MENTAL MATHS

QUESTION BANK
CLASS 7

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

MENTAL MATHS CLASS

VII

2024-25

DIRECTORATE OF EDUCATION

GOVT. OF NCT OF DELHI

ASHOK KUMAR
IAS

सत्यमेव जयते

सचिव (शिक्षा)
राष्ट्रीय राजधानी क्षेत्र
दिल्ली सरकार
पुराना सचिवालय, दिल्ली-110054
दूरभाष: 23890187 टेलीफैक्स : 23890119

Secretary (Education)
Government of National Capital Territory of Delhi
Old Secretariat, Delhi-110054
Phone : 23890187, Telefax : 23890119
E-mail : secyedu@nic.in

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

Directorate of Education,
Govt. of NCT of Delhi
Room No. 12, Civil Lines,
Old Secretariat, Delhi-54
Phone: 011-23890172
Email: diredu@nic.in

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-7)

Dr. SUNIL AGGARWAL, LECTURER

STATE COORDINATOR, MENTAL MATHS PROJECT

Govt. S. Co-ed Sr. Sec. School, Possangipur, B-1 Janak Puri (School ID - 1618003)

SAMPDA GULATI, VICE PRINCIPAL

STATE CO-COORDINATOR, MENTAL MATHS PROJECT

GSKV, C-Block, No.1, Janak Puri (School ID - 1618017)

ASHUTOSH KUMAR AGGARWAL, VICE-PRINCIPAL

GSBV, No.1, Bhola Nath Nagar (School ID-1001008)

NARAYAN DUTT MASIWAL, LECTURER

Govt. S. Co-ed Sr. Sec. School, Possangipur, B-1 Janak Puri (School ID - 1618003)

JAI PRAKASH YADAV, TGT

GSBV, No.1, Bhola Nath Nagar (School ID-1001008)

MAULI KAUSHIK, TGT

SKV, Anand Vihar (School ID- 1001009)

MOHIT SINGH, TGT

SBV, Anand Vihar (School ID- 1001208)

SUNITA SACHDEVA, TGT

GSKV, No.1, Bhola Nath Nagar (School ID-1001018)

KAVITA MEHTA, TGT

SKV, Vivek Vihar (School ID- 1001022)

COVER PAGE DESIGN & TECHNICAL SUPPORT

PREM KUMAR SHARMA, LECTURER

GBSSS, No. 1, C-Block, Janak Puri (School ID - 1618006)

NARESH KUMAR, TGT

GSBV, No. 2, C-Block, Janak Puri (School ID - 1618005)

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	VII	DEVANSH	PAWAN KUMAR	20190210031	RSBV KIRAN VIHAR	1001109	GOVIND GOND
2	VII	UJJAWAL	AJEET	20160149218	RSBV KIRAN VIHAR	1001109	MADHU RANJAN
3	VII	ROHIT KEELKA	GOPAL RAM	20160459570	SBV GANDHI NAGAR	1003012	PRADEEP KUMAR

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	VII	SATYAM KUMAR JHA	BRAHMANAND JHA	20160181430	GSBV K BLOCK MANGOLPURI	1412002	SANTOSH
2	VII	SUBHASH KUMAR	LAXMAN BHAGAT	20160376013	GBSSS NO1 ADARSH NAGAR	1309013	RAJAT KUMAR MALONIA
3	VII	DAIWIK KABIR	SANDEEP KABIR	20190174011	GS COED SEC-8 ROHINI	1413027	RAJVIR

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	VII	VARUN VERMA	SANJAY VERMA	20170413967	G CO-ED SSS BINDAPUR	1618191	UMESH KUMAR
2	VII	VANSHU GARG	ANKUR GARG	20200293047	GGSSS NANGLOI	1617021	ANJU MEHLWAL
3	VII	KSHITIJ RANA	VIJAY RANA	20190490646	GBSSS BAPROLA	1617258	VISHU

REGION -CENTRAL (4TH POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VII	HARSHITA	FAKIR CHAND BISHT	2021017507	SBBM SV SANKRACHARYA MARG	1207008	MUKESH KUMAR SHARMA
2	VII	ISHANT SHARMA	OMVEER SHARMA	20150147385	GSBV L BLOCK SHASHRTI NAGAR	1208229	ANAND KUMAR SAROHA
3	VII	JAI YADAV	SANJAY YADAV	20210157720	RPSV NEW RAJINDER NAGAR	2128032	POONAM

REGION -SOUTH (5TH POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VII	SAMEEKSHA	VINAY	20210155367	SKV GHITORNI	1720033	NIRMALA YADAV
2	VII	SATHVIK	PUNEET KUMAR	20210168646	GB SSS DHARAMPURA	1822258	PUNEET KUMAR
3	VII	DIVYANSHU MISHRA	MAHENDER KUMAR MISHRA	20170406447	GSBV D BLOCK JANAKPURI	1720027	NARPAL SINGH

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	VII	SATVIK SINGH	SHIV BHAJAN SINGH	20210537175	GBSSS NO 2, BADARPUR	1925051	JASBIR SINGH
2	VII	GARIMA SINGH	SANJAY NARAYAN SINGH	20230219932	GGSSS, TAJPUR PAHARI BADARPUR	1925359	MONIKA DHINGRA
3	VII	SHASWAT TIWARI	DEVVRAT TIWARI	20210464465	SBV, JHILMIL COLONY	1001105	AMARNATH JHA

REGION -WEST (2nd POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VII	PRINCE GUPTA	MANOJ KUMAR	20160047259	SCAN SBV NO 2, B-BLOCK, JANAKPURI	1514008	ABHISHEK KATARIA
2	VII	ANAND	JAGRAM	20170410264	GBSSS NO 1, PUNJABI BAGH	1515010	KRISHAN SINGH
3	VII	KOMAL YADAV	SUBHASH CHANDRA YADAV	20200277648	GSKV NANGLOI	1617010	PURNIMA

REGION -SOUTH (3rd POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VII	HEMANT SHARMA	SITA RAM	20220008932	VCSG SBV J-BLOCK, SAKET	1923056	SRIOHM CHOUDHARY
2	VII	PIHU	NITIN JHA	20160044389	RAMANUJAN SKV MEHRAULI	1923038	DEEPTI
3	VII	SUNDARAM KUMAR	GANESH KUMAR	20230274390	D.T.E.A. SR. SEC SCHOO, R.K. PURAM SEC 4	1719079	V. ELANCHOZHAN

REGION -NORTH (4th POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VII	DEVANSH	RAJ KUMAR	20200334502	GBSSS BAWANA	1310019	SUDHIR ATRI
2	VII	AVIYANSH JAIN	ALANKAR JAIN	20220275725	GSV SECTOR 9 ROHINI	1413010	YOGITA CHUGH
3	VII	ANUSHKA RANI	MAHENDER KUMAR	20160083606	BNN GSKV KHERA KALAN	1310039	MEENA KUMARI

REGION -CENTRAL (5th POSITION)

S. No.	CLASS	NAME OF STUDENT	FATHER'S NAME	STUDENT ID	SCHOOL NAME	SCHOOL CODE	NAME OF GUIDE TEACHER
1	VII	YASHWANT	SUDHIR KUMAR	20160102072	GSBV BURARI	1207009	V.K. MISHRA
2	VII	SAUBHAGYA KUMAR SINGH	RAJESH SINGH	20170398780	RPSV NEW RAJENDER NAGAR	2128032	ANIL SHEORAN
3	VII	MUDABBIR HAYAT	MD SABIR AZEEM	20170319003	HARCOURT BUTLER SR SEC SCHOOL	2026025	KAMAL SHARMA

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.]

---

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.

---

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

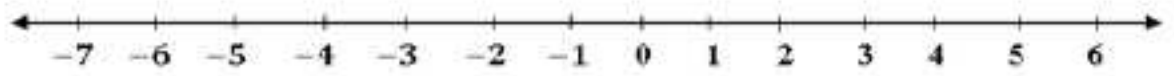
INDEX

CHAPTER 1

INTEGERS

Points to remember:

- The collection of whole numbers and negative numbers is called integers.
- On a number line, all numbers to the right of 0 are positive integers and all numbers to the left of 0 are negative integers.
- Zero is an integer which is neither positive nor negative.
- On a number line, the integer occurring on the right is greater, that is, if integer x lies on the right of integer y, then $x > y$.
- On a number line, the integer occurring on the left is smaller, that is, if integer x lies on the left of integer y then $x < y$.



$4 > 2$, $1 > 0$, $0 > -1$, $-1 < 0$, $-3 < -2$ etc.

- There is no greatest or smallest integer.
- **1** is the smallest positive integer.
- **−1** is the greatest negative integer.
- For any three integers a, b and c :

(i) $\mathbf{a + b = b + a}$ (Commutative law of addition)

(ii) $\mathbf{(a + b) + c = a + (b + c)}$ (Associative law of addition)

(iii) $a \times b = b \times a$ (Commutative law of multiplication).

(iv) $\mathbf{(a \times b) \times c = a \times (b \times c)}$ (Associative law of multiplication)

(v) $\mathbf{a \times (b + c) = a \times b + a \times c}$ (Distributive law of multiplication over addition)

(vi) $\mathbf{a \times (b - c) = a \times b - a \times c}$ (Distributive law of multiplication over subtraction)

- **Product of even number of terms of negative integers is positive, whereas the product of odd number of terms of negative integers is negative.**
- **If a and b are two integers such that $a > b$, then $-a < -b$. For example: $5 > 4$ and $-5 < -4$. Again if $a < b$, then $-a > -b$. For example: $6 < 8$ and $-6 > -8$.**
- **To add two integers of same sign, add them and keep the sign of the greater number. For example :** $\begin{matrix} 8+6 = 14 \\ -8+(-6) = -14 \end{matrix}$
- **To add two integers of opposite sign, subtract them and keep the sign of the greater number For example :** $\begin{matrix} -5+7 = +2 \\ +5+(-7) = -2 \end{matrix}$
- **Zero is the additive identity of integers.**
- **Additive inverse of a is (– a) and vice-versa.**
- **Sum of a number and its additive inverse is always zero.**

  $a+(-a)=(-a)+a=0$.

  Example: $3+(-3)=(-3)+3=0$.
- **One is the multiplicative identity of integers.**

  Example: 2 = 1 x 2

  -3 = 1 x (-3)
- **Multiplicative inverse of a is $\frac{1}{a}$ and vice-versa where $a \neq 0$.**
- **Product of a non-zero number and its multiplicative inverse is always 1**

  $a \times \frac{1}{a} = \frac{1}{a} \times a = 1$ (where $a \neq 0$)

Questions:

1. Find the value of $-102-(-92)$
2. Find the value of $4-5+6-7-(-4)$
3. Find the sum of 72 and -190
4. Find the value of $1800 \div 60+(-20)$
5. Find the value of $55+(-7 \times 5)-12$
6. Subtract the sum of -1777 and 777 from 4000
7. Find the sum of -502, 605 and -120
8. How many integers are greater -12 but less than -7
9. Find the additive inverse of $375-(115+160)$
10. Find the value of $(-225) \times 550+1225 \times 550$
11. Find the two integers which have difference 6 and sum -18
12. Find the value of $1-2+3-4+5-6+7-8+9-10+11-12+13-14+15-16$
13. What is the product of first 3 multiples of 5 ?
14. Find the product of $(-125) \times (-537) \times (-8)$
15. How many odd integers less than 100 are a multiple of both 3 and 5 ?
16. Subtract the sum of (-1032) and 878 from -34
17. Find the value of $-1999-1999 \times 99$
18. Find the value of $(-3)+(-12) \div (-4)-3 \times (-3)$
19. Find the value of $32-\{32-[32-(32-\overline{32-32})]\}$
20. Find the number which is obtained when three is multiplied by one less than the difference of nineteen and five.
21. Some number added to -11 gives 37. Divide this number by -12. Then, multiply by -8. What is the final number ?
22. Find the number obtained when ninety is divided by three more than the sum of 8 and 7.
23. Find the value of $100-8000 \div 40+95$
24. Find the value of $90-(-3) \times (-3) \times (-3)$

25. Find the value of $(-1)^{95} \times (-1)^{15}$

26. Find the value of $(-35) \times 895 + 895 \times (-65)$

27. What is the sum of first ten positive and first ten negative integers ?

28. Divide 324 by (-27)

29. Find the value of $\{(-30) \div 5\} \div 2$

30. The product of two integers is 729. If one of the integer is (-27), find the other integer.

31. If 2401 is divided by (-49), then find the quotient.

32. A group of hikers is descending the mountain at a rate of 600 feet per hour. What is the change in elevation of the hikers after 6 hours ?

33. Arrange the following in increasing order: $-2, -9, 7, -6, 5, 0, -3$

34. Find the value of $510 - [270 - (90 - \overline{80 + 70})]$

35. Determine the integer whose product with -3 becomes zero.

36. A man drives his car at a speed of 40 km/hr. How long will it take to cover 160 km ?

37. In a test $(+6)$ marks are given for every correct answer and (-3) marks are given for every incorrect answer and 0 for answer not attempted. Ramesh gets 5 correct and 8 incorrect out of 15 questions. What is his total score ?

38. Determine the integer whose product with -13 is -351

39. Sara monitors a snail in her aquarium. She notes that this morning it crawled 1 inch up the glass. A few hours later it crawled another 2 inch up the glass. Later, it crawled 4 inch down the glass. How far is the snail from where it started ?

40. Find the product of first five positive integers ?

41. Find the multiplicative inverse of $(-125) + (-50)$?

42. Find the value of $-(20) + (-8) \div (-2) \times 3$

43. An elevator descends into a mine shaft at the rate of 7 m/min. If the descend starts from 5m above the ground level, how long will it take to reach -205 m ?

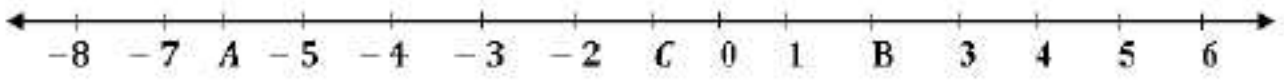
44. The sum of two integers is -1500. If one of them is 599, then find the other integer.

45. Find the value of $125 - 200 \div 8 + 5 \times 25$

46. Garvit earns a profit of ₹ 2 by selling one pen and incurs a loss of 50 paisa by selling one pencil. One day, Garvit earns a profit of ₹ 10. If he sold 15 pens, then how many pencils did he sell ?

47. Add the additive inverse of $(-12 + 16 - 42 \div \overline{3 \text{ of } 7})$ to the product of $-2, -3$ and -4

48. From the given number line, find the additive inverse of $(A - B - C)$



49. An elevator started from the fifth floor and then went up four floors and down six floor and up nine floors and down five floors. On which floor elevator stopped.

50. The product of three integers is -900. If two of them are $+25$ and -6, find the third integer.

Answers:

Q. No.	Answer	Q. No.	Answer
1.	−10	26.	−89500
2.	2	27.	0
3.	−118	28.	−12
4.	10	29.	−3
5.	8	30.	−27
6.	5000	31.	−49
7.	−17	32.	3600 feet
8.	4	33.	−9, −6, −3, −2, 0, 5, 7
9.	−100	34.	180
10.	550000	35.	0
11.	−6, −12	36.	4 hours
12.	-8	37.	6
13.	750	38.	27
14.	−537000	39.	1 inch down
15.	3	40.	120
16.	120	41.	−1/175
17.	−199900	42.	-8
18.	9	43.	30 minutes
19.	0	44.	−2099
20.	39	45.	225
21.	32	46.	40 pencils
22.	5	47.	−26
23.	−5	48.	7
24.	117	49	Seventh floor
25.	1	50.	6

CHAPTER 2

FRACTIONS AND DECIMALS

Points To Remember:

- Fractions are defined as the part of a whole. The whole can be an object or a group of objects.
- The numbers of the form $\frac{a}{b}$, where a and b are whole numbers and $b \neq 0$. are known as fractions. Examples: $\frac{1}{2}, \frac{3}{5}, \frac{14}{9}$ etc.
- A fraction may be a proper fraction, improper fraction or mixed fraction.
- In a proper fraction, the numerator is smaller than the denominator. In an improper fraction the numerator is greater than the denominator.

  $\frac{a}{b}$, $a < b \rightarrow$ Proper Fraction

  $\frac{a}{b}$, $a > b \rightarrow$ Improper Fraction
- A proper fraction represents a part of a whole whereas improper fraction is a combination of whole and a proper fraction.
- Reciprocal of a is $\frac{1}{a}$, $a \neq 0$ and

  Reciprocal of $\frac{1}{a}$ is a, $a \neq 0$.

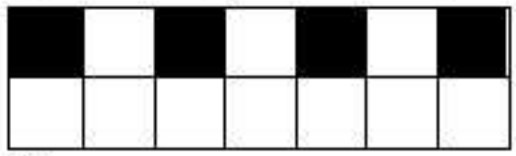
Tips and Tricks

- Product of two fractions $= \frac{\text{Product of their Numerators}}{\text{Product of their Denominators}}$
- When two proper fractions are multiplied, the product is less than both the fractions.
- The product of two improper fractions is greater than each of the fractions that are multiplied.
- To multiply a decimal number by 10, 100 or 1000, we move the decimal point in the number to the right by as many places as the number of zeroes in the multiplier, to get the product.

- Similarly, while dividing a decimal number by 10, 100 or 1000, we move the decimal point in the number to the left by as many places as the number of zeroes in the divisor, to get the quotient.

Questions:

1. Which fraction is represented by the shaded portion ?



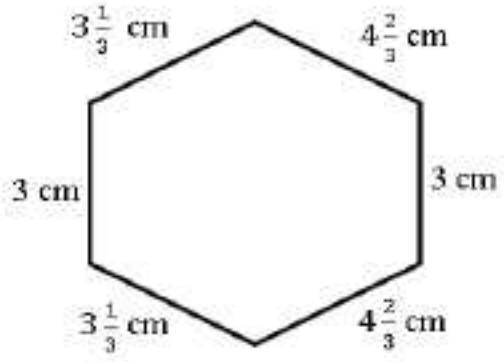
2. Find four fifth of half.
3. Express $\frac{78}{15}$ as a mixed fraction.
4. Find $\frac{3}{20}$ of 1 kg in grams.
5. Find $\frac{4}{25}$ of 1 km in metres.
6. Find the value of $5\frac{1}{7} + 1\frac{4}{7} + 3\frac{2}{7}$
7. $3\frac{3}{4} + \square = 4$
8. $2\frac{3}{5} + 3\frac{1}{5} - 1\frac{1}{5} = \square$
9. Find the value of $6\frac{3}{4}$ of 7
10. Find the value of $\frac{7}{16} \times \frac{15}{25} \times \frac{8}{21}$
11. Find the reciprocal of $\frac{3}{7}$ of $\frac{2}{5}$
12. Find the value of $\frac{\frac{1}{4}+\frac{1}{5}}{1-\frac{3}{8}\times\frac{3}{5}}$
13. Find the value of $\frac{\frac{1}{1}\times\frac{1}{3}}{1-\frac{1}{1}\times\frac{1}{3}}$
14. Find the value of $4\frac{1}{3} \times \frac{4}{15} \div 2\frac{2}{5}$
15. Which is greater $\frac{2}{3}$ of $\frac{9}{5}$ or $\frac{3}{4}$ of $\frac{8}{7}$

16. What should be subtracted from 12 to get $\frac{17}{2}$?

17. What should be added to $5\frac{3}{7}$ to get 12 ?

18. Pooja plants 6 saplings in a row in her garden. The distance between two adjacent saplings is $\frac{3}{5}$ m. Find the distance between the first and the last sapling.

19. Find the perimeter of the given figure



20. The length and breadth of a rectangle are $6\frac{2}{3}$ m and 3 m respectively. Find its perimeter.

21. A family consumes $2\frac{1}{2}$ litres of milk every day. Find the total consumption of milk by the family in the month of June.

22. How many small pieces of length of $\frac{3}{4}$ metre can be cut from a ribbon of length $5\frac{1}{4}$ metres ?

23. The cost of $6\frac{1}{4}$ kg of apples is ₹ 600. Find the cost of 1 kg of apples ?

24. (i) Arrange the following in increasing order : $\frac{2}{3}, \frac{5}{6}, \frac{1}{12}, \frac{7}{24}$

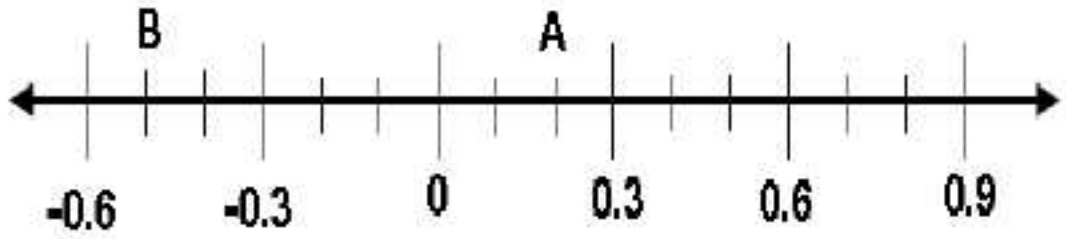
(ii) Arrange the following in decreasing order : $\frac{9}{20}, \frac{3}{10}, \frac{4}{5}, \frac{1}{2}$

25. Find the least positive fraction that must be added to $1\frac{1}{3} \div 1\frac{1}{9}$ to get an integer.

26. Convert $\frac{149}{4}$ into a decimal.

27. Convert into decimal $36 + \frac{2}{5} + \frac{3}{4}$

28. From the given number line, find (A + B)



29. Find the number whose expended form is

$3 \times 100 + 0 \times 10 + 5 \times 1 + 0 \times \frac{1}{10} + 6 \times \frac{1}{100}$.

30. Find the product of 0.2, 0.02 and 2

31. Find the value of $76 \div 0.019$

32. Find the value of: $325.67 \div 10000$

33. Find the sum of place values of 2 in 2364.028.

34. Arrange in ascending order 19.071, 19.170, 19.701, 19.017

35. Arrange in descending order 14.6, 159, 1.07, −1.295, 24.6

36. Evaluate $1.564 - 0.500 + 3.001 - 2.500$

37. Find the value of $0.011 \times 0.39 \div 0.13$

38. Find the value of $1.07 \times 65 + 1.07 \times 26 + 1.07 \times 9$

39. $496.2 \div \square = 4.962$

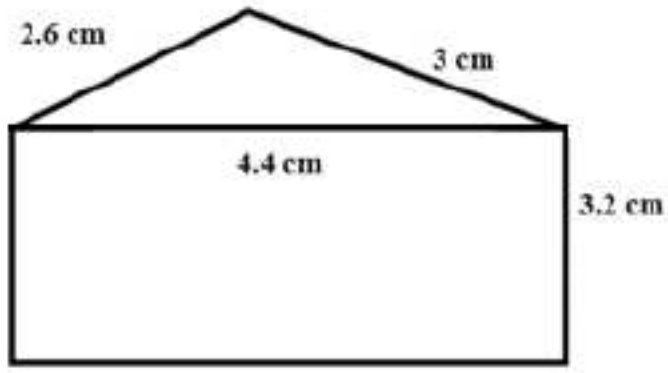
40. If $504 \div 12 = 42$, find the value of $0.504 \div 12$

41. Which decimal number will be obtained on interchanging the digits at the tens place and tenths place of 36.49 ?

42. Find the average of 5.8, 4.6 and 2.2

43. Find the perimeter of the given figure

44. Find the perimeter of the given figure :



45. What should be added to 385.70 to get 499.32 ?

46. By how much 72.46 be decreased to get 29.73 ?

47. 4.5 kg of sweets are shared equally among 5 children. How many grams of sweets does each child get ?

48. A grocer mixes 20.25 kg of green tea with 25.20 kg of ordinary tea and repacks all tea in 45 packets of equal weight. How much does each packet of tea weight ?

49. The side of a square field is 5.5 m, find the area of the square field.

50. Each side of a regular polygon is 1.2 cm in length. The perimeter of the polygon is 14.4 cm. How many sides does the polygon have ?

Answers:

Q. No.	Answer	Q. No.	Answer
1.	$\frac{2}{7}$	26.	37.25
2.	$\frac{2}{5}$	27.	37.15
3.	$5\frac{3}{15}$	28.	-0.3
4.	150 gms	29.	305.06
5.	160 metres	30.	0.008
6.	10	31.	4000
7.	$\frac{1}{4}$	32.	0.032567
8.	$4\frac{3}{5}$	33.	2000.02
9.	$47\frac{1}{4}$	34.	19.017, 19.071, 19.170, 19.701
10.	$\frac{1}{10}$	35.	159, 24.6, 14.6, 1.07, -1.295
11.	$\frac{35}{6}$	36.	1.565
12.	$\frac{18}{31}$	37.	0.033
13.	$\frac{1}{5}$	38.	107
14.	$\frac{13}{27}$	39.	100
15.	$\frac{2}{3}$ of $\frac{9}{5}$	40.	0.042
16.	$3\frac{1}{2} = \frac{7}{2}$	41.	46.39
17.	$6\frac{4}{7}$	42.	4.2
18.	3 metre	43.	16 cm
19.	22 cm.	44.	16.4 cm
20.	$19\frac{1}{3}$ m	45.	113.62
21.	75 litres	46.	42.73
22.	7 pieces	47.	900 gm
23.	₹ 96	48.	1.01 kg
24.	(i) $\frac{1}{12}, \frac{7}{24}, \frac{2}{3}, \frac{5}{6}$ (ii) $\frac{4}{5}, \frac{1}{2}, \frac{9}{20}, \frac{3}{10}$	49.	30.25 sq m
25.	$\frac{4}{5}$	50.	12 sides

CHAPTER 3

DATA HANDLING

Points To Remember:

- Range is the difference between the largest and the smallest observation of the data .
- $\text{Mean} = \frac{\text{Sum of all the observations}}{\text{Number of observations}}$
- Median refers to the value of the data which divides the data into two equal parts i.e. which lies in the middle of data (when arranged in increasing or decreasing order).
- $\text{Median} = \begin{cases} \left(\frac{n+1}{2}\right)^{th} \text{term, when n is odd} \\ \frac{\left(\frac{n}{1}\right)^{th} term + \left(\frac{n}{1}+1\right)^{th} term}{2}, \text{ when n is even} \end{cases}$
- $\text{Class Mark} = \frac{\text{upper limit} + \text{lower limit}}{2}$
- Mode refers to the observation which occurs most frequently.
- Empirical relation between mean, median and mode :

  $\text{Mode} = 3\ \text{Median} - 2\ \text{Mean}$
- Probability is the measure of chance of happening of something.
- $\text{Probability of an event} = \frac{\text{number of ways an event can occur}}{\text{total number of possible outcomes}}$
- The probability of happening of an event is from 0 to 1
- When an event is certain to happen, its probability is 1
- If an event is impossible, its probability is 0

TIPS:

- If each observation of data is multiplied by 'a' then mean is also multiplied by 'a'.
- If each observation, of data is divided by 'a' then mean is also divided by 'a'.
- If 'a' is added or subtracted from each observation then new mean is obtained by adding or subtracting 'a' from the old mean.
- Total number of outcomes in toss of coins is 2^n (where n is number of coins)
- Total number of outcomes in throw of dice = 6^n (where n is number of dice)
- Sum of first n natural numbers $= \frac{n(n+1)}{2}$

Questions:

1. Find the range of given observations

   32, 41, 28, 54, 35, 26, 23, 33, 38, 40
2. Find the mean of first seven natural numbers.
3. Find the mean of first five prime numbers.
4. The mean of 8, 11, 6, 14, x and 13 is 66. Find the value of observation x.
5. Find the mean of first 10 odd numbers.
6. Given that the mean of five numbers is 28. If one of the numbers is excluded, the new mean becomes 25. Determine the excluded number.
7. The mean of five observations is 15. If the mean of the first three observations is 14 and that of the last three observations is 17, find the third observation.
8. The mean of x+1, x+3, x+5 is 4. Find the value of x.
9. Gunika secured 73, 86, 78 and 75 marks in four tests. What is the least number of marks she should secure in her next test if she has to have a mean score of 80 marks in five tests ?
10. The mean of 6, 8, x+2, 10, $2x-1$ and 2 is 9. Find the value of x .
11. The weights of 6 students (in kg) are 14, 26, 28, 20, 35, 30. Find the median weight .

12. Komal worked for $2\frac{1}{2}$ hours on Monday, $3\frac{1}{4}$ hours on Tuesday and $2\frac{3}{4}$ hours on Wednesday. What is the mean number of hours she worked on these three days ?

13. The mean weight of a class of 20 students is 48 kg. Two more students weighing 60 kg and 58 kg respectively join the class. What is the mean weight of the class now ?

14. Find the median of 3, 11, 7, 2, 5, 9, 9, 2, 10

15. Find the mode of 14, 25, 14, 28, 18, 17, 18, 14, 23, 22, 14, 18

16. Radha scored 97, 73 and 88 respectively in her first three examinations. If she scored 80 in her fourth examination, then by how much will her mean score increase or decrease ?

17. The mean, median and mode of four numbers is 8. The smallest number is 7. Find the number.

18. The mean of three numbers a, b and c is 8, and the mean of five numbers a, b, c, d and e is 15. Find the mean of d and e.

19. Following cards are put facing down

A	E	I	O	U

What is the probability of drawing out ?

(a) a vowel (b) A or I (c) U (d) a consonant

20. Find the median of the following data:

10, 32, 17, 19, 21, 22, 9, 35

21. The probability of winning a game is 0.07. What is the probability of losing it ?

22. A dice is thrown once. What is the probability that the numbers shown on the dice is ?

(a) an odd number
(b) a prime number
(c) a composite number
(d) a multiple of 2
(e) a factor of 6
(f) a number greater than 6
(g) a number less than 3

23. The height of 10 girls were measured in cm and results are as follows:

135, 150, 139, 128, 151, 132, 146, 149, 143, 141

(a) What is the height of tallest girl ?

(b) What is the height of shortest girl ?

(c) What is the range of the data ?

(d) What is the mean height of the girls ?

24. If 17 is taken from the following data, then find the new median.

12, 26, 17, 28, 10, 14, 15, 32, 35.

25. The mean of seven numbers is 25. If each number is divided by 2, what will be the new mean ?

26. The mean of 200 items was 50. Later on, it was discovered that the two items were misread as 92 and 8 instead of 192 and 68 respectively. Find the correct mean.

27. Find the median of the given data if the mean is 4.5 :

5, 7, 7, 8, x, 5, 4, 3, 1, 2

28. The mean of three numbers is 10. The mean of other four numbers is 12. Find the mean of all the seven numbers.

29. The following observations have been arranged in ascending order :

29, 32, 48, 50, x, $x + 2$, 72, 78, 82, 96

If the median of the data is 61, find the value of x.

30. The mean of seven numbers is 49. If each number is divided by 7, what will be the new mean ?

31. What is the probability that a student chosen at random out of 3 girls and 4 boys is a boy ?

32. Find the median of first 50 natural numbers.

33. A coin is tossed 100 times with the following frequencies:

Head: 49, Tail: 51

When a coin is tossed at random, what is the probability of getting a Head ?

34. A box contains two pairs of socks of two different colours (black and white). I have picked out a black sock. I pick out one more with my eyes closed. What is the probability that it will make a correct pair ?

35. What is the class mark of the class 30 – 35 ?

(Answer the following questions 36 to 38)

The weight of new born babies (in kg) in a hospital on a particular day are:

2.1, 2.4, 3.8, 3.0, 2.6, 2.1, 1.9, 3.7, 2.6

36. Find the range.

37. Find the median weight.

38. How many babies weigh more the median weight ?

39. Find the median of first 10 even numbers.

40. Find the median of first 50 whole numbers.

41. If two coins are tossed together, what is the probability of getting at most two heads ?

42. A card is drawn from a pack of 50 cards numbered from 1 to 50. Find the probability of drawing a card which is multiple of 5.

43. In a single throw of a die, find the probability of getting

(i) 4

(ii) 2 or 3

(iii) a number greater than 2.

44. The mean of Shivansh's marks in 5 subjects is 86. He got 80 marks in the 6th subject. What is the mean of his marks in all the 6 subjects together ?

45. A carton contains 8 brown and 4 white eggs. If an egg is selected at random, what is the probability that the selected egg is :

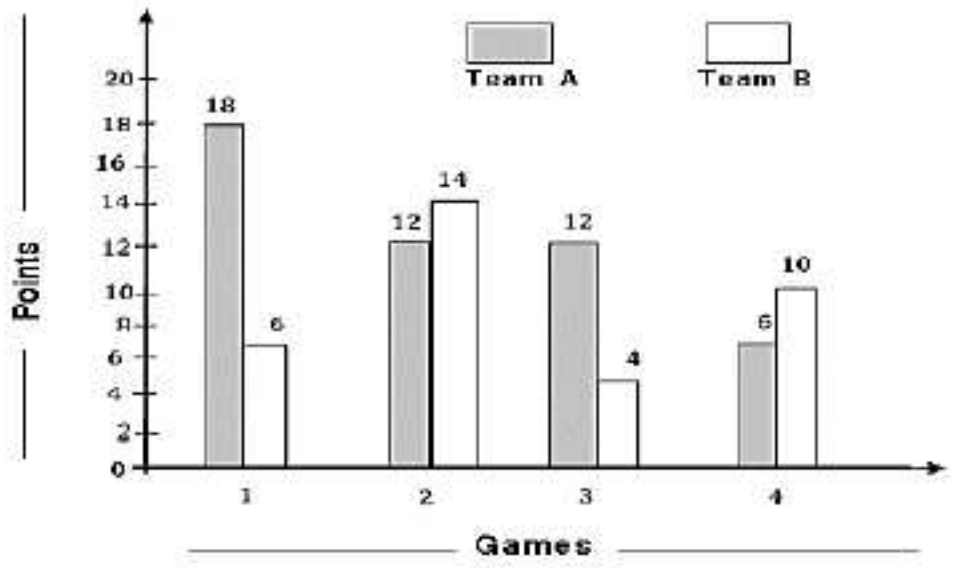
(i) brown (ii) white

46. What is the probability of getting a number 10 on rolling a dice ?

47. Six out of 24 students in a class are left-handed. What is the probability that randomly selected student is right-handed ?

(Answer the following questions 48 to 50)

The following graph shows the points scored in four games of basketball. Study the graph.



48. **What is the lowest score ? Who scored it and in which game ?**

49. **By how many points did team A win in the first game ?**

50. **By how many points did the team B win in the fourth game ?**

Answers:

Q. No.	Answer	Q. No.	Answer
1.	31	26.	50.8
2.	4	27.	4.5
3.	5.6	28.	$11\frac{1}{7}$
4.	344	29.	60
5.	10	30.	7
6.	40	31.	$\frac{4}{7}$
7.	18	32.	25.5
8.	1	33.	0.49
9.	88	34.	$\frac{1}{3}$
10.	9	35.	32.5
11.	27	36.	1.9 kg
12.	$2\frac{5}{6}$ hours	37.	2.6 kg
13.	49kg	38.	3 babies
14.	7	39.	11
15.	14	40.	24.5
16.	Decrease by 1.5	41.	1
17.	7, 8, 8, 9	42.	$\frac{1}{5}$
18.	25.5	43.	(i)$\frac{1}{6}$ (ii)$\frac{1}{3}$ (iii) $\frac{2}{3}$
19.	(a) 1 (b) $\frac{2}{5}$ (c)$\frac{1}{5}$ (d) 0	44.	85
20.	20	45.	(i)$\frac{2}{3}$ (ii)$\frac{1}{3}$
21.	0.93	46.	0
22.	(a) $\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$ (e) $\frac{2}{3}$ (f) 0 (g) $\frac{1}{3}$	47.	$\frac{3}{4} = 0.75$
23.	(i)151 cm (ii) 128 cm (iii)23 (iv) 141.4 cm	48.	Lowest score =4, scored by team B in 3rd game
24.	20.5	49	12 points
25.	12.5	50.	4 points

CHAPTER – 4

SIMPLE EQUATIONS

Points to remember:

- The collection of whole numbers and negative numbers is called integers.
- An equation is a statement of equality which contains a variable on one or on both the sides of the equation.
- An equation involving only a linear polynomial is called a linear equation. For example: $5y - 12 = 23$ etc.
- An equation remains the same if the LHS and the RHS are interchanged.
- Taking terms of one side to other side is called transposing. When we transpose a number from one side of the equation to the other side, we change its sign example $7p - 3 = 18 \Rightarrow 7p = 18 + 3$
- An equation does not change, if :
  - (i) Same quantity is added to both sides.
  - (ii) Same quantity is subtracted from both sides.
  - (iii) Both sides are multiplied by same non zero quantity.
  - (iv) Both sides are divided by same non zero quantity.

Questions:

Find the value of x (Q. No - 1-8)

1. $5x - 4 = 16$
2. $2x + 9 = 3x + 6$
3. $3(x + 6) = 9x$
4. $3(x - 3) = 5(2x + 1)$
5. $20 - (2x - 5) = 25$
6. $\frac{x}{3} + 4 = 6$

7. $x - \frac{1}{3} = 1\frac{2}{3}$

8. $\frac{x+2}{5} - 1 = 3$

9. Find the value of t: $5(t-2) + 3(t+1) = 25$

10. Find the value of y: $6y = \frac{2}{3}(2y - 7)$

11. Find the value of y: $\frac{5}{3}(2y - 1) = 3y - 5$

12. Find the value of x : $\frac{x}{2} + \frac{x}{3} - \frac{x}{4} = 7$

13. Find the value of p: $\frac{p-3}{5} - 2 = -1$

14. Find the value of z: $\frac{z}{13} + \frac{z}{9} = \frac{44}{117}$

15. Find the value of y: $\frac{y}{9} - \frac{y}{12} = \frac{1}{108}$

16. Find the value of y: $2.8\,y = 54 + y$

17. Find the value of p: $p - 2 = \frac{1}{5}(3p - 1)$

18. Find the value of x: $\frac{2x-3}{9} = \frac{3}{5}$

19. Find the value of p: $3p - 0.7 = 1.4$

20. Find the value of p : $4p - 0.8 = 5.2 - 2p$

21. Find the value of t: $\frac{2-3t}{2} = \frac{2t-10}{3}$

22. Find the value of q: $1.8\,q = 24 + q$

23. Find the value of q: $0.1\,(3q - 1) = 0.2\,(1 - 2q)$

24. If $k + 7 = 10$, find the value of $5k - 5$

25. Four times a certain number if decreased by thrice of the same number, we get 17. Find the number.

26. If you take away seven from seven times a number and get 77. Find the number.

27. The sum of two consecutive odd numbers is 28. Find the larger number.

28. The average of three numbers is 20, the first number is one-fourth the sum of other two numbers. Find the first number.

29. In a class of 49 students, number of girls is two-fifth of number of boys. Find the number of boys.

30. One of the complementary angles is double the other. Find the smaller angle.

31. The length of a rectangle is 5m more than its breadth and its perimeter is 230 m. Find its length and breadth.

32. The difference between two supplementary angles is 44°. Find the greater angle.

33. When the smaller of two consecutive integers is added to three times the larger integer, the result is 83. Find both the integers.

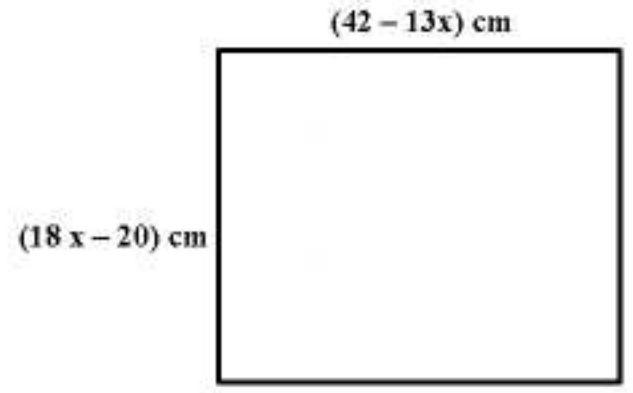
34. A number is multiplied by 8. Nine is subtracted from this product, the result is 47. Find the number.

35. Present age of a son is half the present age of his father. Ten years ago, father's age was thrice the son's age. Find the present ages of father and son.

36. The sum of three consecutive even numbers is 42. Find the numbers.

37. Anuj had some money. He gave two-third of this money to his sister Pooja and he still has ₹ 500. Find the money he had in the beginning.

38. Two adjacent sides of a square are given in fig below. Find the measurement of sides of the square.



39. The difference between two numbers is 7. Six times the smaller number plus the larger number is 77. Find the numbers.

40. The sum of two numbers is 25. One of the numbers exceeds the other by 9. Find the numbers.

41. Sachin scored twice as many runs as Rahul scored. Together their runs fell short to complete the double century. How many runs did each score ?

42. The total cost of a TV and a fan is ₹ 13000. If the cost of TV is twelve times the cost of a fan. Find the cost of TV.

43. In a Hostel mess 50 kg of rice is consumed per day. If students gets 400 gm of rice per day. Find the numbers of students in the Hostel mess.

44. The numerator of a rational number is seven less than its denominator. If denominator is increased by 9 and numerator by 2, we again get the same rational number. Determine the rational number.

45. The ages of Kishan and Rishabh are in the ratio of 4 : 5. Ten years hence the ratio of their ages will be 6 : 7. Find their present ages.

46. Find the measure of an angle if its supplement measures 39° more than twice its complement.

47. In Δ ABC, $\angle A = (3x)^\circ$, $\angle B = (2x + 60)^\circ$ and $\angle C = (5x - 40)^\circ$. Find these angles.

48. Each of the two equal sides of an isosceles triangle is twice as large as the third side. If the perimeter of the triangle is 30 cm, find the length of each side of the triangle.

49. In a bag, the number of one rupee coins is three times the number of two rupees coins. If the total worth of the coins is ₹ 120, find the number of two rupees coins.

50. The interest received by Manas is ₹ 30 more than that of Kishan. If the total interest received by them is ₹ 120, find the interest received by Manas.

Answer:

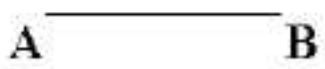
Q. NO.	ANSWER	Q. NO.	ANSWER
1.	$x = 4$	26.	$x = 12$
2.	$x = 3$	27.	15
3.	$x = 3$	28.	12
4.	$x = -2$	29.	35 boys
5.	$x = 0$	30.	30°
6.	$x = 6$	31.	l= 60m, b= 55m
7.	$x = 2$	32.	112°
8.	$x = 18$	33.	20, 21
9.	$t = 4$	34.	7
10.	$y = -1$	35.	20 years, 40 years
11.	$y = -10$	36.	12, 14, 16
12.	$x = 12$	37.	₹1500
13.	$p = 8$	38.	16 cm
14.	$z = 2$	39.	10, 17
15.	$y = \frac{1}{3}$	40.	8, 17
16.	$y = 30$	41.	Rahul 66 runs, Sachin 132 runs
17.	$p = \frac{9}{2}$	42.	₹ 12000
18.	$x = \frac{21}{5}$	43.	125
19.	$p = 0.7$	44.	$\frac{2}{9}$
20.	$p = 1$	45.	20 years and 25 years
21.	$t = 2$	46.	39°
22.	$q = 30$	47.	$\angle A = 48°, \angle B = 92°, \angle C = 40°$
23.	$q = \frac{3}{7}$	48.	12 cm, 12 cm, 6 cm
24.	$k = 10$	49	24
25.	17	50.	₹75

CHAPTER 5

LINES AND ANGLES

Points to remember:

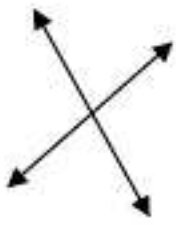
- A line segment has two end points.



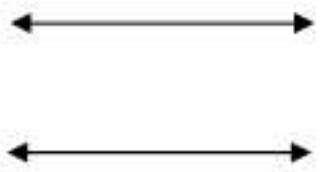
- A ray has only one end point.

- A line has no end points.

- When two lines meet at a point, they are called intersecting lines and when two lines do not meet even on extending, those lines are called parallel lines.



Intersecting lines



Parallel lines.

- Lines passing through the same point are called concurrent lines.
- A line that intersects a pair of lines (intersecting or parallel lines) at distinct points is called a transversal.
- Vertically opposite angles formed by two intersecting lines are equal.
- Two angles whose sum is **90°** are complimentary angles.
- Two angles whose sum is **180°** are supplementary angles.

- Two angles with a common vertex and a common arm between non-common arms are called adjacent angles.
- A linear pair is a pair of adjacent angles which are supplementary.
- When a transversal intersects two parallel lines then:
  - (a) Each pair of corresponding angles are equal.
  - (b) Each pair of alternate interior angles are equal.
  - (c) Interior angles on the same side of the transversal are supplementary.
- Two lines are parallel if :
  - (a) A pair of corresponding angles are equal.
  - (b) A pair of alternate interior angles are equal.
  - (c) A pair of interior angles on the same side of the transversal are supplementary.

Questions:

1. Fill in the blanks: -
   - (i) A line has _____ end points.
   - (ii) If two lines intersect, the vertically opposite angles are _____.
   - (iii) The angles in a linear pair are _____.
2. Find the complement of the following angles :

   (a) 27° (b) 48° (c) 76° (d) 12°
3. Find the supplement of the following angles :

   (a) 121° (b) 49° (c) 117° (d) 78°
4. $\angle ABD$ and $\angle ABC$ are such that they form a linear pair. If $\angle ABD = 65°$, then what is the measure of $\angle ABC$?

5. Two supplementary angles are in the ratio 2:7. Find the angles.

6. Find the measure of an angle which is :

   (a) Complement of itself.

   (b) Supplement of itself.

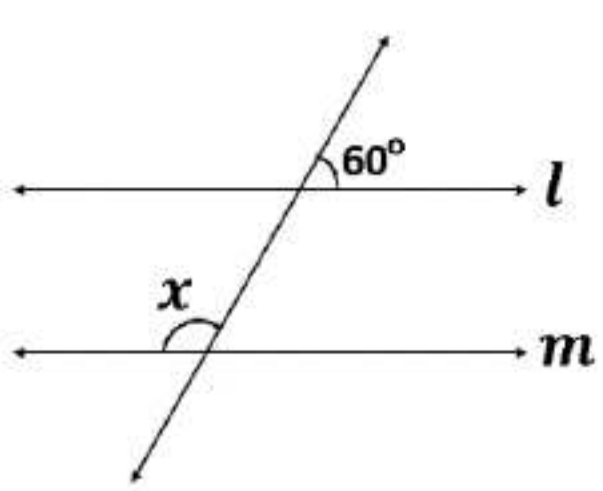
7. Two complementary angles differ by 34°. Find the angles.

8. An angle is eight times its supplement. Find the angle.

9. If the complement of an angle is $28°$, find the supplementary angle.

10. An angle is greater by $60°$ than its supplementary angle. What is the angle ?

11. In the given figure, if $l \parallel m$, then find the value of x.



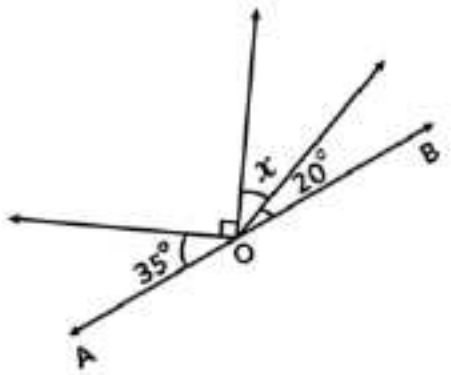
12. The sum of an angle and half of its complementary angle is $75°$. Find the angle.

13. Find the angle which is one-third of its supplementary angle.

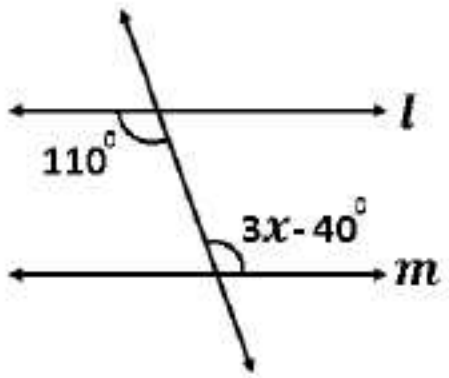
14. The difference in the measures of a pair of complementary angles is $78°$. Find the measure of the angles.

15. The measure of an angle is $14°$ less than the measure of its complement. Find the measure of the larger angle.

16. In the given figure, find the value of x if AOB is a straight line.

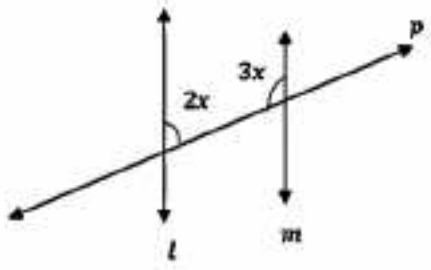


17. In the given figure, if $l \parallel m$, then find the value of x.

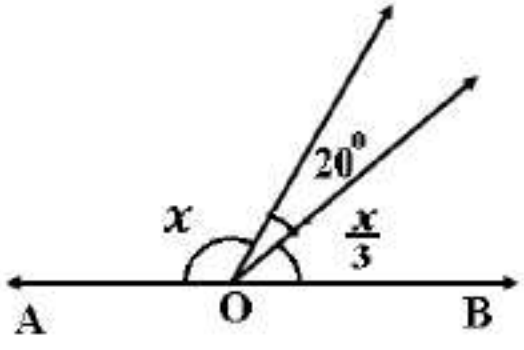


18. What is the measure of obtuse angle made between the hour hand and the minute hand of a clock at 7'o clock ?

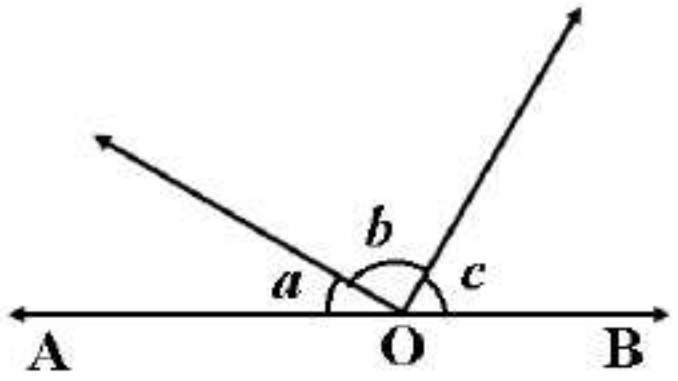
19. Find the value of x if $l \parallel m$ and p is the transversal.



20. Find the value of x :

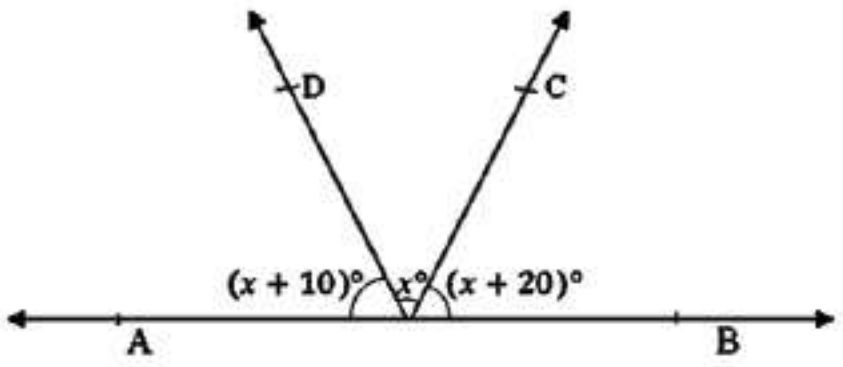


21. In the given figure, if c = 2a, b = 3a, then find the value of b



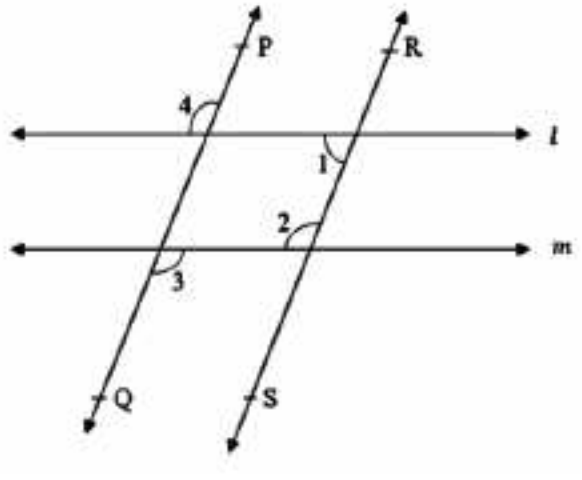
22. The angles of a linear pair are in the ratio 1:2. Find the angles.

23. In the given figure, find x and also find $\angle BOC, \angle COD, \angle AOD$.

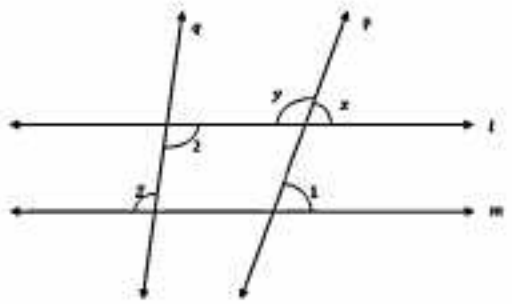


24. A clock reads 4:30. If the minute hand points East, in what direction will the hour hand point ?

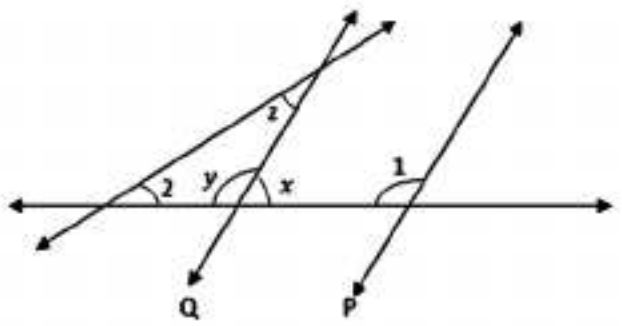
25. In the figure, $l \parallel m$ and $PQ \parallel RS$, if $\angle 1 = 50°$, find $\angle 2, \angle 3$ and $\angle 4$.



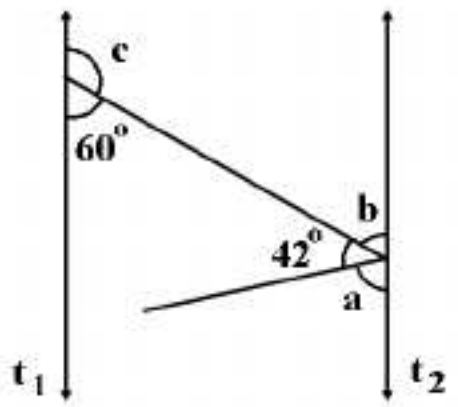
26. In the given figure, $l \parallel m$, $\angle 1 = 60°$, $\angle 2 = 100°$, find the values of x, y and z



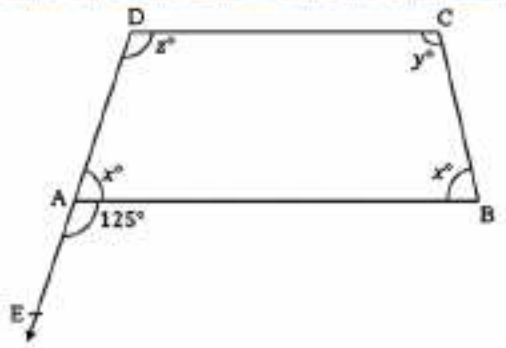
27. In the given figure, $p \parallel q$, $\angle 1 = 100°$ and $\angle 2 = 50°$. Find x, y and z.



28. In the given figure, if $t_1 \parallel t_2$, then find the measure of a, b and c.

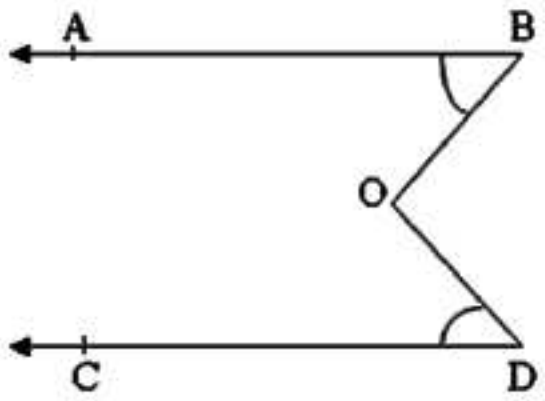


29. In the given figure $AB \parallel CD$ and DA has been produced to E so that $\angle BAE = 125°$, find x, y and z.



30. Two parallel lines l and m are intercepted by a transversal. If the interior angles on the same side of transversal be $(2x - 8)°$ and $(3x - 7)°$, find the measure of each of these angles.

31. In the figure it is given that $AB \parallel CD$, $\angle ABO = 37°$ and $\angle CDO = 69°$, find the measure of reflex $\angle BOD$.



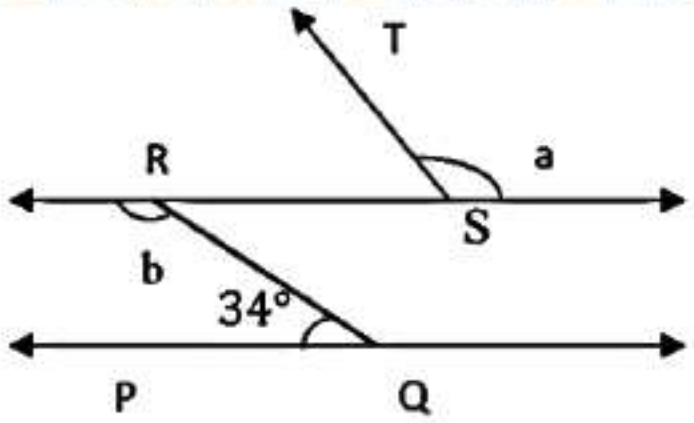
32. Three angles x =3(p+25)°, y = (p+10)°, z = (2p+35)° are on a straight line, find the value of p.

33. Two angles forming a linear pair are in the ratio of 3:7. Find the two angles.

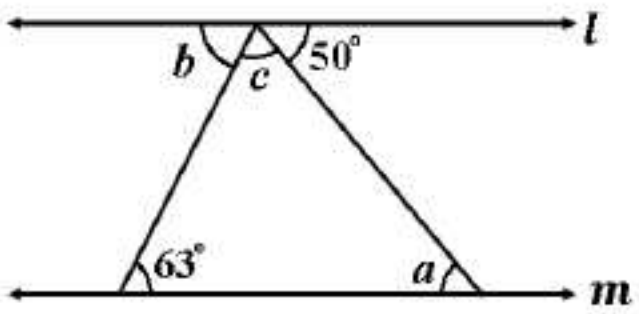
34. An angle is $30°$ more than one half of its complementary angle. Find the angle.

35. If the difference between two supplementary angles is equal to one right angle, find the angles.

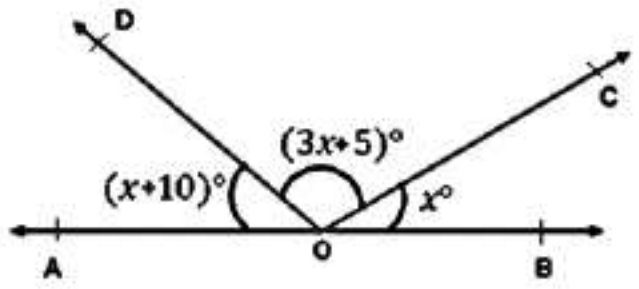
36. In the given figure, if $PQ \parallel RS$ and $QR \parallel ST$, find the value of $(a + b)$.



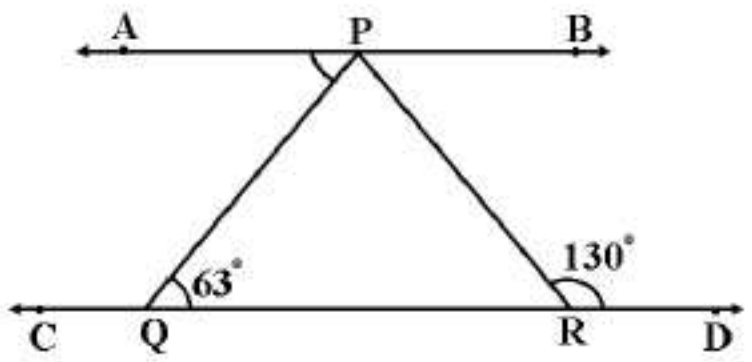
37. In the given figure, if $l \parallel m$ then find the sum of a and b.



38. Find the value of x.



39. In the given figure, $AB \parallel CD$, $\angle APQ = 50°$ and $\angle PRD = 130°$, then find $\angle QPR$.

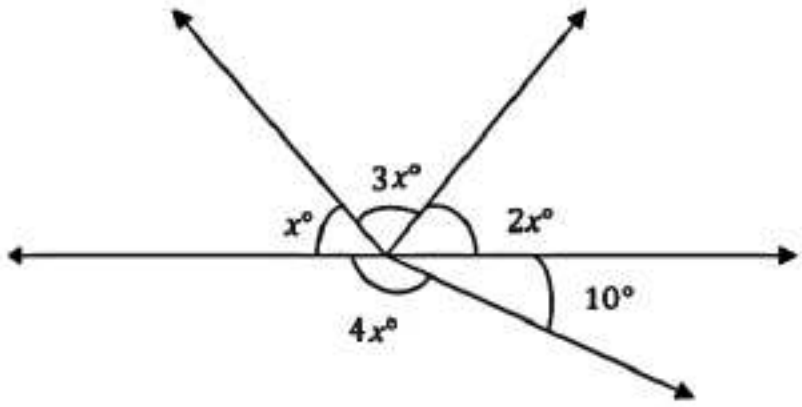


40. **Find the angle which is one-eighth of its complement.**

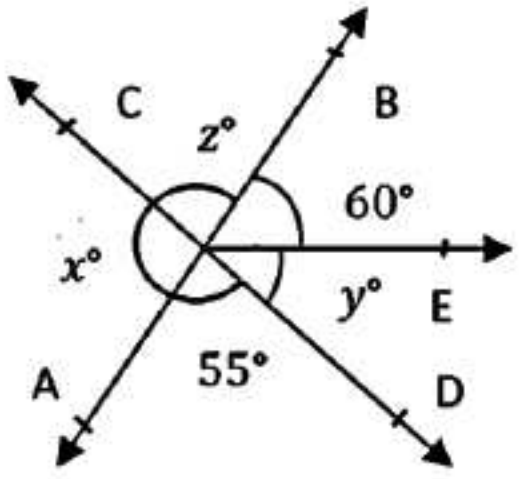
41. **Find the angle which is $80°$ more than its supplement.**

42. **Find the complement of one-fifth of a right angle.**

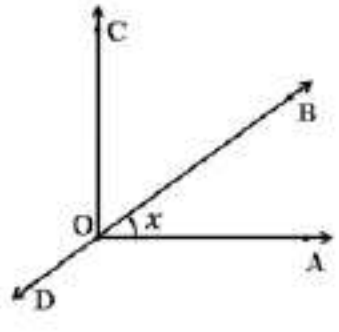
43. **Find the value of x in the given figure.**



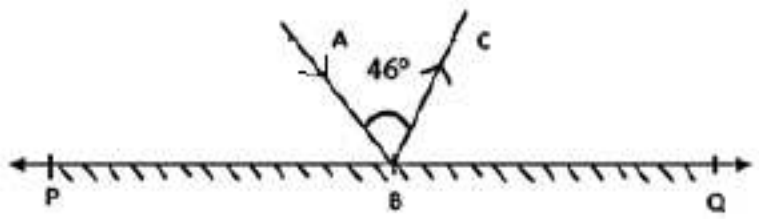
44. **Find the value of $x + y + z$.**



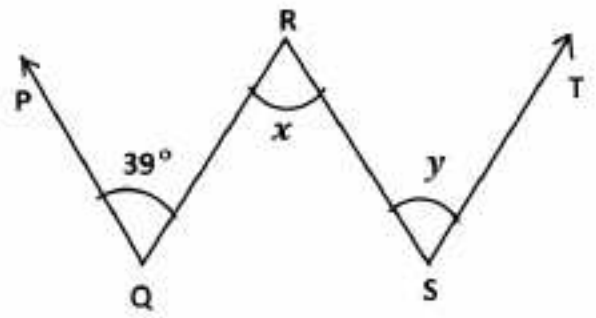
45. **In the given figure, BOD is a straight line and $\angle AOB = x$. If $\angle COD$ is three times $\angle AOB$ and $\angle AOD$ is four times of $\angle AOB$, then find $\angle BOC$.**



46. In the given figure, **PQ** is a mirror, AB is the incident ray and BC is the reflected ray. If $\angle ABC = 46°$, then find $\angle ABP$.



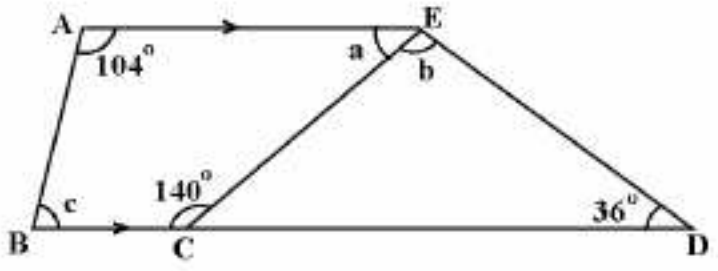
47. In the given figure, **PQ ∥ RS** and **QR ∥ ST**.If $\angle PQR = 39°$, find $x + y$.



48. If $\angle A$ is supplement of $\angle B$, $\angle B$ is complement of $\angle C$ and $\angle A = 118°$, then find the measure of $\angle C$.

49. The sum of an angle and one-third of its supplementary angle is $90°$. Find the angle.

50. In the given figure, if **AE ∥ BD** then find the values of a, b and c.



Answers:

Q. No.	Answer	Q. No.	Answer
1.	(i) no (ii) equal (iii) supplementary	26.	$x = 60°, y = 120°, z = 100°$
2.	(a) 63° (b) 42° (c) 14° (d) 78°	27.	$x = 80°$, $y = 100°$, $z = 30°$
3.	(a) 59° (b) 131° (c) 63° (d) 102°	28.	$a = 78°$, $b = 60°$, $c = 120°$
4.	$\angle ABC = 115°$,	29.	$x = 55, y = 125, z = 125$
5.	40°, 140°	30.	70° and 110°
6.	(a) 45° (b) 90°	31.	254°
7.	28°,62°	32.	$p = 10$
8.	160°	33.	54°, 126°
9.	118°	34.	50°
10.	60°	35.	135°, 45°
11.	120°	36.	292°
12.	60°	37.	113°
13.	45°	38.	33
14.	6° and 84°	39.	80°
15.	52°	40.	10°
16.	35°	41.	130°
17.	$x = 50°$	42.	72°
18.	150°	43.	35
19.	36°	44.	245°
20.	$x = 120°$	45.	72°
21.	$b = 90°$	46.	67°
22.	60° and 120°	47.	78°
23.	$x = 50°, \angle BOC = 70°$, $\angle COD = 50°, \angle AOD = 60°$	48.	28°
24.	North East	49	45°
25.	$\angle 2 = 130°, \angle 3 = 130°$, $\angle 4 = 130°$	50.	$a = 40°, b = 104°$, $c = 76°$

CHAPTER 6

TRIANGLES AND THEIR PROPERTIES

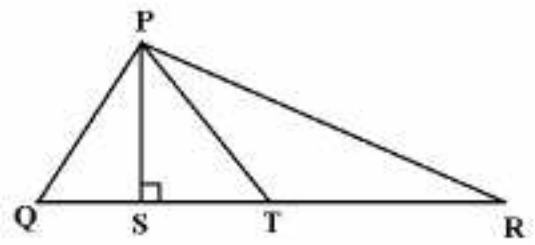
Points to remember:

- A simple closed figure made by three line segments is called a Triangle. *it* is denoted by symbol Δ
- Area inside the triangular region is called Interior Region of the triangle.
- A triangle has three vertices, three angles and three sides.
- Sum of interior angles of a triangle is 180°.
- An Exterior Angle of a triangle is equal to the sum of two interior opposite angles.
- The sum of the length of any two sides of a triangle is greater than the length of the third side.
- In a right triangle the square of the hypotenuse is equal to the sum of the square of the other two sides. This is known as Pythagoras Theorem.

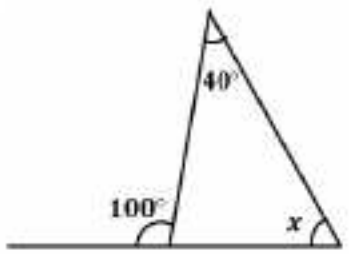
Questions:

1. What is the sum of interior angles of a triangle ?
2. What is the sum of exterior angles of a triangle ?
3. In a ΔABC, AB = BC = CA, name the type of triangle.
4. In a right angled triangle ABC, if $\angle B = 90°$, which side is hypotenuse ?
5. In ΔMNO, if $\angle M = \angle N$, then name the equal sides.
6. How many medians can a triangle have ?

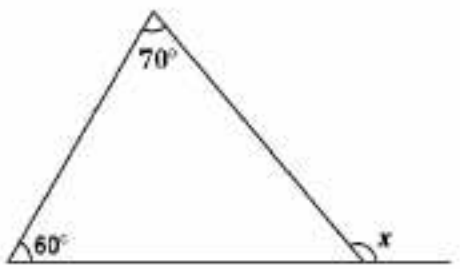
7. **Write the name of median and altitude in the given ΔPQR.**



8. **Find the value of x.**



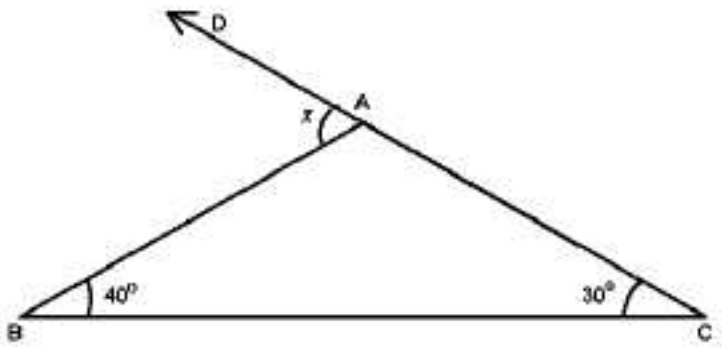
9. **Find the value of x.**



10. **The sum of lengths of two sides of a triangle is always_____ than its third side.**

11. **The point of concurrency of medians of a triangle is known as _____**

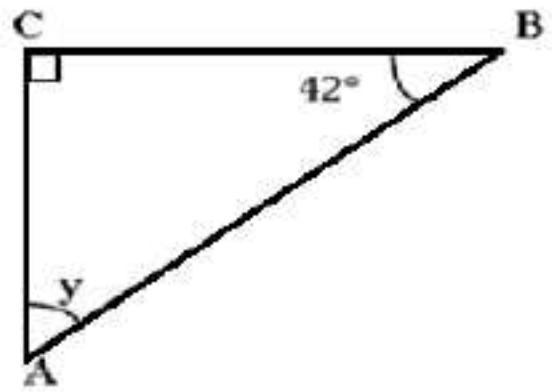
12. **From the given figure, find the value of x.**



13. **The sum of two angles of a triangle is equal to its third angle. Find the third angle.**

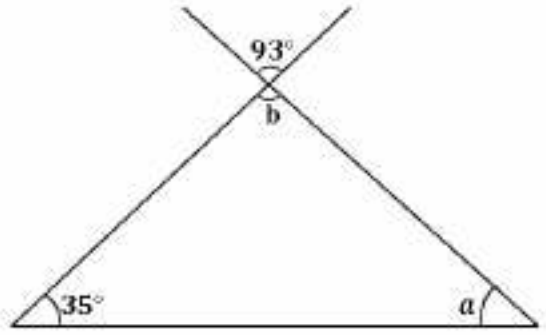
14. **The angles of a triangle are in the ratio 4 : 6 : 8. Find the measurement of the greatest angle.**

15. Find the value of 'y' from the given figure-



16. If one angle of a triangle is 40° and other two angles are in the ratio 3 : 4, find these angles.

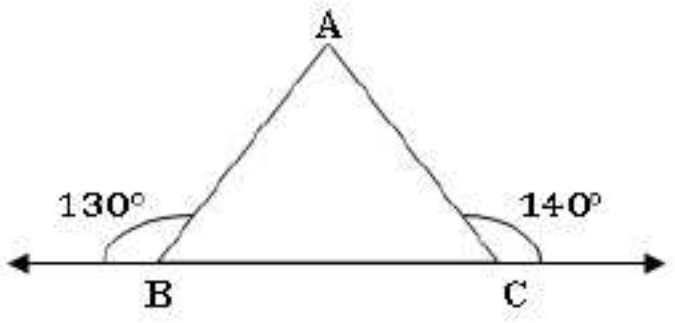
17. From the given figure find the values of 'a' and 'b'.



18. The angles of a triangle are in ratio 3 : 5 : 7. Find the greatest angle.

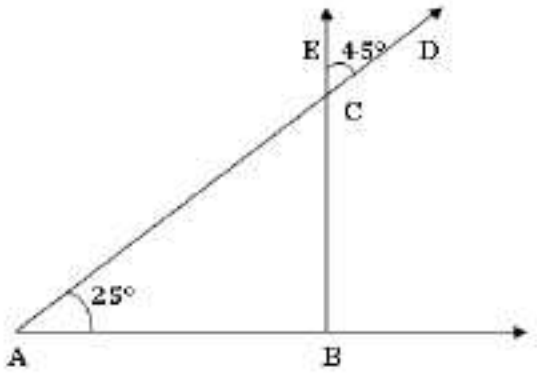
19. The angles of a triangle are $(2x - 5)°, (x - 3)°$, and $x°$. Find the value of x and measurement of angles.

20. Find ∠CAB from the given figure :



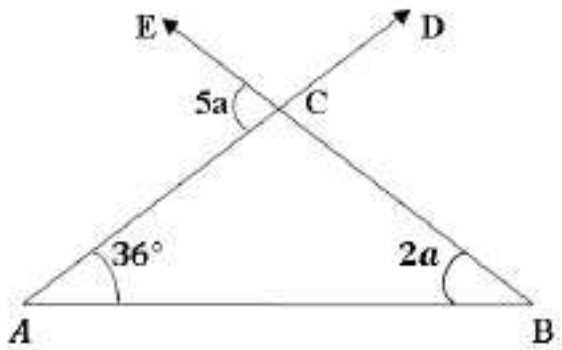
21. What is the minimum and maximum integral value of length of third side of a triangle whose two sides are 7 cm and 10 cm.

22. The angles of a triangle are $(x-20)°, (x-10)°$ and $(x+15)°$. Find the value of x.



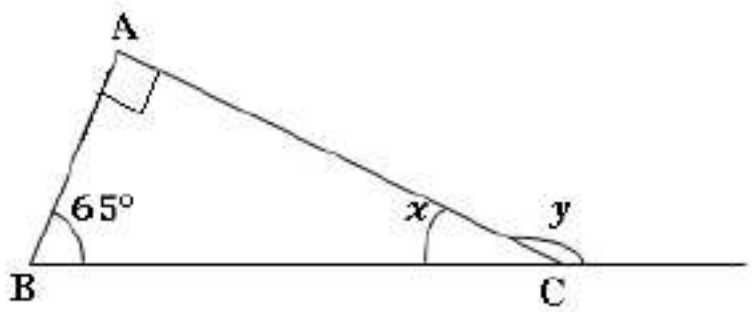
23. In ΔART, if $\angle A = 32°, \angle R = 64°, \angle T = 84°$, then which side is smallest ?

24. Find the value of 'a' from the given figure :



25. ΔXYZ is an equilateral triangle and XP is the median, if $PY = 2.5$ cm, find the perimeter of ΔXYZ.

26. From the given figure, find the value of x and y.

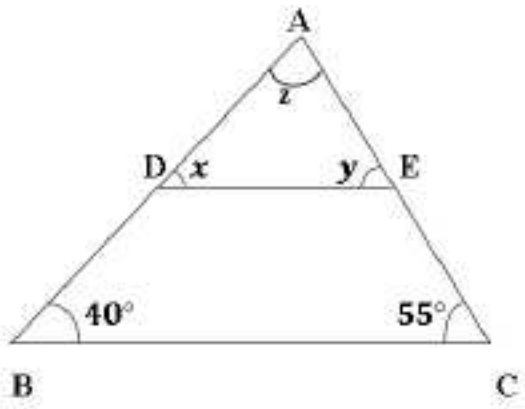


27. In a right angle triangle LMN if $LM^2 + MN^2 = LN^2$, then which angle of this triangle is $0°$?

28. A man goes 10 m due east and then 24 m due north, find his distance from the starting point.

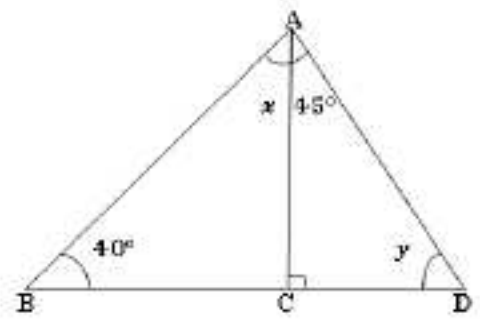
29. A square is described on the hypotenuse of a right angled triangle whose other two sides are 12 cm and 5 cm. What is the area of the square so formed?

30. Find the value of x, y and z if DE ∥ BC in ΔABC .



31. Two acute angles of a right angled triangle are equal. Find these two angles.

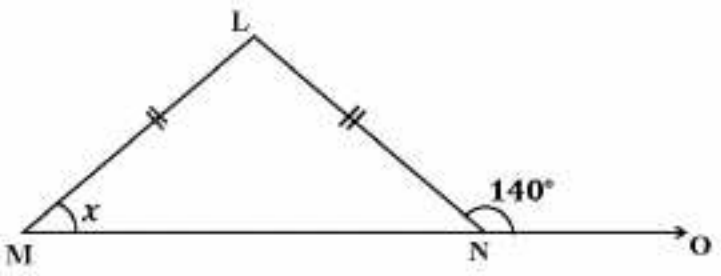
32. From the given figure, find the value of x and y.



33. In ΔABC if $3\angle A = 4\angle B = 6\angle C$, find the angles.

34. In ΔPQR $\angle P = 100°$. PS bisects ∠P and PS ⊥ QR. Find ∠Q.

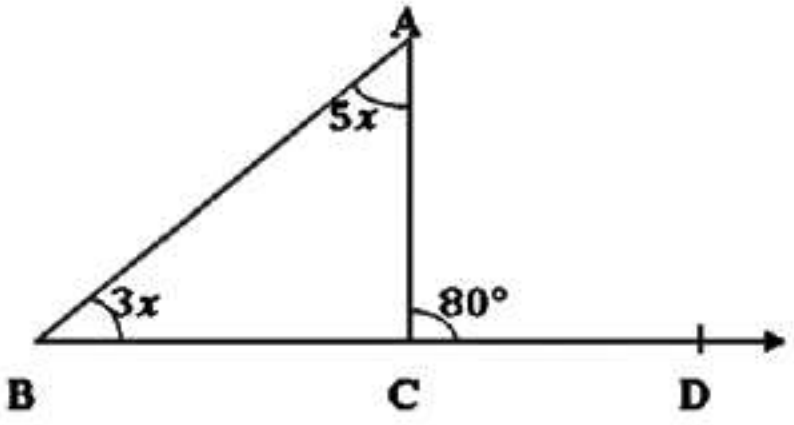
35. Find the value of x in ΔLMN.



36. If one angle of a triangle is 70^0 and other two angles are in the ratio 2 : 3. Find these angles.

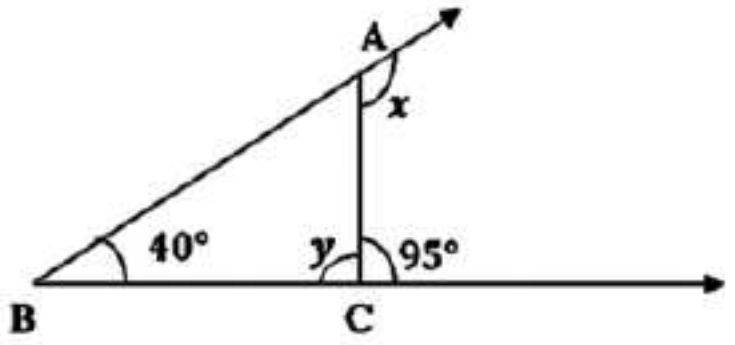
37. An exterior angle of a triangle is 120° and ratio of two interior angles is 3 : 5. Find the interior opposite angles.

38. From the given figure, find $\angle A$ and $\angle B$.



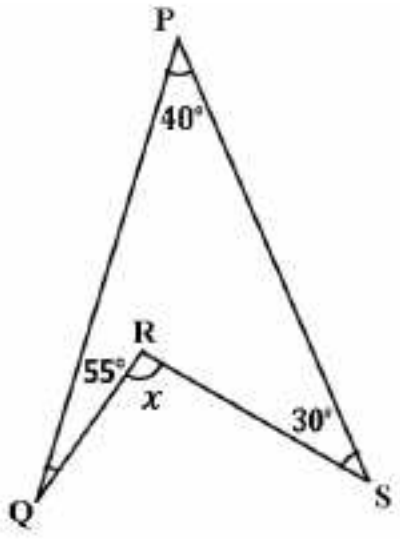
39. One of the exterior angles of a triangle in **100°** and the interior opposite angles are equal to each other. What is the measure of each of these angles ?

40. Find the value of x and y from the given figure :



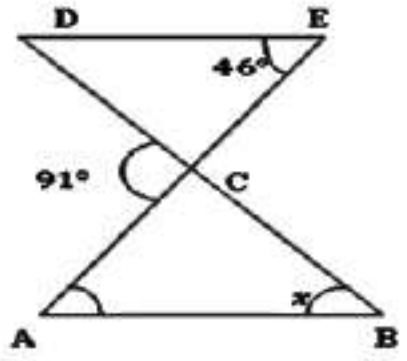
41. The exterior angle obtained on producing the base of a triangle both ways are **104°** and **136°**. Find all the angles of the triangle.

42. Find the value of x in the given figure PQRS.



43. If the exterior angles of a triangle are $(2x + 10)°, (3x - 5)°$ and $(2x + 40)°$, then find the interior angles.

44. In the given figure, **AB ∥ DE**, find the value of x.

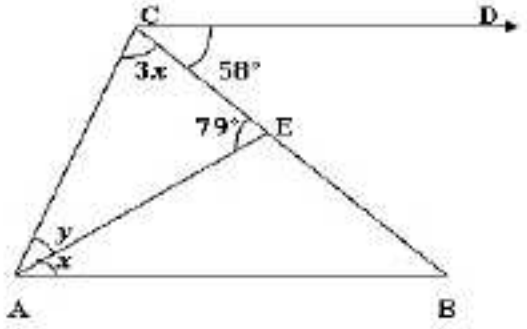


45. A man goes 12 m east and then 5 m north. Find his shortest distance from starting point.

46. Find the length of the diagonal of a square whose side is 8 cm.

47. Find the perimeter of the rectangle whose length is 40 cm and 41cm.

48. In the given figure, **AB ∥ CD** find the value of x and y.



49. If $m^2 + 1, m^2 - 1$ and 2m form a Pythagorean triplet for $m > 1$, then what are the value of Pythagorean triplet for $m = 3$?

50. Find the perimeter of a rectangle whose one side measures 20 m and the diagonal is 29 m.

Answers:

Q. NO.	ANSWER	Q. NO.	ANSWER
1.	180°	26.	$x = 25°, y = 155°$
2.	360°	27.	∠M or ∠LMN
3.	Equilateral triangle	28.	26 m
4.	AC	29.	169 sq cm
5.	OM = ON	30.	$x = 40°, y = 55°, z = 85°$
6.	Three	31.	45°, 45°
7.	PT, PS	32.	$x = 50°, y = 45°$
8.	60°	33.	∠A = 80°, ∠B = 60° ∠C = 40°
9.	130°	34.	40°
10.	Greater	35.	40°
11.	Centroid	36.	44°, 66°
12.	70°	37.	45°, 75°
13.	90°	38.	∠A = 50°, ∠B = 30°
14.	40°, 60°, 80°	39.	50°, 50°, 80°
15.	$y = 48°$	40.	$x = 125°, y = 85°$
16.	60°, 80°	41.	60°, 76°, 44°
17.	$a = 52°, b = 93°$	42.	125°
18.	84°	43.	80°, 50°, 50°
19.	$x = 47$; 89°, 44°, 47°	44.	$x = 45°$
20.	90°	45.	13 m
21.	Min. = 4 cm, Max. = 16 cm	46.	$8\sqrt{2}$ cm
22.	x = 65	47.	98 cm
23.	RT	48.	x = 21°, y = 38°
24.	a = 12°	49	10, 8, 6
25.	15 cm	50.	82 cm

CHAPTER 7

CONGRUENCY OF TRIANGLES

Points to remember:

- Two plane figures are congruent if each when superimposed on the other covers it exactly. Symbol of congruence is '≅' and is read as 'congruent to'.
- The congruency condition for any two triangles to be congruent are :

  SSS – (Side – Side –Side) congruency

  SAS – (Side – Angle –Side) congruency

  ASA – (Angle – Side – Angle) congruency

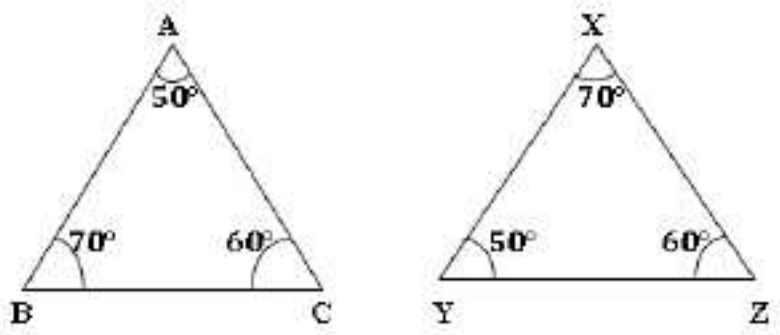
  RHS – (Right angle – Hypotenuse – Side) congruency

- If $\Delta ABC \cong \Delta PQR$, then their corresponding parts are equal. Thus,

  $AB = PQ$, $BC = QR$, $CA = RP$ and $\angle A = \angle P$, $\angle B = \angle Q$ and

  $\angle C = \angle R$.

  Example:



Observe the correspondence of the vertices in above figure

Correspondence of Vertices : $A \leftrightarrow Y$, $B \leftrightarrow X$, $C \leftrightarrow Z$

Correspondence of Sides : $AB \leftrightarrow YX$, $BC \leftrightarrow XZ$, $CA \leftrightarrow ZY$

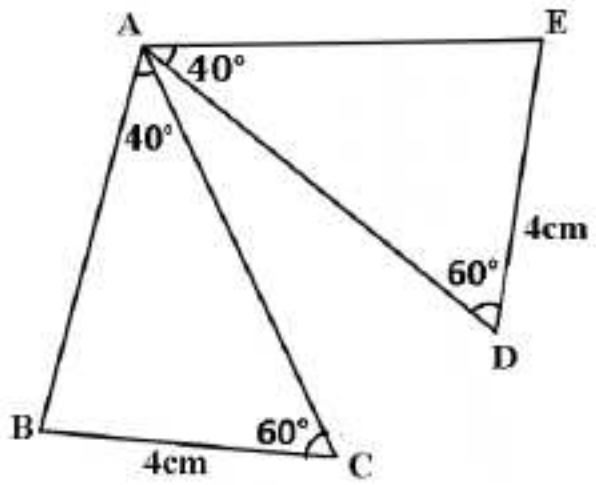
Questions

1. If $\Delta ABC \cong \Delta PQR$, then

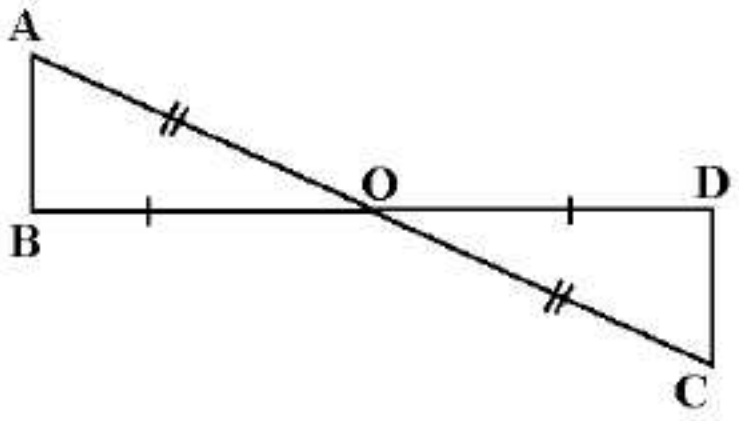
   (i) AB = __ (ii) BC = __ (iii) CA = __ (iv) $\angle A$ = __ (v) $\angle B$ = __ (vi) $\angle C$ = __

2. If $\Delta ABC \cong \Delta YZX$, then (i) AB $\leftrightarrow$ ___ (ii) BC $\leftrightarrow$ ____ (iii) CA $\leftrightarrow$ ____

3. Mention the congruence of two triangles given below in symbolic form.



4. In the given figure, if $\Delta AOB \cong \Delta COD$, state the congruence criteria used :



5. If $\Delta ABC \cong \Delta DEF$ and $\angle A = 90^0$, $\angle B = 55^0$ then $\angle F$=___

6. Fill in the blanks:

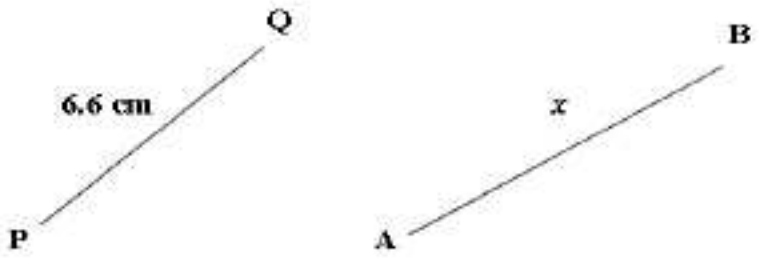
   (i) Two line segments are congruent if their _____ are equal.

   (ii) Two squares are congruent if measurement of their _____ are equal.

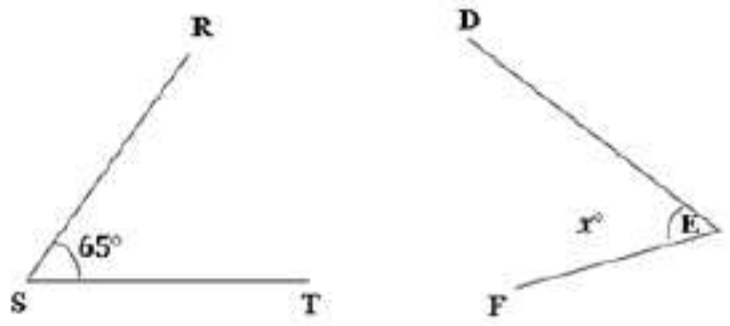
   (iii) Two circles are congruent if their _____ are equal.

What is the measurement of unknown angles or sides in the following pair of geometrically congruent figures (Q. 7 – 10) :

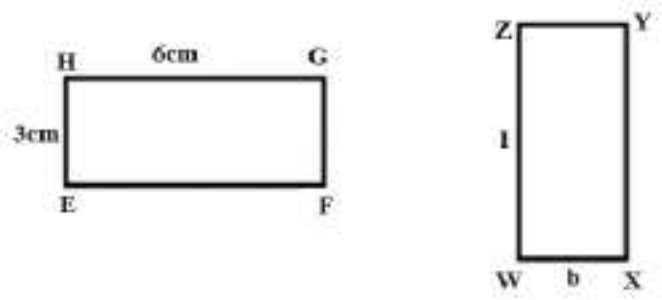
7.



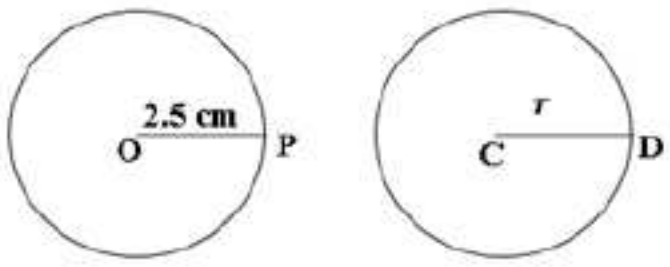
8.



9.



10.

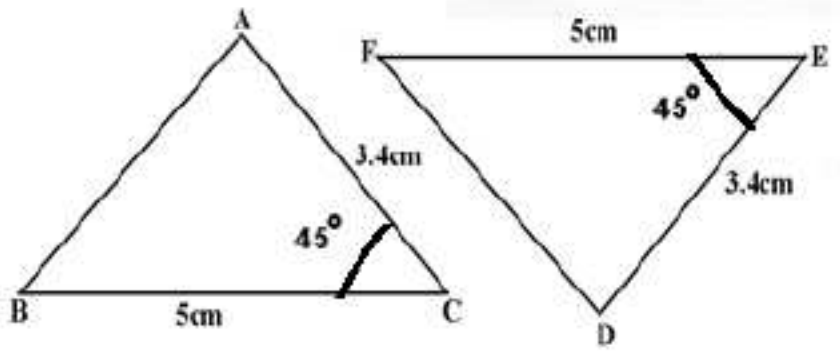


11. If $\Delta LMN \cong \Delta DEF$, then find the value of $\frac{MN}{EF}$.

12. If $\Delta EFG \cong \Delta RST$, then what will be the corresponding part of :

(i) EF (ii) RT (iii) RS

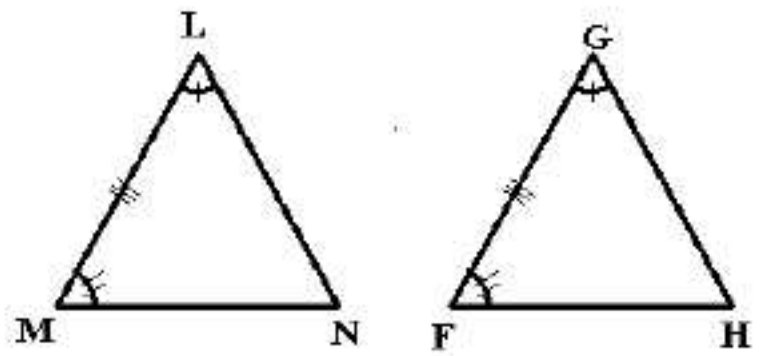
13. Mention the congruence criteria and state the result in the symbolic form.



14. Given below are measurements of two congruent triangles. Mention the congruency of the triangles in symbolic form.

In ΔABC,	In ΔPQR,
$\angle B = 90^0$, AC = 8 cm, AB = 3 cm	$\angle P = 90^0$, PR = 3cm, QR = 8 cm

15. Which congruence criterion do you use if given

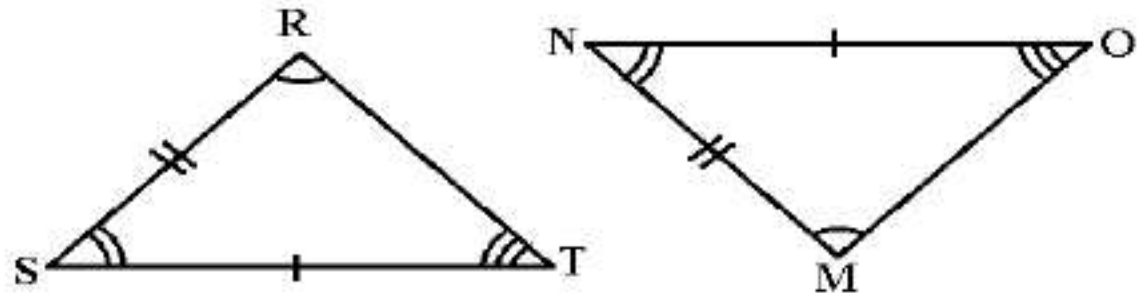


$\angle MLN = \angle FGH$, $\angle NML = \angle GFH$

ML = FG

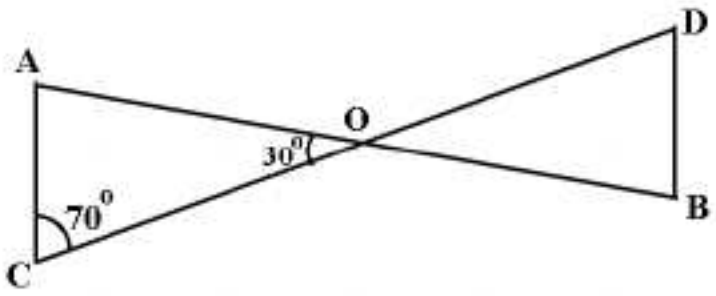
Then, $\Delta LMN \cong \Delta GFH$

16. In the figure, the two triangles are congruent. The corresponding parts are marked. We can write

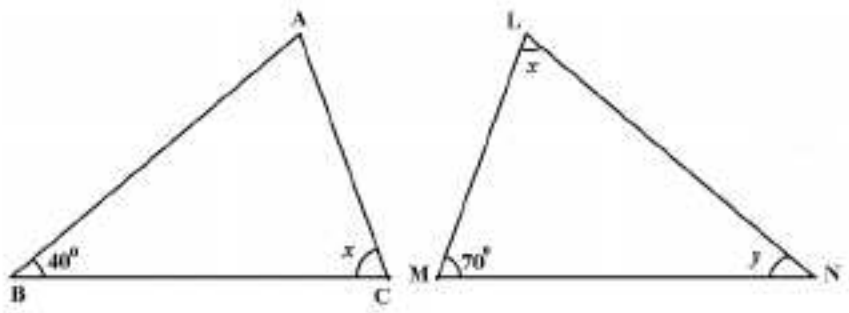


$\Delta RAT \cong$ ___

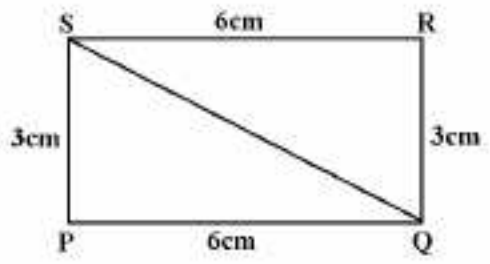
17. If $\Delta AOC \cong \Delta BOD$, find $\angle B$.



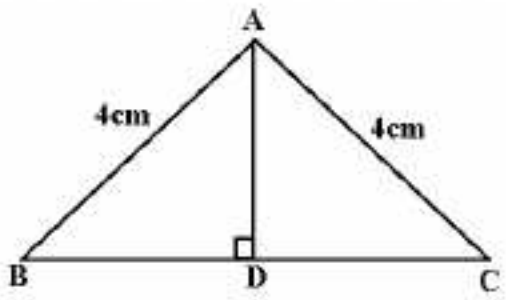
18. If $\Delta ABC \cong \Delta LNM$, then find the values of x, y and z.



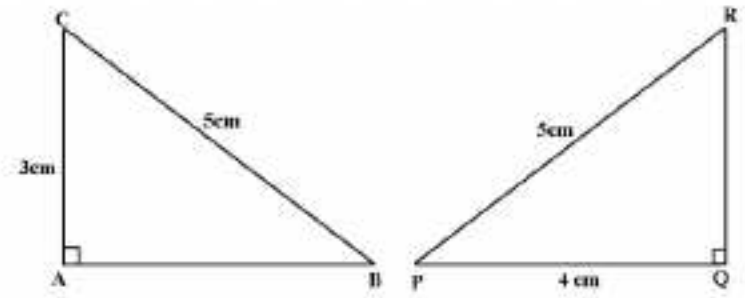
19. In the given figure, which triangles are congruent ? Mention the congruency criterion in the symbolic form.



20. Which congruency criterion do you use to prove $\Delta ADB \cong \Delta ADC$?

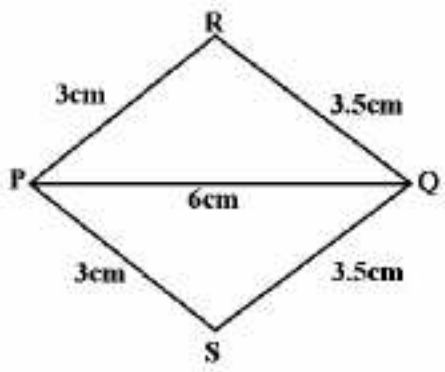


21. If $\Delta ABC \cong \Delta QPR$, then RQ =___

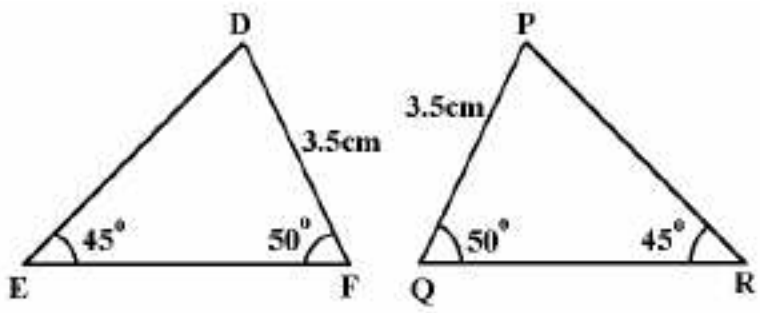


Observe the following pairs of triangles in the questions 22 – 25 and mention the congruence criterion.

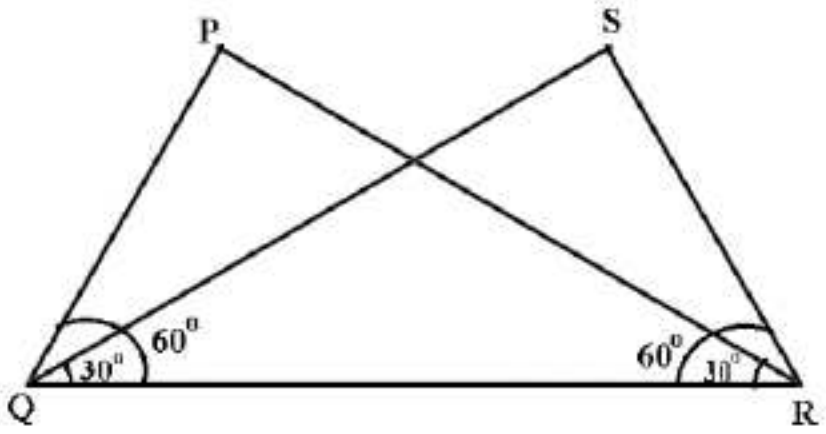
22.



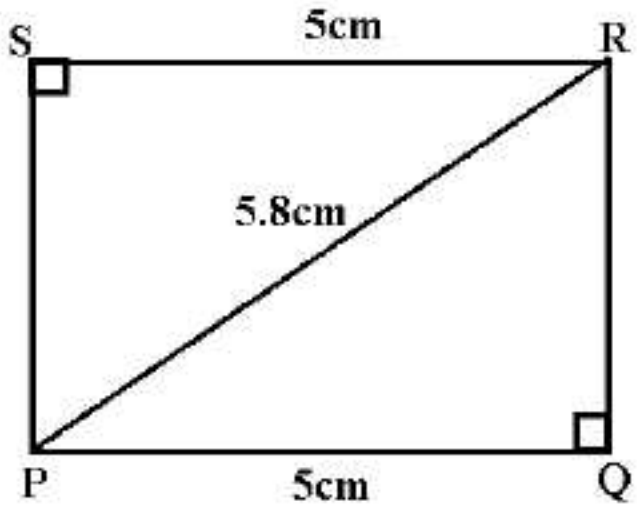
23.



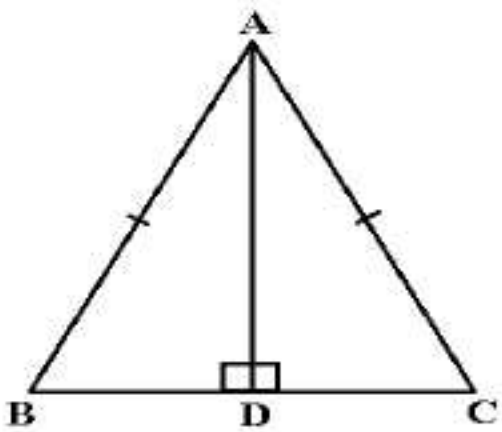
24.



25.



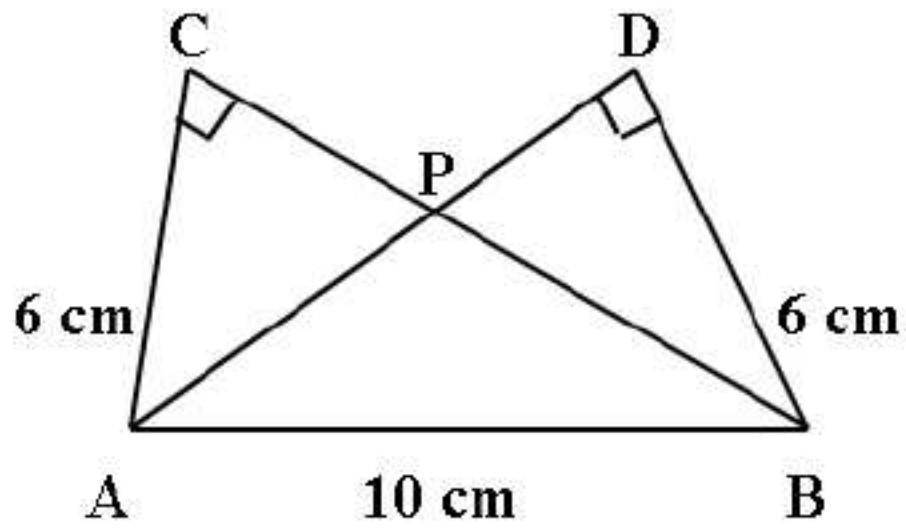
26. Mention the congruence of the triangles given in the figure in symbolic form and criterion used.



27. Two line segments are congruent and one has length 4.6 cm, what will be the length of twice of the other line segment ?

28. On the basis of measurement given in the figure, state the congruence criterion by which

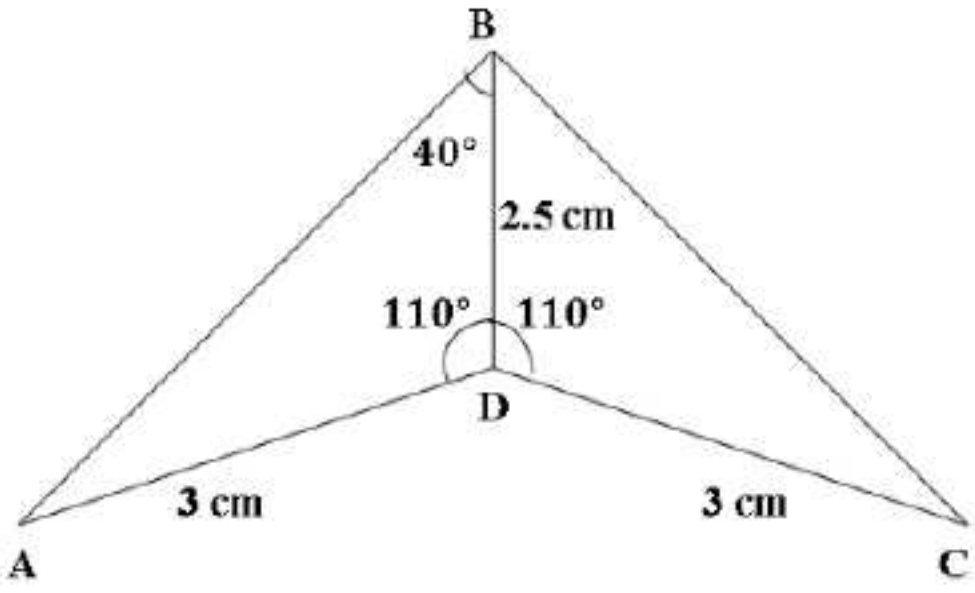
(i) $\Delta ABC \cong \Delta BAD$ (ii) $\Delta ACP \cong \Delta BDP$.



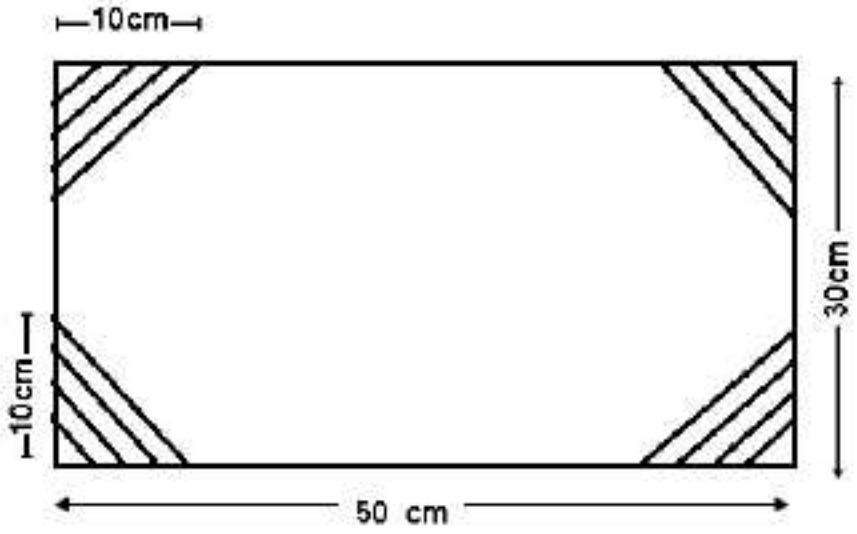
29. If $\Delta ABC \cong \Delta PQR$ and AC =3.8 cm, $\angle B = 60°$, then find PR.

30. If $\Delta PQR \cong \Delta FGH$ and $\angle P = 2x + 15°, \angle F = 5x - 60°$, then find the value of x.

31. From the given figure, find $\angle BCD$.



32. Four congruent triangles are cut off from the corners of a rectangle as shown in the figure, find the area of remaining portion.



33. If radius of a circle is 7 cm, what will be the diameter of the circle congruent to this circle ?

34. If side of a square is 15 cm, what will be the area of the square which is congruent to this square ?

35. If side of an equilateral triangle is 4 cm, what will be the area of the triangle which is congruent to this triangle ?

Answers

Q. No.	Answer	Q. No.	Answer
1.	(i) PQ (ii) QR (iii) RP (iv) $\angle P$ (v) $\angle Q$ (vi) $\angle R$	19.	$\Delta PQS \cong \Delta RSQ$
2.	(i) YZ (ii) ZX (iii) XY	20.	RHS
3.	$\Delta ABC \cong \Delta AED$	21.	RQ = 3 cm
4.	SAS,	22.	SSS
5.	$\angle F = 35°$	23.	ASA
6.	(i) Lengths (ii) Sides (iii) Radius	24.	ASA
7.	$x = 6.6$ cm	25.	RHS
8.	65	26.	$\Delta ABD \cong \Delta ACD$, RHS
9.	$l = 6$ cm, $b = 3$ cm	27.	9.2 cm
10.	$r = 2.5$ cm	28.	(i) RHS (ii) ASA
11.	$\frac{MN}{EF} = 1$	29.	PR = 3.8 cm, $\angle Q = 60°$
12.	(i) EF = RS (ii) RT = EG (iii) RS = EF	30.	$x = 25°$
13.	$\Delta ACB \cong \Delta DEF$	31.	$\angle BCD = 30°$
14.	$\Delta ABC \cong \Delta RPQ$	32.	Area = 1300 sq cm
15.	ASA	33.	Diameter = 14 cm
16.	ΔWON	34.	Area = 225 sq cm
17.	$\angle B = 80°$	35.	Area = $4\sqrt{3}$ sq cm
18.	$x = 70°, y = 40° z = 70°$		

CHAPTER 8

COMPARING QUANTITIES

Points to remember:

- When two quantities of same kind with same units are compared by division, ratio of two quantities is obtained.
- A ratio has no unit.
- A ratio is said to be in simplest form, if its two terms have no common factor other than one.
- Comparison of two ratios is done by making them fractions with equal denominators and these ratios are called equivalent or proportional.
- Another method of comparison is percentage.
- Any simple fraction, decimal fraction or ratio can be converted into percentage and any percentage can be converted into simple fraction, decimal or ratio.

  Percentage means 'for each 100'; $\% = \frac{1}{100}$
- When S.P. > C.P., there is Profit.
- Profit = S.P. − C.P.
- Profit % = $\frac{\text{Profit}}{\text{C.P.}} \times 100\ \%$
- When C.P. > S.P. , there is Loss.
- Loss = C.P. − S.P.

- Loss % $= \frac{\text{Loss}}{\text{C.P.}} \times 100\ \%$
- Simple Interest $= \frac{\text{Principal} \times \text{Rate of interest} \times \text{Time}}{100}$

TRICKS

- A number which, when added to terms of a:b makes it equal to the c:d is $\frac{ad-bc}{c-d}$
- A number which, when subtracted from the terms of ratio a:b makes it equal to ratio c:d is $\frac{bc-ad}{c-d}$
- If the sum of two numbers is A and their difference is B, then the ratio of numbers is given by A + B : A – B
- If a : b :: c : d, then a × d = b × c.

Questions

1. Find the ratio :
   (a) 15 days to 36 hours (b) 27cm to 9 m
2. Convert given fraction into percent :
   (a) $\frac{3}{40}$ (b) $\frac{2}{7}$ (c) $\frac{5}{4}$
3. Convert percent into fraction :
   (a) 15 % (b) 120 % (c) 2.5 %
4. Convert given ratio into percent :
   (a) 12 : 5 (b) 3 : 4
5. Express in fraction (lowest form) : (i) 45% (ii) 19%
6. Find: (i) 40% of ₹ 120 (ii) 65% of 1kg. (iii) 1% of 1 hour
7. Find the value of x if (i) 4 : 8 = x : 12, (ii) 20 : 4= 35 : x
8. 12% of 50 + 5% of 120 = _____

9. What percent of numbers from 1 to 25 are divisible by 4 ?

10. If C.P. of 16 articles is equal to S.P. of 20 articles, then find the gain or loss percent.

11. 12.5 % more is gained by selling a pen for ₹ 88 instead of selling for ₹ 80. Find the C.P. of pen.

12. S.P. of an article is $\frac{3}{4}$ of its C.P. What is the loss % ?

13. At what rate % of simple interest per annum, will a sum of money double itself in 8 years ?

14. At a certain rate of simple interest a certain sum doubles itself in six years. In how many years will it triple itself ?

15. In an exam, 14% students fail and 559 passed. Determine number of fail students.

16. In what time period will ₹3000 triples itself, if the rate of simple interest is 20% per annum ?

17. A fruit basket has 20 apples out of which 30% are rotten. How many good apples are there in the basket ?

18. Divide 112 pens into Sam and Somya in the ratio 3 : 5. Find the number of pens Sam get.

19. Sides of two squares are 7.5 cm and 5 cm respectively. Find the ratio of their areas.

20. Manas saves 35 % from his salary. If his savings is ₹14000, then what is his salary ?

21. Ankur saves 30 % from his salary. If his salary is ₹ 50000, then find his expenditure.

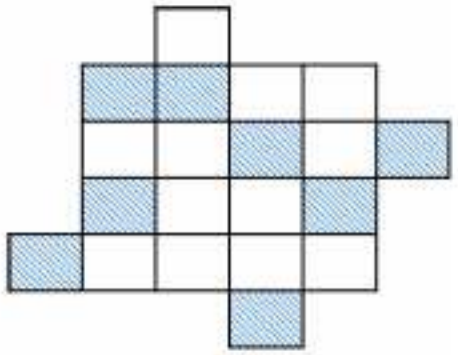
22. If price of one dozen banana is ₹ 72, then find price of 15 such bananas.

23. Ram purchased an old car for ₹ 100000. He spent 10 % of cost price on its repair. He sold the car for ₹ 99000, find his gain or loss percent.

24. Iqbal purchased an old scooter for ₹ 20000 and spent 20 % of its C.P. on painting and sold the scooter for ₹ 30000. Find his gain or loss percent.

25. If 30 % of y is 150, then find y.

26. How many more squares must be shaded so that only 30% of the figure left unshaded.



27. A farmer gained 50% after selling his cow for ₹ 15000. Find C.P. of the cow.

28. A person sold his motorcycle for ₹ 38000 with 5 % loss, find C.P. of the motorcycle.

29. A bucket of 20 litres is 35% full with water. How many litres of water must be added so that it is 65% full with water ?

30. A sum of money triples itself in 25 years. Find the rate of simple interest.

31. A sum of ₹ 2000 invested for 3 years at simple interest 6 % per annum. Find the amount at the end of 3rd year.

32. A sum of ₹ 5000 is invested for six months at 10 % per annum. Find the amount at the end of this time period.

33. 90 is 25% of what number ?

34. 3 kg of flour is enough for 15 people. How much flour is needed for such 80 people.

35. A dealer buys a radio for ₹ 2500 and spends ₹ 500 on transportation. He sells the radio for ₹ 3300. Find his gain or loss percent.

36. At what rate percent per annum will ₹ 8000 amounts to ₹ 10000 in a year ?

37. 15 persons finish a work in 30 days, how many days will be taken to finish the same work by 5 persons ?

38. The first three numbers of a proportion are 8, 10 and 12. Find the fourth number.

39. The ratio of three angles of a triangle is 3:4:5. Find the smallest angle.

40. Ratio of calcium, carbon and oxygen in chalk is 8: 3: 9. Find the percentage of carbon in the chalk.

41. A library contains 50 % of books in Hindi, 30 % of books in English and remaining 300 books are in Punjabi. Find total number of books in library.

42. The population of a town has increased from 80000 to 92000. Find the percentage increase in population.

43. There are 12 boys and 8 girls in a class. Find the percentage of girls in the class.

44. What percentage of 5 km is 200 metres ?

45. Annual income of a person is ₹ 800000. If his salary increases 5 % per annum, what will be his salary after 2 years ?

46. Fill in the boxes: $\frac{15}{18} = \frac{\square}{6} = \frac{10}{\square} = \frac{\square}{30}$

47. If 9 : 15 : : 27 : m, then find the value of m.

48. Sum of two numbers is 100 and their ratio is 9 : 16. Find the bigger number.

49. If the ratio of the cost price and selling price of an article is 5:6, then find the gain or loss percentage.

50. A man buys balloons at the rate of 3 balloons for a rupee and sells them at the rate of 2 balloons for a rupee. Find his gain or loss percent.

Answers:

Q. NO.	ANSWER	Q. NO.	ANSWER
1.	(i) 10 : 1 (ii) 3 : 100	26.	6 squares
2.	(i) $7\frac{1}{2}\%$, (ii) $\frac{200}{7}\%$, (iii) 125%	27.	₹ 10000
3.	(i) $\frac{3}{20}$, (ii) $\frac{6}{5}$, (iii) $\frac{1}{40}$	28.	₹ 40000
4.	(i) 240%, (ii) 75%	29.	6 litres
5.	(i) $\frac{9}{20}$, (ii) $\frac{19}{100}$	30.	12%
6.	(i) ₹ 48, (ii) 650 gm, (iii) 36 seconds	31.	₹ 2360
7.	(i) x = 6 (ii) x = 7	32.	₹ 5250
8.	12	33.	360
9.	24%	34.	16 kg
10.	Loss = 20%	35.	10%
11.	₹ 64	36.	25%
12.	25%	37.	90 days
13.	$12\frac{1}{2}\%$	38.	15
14.	12 years	39.	45°
15.	91 students	40.	15%
16.	15 years	41.	1500 books
17.	14	42.	15 %
18.	Sam = 42 pens	43.	40%
19.	9 : 4	44.	4%
20.	₹ 40000	45.	₹880000
21.	₹ 35000	46.	$\frac{15}{18} = \frac{5}{6} = \frac{10}{12} = \frac{25}{30}$
22.	₹ 90	47.	45
23.	Loss = 10 %	48.	64
24.	Profit = 25%	49	Gain = 20%
25.	500	50.	Gain = 50%

CHAPTER 9

RATIONAL NUMBERS

Points to remember

- Rational numbers are the numbers which can be expressed as $\frac{p}{q}$, where p and q are integers and $q \neq 0$, for example, $\frac{3}{7}, \frac{-4}{9}, \frac{5}{6}$ etc.
- Number 0 is neither a positive rational number nor negative rational number. It is only a rational number.
- If two or more rational numbers have equal simplest form, then these are called equivalent rational numbers.
- All integers and fractions are rational numbers.
- There are infinitely many rational numbers between any two rational numbers.

Questions:

1. Write down the rational number in the form of $\frac{p}{q}$ whose numerator and denominator are $(-3) \times 7$ and $(-15) + 4$ respectively.
2. Find the rational number whose numerator is $64 \div 8$ and denominator is $32 - 17$
3. Express $\frac{-4}{7}$ as a rational number whose numerator is 12
4. Express $\frac{-3}{8}$ as a rational number with denominator is 24
5. Express $\frac{90}{216}$ as a rational number with numerator 5
6. Express $\frac{-65}{150}$ into simplest form.
7. Find the product of $\frac{-5}{9}$ and its reciprocal.
8. Find $-2\frac{1}{9} - 6$
9. Fill in the blanks (in the box) : $\frac{-3}{5} = \frac{6}{\square} = \frac{\square}{-15}$

10. Find x such that the given rational numbers become equivalent :

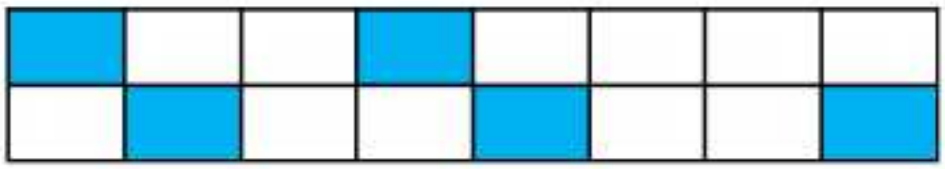
$\frac{8}{7}, \frac{x}{-35}$

11. Find the sum of the smallest natural number and the largest negative integer.

12. Find the product of the smallest whole number and the smallest positive integer.

13. Amongst how many people 21 Kg of ration be distributed equally so that each one gets $\frac{7}{3}$ Kg.

14. Express the shaded portion as a rational number:



15. Which rational number is greater $\frac{-4}{9}$ or $\frac{5}{-6}$

16. Find the sum of $\frac{-3}{11}$ and $\frac{-2}{7}$

17. Find the value of $\left(\frac{3}{5} \times \frac{15}{7}\right) + \left(\frac{1}{7} \times \frac{3}{1}\right)$

18. Find the value of $\frac{5}{4} - \frac{7}{6} - \left(\frac{-2}{3}\right)$

19. Subtract $\frac{3}{2}$ from $\frac{2}{3}$.

20. Find the value of $\frac{4}{3} \div \left(\frac{4}{5} - \frac{3}{4}\right)$

21. Express $\frac{1}{4} + \frac{1}{5}$ into decimal form.

22. Arrange in ascending order $\frac{-4}{7}, \frac{-5}{-2}, \frac{-2}{5}$.

23. Divide $\frac{-8}{9}$ by $\frac{8}{9}$

24. A person bought $\frac{3}{4}$ Kg potatoes and $\frac{2}{3}$ Kg onions from the market. What is the amount of weight he is carrying ?

25. On a number line, what is the length of the line segment joining $\frac{-1}{2}$ and $-2\frac{1}{2}$.

26. Find the product of $\frac{2}{5}$ with the reciprocal of -2

27. Find the value of $\frac{-5}{3} - \left(\frac{-7}{15}\right)$

28. Divide the reciprocal of $\frac{2}{5}$ by $\frac{-4}{5}$

29. Which is greater $\left(\frac{-3}{8} + \frac{7}{11}\right)$ or $\left(\frac{2}{11} \div 8\right)$

30. Find the additive inverse of $\frac{5}{3} + \frac{3}{4}$

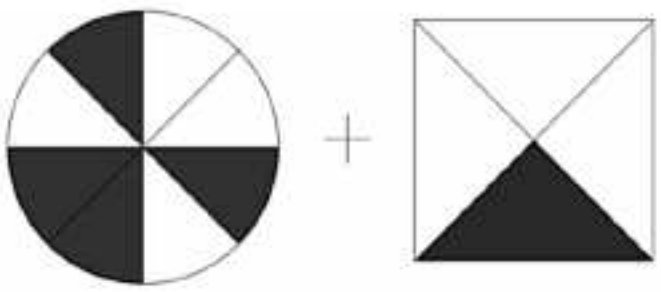
31. The sum of two rational numbers is -5. If one of the numbers is $\frac{2}{3}$, find the other.

32. Find the value of $\frac{48}{25} \div \left(\frac{16}{-5}\right)$

33. Product of two rational numbers is $\frac{8}{27}$. If one of the numbers is $\frac{2}{3}$, then find the other number.

34. Which number gives $\frac{2}{3}$ on multiplying with $\frac{-4}{3}$

35. Express the shaded portion as a rational number



36. $\frac{-5}{7}$ should be added to which number to get $\frac{22}{14}$?

37. Ramesh gives $\frac{3^{th}}{5}$ of his income to his wife and $\frac{1^{th}}{8}$ to his son. Find what fraction does he have now ?

38. Find the value of $\frac{-4}{11} + \frac{-7}{22}$

39. Find the value of $\frac{2}{5} + \frac{3}{4} + \frac{5}{12}$

40. Find the multiplicative inverse of $\frac{4}{5} + \frac{5}{4}$

41. Find the value of $\left(\frac{-4}{3} + \frac{5}{7}\right) \times \frac{7}{9}$

42. Find the value of $\left(\frac{-17}{18}\right) \times (-108)$

43. Find the rational number that should be subtracted from 5 so as to get $\frac{7}{9}$.

44. Two boys are standing at one place. A boy walks $\frac{7}{24}$ Km towards north direction and another boy walks $\frac{17}{36}$ Km towards south direction. Find the distance between two boys.

45. With what number should we multiply $\frac{-36}{35}$ to get $\frac{-6}{5}$?

46. If $p = 2m \times r$ and $q = n \times 2r$, then find $\frac{p}{q}$

47. Divide the sum of $\frac{5}{21}$ and $\frac{4}{7}$ by their difference.

48. From a rope of the length 40m, a man cuts some equal sized pieces. How many pieces can be cut if each piece is of $\frac{4}{9}$m length ?

49. Which rational number does not have a reciprocal ?

50. A drum of oil is $\frac{3}{4}$ full. When 15 litres of oil are taken out from it, it is $\frac{7}{12}$ full. Find the total capacity of the drum.

ANSWERS

Q.No.	Answer	Q.No.	Answer
1.	$\frac{21}{11}$	26.	$\frac{-1}{5}$
2.	$\frac{8}{15}$	27.	$\frac{-6}{5}$
3.	$\frac{12}{-21}$	28.	$\frac{-25}{8}$
4.	$\frac{-9}{24}$	29.	$\frac{-3}{8}+\frac{7}{11}$
5.	$\frac{5}{12}$	30.	$\frac{-29}{12}$
6.	$\frac{-13}{30}$	31.	$\frac{-17}{3}$
7.	1	32.	$\frac{-3}{5}$
8.	$\frac{-73}{9}$	33.	$\frac{4}{9}$
9.	$-10,9$	34.	$\frac{-1}{2}$
10.	-40	35.	$\frac{6}{8}$ or $\frac{3}{4}$
11.	0	36.	$\frac{16}{7}$
12.	0	37.	$\frac{11}{40}$
13.	9	38.	$\frac{-15}{22}$
14.	$\frac{5}{16}$	39.	$\frac{47}{30}$
15.	$\frac{-4}{9}$	40.	$\frac{20}{41}$
16.	$\frac{-43}{77}$	41.	$\frac{-13}{27}$
17.	$\frac{12}{7}$	42.	102
18.	$\frac{3}{4}$	43.	$\frac{38}{9}$
19.	$\frac{-5}{6}$	44.	$\frac{55}{71}$Km
20.	$\frac{80}{3}$	45.	$\frac{7}{6}$
21.	0.45	46.	$\frac{m}{n}$
22.	$\frac{-4}{7}, \frac{-2}{5}, \frac{-5}{-2}$	47.	$\frac{-17}{7}$
23.	-1	48.	90
24.	$1\frac{5}{11}$kg	49.	0
25.	2 units	50.	90

CHAPTER 10

PRACTICAL GEOMETRY

Points to remember

- A triangle can be constructed if sum of the lengths of any two sides is greater than the third side.
- In a triangle, the sum of interior angles is 180°. This is known as Angle Sum Property of a triangle.
- Exterior angle of a triangle is equal to the sum of both opposite interior angles.
- In a right angled triangle, square of hypotenuse is equal to the sum of the squares of other two sides.
- Minimum three elements are required to construct a triangle. A triangle can be constructed uniquely if
  - a) Three sides are given (SSS)
  - b) Two sides and included angle are given (SAS)
  - c) One side and both angles lying on the sides are given (ASA)

    If any two angles of a triangle are given, we can find the required (third) angle by using the angle sum property (ASP) of a triangle.
  - d) In case of a right triangle, hypotenuse and one of the other two sides are given. (RHS)

Questions:

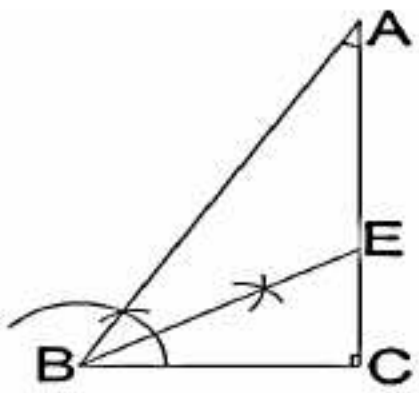
1. How many lines can be drawn through a point ?
2. In which type of triangles does the Pythagoras theorem apply ?
3. How many lines can be drawn through two distinct points ?
4. Which tool can be used to construct angle bisector ?
5. What is the measure of an exterior angle of an equilateral triangle ?

6. How many lines can be drawn parallel to a given line through a point outside it ?

7. What is the relationship between the three sides of a triangle ?

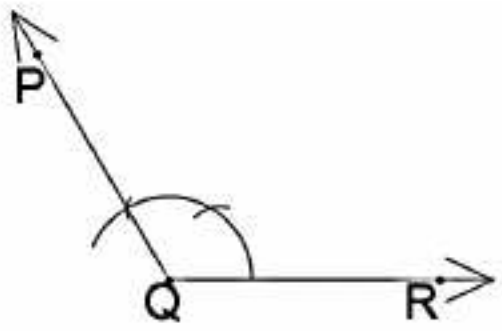
8. How many minimum numbers of elements are required to construct a triangle ?

9. Find the measure of ∠BAC in the given figure.



10. Find the measure of ∠BEC in the figure of Question number 9.

11. Find the measure of ∠PQR.



12. In a triangle, the sum of squares of two sides is equal to the square of the third side. Name the triangle.

13. Which angle needs to be bisected to construct an angle of 75° ?

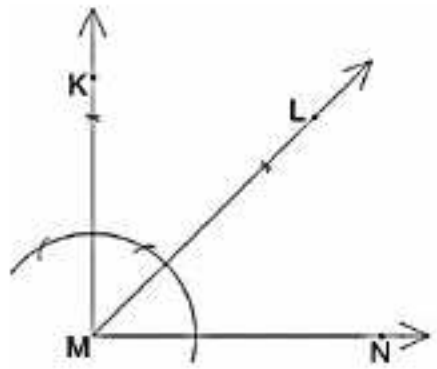
14. How many perpendiculars can be drawn on a line ?

15. What is the measurement of shorter angle formed by two hands of the clock at 7o' clock ?

16. If line a is perpendicular to line b and line b is perpendicular to line c, then what type of lines are a and c ?

17. What type of angles will be formed on bisecting an obtuse angle ?

18. Find the measure of ∠KML.

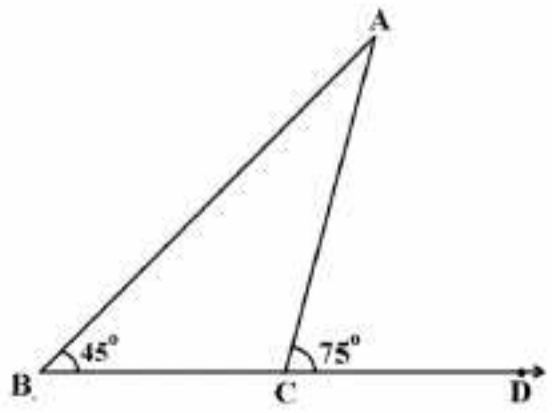


19. If the unequal angle of an isosceles triangle is 40°, then find the measures of other two angles of the triangle.

20. What is the difference of two angles formed by two hands of the clock at 5 o'clock ?

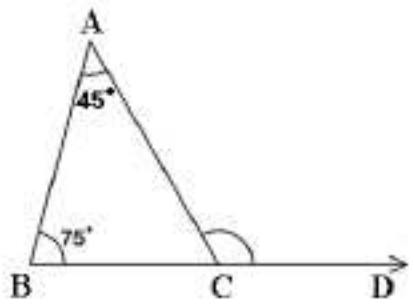
21. If measure of three angles of a triangle are 62°, 58° and 60°, then what type of triangle is this ?

22. Find the value of ∠BAC



23. If the length of the hypotenuse and a side of a right angled triangle are 17 cm and 8 cm respectively, then what is the length of the third side ?

24. Find the measure of ∠ACD.



25. In a ΔABC, AB=5.5cm, BC = 4.6cm and $\angle B = 110°$. According to which criteria this triangle can be constructed ?

26. If three sides of a triangle are 4cm, 5 cm and 5.5 cm, then what type of triangle is this ?

27. How many times we need to construct the bisector of 120° in order to construct an angle of 30°

28. If line p is parallel to q and q is parallel to r, then what kind of lines are p and r ?

29. If the sum of squares of the two sides of a right-angled triangle other than hypotenuse is 625 sq cm, then what is the length of third side of the triangle ?

30. Find the length of the hypotenuse in a right-angled triangle whose two sides are of length 3cm and 4cm.

Answers:

Q. No.	Answer	Q. No.	Answer
1.	Infinite	16.	a & c are Parallel Lines
2.	Right-angled Triangle	17.	Acute Angles
3.	Only One	18.	45°
4.	Compass	19.	70°, 70°
5.	120°	20.	60°
6.	Only One	21.	Scalene Acute angled Triangle
7.	Sum of two sides of a triangle is always greater than the third side & difference of two sides of a triangle is always less than the third side.	22.	30°
8.	Three	23.	15 cm
9.	30°	24.	120°
10.	60°	25.	SAS
11.	120°	26.	Scalene Acute angled Triangle
12.	Right Angled Triangle	27.	Two
13.	150°	28.	p & r are Parallel Lines
14.	Infinite	29.	25cm
15.	150°	30.	5cm

CHAPTER 11

PERIMETER AND AREA

Points to remember

Parallelogram:

- Perimeter = Sum of all sides
- Area = Base × Corresponding height

Rectangle:

- Perimeter = 2 × Sum of adjacent sides

  Or

  = 2 × (length + breadth)

- Area = length × breadth

  Or

  = Product of adjacent sides

Square:

- Perimeter = 4 × side
- Area = Side × Side or $(\text{side})^2$

Perimeter of regular polygon = No. of sides × Length of one side

Triangle:

- Perimeter = Sum of all sides
- Area $= \frac{1}{2} \times$ Base × Corresponding height

Area of Triangle $= \frac{1}{2} \times$ Area of parallelogram

Circle:

- Circumference (Perimeter) $= 2 \times \pi \times$ radius
- Area $= \pi \times$ radius $\times$ radius or $\pi \times (\text{radius})^2$

Conversion of area units:

$$1\ cm^2 = 1\ cm \times 1\ cm = 10\ mm \times 10\ mm = 100\ mm^2$$

Similarly, $1\ m^2 = 10000\ cm^2$

1 Hectare $= 10000\ m^2$

Tricks

- Area of Path-

  a) When path is outside the rectangle

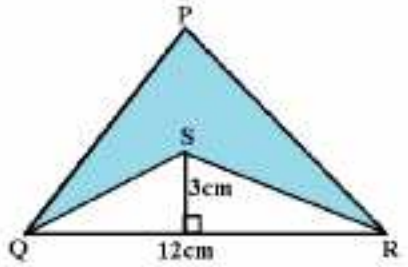
  Area of path = 2 × (Width of path) × [Length + Breadth of rectangle + 2(Width of path)]

  b) When path is within the rectangle

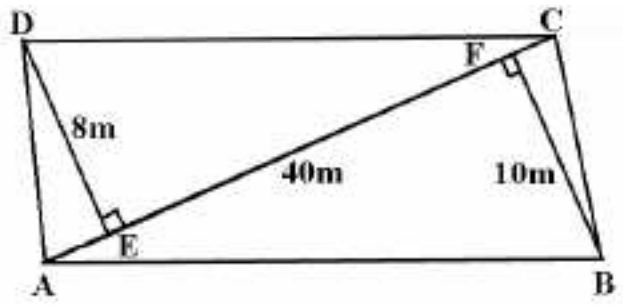
  Area of path = 2 × (Width of path) × [Length + Breadth of rectangle − 2(Width of path)]
- Area of ring $= \pi \times$ width of ring $\times$ [2 × smaller radius + width of ring]
- If the length and breadth of a rectangle is increased by x% and y% respectively, then area is increased by $\left(x + y + \frac{xy}{100}\right)\%$
- Area of a square inscribed in a circle of radius r = $2r^2$
- Area of a square circumscribed to a circle of radius r = $4r^2$
- If perimeter of a square is P and Area is A then $P = 4\sqrt{A}$ and $A = \left(\frac{P}{4}\right)^2$

Questions:

1. Perimeter of a square shaped park is 204 m. Find the side of the park.
2. A rectangular room has area 180 sq m and breadth 12 m. Find length of the room.
3. Area of a triangle is 144 sq m and perpendicular is 6 cm. Find the base of the triangle.
4. Circumference of a circle is 220 m. Find the diameter of the circle.
5. A parallelogram has base 20 m and height 7.5 m. Find its area.
6. The length and breadth of a rectangular park are in the ratio 3:2. If the perimeter of park is 200 m, then find its area.
7. A rhombus has area 98 sq m and one of its diagonal is 14 m. Find the other diagonal.
8. Find the area of the shaded parts if big triangle has area 48 sq cm.



9. Find the area of given figure:

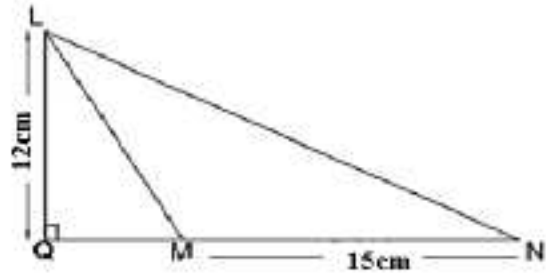


10. In ΔPQR, $PL \perp QR$, $PL = 5$ cm and $QR = 18$ cm, find the area of the triangle.
11. If base and height of a parallelogram are 20 cm and 5.5 cm respectively, then find its area.
12. Find the breadth of the rectangle whose length and breadth are in the ratio 5:3 and perimeter is 48 m.

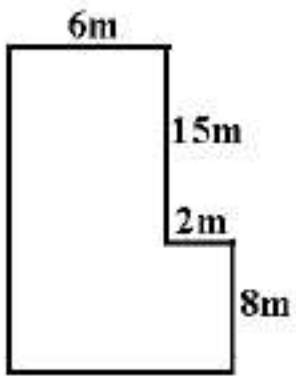
13. If the ratio of radii of two circles is 6:5, then find the ratio of their circumferences.

14. A triangle has 19 m base and 6 m corresponding height. Find its area in sq cm.

15. In the given figure, find the area of ΔLMN with side LQ = 12cm.



16. Find the perimeter of given figure:



17. If length of a rectangle is 12 cm and area is 108 sq cm, then find the perimeter.

18. A Circular piece of land has radius 77 m. Find the cost of fencing around this land at the rate of ₹ 10 per metre.

19. Area of a circle is 1540000 sq cm, find the radius.

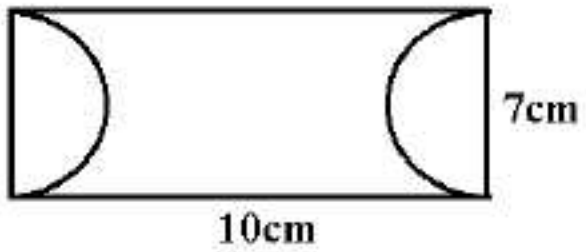
20. For making a paper envelope, a rectangular paper of 15 cm × 12 cm is required. Find the total cost of 5 such envelopes at 2 paisa per sq cm.

21. If radius of a wheel is 7 m, find the distance covered by it in 15 revolutions.

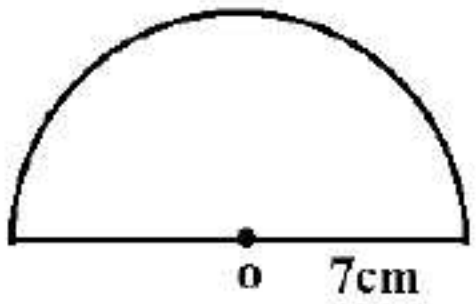
22. Length and breadth of a garden are 300 m and 200 m respectively, find its area in hectares.

23. Find the length of the rectangle whose breadth is 20 cm and perimeter is 90 cm.

24. A rectangular sheet of paper has side PQ = 10 cm and QR = 7 cm. Two semi circles whose diameters are QR and PS are cut from the sheet. Find the area of remaining sheet.



25. Find the perimeter of the given semicircular shape.



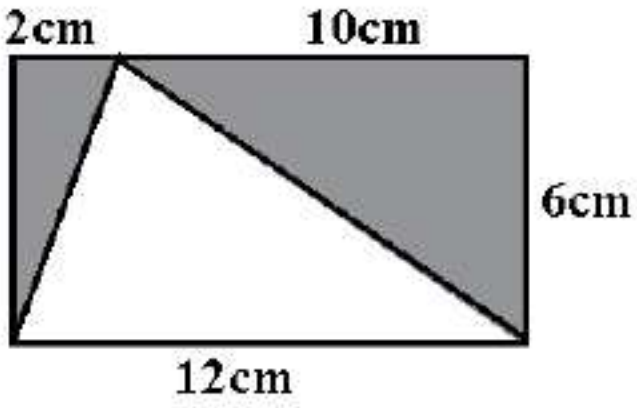
26. A rhombus has area 119 sq cm and perimeter 56 cm. Find its height.

27. If the area of a triangle is equal to the area of a square of side 12 cm and height is 18 cm, then find the corresponding side.

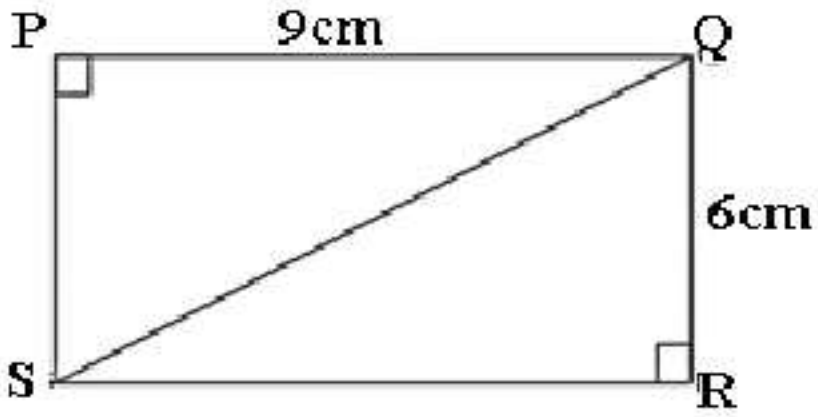
28. A wire bent in the form of rectangle with length 65 cm and breadth 35 cm. If it is re-bent in the form of a square, then find the area of square.

29. A square carpet of side 10 m is laid on a rectangular floor with dimensions 12 m × 10 m, find area of the floor which is not carpeted ?

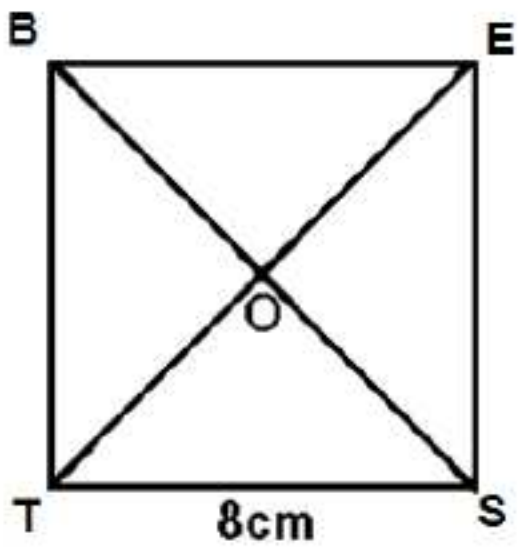
30. Find the area of shaded region in the adjoining figure.



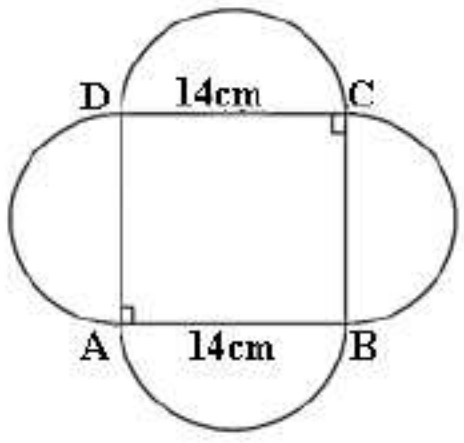
31. Find the area of ΔRSQ in the adjoining figure.



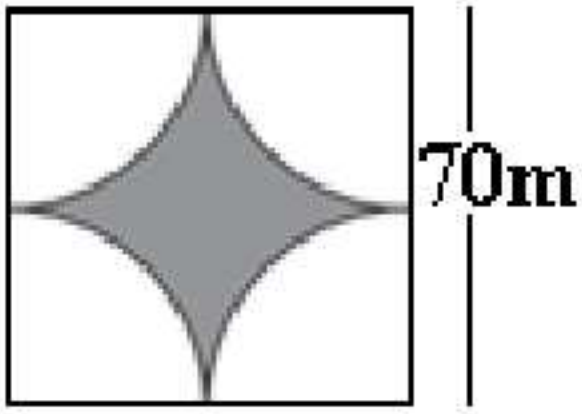
32. A square BEST is divided into four triangles. Find the area of ΔEOS.



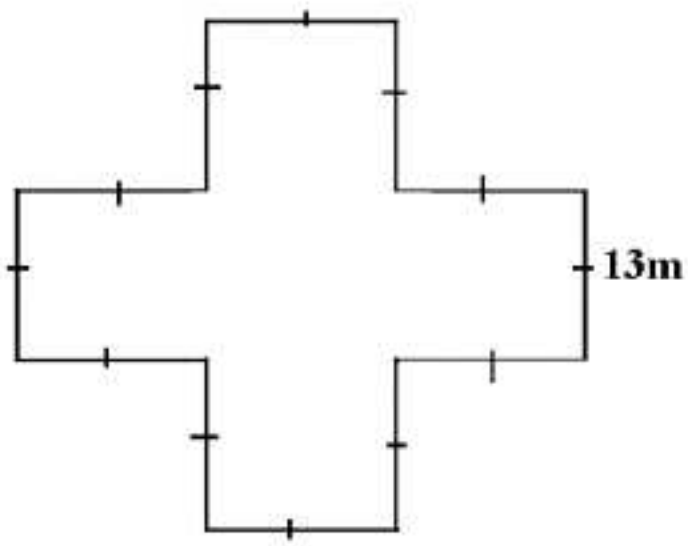
33. Find the perimeter of adjoining figure.



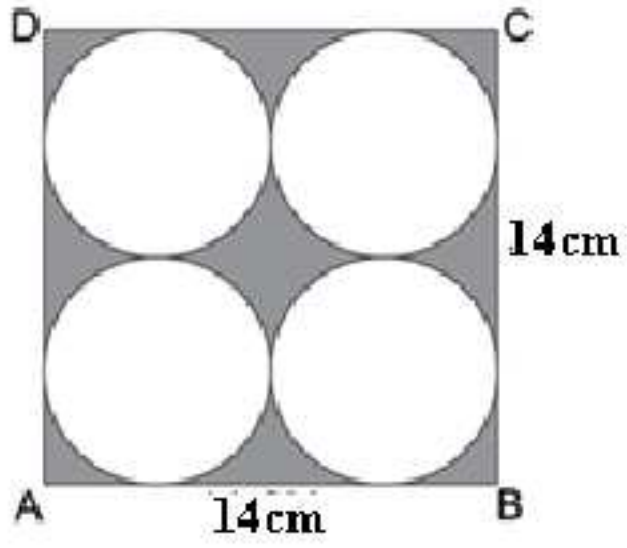
34. Find the area of the shaded region



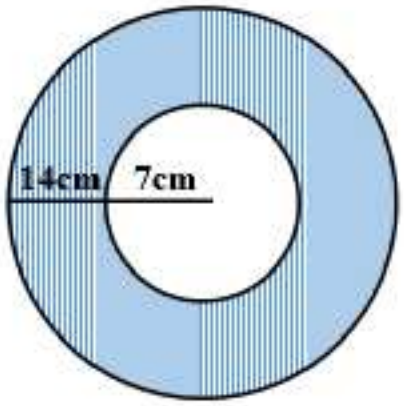
35. Find the area of the given figure



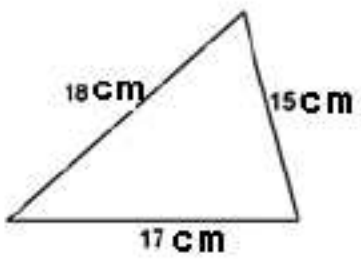
36. Find the area of shaded region in the adjoining figure.

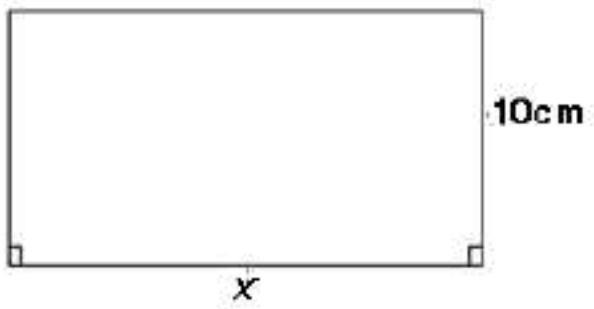


37. Find the area of shaded region.

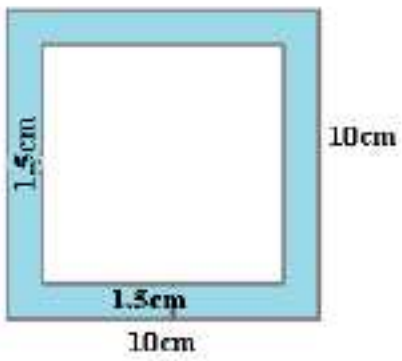


38. Find the length of rectangle, if both shapes have same perimeter.

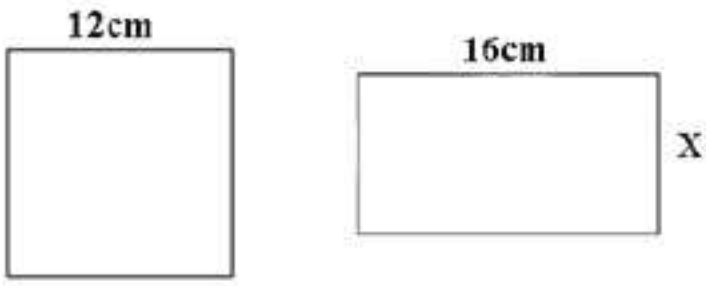




39. Find the area of the shaded region in the following figure:



40. Find the breadth of rectangle, if both figures are made by same length of wire.



Answers:

Q. No.	Answer	Q. No.	Answer
1.	51 m	21.	660 m
2.	15 m	22.	6 Hectares
3.	48 cm	23.	25 cm
4.	70 m	24.	31.5 sq cm
5.	150 sq m	25.	36 cm
6.	2400 sq cm	26.	8.5 cm
7.	14 m	27.	16 cm
8.	30 sq m	28.	2500 sq cm
9.	360 sq m	29.	20 sq m
10.	45 sq cm	30.	36 sq cm
11.	110 sq cm	31.	27 sq cm
12.	9 m	32.	16 sq cm
13.	6:5	33.	88 cm
14.	570000 sq cm	34.	1050 sq m
15.	90 sq cm	35.	845 sq m
16.	62 m	36.	42 sq cm
17.	42 cm	37.	462 sq cm
18.	₹ 4840	38.	15 cm
19.	700 cm	39.	51 sq cm
20.	₹ 18	40.	8 cm

CHAPTER 12

ALGEBRAIC EXPRESSIONS

Points to remember

- Algebraic expressions are formed using variables and constants.
- A quantity having a fixed numerical value is called a constant whereas a quantity with possibility of having different numerical values is called a variable.
- Expressions are made up of terms.
- Terms which have the same algebraic factors are like terms and terms which have different algebraic factors are unlike terms.
- Any algebraic expression with one or more terms and having non negative integral exponential value is called a polynomial. A one term algebraic expression is called monomial, a two-term algebraic expression is called binomial and a three term algebraic expression is called trinomial.
- The highest power of the involved variable is the degree of an algebraic expression.
- Rules and formula are written in a concise and general form using algebraic expressions.

QUESTIONS:

1. Classify the following algebraic expression as monomial, binomial or trinomial :

   (i) $3x^2 + 2x + 4$ (ii) $36xyz$ (iii) $-4xy + 5y^2 + 6y^2$ (iv) $9x + 2y$

2. Write degree of each algebraic expression :

   (i) $7x + 3x^3 + x^2$ (ii) $4y^3 - y^4$

3. Write the coefficient of x^3 in each of the algebraic expression:

   (i) $-8x^3 + 3x - 9$ (ii) $6x + 4x^3 + 3x^3$ (iii) $x + \frac{4}{5}x^3 - 9x^2 + 5$

4. Find the sum of $4ab^2, -8b^2a$ and $6ab^2$

5. Find the sum of $9x^2y, -5xy^2, 6x^2y, 4xy^2$ and $-8yx^2$

6. Find the value of $7x + 9(x - 2y) - (6y - 5x)$

7. Find the value of $3x^3 + 2x^2 + 4x - 2$ *if* $x = -2$

8. Subtract $(4ab - 9)$ from $(8 - 2ab - 5a)$

9. Find the value of $2x^2y - 4xy + 3$ if $x = 1, y = -3$

10. Find the value of $7x^2 + 4 - 5x$ for $x = -3$

11. Add the algebraic expressions:

    $(-13x + 20)$ and $(22xy - 7y + 20x)$

12. Find the value of algebraic expression

    $(2ab + 3bc + 4ca)$, when $a = 2, b = -1$ and $c = 1$

13. Solve $8x^2 + 4xy + 6 - (6xy - 2x^2 + 4)$

14. Subtract $(1 - 2x^2)$ from $(x^3 + 5x^2 + x + 1)$

15. Find the value of $5x - [\{3y - (x - 2y)\}]$

16. Solve $3.8\,ab + 1.2\,ba - 2.5\,ab$

17. Subtract $(2x^4 - y^4)$ from $(6x^4 - 2x^2y^2 - y^4)$

18. What should be added to $a^2 + b^2$ to get $(a - b)^2$?

19. What should be added to $a^2 + b^2 - 2ab$ to get $(a + b)^2$?

20. Find the value of $\frac{1}{2}p - \frac{1}{2}q$, if $q - p = 32$

21. By how much is $4x^3 - 2x^2 + 8x$ greater than $2x^3 - 2x^2 + 6x$?

22. Add $3x + 5$ *and* $5x + 3$ and find the coefficient of x.

23. Find the product of numerical coefficient of x^2 and y in the algebraic expression $5x^2 + 2y^2 - 7y + 2x + 9$

24. Find the value of $(4ax - 3by)(4ax + 3by)$

25. Find the value of $9n^2 + 5n - 6$ if $n = -3$.

26. Find $x^3 + y^3$ if $x = 4$ *and* $y = -3$.

27. Add $(2x^2 - 3x + 1)$ to sum of $(5x^2 - 3x)$ and $(2x + 3)$.

28. Find the value of $(x + 3y - 2) - (4 + 2x - 6y) + (-3x + 4y + 2)$

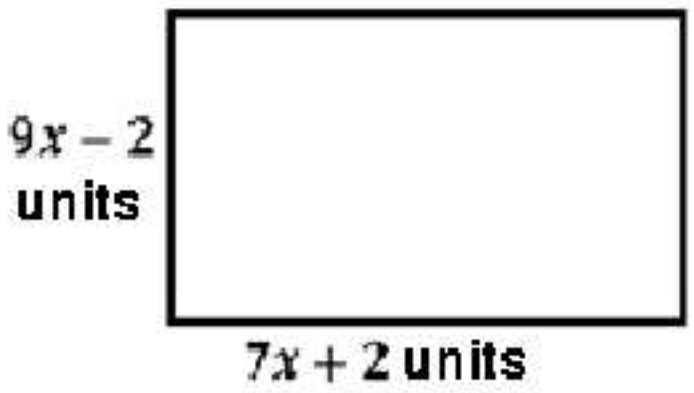
29. If a side of an equilateral triangle is $9x$ units, then find the perimeter of the triangle.

30. The perimeter of a triangle is $(12x - 5)$ cm. If its two sides are $(x - 2)$ cm and $(5x + 12)$ cm long, then what is the length of its third side ?

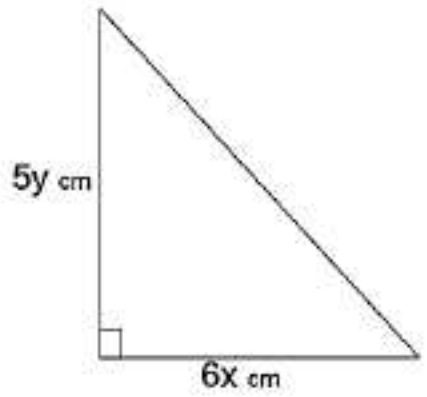
31. Subtract $8x^2 - 4y^2 + 6y - 3$ from $5x^2 + 4xy + 6y^2 - 2y$

32. The length of three sides of a triangle are $4a - 3, 6a + 2$ and $3a + 4$. Find the perimeter of the triangle.

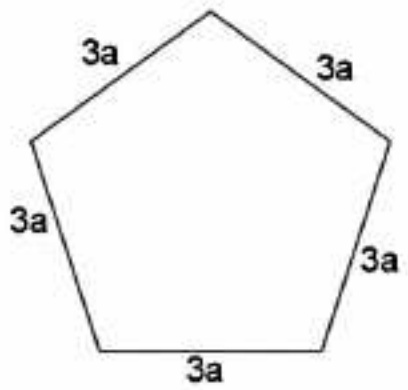
33. Find the area of the rectangle, if $x = 2$.



34. Base of the triangle is 6x cm and its height is 5y cm, find the area of the triangle.

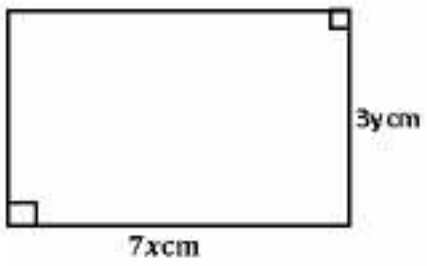


35. Find the perimeter of a regular pentagon whose side is 3a cm.

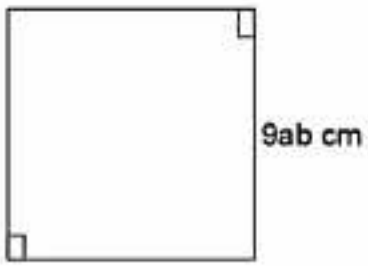


36. Find the area of a square whose side is 4xy.

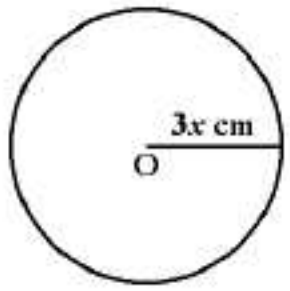
37. In the given figure, rectangular length is 7x cm and its breadth is 3y cm, find its perimeter.



38. Find the perimeter of a square whose side is 9ab cm.



39. Find the perimeter of a circle whose radius is $3x$ cm.



40. Area of a square is $36x^2$ sq cm. Find its perimeter.

41. Find the value of: $16a^2b + 9ba^2 + 3a^2b - 4a^2b$ and find the numerical coefficient of the resultant algebraic expression.

42. Find the value of $(-4a + 5x)(5x + 4a)$

43. Find $(a + b)(a - b)$ if $a = 7$ and $b = -6$

44. Evaluate $5ab + 4a^2 - 2b^2$ for $a = 1$ and $b = -1$

45. Give statement for following algebraic expression:

    (i) $9x + 4$ (ii) $3xy - 7$

46. Find the value of $7x + [5x - (2 - x) + 2]$

47. Find the value of $-2a^2 + (2a - b)(a + b) + 2ba + b^2$

48. Give an algebraic expression for:

    5 is subtracted from the sum of x and y.

49. Find the n^{th} term of the number pattern 6, 11, 16, 21, ...

50. Find the n^{th} term of the number pattern 4, 8, 12, 16, ...

Answers

1.	(i)Trinomial (ii)Monomial (iii)Binomial (iv)Binomial	26.	37
2.	(i)3 (ii) 4	27.	$7x^2 - 4x + 4$
3.	(i) -8 (ii) 3 (iii) $\frac{4}{5}$	28.	$(-4x + 13y - 4)$
4.	$2ab^2$	29.	27x units
5.	$xy\,(7x - y)$	30.	(6x – 15) cm
6.	$3(7x - 8y)$	31.	$-3x^2 + 4xy + 10y^2 - 8y + 3$
7.	-26	32.	(13a + 3) units
8.	$-5a - 6ab + 17$	33.	256 sq units
9.	9	34.	15xy sq cm
10.	82	35.	15a cm
11.	$22xy + 7x - 7y + 20$	36.	$16x^2\,y^2$ sq units
12.	1	37.	$(14x + 6y)$ cm
13.	$10x^2 - 2xy + 2$	38.	36ab cm
14.	$x^3 + 7x^2 + x$	39.	6πx cm
15.	$6x - 5y$	40.	24x cm
16.	2.5ab	41.	24
17.	$2x^2\,(2x^2 - y^2)$	42.	$25x^2 - 16a^2$
18.	$-2ab$	43.	13
19.	4ab	44.	-3
20.	-16	45.	(i) Four is added to nine times a number. (ii) Seven is subtract from three times the product of two numbers.
21.	$2x^3 + 2x$	46.	13x
22.	8	47.	3ab
23.	-35	48.	$x + y - 5$
24.	$16a^2\,x^2 - 9b^2\,y^2$	49.	$5n + 1$
25.	60	50.	4n

CHAPTER – 13

EXPONENTS AND POWERS

Points to Remember

Recall that we may write $3 \times 3 \times 3 \times 3$ as 3^4 and read it as three raise to the power four. In 3^4 , we call 3 as base and 4 as exponent. Similarly, when an integer 'a' is multiplied 'n' times the result is expressed as a^n. Here 'a' is called the base and 'n' is called as exponent.

- LAWS OF EXPONENTS:

  (i) $a^m \times a^n = a^{m+n}$ (ii) $\frac{a^m}{a^n} = a^{m-n}$

  (iii) $(a^m)^n = a^{m \times n}$ (iv) $a^m \times b^m = (ab)^m$

  (v) $a^m \div b^m = \left(\frac{a}{b}\right)^m$ (vi) $a^{-m} = \frac{1}{a^m}$

- Further we recall that

  (i) $a^0 = 1$

  (ii) $(-1)^{\text{even number}} = 1$

  (iii) $(-1)^{\text{odd number}} = -1$

- STANDARD FORM:

  When a number is expressed as a decimal between 1.0 and 10.0 multiplied by a power of 10 is called its standard form. Thus $A \times 10^n$ is the standard form where $1 \leq A < 10$, n is an integer. For example, a number 2806196 can be expressed in standard form as 2.806196×10^6

Questions:

1. Express in exponential form :

   (i) $5 \times 5 \times 5$ (ii) $(-3) \times (-3) \times (-3) \times (-3)$

   (iii) $4 \times 4 \times a \times a \times b \times b \times b$

2. Find the value of (i) 7^3 (ii)$(-3)^5$ (iii) 2^4

3. What is the base and exponent of (i) 5^{-2} (ii) $(-2 \times 3)^0$ (iii) $(7^0)^2$

4. Find the value of x : (i) 1 million = 10^x (ii) 1 lakh = 10^x

5. Find the value of $(-3)^2 \times (-3)^4$

6. Express 64×27 in exponential form.

7. Express 2000000 in standard form.

8. What is usual form of 3.469×10^6 ?

9. Find the value of $(2^{-1} \times 3^{-1} \times 4^{-1})^2$.

10. If a = 2 and b = 3, find the value of $a^2 + b^2$.

11. Find the value of $(-1)^{10} + (-1)^{101} + (-1)^{51}$

12. Which one is greater $(2^2) \times 5$ or $(2^2)^5$?

13. Find the value of $(a^0 + b^0) \times (a^0 - b^0)$

14. Find the value of $2^3 \times 3^3$

15. Find the product of square of 2 and square of 3.

16. Find the value of $\left(\frac{1}{36}\right)^3 \times (-6)^3$

17. Express $\left(\frac{-3}{2}\right)^3$ in the form $\frac{p}{q}$.

18. Find the value of x if (i) $2^5 \times 4^2 = 2^x$ (ii) $100^2 \div 10^4 = 10^x$

19. Find the value of $(2p^3)^3 \div 3(p^2)^3$

20. Find value of $(81)^{-\frac{1}{4}} \times (25)^{\frac{1}{2}}$

21. Find the value of x if $(3^4)^5 = 3^{2x}$

22. Find the value of $[(36)^{\frac{1}{2}} + (16)^{\frac{1}{4}}]^2$

23. Find the value of $\left(-\frac{1}{64}\right)^{\frac{1}{3}}$

24. Express $\left(-\frac{27}{125}\right)$ in exponential form.

25. Express $\frac{128}{81}$ in exponential form.

26. Find the value of $(7^0 + 5^0) \times (8^0 - 3^0)$

27. Find the value of and express in exponential form $(5^4 \times 5^6) \div 5^{10}$

28. Find the value of $\left(\frac{a}{b}\right)^{-1} \times \left(\frac{b}{a}\right)^2 \times a^3 \times b^3$

29. What is usual form of 2.29×10^4 ?

30. If $\left[\left(\frac{2}{5}\right)^2 \times \left(\frac{2}{5}\right)^t\right] = 1$, then find the value of t.

31. The speed of light is 300000000 m/s. Express it in standard form.

32. Change $\left(\frac{2}{3}\right)^{-3}$ in to positive exponent.

33. Change $(3^2)^5$ in to negative exponent.

34. If $4^{2x} = 64$, then find the value of x.

35. Find the value of x if $3^{2x} \times 3^2 = 3^8$

36. What number is obtained from expanded form

$5 \times 10^4 + 2 \times 10^3 + 5 \times 10^2 + 2 \times 10^1 + 10^0$

37. If $2^{2x-3} = 64^x$, find the value of x.

38. If $\frac{p}{q} = \left(\frac{2}{7}\right)^2 - \left(\frac{2}{7}\right)^0$, then find the value of $\frac{q}{p}$

39. Find the value of $(3^{-2} - 5^{-1}) \times 13^0$.

40. If $2^x \times 3^y = 64 \times 81$, then find the value of x + y

41. What is the standard form of the number 2467895 ?

42. Find the value of x if $\left(-\frac{8}{3}\right)^{10} \div \left(-\frac{8}{3}\right)^4 = \left(-\frac{8}{3}\right)^{2x+2}$

43. Find the value of and express in exponential form:

$\{(2^5)^2 \times 3^4\} \div \{2^8 \times 3^2\}$

44. What is the standard form of the number 0.0032456 ?

45. Express $4 \times 4 \times 4$, taking base as 2

46. Find the value and express in exponential form $\left(\frac{6^7}{6^1}\right) \times 6^5$

47. Find the value of x if, $(2^6 \div 2^{-3}) \times 2^{14} = 2^x$

48. Find the value of $\left(\frac{1}{4}\right)^{-2} + \left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2}$

49. Find the value of :

(i) 5×10^4 (ii) $(-3)^3 \times (-10)^3$

50. Find the value of $\frac{\left(\frac{1}{5}\right)^5 \times \left(\frac{1}{3}\right)^1}{\frac{4}{9} \times \left(\frac{1}{5}\right)^3}$

ANSWERS

1	(i) 5^3, (ii) $(-3)^4$, (iii) $4^2a^2b^3$	26	0
2	(i)343, (ii) (-243), (iii) 16	27	5^0
3	(i)Base = 5, exponent = -2 (ii) Base = -6, exponent = 0, (iii) Base = 7, exponent = 0	28	b^6
4	(i)6, (ii) 5	29	22900
5	729	30	$t = -2$
6	$2^6 \times 3^3$	31	3.0×10^8 m/s
7	2×10^6	32	$\left(\frac{3}{2}\right)^3$
8	3469000	33	$\left(\frac{1}{3}\right)^{-10}$
9	$\frac{1}{576}$	34	$x = \frac{3}{2}$
10	13	35	$x = 3$
11	-1	36	52521
12	$(2^2)^5$	37	$-\frac{3}{4}$
13	0	38	$-\frac{49}{45}$
14	216	39	$-\frac{4}{45}$
15	36	40	10
16	$\frac{-1}{216}$	41	2.467895×10^6
17	$\frac{-27}{8}$	42	$x = 2$
18	(i)9 (ii) 0	43	6^2
19	$\frac{8}{3}p^3$	44	3.2456×10^{-3}
20	$\frac{5}{9}$	45	2^6
21	10	46	6^{10}
22	100	47	$x = 23$
23	$\frac{1}{16}$	48	29
24	$\left(\frac{-3}{5}\right)^3$	49	(i)50000 (ii) 27000
25	$\frac{2^7}{3^4}$	50	$\frac{4}{25}$

CHAPTER 14

SYMMETRY

Points to remember

- A line that divides a figure into two congruent parts is called the line (axis) of symmetry.
- There may be one, more than one or no line of symmetry in a figure.
- The angle by which a figure is rotated to get same position is called angle of rotation.
- One complete rotation is 360°.
- Figures having no line of symmetry can still have rotational symmetry.
- The number of times the shape coincides with the original shape while rotating it till complete rotation is called its order of rotational symmetry. (either rotating clockwise or anticlockwise)
- Every object has a rotational symmetry of order at least 1.
- A regular polygon has number of lines of symmetry and order of rotational symmetry equal to its number of sides.

Questions:

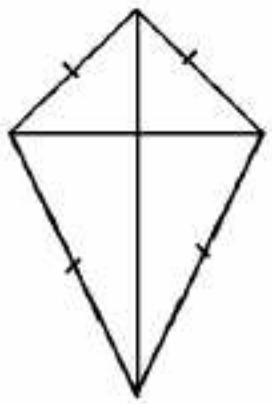
1. What is the line of symmetry of a line segment called ?
2. How many lines of symmetry are there in a square ?
3. What is the
   (i) Order of rotational symmetry
   (ii) Angle of rotation of an equilateral triangle ?
4. How many lines of symmetry does a trapezium have ?
5. Fill in the blanks: -
   (i) The line of symmetry of an isosceles triangle is called its _____.
   (ii) A rhombus has _____ lines of symmetry namely its _____.
   (iii) The fixed point about which an object can rotate is its _____.
6. Angle of rotation of a figure is 60°. Find the number of lines of symmetry.

7. What is the order of rotational symmetry for the given figure ?

8. List all the single digit numbers which have both vertical and horizontal line of symmetry ?

9. What is the maximum number of lines of symmetry in a regular polygon with (n−1) sides ?

10. Find the number of lines of symmetry in the given figure and also find the order of rotational symmetry.

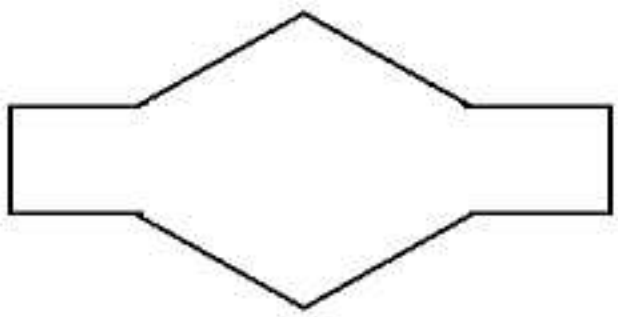


11. Name the figure which have five lines of symmetry and order of its rotational symmetry 5.

12. In the given figure, find the

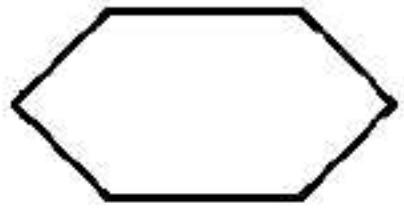
    a) Order of rotational symmetry.

    b) Degree measure of the angle of rotation.

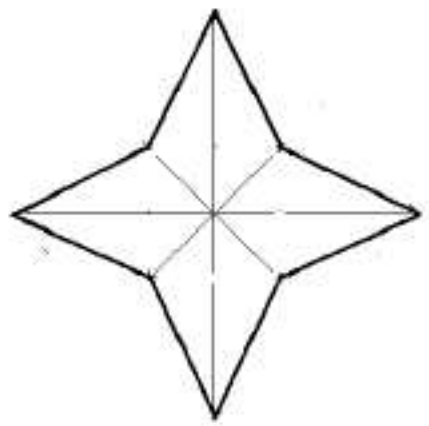


13. Find the number of lines of symmetry in the given figure:

14. Find the number of lines of symmetry in the given figure:

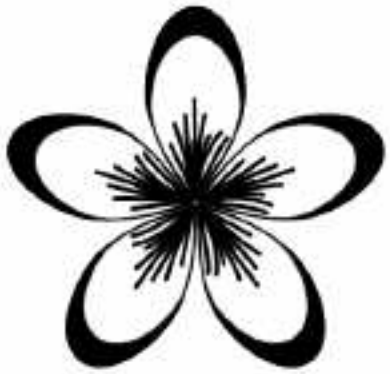


15. Find the order of rotational symmetry and the number of lines of symmetry.

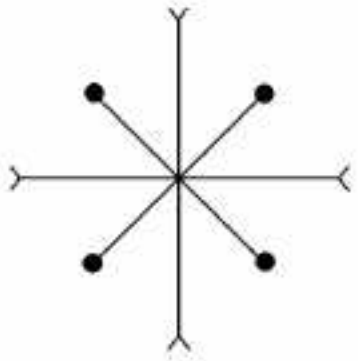


16. Which plane figure can have an angle of any measurement as the angle of rotation ?
17. What is the relation between order of rotational symmetry and angle of rotation ?
18. How many lines of symmetry are there in an isosceles trapezium ?
19. If the angle of rotation of a figure is 22°, then what is the number of lines of symmetry ?
20. If the angle of rotation of a figure is 45°, then what is the number of lines of symmetry ?

21. **Find the order of rotational symmetry and angle of rotational symmetry.**



22. **Find the order of rotational symmetry.**



23. **In the given figure, find the**

    a) **Order of rotational symmetry.**

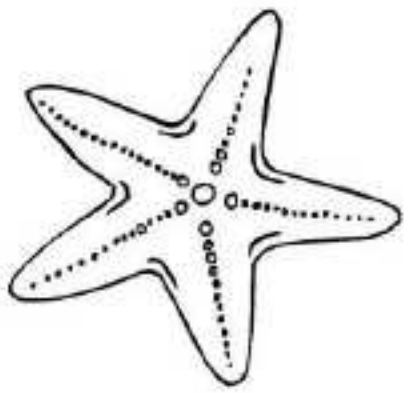
    b) **Degree of measure of the angle of rotation.**

24. **What is the order of rotational symmetry ?**

25. The alphabets X, H, O have reflection symmetry about both vertical and horizontal mirror, name one another such alphabet.

26. Find the number of lines of symmetry in the given figure.

27. What is the order of rotational symmetry of a star fish ?

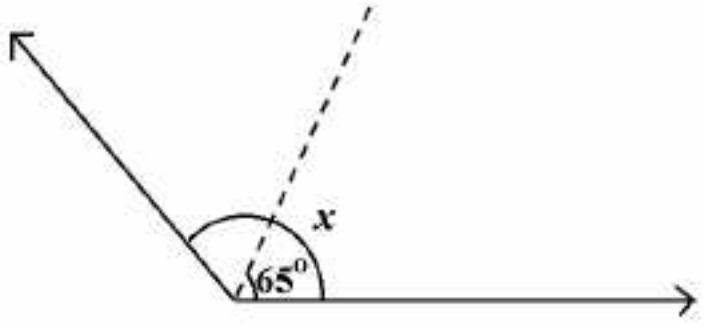


28. What is the difference between the number of lines of symmetry of a regular pentagon and a rectangle ?

29. If the angle of rotation of a figure is 35°, then what is the number of lines of symmetry ?

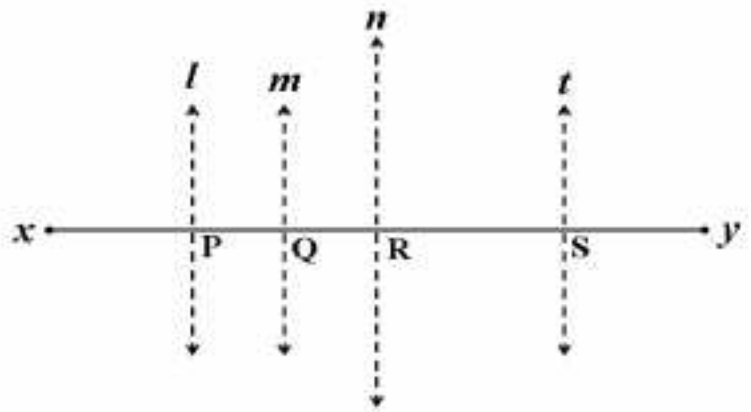
30. Find the number of lines of symmetry in a peepal leaf.

31. If the dotted line represents the line of symmetry of the given angle, then find the value of x.



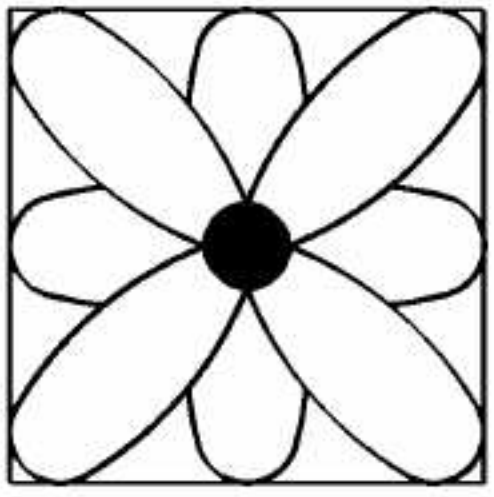
32. l,m,n,t are the lines of symmetry of line segment XQ,PR,XY and RY respectively. If XP= 1.8cm, find the length of the line segments

(a) PQ (b) QR (c) RY (d) PR.



33. Name the centre of rotation of an equilateral triangle.

34. What is the smallest number of degrees you need to rotate the following image for it to look the same ?



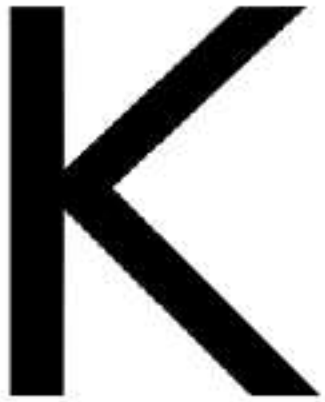
35. Which quadrilateral other than Rhombus has both the diagonals as the axis of symmetry ?

36. What is the number of lines of symmetry for a regular hexagon ?

37. In ΔPQR, $PQ = QR = 8$ cm and $PR = 7$ cm. Name the vertex through which the line of symmetry will pass.

38. What is the centre of rotation for a square and rectangle ?

39. How many lines of symmetry are there in the given figure ? Also find the order of rotational symmetry.



40. A rectangle is rotated by 90° and even then it remains symmetrical about its centre of rotation. What can you tell about the sides of this rectangle ?

Answers

Q.No.	Answer	Q.No.	Answer
1.	Perpendicular Bisector	21.	5, 72°
2.	4	22.	4
3.	(i) 3 (ii) 120°	23.	4, 90°
4.	None	24.	2
5.	(i) Perpendicular Bisector (ii) 2, Diagonals (iii) Centre of rotation	25.	I
6.	6	26.	0
7.	1	27.	5
8.	0, 8	28.	3
9.	n – 1	29.	0
10.	1,1	30.	1
11.	Regular pentagon	31.	130°
12.	(a) 2 (b) 180°	32.	(a)1.8cm, (b) 1.8cm, (c) 5.4cm (d) 2.7cm
13.	1	33.	Centroid
14.	2	34.	90°
15.	4, 4	35.	Square
16.	Circle	36.	6
17.	Order of symmetry = $\frac{360°}{\text{Angle of Rotation}}$	37.	Q (Point Q or Vertex Q)
18.	1	38.	Point of intersection of their diagonals
19.	0	39.	1, 1
20.	8	40.	All sides are equal

CHAPTER 15

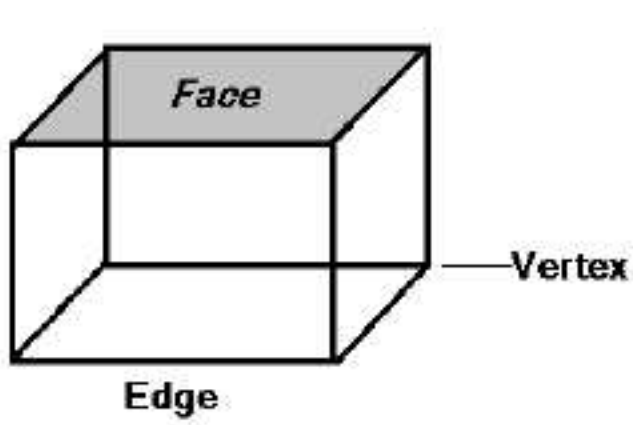
VISUALISING SOLID SHAPES

Points to remember:

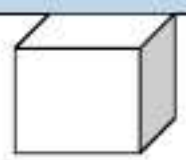
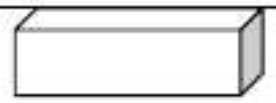
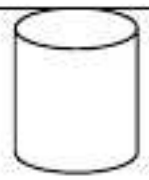
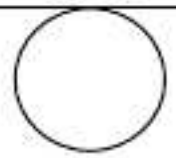
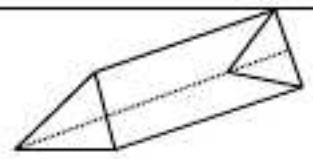
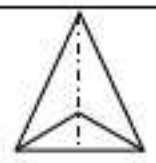
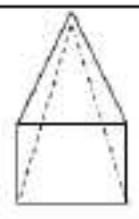
- One dimensional figure: Lines, rays, line segments.
- Two dimensional figures or 2 D :

  Circle, square, rectangle, quadrilateral, polygon etc.
- Three dimensional figures or 3 D :

  Cube, cuboid, cylinder, cone, sphere, prism, pyramid etc.
- A net is a skeleton outline of a solid that can be folded to make it.



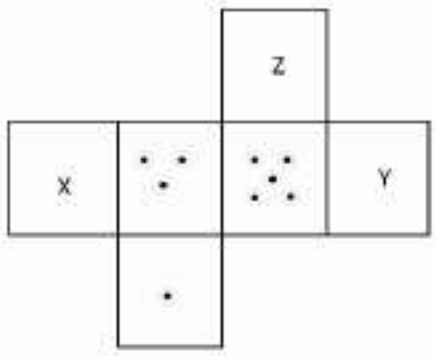
- Cube and cuboid are also called square prism and rectangular prism respectively.
- A pyramid is named according to the shape of its non-triangular face.
- If all the faces are triangular, then it is called a triangular pyramid (Tetrahedron)
- If the base is a square and remaining sided are triangles, then it is called a Square Prism.
- Euler's formula: F+V= E+2, where F= number of faces, V= number of vertices, E= number of edges.

3-D Figures	Faces	Vertice	Edges
1. Cube (Square Prism) 	6	8	12
2. Cuboid(Rectangular Prism) 	6	8	12
3. Cylinder (Circular Prism) 	3	0	2
4. Cone 	2	1	1
5. Sphere 	1	0	0
6. Hemisphere 	2	0	1
7. Triangular Prism 	5	6	9
8. Triangular Pyramid 	4	4	6
9. Square Pyramid 	5	5	8
10. Rectangular Pyramid 	5	5	8

Questions:

1. How many vertices does a dice have ?
2. How many vertices are there in a (i) sphere (ii) hemisphere (iii) cylinder.
3. How many faces a hemisphere have ?
4. How many faces does a triangular - pyramid have ?
5. What are the number of faces in a polyhedron having 6 vertices and 9 edges ?
6. How many edges and vertices does a triangular - pyramid have ?
7. A polyhedron has 5 faces and 6 vertices, find the number of edges of the polyhedron.
8. What is the sum of dots on opposite faces on a dice ?
9. A man has 10 rupees coins of similar kind. He puts them exactly one over the other. What shape will he get ?
10. Name two 3-D shapes such that vertices, edges and faces of one shape are equal in number to vertices, edges and faces of another shape.

Q. No. - 11 to 13, Net of a dice is given below:

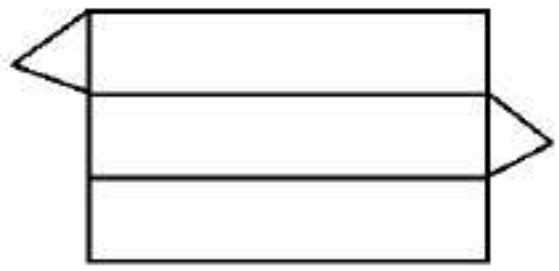


11. Find the number of dots on the face X of the dice.
12. Find the number of dots on the face Z of the dice.
13. What will be the sum of the dots on the face X and Y ?

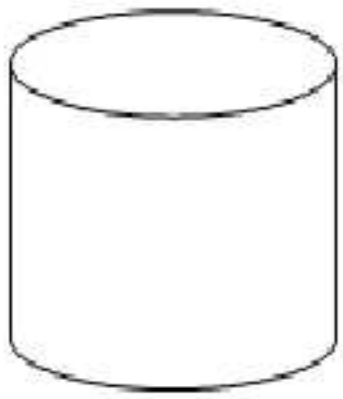
14. A polyhedron has 6 faces, 8 vertices and 12 edges with equal edge. Name the 3D shape.

15. Name the solid shape whose net consists of 4 triangles and one square.

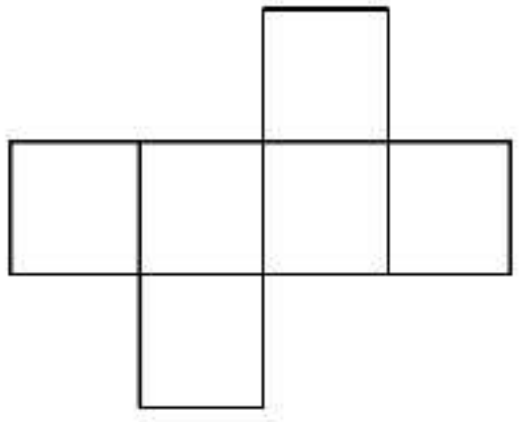
16. Name the 3D shape of the given net.



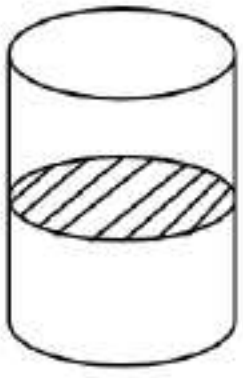
17. What geometrical shape will the cross section have if a vertical cut is given to a cylinder ?

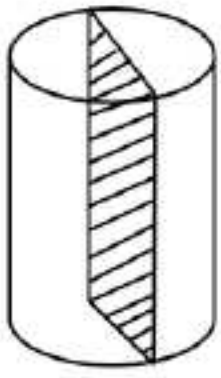


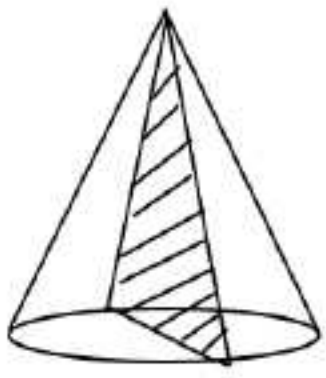
18. Which solid is formed by the following net diagram ?



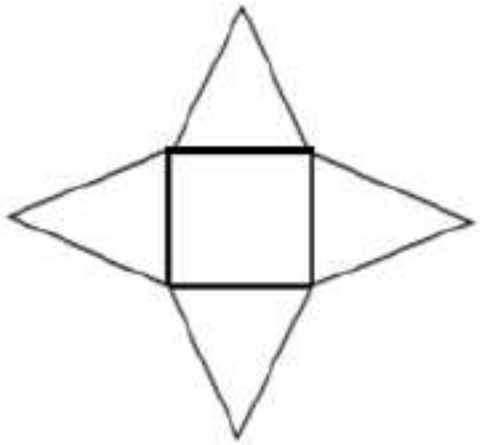
19. Name the shape of the cross-section in each of the following solids.

(i) 

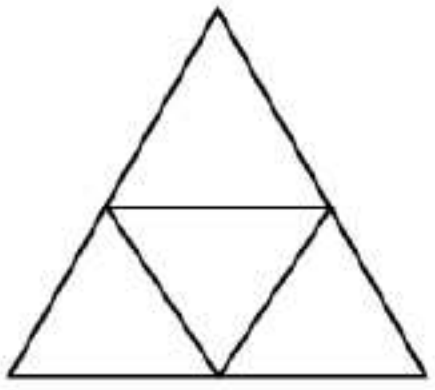
(ii) 

(iii) 

20. Which solid is formed by the following net diagram ?



21. Which solid shape is formed by the following net diagram ?



22. How many vertices the following solid have ?

(i) Cone (ii) Square pyramid

23. The three views (a), (b) and (c) are given for the solid. Identify them as front view, side view or top view.

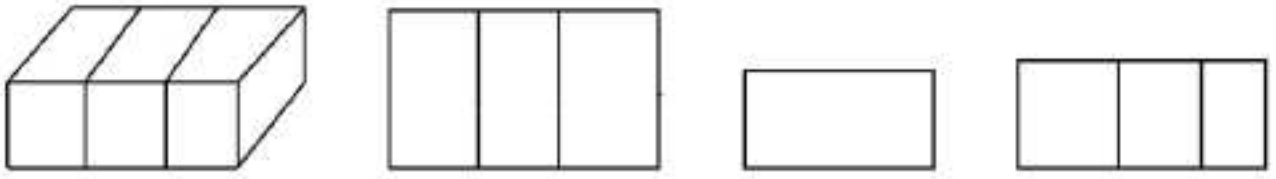


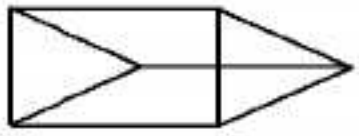
Figure (a) (b) (c)

24. A dice has A, B, C, D written in a clockwise order on the adjacent faces and E and F at the top and bottom respectively. When C is at the top, what will be at the bottom ?

25. Which cross-section (horizontal or vertical) of the given prism with equilateral triangular base will be

(i) A rectangle

(ii) An equilateral triangle



26. The net of a solid consists of a rectangle and two equal circles. Name the solid.

27. Find the missing number.

	Face	Vertices	Edges
(i)	4	?	6
(ii)	8	12	?

28. Name the shape of a book.

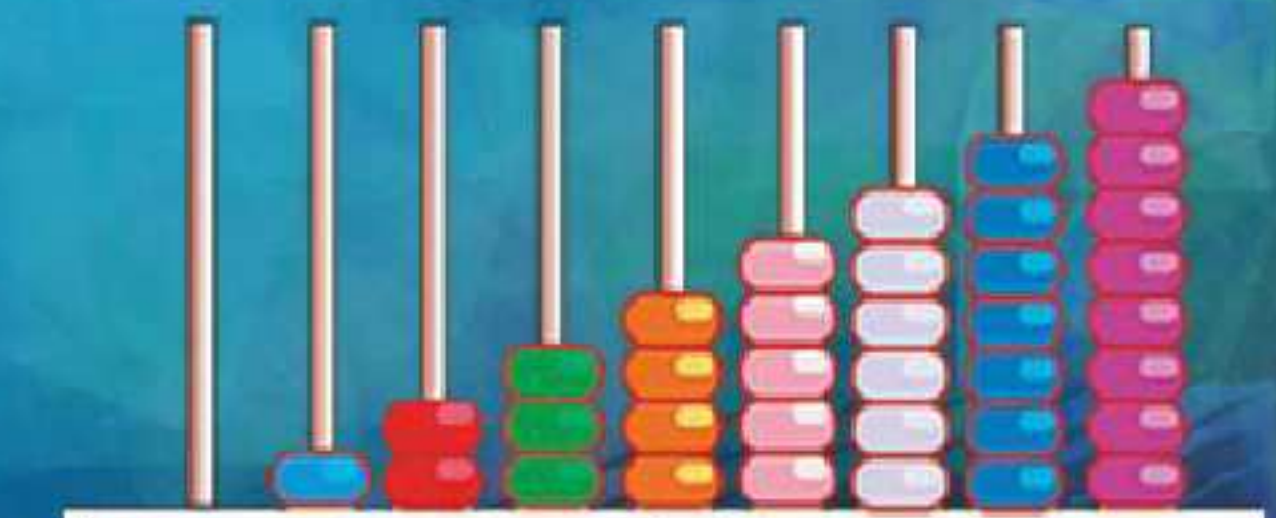
29. Does cube and square prism refer to the same solid ?

30. How many edges and vertices does a square pyramid have ?

Answers:

Q.No.	Answer	Q.No.	Answer
1.	8	16.	Triangular prism
2.	(i) 0 (ii) 0 (iii) 0	17.	Rectangle
3.	1 (faces are flat surfaces)	18.	Cube
4.	4	19.	(i) Circle (ii) Rectangle (iii) Triangle
5.	5	20.	Square Pyramid
6.	Edges = 6, Vertices = 4	21.	Triangular Pyramid
7.	9	22.	(i) 1 (ii) 5
8.	7	23.	(a) Top (b) Side (c) Front
9.	Cylinder	24.	A
10.	Cube , Cuboid	25.	(i) Vertical (ii) Horizontal
11.	X = 2	26.	Cylinder
12.	Z = 6	27.	(i) 4 (ii) 18
13.	6	28.	Cuboid
14.	Cube	29.	Yes
15.	Square Pyramid	30.	Edges = 8, Vertices = 5

MENTAL MATHS



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