
22. Out of 45 students, 9 are absent. Find the ratio of present students to absent ones.
23. The weekly consumption of potatoes in a hostel with 640 students is 160 kilograms. Find the consumption if the number of students become 800.

24. If 22.5 metres of a uniform iron rod weighs 85.5 kilograms, then find the length of 17.1 kilograms of the same rod.
25. 6 taps can fill a water tank in 90 minutes. How many taps can fill the same water tank in 30 minutes?
26. If Aman reads 12 pages daily, then he can complete a book in 15 days. How many days will he take to complete the book, if he reads 30 pages daily?
27. A stock of food grains is enough for 600 students for 10 weeks. How long will the same stock last for 240 students?
28. If the length of a rectangle is halved, then what change should be made in its breadth so that its area remains the same?
29. 12 workers can construct a room in 7 hours. How many workers will be needed for constructing the same sized room in 2 hours?
30. Aman and Abhinav can complete a project in 24 days. Aman alone can do the same task in 36 days. How much time will Abhinav take alone to complete the same project?
31. In a library, 189 copies of a certain book require a shelf length of 3.78 metres. How many copies of the same book would occupy shelf length of 0.42 metres?
32. Mohan is paid ₹ 2720 for working eight days. If his total wages during a month is ₹ 6800, then find the number of days he works.
33. A train running at the speed of 108 kilometres per hour passes a signal post in 10 seconds. Find the length of the train in metres.
34. If 30 stamps occupy an area of 75 square centimetres, then find the area of paper required for putting 330 stamps assuming that no area is wasted in between two stamps.
35. It takes 2 hours for 6 pipes to fill a tank. Find the time needed to fill 10 such tanks if 12 pipes are used.
36. In 25 days, the earth absorbs 6×10^8 pounds of dust from the atmosphere. How much dust (in pounds) will it absorb in 15 days in standard form?
37. If 75 goats can graze a field in 13 days, then how many goats will graze the same field in 25 days?

38. Kavita can type a given assignment in 1 hour 30 minutes at a speed of 50 words per minute. Her friend Kareem can type the same assignment in 60 minutes. Find Kareem's typing speed.

39. If 40 square metres of a carpet cost ₹ 241.60, then find the cost of 50 square metres of carpet.

40. Reena, Meena and Teena can complete a job in 10, 12 and 15 days respectively. In how many days will they complete the work together?

41. A journey by car takes 45 minutes at 40 kilometres per hour. How fast must a car go to undertake the same journey in 25 minutes?

42. If 30 women can repair a road in 48 days, then how long will 18 women take to repair the same road?

43. Rekha can drive to Gwalior in eight hours at 60 kilometres per hour. How long will Ravi take to drive to Gwalior from the same place, if his speed is 40 kilometres per hour?

44. The speed of a train 125 metres long is 45 kilometres per hour. How much time will it take to pass a platform 1375 metres long?

45. 6 monkeys take 6 minutes to eat 6 bananas. How many minutes will 10 monkeys take to eat 10 bananas if their speed of eating is equal?

46. How long will an athlete take to run around a rectangular park measuring 50 metres × 40 metres, if she runs at a speed of 3 metres per second?

47. Reema types 540 words in half an hour. How many words would she type in 12 minutes?

48. If a weight of 150 gram produces an extension of 2.9 centimetres, then find the weight that will produce an extension of 17.4 centimetres.

49. A shopkeeper has enough money to buy 40 books, each costing ₹ 125. How many more books he can buy if he gets a discount of ₹ 25 on each book?

50. A person can finish his work in 25 days, working eight hours a day. If he wants to finish the same work in 20 days, then how many hours should he work in a day?

51. A car travels 60 kilometres in 1 hour 30 minutes. How long it takes to cover a distance of 100 kilometres at the same speed?

52. A 150 metres long train is running at 72 kilometres per hour. It crosses a bridge in 13 seconds. Find the length of the bridge.

53. A 400 metres long train is running at a speed of 72 kilometres per hour. How much time does it take to cross a telegraph post?

54. Two bus drivers start from same place in opposite directions. One goes towards north at the speed of 36 kilometres per hour and other goes towards south at the speed of 40 kilometres per hour. After how many minutes will they be 190 kilometres apart?

55. Satyam has enough money to buy 60 oranges at ₹ 5 per orange. How many oranges can he buy if the price is increased by ₹ 1 per orange?

56. The cost of 32 packets of Vim each weighing 900 grams is ₹ 576. What will be the cost of 27 packets if each packet weighs 1 kilograms?

57. Abha cycles to her school at an average speed of 15 kilometres per hour. It takes 20 minutes to reach the school in time. At what speed should she cycle, if she has to reach 5 minutes earlier?

58. While driving his car at a speed of 50 kilometres per hour, Rajesh covers a distance from home to his office in 1 hour 30 minutes. One day, he started 15 minutes late from his home. In order to reach office at time, what should be the speed of his car?

59. A group of 3 friends staying together consume 54 kilograms of wheat every month. Some more friends join this group and they find the same amount of wheat last for 18 days. How many new members joined this group?

60. Ranjeet starts his journey to a certain place by car at 9 a.m. and reaches the place at 1 p.m., if he drives the car at a speed of 30 kilometres per hour. By how much should he increase the speed so that he can reach the place by 12 noon?

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	₹ 182	28.	Breadth should be doubled
2.	₹ 592	29.	42 workers
3.	28 kg	30.	72 days
4.	₹ 500	31.	21 copies
5.	195 minutes or 3hours 15 minutes	32.	20 days
6.	10 km	33.	300 m
7.	40 minutes or 2/3 hours	34.	825 sq cm
8.	40 days	35.	10 hours
9.	11 km	36.	3.6×10^8 pounds
10.	10 days	37.	39 goats
11.	40 boxes	38.	75 words per minutes
12.	3 days	39.	₹ 302
13.	6 days	40.	4 days
14.	₹ 504	41.	72 km/h
15.	10 days	42.	80 days
16.	Area becomes 4 times	43.	12 hours
17.	143 km	44.	2 minutes
18.	12 days	45.	6 minutes
19.	284 kg	46.	60 seconds or 1 minute
20.	32 minutes	47.	216 words
21.	5 m	48.	900 gm
22.	4:1	49.	10 more books
23.	200 kg	50.	10 hours per day
24.	4.5 m	51.	2 hours 30 minutes
25.	18 taps	52.	110 m
26.	6 days	53.	20 seconds
27.	25 weeks	54.	150 minutes or 2 hours 30 minutes
55.	50 oranges	58.	60 km/h
56.	₹ 540	59.	2 new members
57.	20 km/h	60.	10 km/h

CHAPTER – 12

FACTORIZATIONS

Points to Remember

- When we factorize an algebraic expression, we write it as a product of its factors. These factors are either numbers or algebraic variables or algebraic expressions.
- We use following methods of factorization:

- Method of common factors
- Regrouping method
- Factorization using following identities

$$a^2 + 2ab + b^2 = (a + b)^2$$

$$a^2 - 2ab + b^2 = (a - b)^2$$

$$a^2 - b^2 = (a - b)(a + b)$$

$$x^2 + (a + b)x + ab = (x + a)(x + b)$$

- An irreducible factor is a factor which cannot be expressed further as a product of factors (i.e. prime factor for numbers) eg. $x + 2, a + b, x - y$ etc.
- The general relation for division is:

$$\text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$$

- If remainder $= 0$, then divisor is a factor of dividend.

e.g. $\frac{x^2 - 3x - 12}{x - 4} = \frac{(x-4)(x+3)}{x-4} = (x + 3)$. So $(x - 4)$ is a factor of the dividend.

- The degree of a polynomial is the highest power of the variables. e.g. the degree of the polynomial $4x^3 + 2x^2 - 7x + 5$ is 3.

QUESTIONS

1. Find the prime factors of 45
2. Find the common factor of $13xyz$, $26xy^2$ and $39x^2y$
3. Find the common factor of $(3uv + 9u)$ and $2(v + 3)$
4. Find the common factor of $(u + v)(a + b)$ and $w(a + b)$
5. Find the factorized form of $21xy - 42x + 34y - 68$
6. Find the remainder when divisor is a factor of the dividend.
7. Simplify: $\frac{77xyz}{7x}$
8. Factorise : $k^6 - 12k^3$
9. Which identity will be used to factorise $a^2 + 20b + 100$?
10. Find the product of $(3x + 2)(3x - 2)$.
11. Find the quotient on dividing $x^2 - x - 30$ by $(x - 6)$.
12. Factorizing $100x^4 - 81y^4$ gives $10x^2 - 9y^2$ as one factor, find the other factor.
13. Find the value of $(96)^2$ using suitable identity.
14. Find the value of $(105 \times 105 - 5 \times 5)$
15. Evaluate: 99×101
16. Factorise: $x(y - z) + y(y - z)$
17. Express $y^2 + 5y - 6$ as product of two expressions.
18. If $a = 15$ and $b = 14$, then find the value of $(a^2 - b^2)$.
19. Find the coefficient of u^2 in the quotient of the algebraic expression $\frac{3u^3 + 5u^2 + 7}{u+2}$.
20. Find the quotient of algebraic expression $\frac{4x^2y + 8x^2y^2 - 16xy^2}{4xy}$.
21. Find the coefficient of a^4 in the product of $\left(\frac{1}{4}a^2 + b^2\right)\left(a^2 - \frac{3}{2}b^2\right)$.
22. Find the constant term in the product of $(z + 3)(z - 7)$.
23. What should be added to $16x^2 + 9$ to make it $(4x - 3)^2$?
24. What should be subtracted from $25y^2 + 20$ to make it $(5y - 4)^2$?
25. Find the two numbers P and Q such that $P - Q = 2$ and $PQ = 24$.
26. Find the value of $(a^2 - b^2)$, if $a = -3$ and $b = 3$.

27. Find the value of k, if $k(a^2 - b^2) = a^4 - b^4$

28. Find the value of q, if $q(a^2 + b^2) = a^4 - b^4$

29. Find Dividend when Divisor = $(x + 3)$, Quotient = $(x + 1)$ and Remainder = 0.

30. Find Quotient, if Dividend = y^2, Divisor = $y - 5$ and Remainder = 25.

31. If $2a + 3b = 12$ and $2a - 3b = 20$, then find the value of a.

32. If $3x - 5y = 1$ and $3x + 5y = 11$, then find the value of x^3.

33. If $a + \frac{1}{a} = \sqrt{3}$, then find the value of $a^2 + \frac{1}{a^2}$

34. If $x - \frac{1}{x} = 7$, then find the value of $x^2 + \frac{1}{x^2}$

35. If $z + \frac{1}{z} = 11$, then find the value of $z^2 + \frac{1}{z^2}$

36. Find the value of $6^2 - 2 \times 6 \times 5 + 5^2$

37. Simplify: $\frac{(x+y)^2 - (x-y)^2}{xy}$

38. Simplify: $\frac{(x^2+y^2)}{(x^4-y^4)}$

39. Simplify: $\frac{x^4 - 16}{(x^2+4)(x-2)}$

40. Find the value of $\frac{2.1 \times 2.1 \times 2.1 \times 2.1 - 1.9 \times 1.9 \times 1.9 \times 1.9}{2.1 \times 2.1 + 1.9 \times 1.9}$

41. Find the value of $(7.4)^2 - (2.6)^2$

42. Find the value of $\frac{9.5 \times (3+1.5)}{1 + 3.5}$

43. Find the value of $\frac{7.2 \times 2.8}{10 - 2.8}$

44. Find the value of $y^3 + y^2 - y + 1$, if $y = 1$.

45. Find the value of $z^3 - z^2 + z + 2$, if $z = -1$.

46. The area of a rectangular playground is $(14p^2 - 35p)$ square units. If one of its side measures $7p$ units, then find the measure of the other side.

47. If $(49x^2 + 14x + 35)$ kilograms of sugar is stored in 7 bags in equal quantities, then how many kilograms of sugar is there in each bag?

48. The radius of a circle is $(7ab - 7bc - 14a)$ centimetres. Find the circumference of this circle. (Use $\pi = \frac{22}{7}$)

49. Factorise: $x^2 - (p - 5)x - 5p$

50. Factorise: $(x - 10)(x + 10) + 36$

51. If $1003 \times 997 = 1000^2 - k$, then find the value of 'k'.

52. To find the value of 196×206, a student rewrite it as $200^2 + q \times 200 - 24$. What is the value of q ?

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	3 and 5	27.	$a^2 + b^2$
2.	$13xy$	28.	$a^2 - b^2$
3.	$(v + 3)$	29.	$x^2 + 4x + 3$
4.	$(a + b)$	30.	$(y + 5)$
5.	$(21x + 34)(y - 2)$	31.	$a = 8$
6.	0	32.	$x^3 = 8$
7.	$11yz$	33.	1
8.	$k^3\,(k^3 - 12)$	34.	51
9.	$\mathbf{a^2 + 2ab + b^2 = (a + b)^2}$	35.	119
10.	$9x^2 - 4$	36.	1
11.	$x + 5$	37.	4
12.	$10x^2 + 9y^2$	38.	$\frac{1}{x^1 - y^1}$ or $\frac{1}{(x+y)(x-y)}$
13.	9216	39.	$(x + 2)$
14.	11000	40.	0.8
15.	9999	41.	48
16.	$(x + y)(y - z)$	42.	9.5
17.	$(y + 6)(y - 1)$	43.	2.8
18.	29	44.	2
19.	3	45.	-1
20.	$x + 2xy - 4y$	46.	$(2p - 5)$ units
21.	$\frac{1}{4}$	47.	$(7x^2 + 2x + 5)$ kg
22.	-21	48.	$44(ab - bc - 2a)$ cm
23.	$-24x$	49.	$(x - p)(x + 5)$
24.	$(40y + 4)$	50.	$(x - 8)(x + 8)$
25.	P = 6, Q = 4	51.	$k = 9$
26.	0	52.	$q = 2$

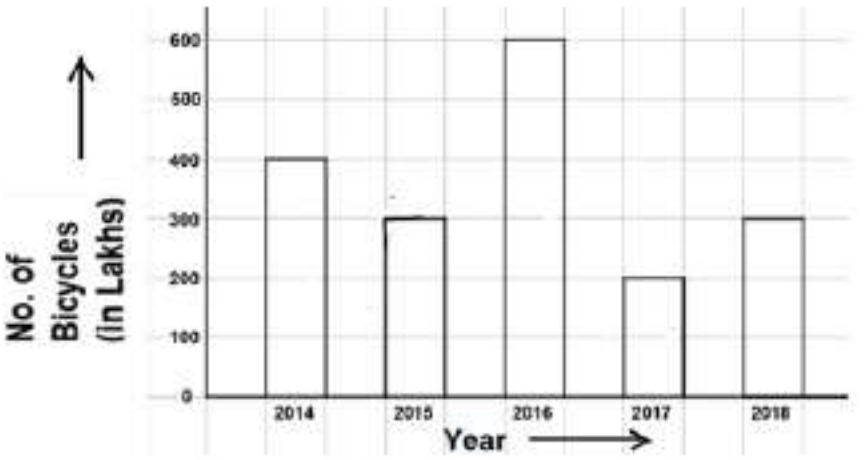
CHAPTER – 13

INTRODUCTION TO GRAPHS

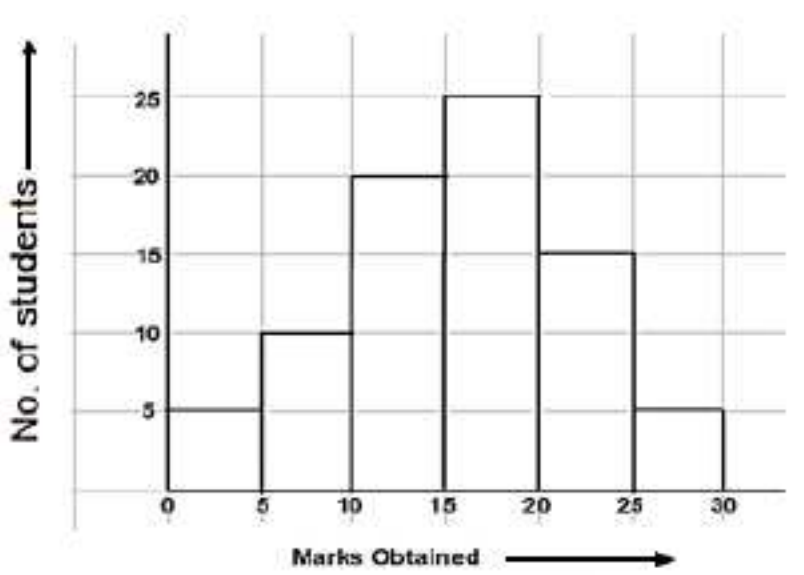
Points to Remember

Following are the different types of graphs:

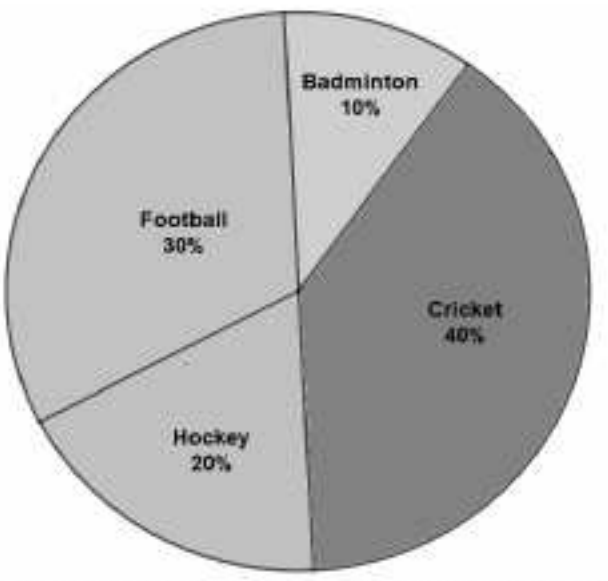
1. BAR GRAPH: Bar graph is used to show comparison among categories.



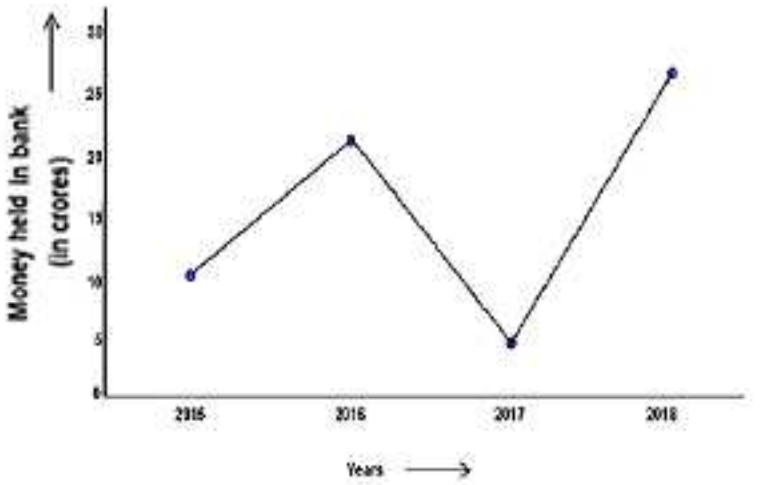
2. HISTOGRAM: Histogram is used when grouped data is given.



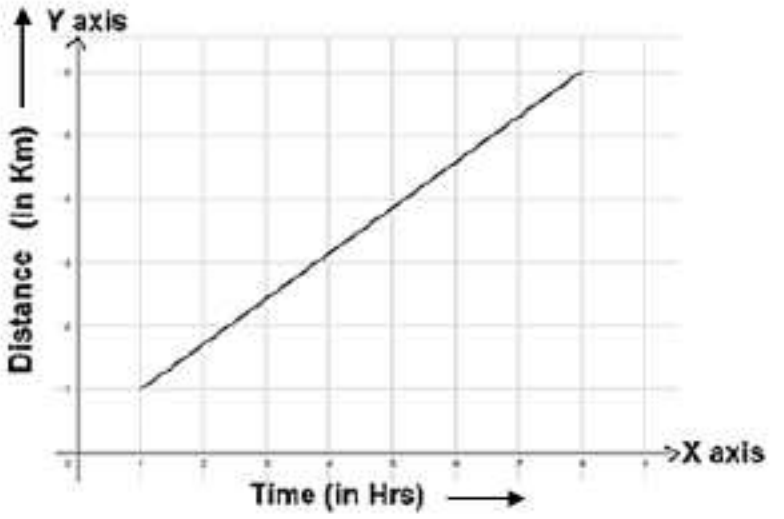
3. PIE CHART: Pie Chart is used to compare parts of a whole.



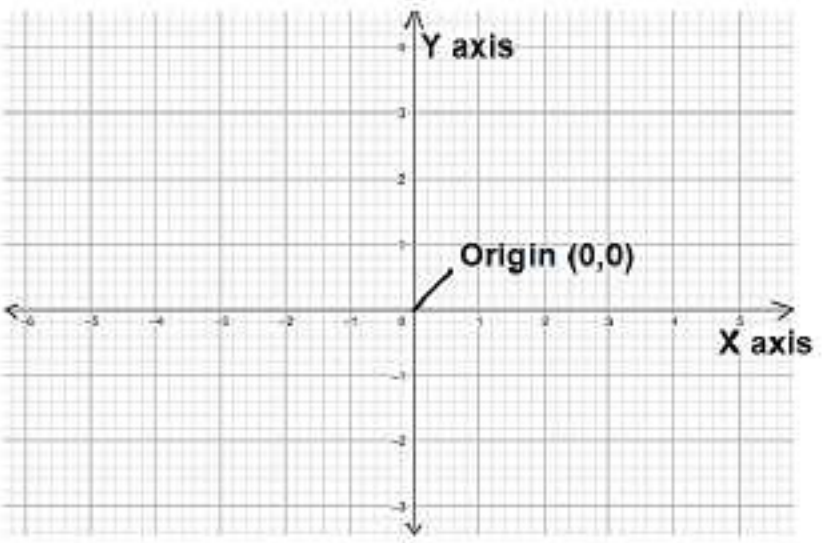
4. LINE GRAPH: A line graph is used to display the data that changes continuously over a period of time.



5. LINEAR GRAPH: A line graph which is a whole unbroken line is called a linear graph.

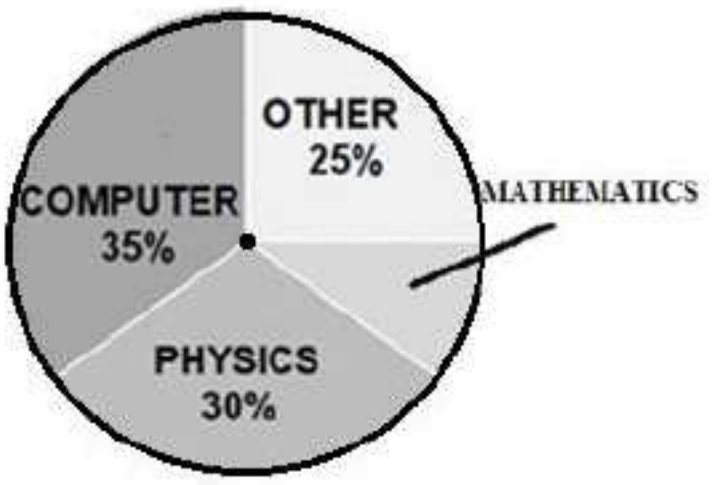


6. CARTESIAN SYSTEM: The 17th century mathematician Rene Descartes provided a system of locating a point with the help of two measurements, horizontal(x-coordinate) and vertical(y-coordinate). This system is known as Cartesian System of coordinates.



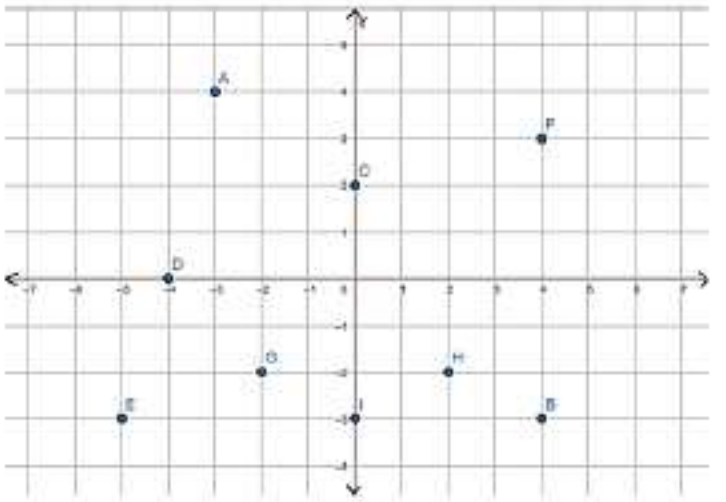
QUESTIONS

1. Point (0, −2) lies in /on _____.
2. Find the figure obtained by joining the points (0, 0), (0, 2), (2, 2) and (2, 0) in the given order.
3. A point which lies on both the axes is _____.
4. Find the distance of point (3, 4) from x-axis and y − axis.
5. Find the x-coordinate of a point lying on y-axis and y-coordinate of a point lying on x-axis .
6. Find the perpendicular distance of the point (7, 8) from x-axis.
7. Find the perpendicular distance of the point (4, 5) from y-axis.
8. Find the coordinates of a point which is at a distance of 6 units from x axis and 5 units from y axis.
9. Find the shortest distance of the point (6, 8) from origin.
10. Find the shortest distance of the point (7, 0) from origin.
11. Find the shortest distance of the point (0, 8) from origin.
12. Find the shortest distance between the points (14, 3) and (9, 3).
13. Find the distance between two points A (0, 3) and B (0, −9).
14. Find the coordinates of the point for which $x = 0$ and $y = x + 2$.
15. Find the coordinates of the point for which $y = 0$ and $y = x + 2$.
16. To which axis will the line joining the points having x-coordinate constant will be parallel?
17. To which axis will the line joining the points having y-coordinate constant will be parallel?
18. Name the point where two axes intersect.
19. The pie chart below shows the number of pupils taking subjects in a science class. Find the angle that represents Mathematics.



20. A bag contains 144 coloured balls among which 12 are red, 18 are yellow, 28 are blue, 42 are green and remaining is white. Find the central angle needed for white colour balls to draw a pie chart.

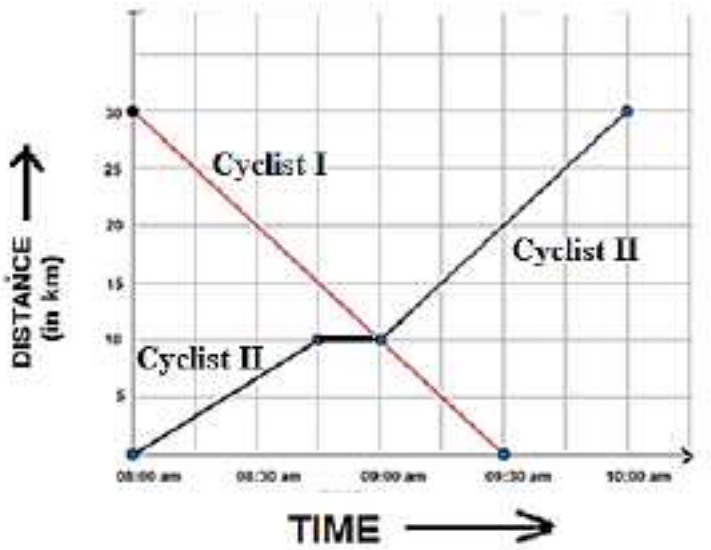
21. Write the coordinates of the points A to I in the following graph_1:



Graph_1

For question 22 – 26

The following graph shows the journey made by two cyclists, one from town A to B and other from B to A.



22. At what time did the two cyclists start their journey?

23. At what time did the two cyclists meet?

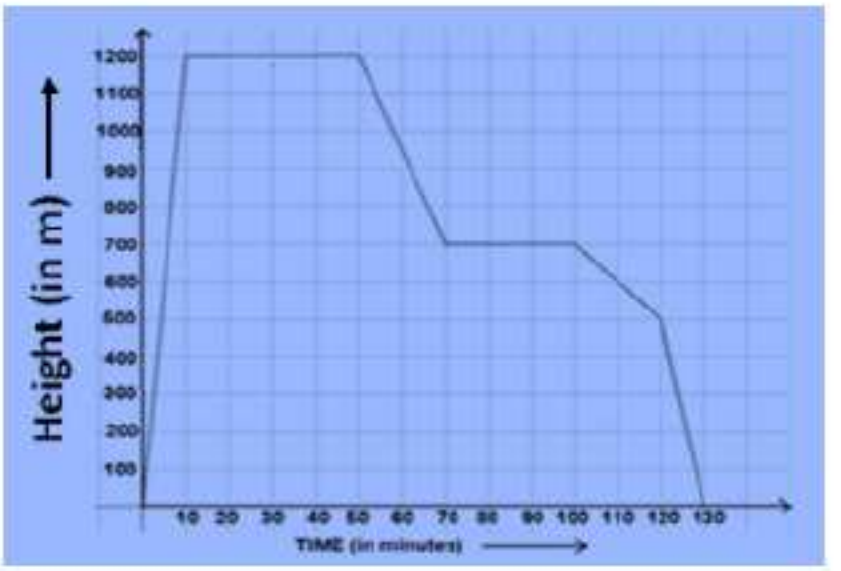
24. For what duration did the cyclist II rest?

25. Find the sum of time taken by both cyclists to complete their journey.

26. What distance was travelled by second cyclist, when he met first cyclist?

For question 27 – 31

The following graph depicts the height at which aeroplane is flying with respect to time.



27. **What are the scales taken on x-axis and y-axis?**

28. **Find the height at which aeroplane is flying after $1\frac{1}{4}$ hour.**

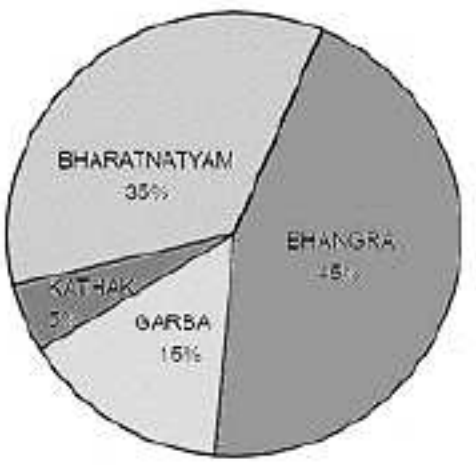
29. **Find the speed of the aeroplane while rising.**

30. **For what duration was the plane in level flight?**

31. **Find the duration of the whole flight in hours.**

For question 32 – 35, see graph_4:

The pie chart below shows the dance forms preferences of 300 students of a school.



32. **How many students prefer to learn Bharatanatyam?**

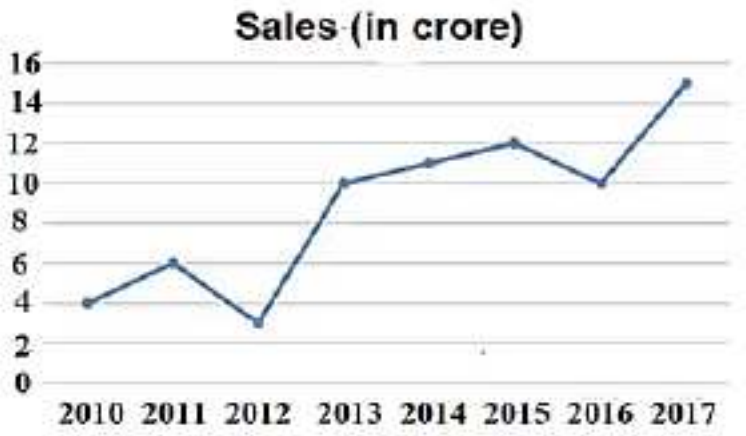
33. **How many more students prefer to learn Bhangra than Bharatanatyam?**

34. **How many students prefer to learn Kathak and Garba?**

35. **Find the ratio of students who prefer to learn Kathak to those who prefer to learn Bharatanatyam.**

For question 36 – 41

The following line graph shows the annual sales of a company.



36. **Find the percentage increase in sales from 2013 to 2017.**
37. **Find the sum of minimum sales and maximum sales.**
38. **Find the difference between the sales in 2012 and 2016.**
39. **Find the ratio of minimum sales to the maximum sales.**
40. **In which year there was maximum decrease in the sales as compared to its previous year?**

For question 41 – 45

The graph shows the per hour cost of booking a badminton court.

A badminton academy charges fees on a per-hour basis for their badminton court. They also issue monthly booking passes costing Rs 1500. The pass allows a user to play for 2 hours, 5 times a week. Any extra time is charged on an hourly basis.

41. **Anuj plays for an hour each on Saturday and Sunday. Find the amount he will pay.**

42. Manish and his friends booked the badminton court for 3.5 hours. How much did the booking cost?

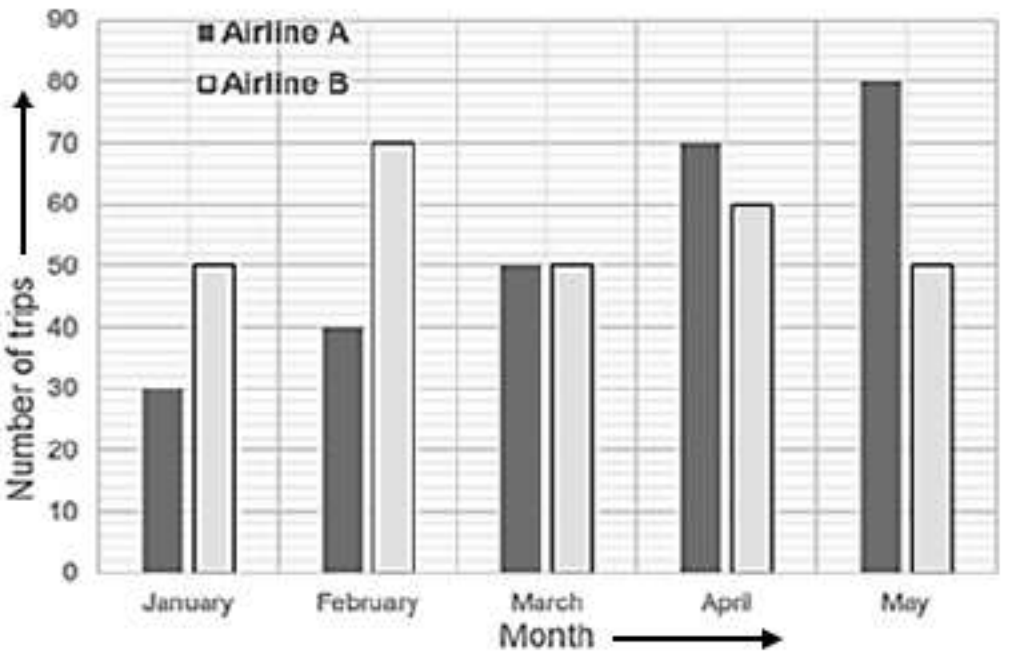
43. Rohan plays for 2 hours, 4 times a week. He pays on an hourly basis. Find the amount paid by Rohan.

44. Preeti wants to be badminton professional. She decided to practice at least 40 hours a month at the academy. What is the minimum amount Preeti will be paying to the academy?

45. Shreya is thinking to join the badminton academy. She decided to practice for 30 hours in a month at the academy. Which is a better option for Shreya - paying on per-hour basis or getting a monthly booking pass?

For question 46 – 50

The double bar graph below shows the number of trips made to London from Mumbai by two airlines A and B.



46. In which month were the number of trips by both the airlines same?

47. In which month did Airline A made the most trips?

48. Find the total number of trips made by Airline B from February to April.

49. Find the total number of trips Airline A made.

50. Calculate the average number of trips per month trips for Airline A.

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	*y*-axis	26.	10 km
2.	square	27.	*x*-axis: 1 unit = 10 minutes *y*-axis: 1 unit = 100 metres
3.	origin or (0,0)	28.	700 m
4.	4 and 3	29.	2 m/s
5.	0 and 0	30.	70 minutes or 1hour10 minutes
6.	8 units	31.	$2\frac{1}{6}$ hours or 2 hours 10 minutes
7.	4 units	32.	105
8.	(5, 6)	33.	30
9.	10 units	34.	60
10.	7 units	35.	1:7
11.	8 units	36.	20%
12.	5 units	37.	18 crores
13.	12 units	38.	7 crores
14.	(0, 2)	39.	1:5
15.	(−2, 0)	40.	In 2012
16.	*y*-axis	41.	₹ 100
17.	*x*-axis	42.	₹ 175
18.	origin	43.	₹ 1600
19.	36°	44.	₹ 2000
20.	110°	45.	Both are same
21.	A (−3, 4); B (4, −3); C (0, 2); D (−4, 0); E (−5, −3); F (4, 3); G (−2, −2); H (2,−2); I (0, −3)	46.	March
22.	08:00 am	47.	May
23.	09:00 am	48.	180
24.	15 minutes	49.	270
25.	3 hours 30 minutes	50.	54

CHAPTER – 14

PLAYING WITH NUMBERS

Points to Remember

- A two digit number having 'a' as its ten's digit and 'b' as unit's digit is written as: 10a + b in expanded form e.g. $52 = 5 \times 10 + 2$
- Divisibility rules:
- If the One's digit of a number is 0, 2, 4, 6, or 8, then the number is divisible by 2.
- If sum of the digits of a number is divisible by 3, then the number is divisible by 3.
- If the number formed by Ten's and One's digit is divisible by 4, then the number is divisible by 4.
- If the One's digit of a number is 0 or 5, then the number is divisible by 5.
- If the number is divisible by 2 and 3 both, then the number is divisible by 6.
- If the number formed by hundred's, ten's and one's digit is divisible by 8, then the number is divisible by 8.
- If sum of the digits of a number is divisible by 9, then the number is divisible by 9.
- If the One's digit of a number is 0, then the number is divisible by 10.
- If the difference between sum of the digit of a number at its odd places and the even places is either '0' or divisible by '11', then the number is divisible by 11.

e.g. Checking the divisibility of a number 635270

Divisible by	Divisible or Not	Divisibility Rule
2	Yes	Digit at unit place is zero
3	No	Sum of the digits is 23 which is not divisible by 3
4	No	Number formed by ten's and one's digit is 70 which is not divisible by 4
5	Yes	Digit at unit place is zero
6	No	Number is not divisible by 2 and 3 both
8	No	Number formed by hundred's, ten's and one's digit is 270 which is not divisible by 8
9	No	Sum of the digits is 23 which is not divisible by 9
10	Yes	Digit at unit place is zero
11	No	Sum of the digits at odd places is 5 and sum of digits at even places is 18, their difference is 13 which is not a multiple of 11

QUESTIONS

1. The sum of a two-digit number and the number obtained by reversing its digits is always divisible by _____.
2. Find the standard form of a two digits number ab .
3. If 1A × A = 9 A, then the value of A is _____.
4. Find the largest 3-digit number which is divisible by 6 .
5. Find the value(s) of the digit x for which the number 20 x 3 is a multiple of 3 .
6. Find the value of the digit N for which the three-digit number is 65N is divisible by 9 .
7. Find the least number to be added to 194562 so that the number obtained is divisible by both 5 and 10 .
8. Find the least number to be subtracted from 53214 so that the number obtained is divisible by 8 .
9. Find the smallest 4-digit number which is divisible by 7 .
10. If a three digits number 'xyz' is divisible by 11, then $x - y + z$ is always a multiple of _____.
11. You are participating in a race. You overtake the third runner, at what position are you now?
12. Find the number of times a 5 m long rope needs to be cut for dividing it into 20 equal pieces.
13. Find the smallest 3-digit number which is divisible by 5.
14. Find the greatest 3-digit number which is divisible by 2.
15. Find the greatest 4-digit number which is divisible by 9.
16. Find the smallest 5-digit number divisible by 3.
17. Find the smallest 3-digit number which is divisible by both 2 and 3.
18. Find the greatest 3-digit number divisible by both 2 and 5.
19. Find the greatest 4-digit number which is divisible by both 5 and 10.
20. Find the remainder when difference of 985 and 958 is divided by 9?
21. Find the least number that should be added to 2184 so that it becomes divisible by 10.
22. Find the least number that should be subtracted from 43787, so that it becomes divisible by 5.
23. Find the least number that should be added to 27841, so that the number is divisible by 3.

24. Find the least number that should be subtracted from 4673, so that the number is divisible by 9.
25. Find the 3-digit greatest number which leaves a remainder 7 when divided by 9.
26. Find the least number that should be added to 74862, so that the number is divisible by 3 and 4 both.
27. By which least number 600 may be multiplied to get a perfect square number?
28. Find the least number which when divided by 3, 9 and 12 leaves a remainder 2 in each case.
29. Find the smallest number by which 80 must be multiplied to make it a perfect cube.
30. If 63_ is divisible by 15, then find the least possible value of missing digit.
31. How many halves are there in $28\frac{1}{2}$?
32. Find the least possible missing digit if 81972_6 is divisible by 8.
33. Subtract the smallest 2-digit negative integer from the largest 2-digit negative integer.
34. If 62_5 is a multiple of 3, find the least possible missing digit.
35. Find the value of x so that 14 x 32 is a multiple of 11.
36. For which value of 'n' is the number $(10^n - 1)$ divisible by 11?
37. Find the values of y so that 32y4 is a multiple of 4.
38. Find the values of x so that 73 x 56 is divisible by 6.
39. Find the smallest number with 4 different digits which is divisible by 11.
40. For 5AAA82, which least possible missing digit will make it divisible by 9?
41. Find the number that should be added to 189573 to make it divisible by both 2 and 3.
42. Find the least values of digits A and B that will make the number 894A5B divisible by 2 and 3.
43. Find the smallest value of x, so that 9 2 x 5 is divisible by 3 and 5.
44. For what value of x the number 92 x 5 x 6 is divisible by 9?
45. If on dividing N by 5 we get a remainder 2, then what might be the greatest one's digit?
46. If 8237AA is a number divisible by 3 and 'A' is a digit, then what are the possible values of 'A'?

47. Mohan bought 17B litres of milk. He chose 2 old age homes and 4 orphanages near his locality to distribute this milk equally. Find the minimum value of B that will fulfill this objective of Mohan.

48. A housing society has 16 towers, named A, B, C and so on. Each tower has a different number of flats. There are 720 fans installed in the flats of tower A. Each flat has 9 fans. How many flats are there in tower A?

49. A shopping complex in the housing society has shops of the same size. Each shop has 10 lights inside the shop and two outside the shop. There are 360 lights fitted in them. How many shops are there?

50. Tower J has some flats with 3 bedrooms and some with 2 bedrooms. Three-fourth of the flats has 3 bedrooms and the rest has 2 bedrooms. The total number of bedrooms is 385. How many two bedroom flats are there in tower J?

51. A three-digit number can be written as $100x + 10y + z$. A new number is formed by interchanging x and z. What is the difference between the two numbers?

52. For what value of A and B, AB × 6 = BBB?

For the following questions (Q53 to Q 60), find X, Y and Z:

53.
$$\begin{array}{r} XY \\ +1X \\ \hline Y7 \end{array}$$

54.
$$\begin{array}{r} XY6 \\ \times Z \\ \hline 182Z \end{array}$$

55.
$$\begin{array}{r} 12X \\ +6XY \\ \hline X09 \end{array}$$

56.
$$\begin{array}{r} 58X \\ +3Y1 \\ \hline Z09 \end{array}$$

57.
$$\begin{array}{r} 2Y \\ \times Y \\ \hline 12Y \end{array}$$

58.
$$\begin{array}{r} 53X \\ +2Y5 \\ \hline Z07 \end{array}$$

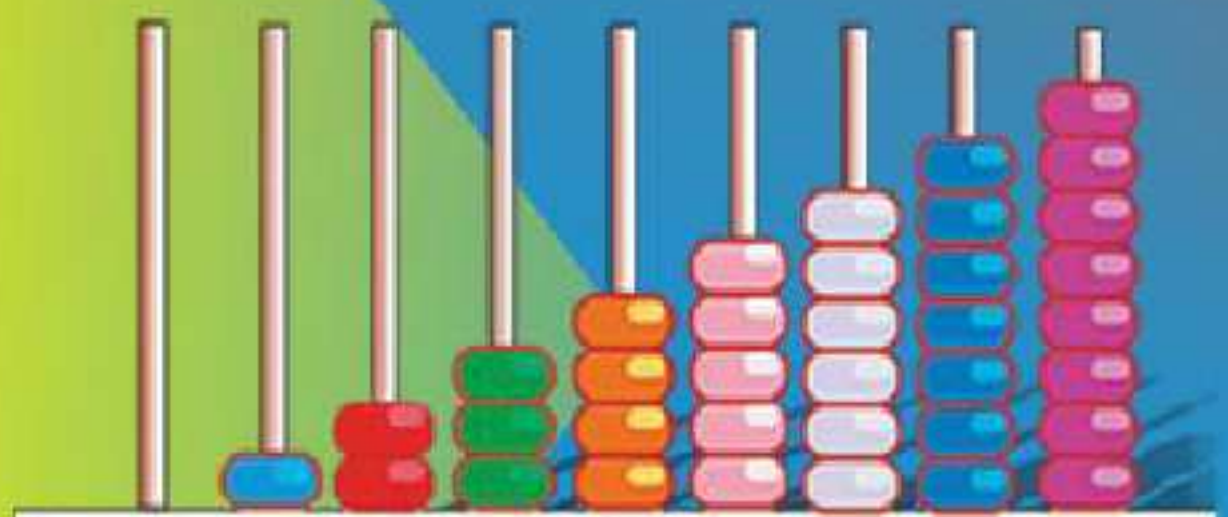
59.
$$\begin{array}{r} Z \\ Z \\ Z \\ +65Z \\ \hline YY6 \end{array}$$

60.
$$\begin{array}{r} ABA \\ \times 5 \\ \hline 44B0 \end{array}$$

ANSWERS

Q. No.	Answer	Q. No.	Answer
1.	11	27.	6
2.	$10a + b$	28.	38
3.	6	29.	100
4.	996	30.	0
5.	1, 4, 7	31.	57
6.	7	32.	1
7.	8	33.	89
8.	6	34.	2
9.	1001	35.	4
10.	11	36.	for all even values of 'n'
11.	Third	37.	y = 0, 2, 4, 6, 8
12.	19	38.	x = 0, 3, 6, 9
13.	100	39.	1023
14.	998	40.	A = 1
15.	9999	41.	3
16.	10002	42.	A = 1; B = 0
17.	102	43.	2
18.	990	44.	7
19.	9990	45.	7
20.	0	46.	A = 2, 5, 8
21.	6	47.	B = 4
22.	2	48.	80
23.	2	49.	30
24.	2	50.	35
25.	997	51.	$99(x - z)$
26.	6	52.	A = 7; B = 4
53.	X = 3; Y = 4	57.	Y = 5
54.	Z = 4; Y = 5	58.	X = 2; Y = 7; Z = 8
55.	X = 8; Y = 1	59.	Y = 6; Z = 4
56.	X = 8; Y = 2; Z = 9	60.	A = 8; B = 9

MENTAL MATHS



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