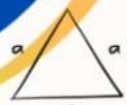
$ax^2 + bx + c = 0$

केन्द्रीय विद्यालय संगठन

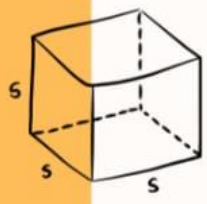
Kendriya Vidyalaya Sangathan

आंचलिक शिक्षा एवं प्रशिक्षण संस्थान, भुवनेश्वर

ZONAL INSTITUTE OF EDUCATION AND TRAINING, BHUBANESWAR



$A = \frac{\sqrt{3}}{4}a^2$



$V = s^3$

MATHEMATICS

Study Material

for Class VIII

$f(X)$

$V = \frac{4}{3}\pi r^3$

SESSION - 2025-26

$y = mx + b$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

"Mathematics is not about number, equations, computation or algorithm, it is about understanding."

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स्विकृति / ACKNOWLEDGEMENT

Dr. Anurag Yadav
Deputy Commissioner &
Director
Zonal Institute of Education and Training, Bhubaneswar

Mr. Suryakanta Nanda

Associate Course Director & Coordinator

Training Associate (Maths), ZIET Bhubaneswar

Resource Persons

AMRENDRA KUMAR MISHRA

PGT(Maths)

PM SHRI KendriyaVidyalaya No-6, Bhubaneswar Bhubaneswar Region

V N SASIDHAR VALLURI

PGT (Maths)

KendriyaVidyalaya No-4, Central University, TezpurGuwahati region

TEACHERS WHO CONTRIBUTED

GROUP 1 - "CLASS VIII- SQUARE AND CUBES"		
1	**SH. SANDEEP AHLAWAT**	PM SHRI KV KUNJABAN, SILCHAR
2	SH. SATYAJIT PRADHAN	PM SHRI KV SONEPUR, BHUBANESWAR
3	SH. TARUN KUMAR MEENA	PM SHRI KV COOCH BEHAR , KOLKATA
4	SH. AJIT ANAND	PM SHRI KV NARANGI, GUWAHATI
5	SH. SUNIL KUMAR	KV DIBRUGARH , TINSUKIA
GROUP 2- "CLASS VIII - POWER PLAY"		
1	**SMT. PREETI RANI**	KV LONGDING , TINSUKIA
2	MS. SANGEETA MEENA	PM SHRI KV BAGAFA , SILCHAR
3	MS. AANCHAL ARYA	PM SHRI KV COSSIPORE , KOLKATA
4	SMT. RANJANA KUMARI	KV TATANAGAR , RANCHI
GROUP 3- "CLASS VIII- A STORY OF NUMBERS"		
1	**SH. KAMADEV SWAIN**	PM SHRI KV, BHUBANESWAR
2	MS. APRAJITA SHARMA	PM SHRI KV TEZPUR NO.1 , GUWAHATI
3	SH. SUNIL PRASAD RAY	PM SHRI KV DURGAPUR (CMERI), KOLKATA
4	SH. SUBENDU MONDAL	PM SHRI KV DUMKA , RANCHI
GROUP 4- "CLASS VIII- QUADRILATERALS"		
1	**MS. NISHA DEVI**	KV NO.2 ANGUL, BHUBANESWAR
2	MS. NEHA KUMARI	PM SHRI KV FORT WILLIAM, KOLKATA
3	SH. ASHISH DANGI	PM SHRI KV AFS LAITKOR PEAK , SILCHAR

4	SMT. MANISHA JAISAWAL	KV RANCHI CCL , RANCHI
5	SH. MADHUSUDAN SINGH NEGI	PM SHRI KV BARPETA , GUWAHATI
GROUP 5- "CLASS VIII- NUMBER PLAY"		
1	**SMT. SONAL**	PM SHRI KV COMMAND HOSPITAL , KOLKATA
2	SH. SOURABH SHARMA	PM SHRI KV NABARANGPUR , BHUBANESWAR
3	SH. AMIT KUMAR	PM SHRI KV NEHU SHILLONG , SILCHAR
4	SH. FAHEEM ANSARI	KV ROING , TINSUKIA
5	MRS. VIBHA KUMARI MISHRA	PM SHRI KV HAZARIBAGH , RANCHI
GROUP 6 - "CLASS VIII- WE DISTRIBUTE YET THINGS MULTIPLY"		
1	**SH. ASHISH CHANDAN**	KV IIT , GUWAHATI
2	SH. SARAT KUMAR NAYAK	PM SHRI KV NO.6 BBSR, BHUBANESWAR
3	SH. HANUMAN PRAJAPAT	KV TAMENGLONG , TINSUKIA
4	SH. MADHUSUDAN KUILA	PM SHRI KV KHARAGPUR NO.2 (RLY.) , KOLKATA
GROUP 7 - "CLASS VIII - PROPORTIONAL REASONING 01"		
1	**SH. RIJU SINGH**	KV BOKARO THERMAL , RANCHI
2	SH. HEM RAJ JANGID	PM SHRI KV LEKHAPANI TINSUKIA
3	SH. SAPAN KUMAR GAHAN	PM SHRI KV NO.1 BALASORE ,BHUBANESWAR
4	SH. ASIM JANA	PM SHRI KV KALAIKUNDA NO.1, KOLKATA
5	SH. ASHUTOSH YADAV	KV NHPC GERUKAMUKH , GUWAHATI
GROUP 8 - COMPILATION OF WORK		

1	**SH. SUMAN SAURABH**	PM SHRI KV NO. 1 ISHAPORE , KOLKATA
2	MS. MANSI	PM SHRI KV DIGAPAHANDI, BHUBANESWAR
3	SMT. DIMCLE RIJI	PM SHRI KV DIMAPUR , TINSUKIA
4	SH. SHESHNATH SINGH	PM SHRI KV DHANBAD NO.1, RANCHI
5	MS. PRIYA	KV DOOM DOOMA ,GUWAHATI

Compiled & Edited By:

SURYAKANTA NANDA, TA (MATHEMATICS), ZIET, BHUBANESWAR

अनुक्रमणिका / INDEX

CHAPTER 1: A SQUARE AND A CUBE

SECTION – A (1 MARK)

Q. 1 A boy having 115 cubes of edge 1 unit. While stacking the cubes to form a bigger cube, he finds out that there is shortage of some cubes, how many more cubes are needed?

(a) 4 (b) 10 (c) 6 (d) 7

Q.2 In a highway, two milestones are marked 14^2 and 15^2. How many milestones are there between these two?

(a) 29 (b) 28 (c) 30 (d) 32

Q.3 Arun wants to find out a number, which is closer to 250 and is also a perfect square, which of the following number will be chosen by him

(a) 225 (b) 28 (c) 256 (d) 248

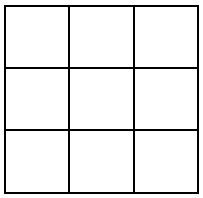
Q.4 If $125^2 = 15625$, what is the value of 126^2?

(a) 15625 + 126 (b) 15625 + 26^2 (c) 15625 + 251 (d) 15625 + 253

Q.5 A farmer wants to plant banana plants in his field such that no. of plants in each row and each column is same, which of the following number of plants could he choose?

(a) 80 (b)144 (c) 120 (d) 99

Q.6 Rohit saw a 3 x 3 square as shown in the fig below, how many squares are there in the given figure?



(a) 9 (b) 12 (c) 14 (d) 15

Q.7 If the sum of first n odd numbers is n^2, What will be the sum of first n even numbers?

(a) n^2 (b) n(n+1) (c) $2n^2$ (d) $4n^2$

Q.8 If $15^2 = 225$, what will be the value of $(1.5)^2$?

(a) 22.5 (b) 2.25 (c) 0.225 (d) 0.0225

Q.9 How can you determine if a number is perfect square by successively subtracting odd numbers?

(a) If the numbers subtracted are all prime
(b) If the final result is zero after subtracting consecutive odd numbers starting from 1
(c) If the final result is an odd number
(d) If the process never ends

Q.10 After squaring a prime number 'a', we get another number 'b'? How many factors are there of the number 'b'?

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

ANSWERS:

Q. 1 (b)	Q. 2 (b)	Q. 3 (c)	Q. 4 (c)	Q. 5 (b)
Q. 6 (c)	Q. 7 (b)	Q. 8 (b)	Q. 9 (b)	Q. 10 (c)

SECTION – B (2 MARKS)

Q. 1 A school is constructing a square-shaped parking lot where each car requires 4 m² of space. The side of parking lot is 14 m. How many cars can be parked?

Q. 2 A farmer has a square field of area 625 m². He wants to divide it into 25 equal square plots for growing different vegetables. What will be the side of each smaller square plot?

Q. 3 Using the given pattern, find the missing numbers:

$1^2 + 2^2 + 2^2 = 3^2$

$2^2 + 3^2 + 6^2 = 7^2$

$3^2 + 4^2 + 12^2 = 13^2$

(i) $4^2 + 5^2 + (\_\_\_\_)^2 = 21^2$

(ii) $5^2 + (\_\_\_\_)^2 + 30^2 = 31^2$

Q. 4 Arjun wants to find a square number which is divisible by 4, 9, and 10. What will be the smallest such number?

Q. 5 Using prime factorization show that 3375 is a perfect cube?

Q. 6 Express 51^2 as the sum of square of two consecutive positive integers.

Q. 7 Find the smallest number by which the given number 605 must be multiplied so that the product becomes a perfect square. Hence find the square thus obtained.

Q. 8 What will be the unit digit of the square of the number 7898437?

Q. 9 How many non-perfect square natural numbers lie between the squares of the following numbers?

(i) 18 and 19

(ii) 78 and 79

Q. 10 Find the smallest number by which 400 must be multiplied to make it a perfect cube.

ANSWER:

Q. 1. The side of the parking lot = 14 m.

Area of square parking lot = 14 x 14

Area = 196 m²

Space for 1 car = 4 m²

No. of cars = 196 ÷ 4 = **49 cars**

Q. 2 Side of big square = √625 = 25 m

Total area = 625 m²

Area of 1 smaller plot = 625 ÷ 25 = 25 m²

Side of smaller square = √25 = 5 m

Each smaller plot has side **5 m.**

Q. 3 Given: $1^2 + 2^2 + 2^2 = 3^2$
$\Rightarrow 1^2 + 2^2 + (1 \times 2)^2 = 3^2$
$2^2 + 3^2 + 6^2 = 7^2$
$\Rightarrow 2^2 + 3^2 + (2 \times 3)^2 = 7^2$
$\Rightarrow 2^2 + 3^2 + 2^2 \times 3^2 = 7^2$
$3^2 + 4^2 + 12^2 = 13^2$
$\Rightarrow 3^2 + 4^2 + (3 \times 4)^2 = 13^2$

(i) Therefore $4^2 + 5^2 + (4 \times 5)^2$
$= 4^2 + 5^2 + 20^2 = 21^2$

(ii) $\Rightarrow 5^2 + 6^2 + (5 \times 6)^2 = 31^2$
$\Rightarrow 5^2 + 6^2 + 30^2 = 31^2$

Q. 4 LCM of 4, 9, 10 = 180.
Prime factorization: $180 = 2^2 \times 3^2 \times 5$.
To make it a perfect square, multiply by 5.
Smallest perfect square = $180 \times 5 = 900$.

Q. 5 Factor of $3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5$
$= (3 \times 5)^3 = 15^3$.
Hence, 3375 is a perfect cube and cube root = 15.

Q. 6 Let the two positive consecutive integers be n and n + 1.
Then, $n + (n + 1) = 51^2$
$\Rightarrow 2n + 1 = 2601$
$\Rightarrow 2n = 2600$
$\Rightarrow n = 1300$
Therefore, the numbers are 1300 and 1301
And 1300 + 1301 = 2601

Q. 7 Factor of $605 = 5 \times 11 \times 11$
Since 5 is not in pairs so we multiply 605 by 5 to make it a perfect square.
Perfect square = $605 \times 5 = 3025$

Q. 8 The unit digit of the square of a number is the unit digit of the square of the unit digit of the given number.
Unit digit of 7898437 = 7
$7 \times 7 = 49$
Unit digit of 49 is 9.
∴The unit digit of the square of 7898437 = 9.

Q. 9 There are 2n non-perfect square numbers between two consecutive square numbers n^2 and $(n + 1)^2$
(i) For 18^2 and 19^2
n = 18
∴ 2n = 36
∴ There are 2n = 36 non-perfect square numbers between 182 and 192.
(ii) For 78^2 and 79^2
n = 78
∴ $2n = 2 \times 78 = 156$.
∴ There are 2n = 156 non-perfect square numbers between 78^2 and 79^2.

Q. 10 Factor of 400 = $2 \times 2 \times 2 \times 2 \times 5 \times 5 = 2^4 \times 5^2$.
For cube, powers must be multiple of 3.
Need $2^2 \times 5 \rightarrow 20$.
Smallest number = 20.

Section – C (3 MARKS)

Q. 1. Find the least number of persons among whom Rs. 33,275 must be distributed equally so that each person gets an amount which is a perfect square.

Q. 2. A school wants to build a square playground of area 1521 m^2. If square shaped tiles of side 3 m are used then how many tiles are needed?

Q. 3. A cubical block of side 6 m is to be built using small cubes of side 2 m. Find the number of such small cubes.

Q. 4. Find the smallest number which when multiplied with 3600 will make the product a perfect cube. Find the cube root of the product.

Q. 5. A tailor has a square cloth of area 1600 cm^2. He wants to cut square shaped handkerchiefs of side 8 cm. How many can he make?

Q. 6. A farmer has a square plot of land of area 8100 m^2. He wants to build a square pond inside the plot such that the pond occupies exactly one-fourth of the total area. Around the pond, he wants to build a fence. Find the length of the fence required.

Q. 7. A square carpet has an area of 2025 m^2. It is surrounded by a border of width 1 m which is decorated. Find the area of the decorated border.

Q. 8. Find the smallest square number that is divisible by each of the numbers 8, 15 and 20.

Q.9. A rectangular paper of length 45cm and breadth 5 cm is cut to form a square with the same area. What is the side of the square?

Q.10. Three numbers are in the ratio 1:2:3 and the sum of their cubes is 4500. Find the numbers.

ANSWER:
Sol.1. Factorize 33275 into prime factors: $33275 = 5^2 x 11^2 x 11$
For the quotient to have a perfect square, each prime factor's exponent must be a multiple of 2.
Divide by 11 to get a perfect square.
So, the required least number of persons =11.

Sol. 2. Area of one tile = 3 x3 = 9 m^2.
Number of tiles = 1521 / 9 = 169 tiles.

Sol. 3. Volume of large cube = 6^3 = 216 m^3.
Volume of small cube = 2^3 = 8 m^3.
Number of small cubes = 216 / 8 = 27 cubes.

Sol. 4. Factorize 3600:
$3600 = 2^4 \times 3^2 \times 5^2$
For a perfect cube, need $2^3 \times 3^3 \times 5^3$

Multiply by 2^2 x 3 x 5 = 60.
Cube root of product = $\sqrt[3]{}(2^6 \times 3^3 \times 5^3) = 2^2 \times 3 \times 5 = 60$.

Sol. 5. Side of cloth = √1600 = 40 cm.
Number of handkerchiefs along one side = 40 / 8 = 5
Total handkerchiefs = 5 x 5 = 25

Sol 6. Area of pond = 8100 / 4 = 2025 m²
Side of pond = √2025 = 45 m
Length of the fence required=45x4=180 m

Sol. 7. Area of carpet = $2025m^2$
Side of carpet = √2025 = 45 m
Side with border = 45 + 2 = 47 m
Area with border = 47^2 = 2209 m².
Area of border = 2209 - 2025 = 184 m².

Sol. 8. LCM of 8, 15, 20 =120
Prime factorization of 120 = 2x2x2x3x5.
Smallest square number divisible by 120 = 2x2x2x3x5x(2x3x5) = 3600.

Sol. 9. Area of rectangle = 45 x 5 = 225 cm².
Area of square = 225 cm².
Side of square = √225 = 15 cm.

Sol. 10. Let the common factor be x
Then the numbers be x, 2x, 3x.
$x^3 + (2x)^3 + (3x)^3 = 4500$.
$x^3 + 8x^3 + 27x^3 = 4500$.
$36x^3 = 4500$.
$x^3 = 4500/36 = 125$
x = 5
So, the required numbers are 5,10 and 15.

SECTION – D (4 MARKS)

Q. 1 Passage 1: The Tiling Project

Ramesh is a contractor hired to tile the floor of a large square hall. The hall has a side length of 12 meters. Ramesh has two types of square tiles available: one with a side length of 40 cm and another with a side length of 50 cm. He wants to use only one type of tile to avoid a mixed pattern.

(a) If Ramesh uses the 40 cm tiles, how many tiles will be needed? (2 marks)
(b) Which size of tile would be more cost-effective to use if the 40 cm tile costs ₹20 each and the 50 cm tile costs ₹30 each? Show your calculations. (2 marks)

Q. 2 **Passage 2: The Cubical Box Puzzle**
A carpenter is making a large cubical box to store toys. The box has a volume of 8 cubic meters. He decides to paint the outside of the box with a special anti-scratch paint. A small can of this paint can cover 4 square meters. Given that the volume of cube = l^3
(a) What is the length of one side of the cubical box? (2 marks)
(b) How many cans of paint will the carpenter need to buy to paint one side of the box? (2 marks)

Q. 3 **Passage 3: The Garden and the Paving Stones**
Mrs. Sharma has a square garden with a perimeter of 40 meters. She wants to create a square path around the garden using paving stones. The path will be 1 meter wide on all sides. She is curious about how many paving stones she will need. Each paving stone is a square with a side length of 50 cm.


(a) What is the area of Mrs. Sharma's garden? (2 marks)
(b) What is the area of the path, and how many paving stones will she need to cover it? (2 marks)

Q. 4 **Passage 4: The School Block Challenge**
A teacher gives a group of students 27 small wooden cubes, each with a side length of 3 cm. She challenges them to arrange all the small cubes to form a single, larger cube.
(a) Is it possible for the students to form a single, larger cube using all 27 small cubes? If so, what would be the side length of the larger cube? (2 marks)
(b) What is the difference between the total surface area of all 27 small cubes (when they are separate) and the surface area of the larger cube they form? (2 marks)

Q. 5 **Passage 5: The Gift Box and the Ribbon**
An event planner is decorating gift boxes for a party. Each gift box is a cube with a side length of 25 cm. For each box, she needs to tie a ribbon around all four sides of the top face, plus an extra 20 cm for a bow.

(a) What is the total length of ribbon needed for one gift box? (2 marks)
(b) If the event planner has a 10-meter roll of ribbon, how many gift boxes can she decorate completely? (2 marks)

Solution:
Q. 1 Passage 1: The Tiling Project
(a) Hall side = 12 m, 40 cm = 0.40 m
Area of hall = 12^2 = 144 m^2
Area of one 40 cm tile = 0.40 × 0.40 = 0.16 m^2
Number of tiles = 144 ÷ 0.16 = 900 tiles
Answer: 900 tiles

(b) 50 cm = 0.50 m → Area = 0.25 m^2
Number of tiles = 144 ÷ 0.25 = 576 tiles
Cost: 40 cm → 900 × 20 = ₹18000
Cost: 50 cm → 576 × 30 = ₹17280
Answer: 50 cm tiles are cheaper (₹17280)

Q. 2 Passage 2: The Cubical Box Puzzle
(a) Volume = 8 m^3 → side = $\sqrt[3]{8}$ = 2 m
Answer: 2 m

(b) area of each side= 2^2 = 4m^2
1 can covers 4 m^2 → 4 ÷ 4 = 1 can
Answer: 1 can

Q. 3 Passage 3: The Garden and the Paving Stones
(a) Perimeter = 40 m
4 x side = 40
Side = 40 ÷ 4 = 10 m
Area = 10^2 = 100 m^2
Answer: 100 m^2

(b) Outer side = 10 + 2 = 12 m
Outer area = 12^2 = 144 m^2
Path area = 144 − 100 = 44 m^2
Stone area = 0.5 × 0.5 = 0.25 m^2
Stones = 44 ÷ 0.25 = 176 stones
Answer: 44 m^2, 176 stones

Q. 4 Passage 4: The School Block Challenge
(a) Small cube volume = $3^3 = 27\ cm^3$
Total = $27 \times 27 = 729\ cm^3$
Side = $\sqrt[3]{729} = 9$ cm
Answer: Yes, side = 9 cm

(b) One cube area = $6 \times 3^2 = 54\ cm^2$
Total area = $27 \times 54 = 1458\ cm^2$
Large cube area = $6 \times 9^2 = 486\ cm^2$
Difference = $1458 - 486 = 972\ cm^2$
Answer: $972\ cm^2$

Q. 5 Passage 5: The Gift Box and the Ribbon
(a) Perimeter of top = $4 \times 25 = 100$ cm
+ bow 20 cm → 120 cm
Answer: 120 cm
(b) 10 m = 1000 cm → $1000 \div 120 = 8.33$ → 8 boxes
Answer: 8 boxes

A SQUARE AND A CUBE

Class test

Section A (MCQ – 1 mark each × 4 = 4 marks)

1. A farmer fenced a square plot of land. Its area is 144 m². Which of the following is the length of one side of the plot?
   (a) 14 m (b) 13 m (c) 12 m (d) 11 m

2. A classroom has a square carpet of area 225 m². What will be the length of each side of the carpet?
   (a) 16 m (b) 15 m (c) 14 m (d) 13 m

3. Which of the following numbers is a perfect cube?
   (a) 300 (b) 500 (c) 124 (d) 216

4. The unit digit of the square of 7898437 is:
   (a) 1 (b) 9 (c) 3 (d) 7

Section B (2 marks each × 3 = 6 marks)

5. A farmer has a square field of area 625 m². He wants to divide it into 25 square plots for growing different vegetables. What will be the side of each smaller plot?

6. Determine whether 3375 is a perfect cube by prime factorization.

7. Find the unit digit of the cube of 87523.

Section C (3 marks each × 2 = 6 marks)

8. Find the smallest square number that is divisible by each of the numbers 8, 15 and 20.

9. A tailor has a square cloth of area 1600 cm². He wants to cut square handkerchiefs of side 8 cm. How many handkerchiefs can he make?

Section D – Case Based Question (4 marks = 4 sub-parts × 1 mark each)

10. The Cubical Box Puzzle

A carpenter is making a large cubical box to store toys. The box has a volume of 8 cubic meters. He decides to paint the outside of the box with a special anti-scratch paint. A small can of this paint can cover 4 square meters. Given that the volume of cube = l^3

(a) What is the length of one side of the cubical box? (2 marks)

(b) How many cans of paint will the carpenter need to buy to paint one side of the box? (2 marks)

SOLUTIONS:

1. (C)12m
2. (b) 15 m
3. (d) 216
4. (b) 9

5. Area of the square field= 625 m^2
   Square field into 25 square parts = 625/25 = 25 m^2
   Area of one part = 25 m^2
   Side of the square field = 5m

6. Prime factorization of 3375 = 3 x 3 x 3 x 5 x 5 x 5 = $3^3 \times 5^3$

7. The number = 87523
   Unit digit of number = 3
   Square of unit digit = 9
   Unit digit of the number = 9

8. LCM of 8, 15, and 20 = 120
   Prime factorization of 120 = 2 x 2 x 2 x 5 x 3 = 2^2 x 3 x 5
   = 2 x 2 x (2 x 5 x 3)
   Smallest square number divisible = 2 x 2 x 2 x 2 x 5 x 5 x 3 x3 = 3600

9. Area of square cloth = 1600 cm^2
   Side of each handkerchief = 8 cm
   Area of each handkerchief = 16 cm^2
   Total number of handkerchiefs = 1600/16 = 100

10. <u>Passage 2: The Cubical Box Puzzle</u>
    (a) Volume = 8 m^3 → side = $\sqrt[3]{8}$ = 2 m
    Answer: 2 m

    (b) Surface area = 2^2 = 4m^2
    1 can covers 4 m^2 → 4 ÷ 4 = 1 can
    Answer: 1 can

CHAPTER 2: POWER PLAY

SECTION A (1 mark questions)

Q 1 .A popular stationery company claims it sells one million pens every year. What is the scientific notation of the data?
(A) 10^7 (B) 10^6 (C) 10^8 (D) 10^5

Q2 In a wildlife sanctuary, a cub is born weighing 4 kg. The sanctuary's scientist observes that the cub's weight doubles each year (power of 2 growth). What will be its weight after 5 years?
(A) 126 (B) 40 (C) 120 (D) 128

Q3 Rohan organizes a juice party. He played a game with his friend. They pour 1 litre of juice into 3 glasses. Then, each glass is again poured equally into 3 smaller glasses. If this process continues for 5 rounds, how many glasses of juice will finally be on the table?
(A) 3^3 (B) 3^5 (C) 5^3 (D) 5X3

Q4. Which of the following is equal to $2^5 \times 3^2$?
(A) 96 (B) 144 (C) 288 (D) 192

Q5 A digital display in a smart calculator shows any non-zero number raised to the power zero. If Riya enters any non-zero number (say 7, 15, or 120) and presses the "power 0" key, what number will appear on her calculator screen?
(A) 7 (B) 0 (C) 1 (D) 2

Q6. Ritta writes the number 6.7894×10^{-7} in normal(decimal) form as 67894000 but Sneha writes as 0.00000067894. Sohan writes as 0.0000067894 and Meena writes as 678940000000. Who is correct?
(A) Ritta (B) Sneha (C) Sohan (D) Meena

Q7. A hundred crore =
(A) an arab (B) a khrab (C) 2 million (D) 2 billion

Q8 Hundred koties are called…….
(A) niyuta (B) kankara (C) ayuta (D) sarvajna

Q9. Use the power line of 4. Fill in the blank 1024=64X……
(A) 4^3 (B) 4^5 (C) 4^6 (D) 4^2

Q 10. In 8th class, the class teacher gives a question to solve $((3)^2)^4$. Ashuk said that it is solved with applying operation addition in powers and we get 3^6 as answer but Sonu said that "I think, here multiplication operation is applied on powers and then we get answer 3^8." Rohan gave the answer as 9^4 while Sneha gave the answer 81^2. Who is not correct?
(A) Ashuk (B) Sonu (C) Rohan (D) Sneha

SOLUTION

Solution 1: option B: 1000000=10^6
Solution 2: Option D : Weighs of the baby after 5 years=4x2^5=4x32=128kg.
Solution3: Option B: Number of glasses: =3^5=243
Solution4: Option C: 288
Solution5: Option C: a^0=1
Solution 6: Option B: Decimal form is 0.00000067894. So, Sneha is right.
Solution 7: Option A: an arab
Solution 8: Option C: ayuta
Solution 9: option D: 1024=64X16=64X4^2
Solution 10: option A: Ashuk is incorrect.

SECTION B (2 marks questions)

Q 1. The distance between earth and sun is 149600000000 m. Write this data into scientific form in metres and in kilometres?

Q.2. A student, Yash wants to make 4-character passwords using digits 0 to 9 and uppercase letters A to Z for his piggy bank. How many passwords can be formed by him, if repetition is allowed?

Q.3 A bacteria double every hour in the process of converting milk to curd. Milk takes 6 hours to convert into curd. If there are 2^4 bacteria initially, how many bacteria will there be after converting into curd?

Q.4 Raman has 3 dresses, 2 hats, and 4 pairs of shoes. How many different outfits can Raman create?

Q5. Write 47651 in expanded form and then express in powers of 10.

Q6. Express $4^{-3}x8^2x2^3$ as a power with base 2.

Q 7. Express the number 32400 as a product of its prime factors and represent the prime factors in their exponential form.

Q8. Nestle Maggie is introducing a new flavour, and they want to package it in boxes that can hold ($3^2+2^4+2^8x2^{-5}$) packets of Maggie. How many packets of Maggie can each box hold?

Q9 What is the value of $4^n/4^n$? Which property of power can you use here to find this value?

Q10 Sonu wants to make a password of 3 digits for his suitcase bag using digits 0–9.
(a) How many possible passwords are there if repetition is allowed?
(b) How many possible passwords are there if repetition is not allowed?

SOLUTION

Solution 1: Distance between earth and sun = 149600000000m= 149600000km
Scientific form: 1.496x10^{11}m = 1.496x10^8 km

Solution 2: Number of digits (0 to 9) is 10
And number of letters (A to Z) is 26
Total characters = 10+26 = 36

Each of the 4 positions can be filled in 36 ways.
Therefore, Total passwords $=36^4$

Solution 3: number of bacteria in starting $=\mathbf{2^4}$
Since bacteria doubles after every hour
so, the number of bacteria after 6 hours is $=2^4x2x2x2x2x2x2=2^4x\ 2^6=2^{10}=1024$

Solution 4: The total number of different outfits is calculated by multiplying the number of choices for each independent item, as expressed by the formula: Total Outfits = Number of Dresses × Number of Hats × Number of Shoes.
The values are substituted into the formula: Total Outfits =3 × 2 × 4 =24

Solution5 : expanded form 47561=4x10000+7x1000+5x100+6x10+1
In power of $10=4x10^4+7x10^3+5x10^2+6x10^1+1x10^0$

Solution 6 : $4^{-3}x8^2x2^3=(2^3)^2x2^3/(2^2)^3=2^{6+3}/2^6=2^{9-6}=2^3$

Solution 7 : 32400= 2 × 2 × 2 × 2 × 3 × 3 × 3 × 3x5x5
Exponential form$=2^4x3^3x5^2$

Solution 8:No. Of packets of Maggie in each box=

$=(3^2+2^4+2^8x2^{-5})=9+16+2^3=25+8=33$ packets

Solution 9: $4^n/4^n=1$
Properties of power$=a^0=1$
Here $4^n/4^n=4^{n-n}=4^0=1$
OR $a^n/b^n=(a/b)^n$
$(4/4)^n=1^n=1$

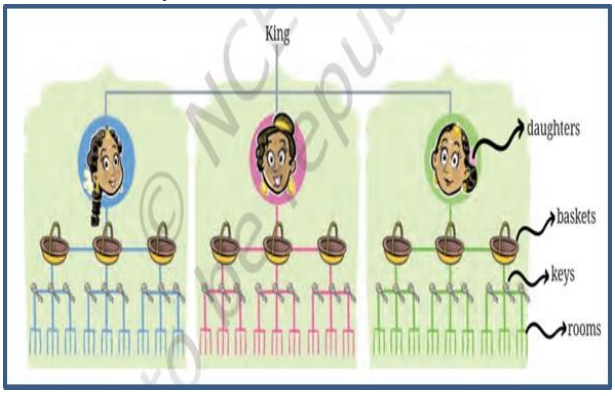
Solution 10 : (a) total possible password of 3 digits (using digits 0-9) =10×10×10
$=10^3=1000$

(b) when repetition is not allowed then total possible password of 3 digits (using digits 0-9) = 10×9x8=720

SECTION C (3 marks questions)

Q1. Find the total thickness of 5 bundles of paper placed on each other. Each bundle contains 500 papers and the thickness of one paper is 0.0016 cm. Express the total thickness in standard form also.

Q2-Three daughters with curious eyes. Each got three baskets — a kingly prize. Each basket had three silver keys. Each opens three big rooms with ease. Each room had tables — one, two, three. With three bright necklaces on each, you see. Each necklace had three diamonds so fine…



a) How many necklaces are there in total?
b) How many diamonds are there in total?
c) find the sum of total necklaces and diamonds.

Q 3 A scientist is studying two types of bacteria growth in a competitive environment. Type A grows linearly by adding 5 bacteria every hour. Type B grows exponentially by doubling every hour. If both start with 10 bacteria, how many bacteria will each type have after 4 hours? Use exponents for Type B. Moreover, calculate the ratio of Type B bacteria to Type A bacteria after 4 hours.

Q4 The volume of water on Earth is approximately 1.386×10^{21} litres. If you drink 1 litre of water every hour, how long would it take to drink this volume in years? Express your answer using scientific notation.

Q5 Find the value of x: $(11/9)^3 \times (9/11)^6 = (11/9)^{2x-1}$

Q6. An electronics store uses scientific notation to represent numbers of small electrical resistance values. (For example if one resistor has 2 ohms and another has 3 ohms then in series their total resistance is 2+3=5 ohms, where ohms is unit of resistance.)
You are having one resistor of resistance 4.7×10^{-5} ohms and another of 2.3×10^{-3} ohms.
a) Express both resistances in "usual" (decimal) form.
b) Which resistor has higher resistance?
c) If you combine them in series, what's the total resistance (give your answer in scientific notation)?

Q7. A scientist is studying three different types of viruses under a microscope. Their sizes are given as:

- Virus A: 2×10^{-7} m
- Virus B: 5×10^{-8}m
- Virus C: 9×10^{-9} m

According to you:

A. Which virus is the smallest in size?
B. Arrange the viruses in descending order of size.
C. Why is expressing such small sizes using exponents helpful in real-life scientific studies?

Q8 Rohan read in 8th class. His teacher gave a problem to solve $3^4 \times 4^{-3} \times 3^2 / (3^{-5} \times 5^{-3} \times 4^5)$. But Rohan has some doubts. Help Rohan to solve his problem.

Q9 A doctor prescribes a medicine in the following doses:

- Morning dose: 2×10^{-2} L
- Afternoon dose: 5×10^{-3} L
- Night dose: 1×10^{-2} L

Answer the following:

1. What is the total medicine consumed in a day (in decimal form)?
2. Which dose is the smallest?
3. Convert all doses into decimal form.

Q10. A toy store sells blocks. Each block is made from combining smaller cubes. The total number of small cubes in one block is 648.
Answer the following question:
(a). Find the prime factorization of 648, expressing it as a product of prime powers.
(b). A bigger block is made by combining 5 such blocks. What is the prime factorisation of total small cubes in the big block.

SOLUTION

Solution 1:

Number of papers = 500

Thickness of one paper = 0.0016 cm

Total height = Number of papers × Thickness of one paper

= 500 × 0.0016 cm

= 0.8 cm

= 8×10^{-1} cm

Therefore, the height of the bundle of 500 papers is 8×10^{-1} cm.

Solution 2

a) total necklaces=3x3x3x3x3x3=3^6=729

b) Total diamonds= 3^7=2187

(c) 3^6+3^7=729+2187=2916

Number of necklaces = $27 \times 3 = 3^3 \times 3 = 3^4$ = 81 necklaces.

So, Total diamonds = $81 \times 3^2 = 3^{4+2} = 3^6$ = 729 diamonds.

Solution3

Type A (linear)= 10 + 5×4 = 30 bacteria

Type B (exponential)= 10×2^4= 10×16 = 160 bacteria

Ratio of Type B to Type A = 160/30 = 16/3= 16:3

Solution 4

Time in hours =1.386×10^{21} hours

Time in years ≈ $(1.386 \times 10^{21}) / (24 \times 365) \approx (1.386 \times 10^{21}) / 8760$

≈1.58×10^{17} years

Solution 5

$(11/9)^3(9/11)^6=(11/9)^{2x-1}$

$(11/9)^3(11/9)^{-6}=(11/9)^{2x-1}$

$(11/9)^{3-6}=(11/9)^{2x-1}$

-3=2x-1

-2=2x

x=-2/2=-1

Solution 6 a) 4.7×10^{-5}=0.000047ohms (move decimal 5 places to left)

And 2.3×10^{-3}=0.0023 ohms

b) Clearly, 0.0023>0.000047, so the second resistor (2.3×10^{-3}ohms) has higher resistance.

c)Total resistance in series = sum =0.0023+0.000047=0.002347 ohms
Now convert into scientific notation: $0.002347=2.347\times10^{-3}$

Solution 7

A) Virus C is the smallest in size because 9×10^{-9} is the smallest number.
B) Descending order: Virus A > Virus B > Virus C
C) Expressing very small values using exponents makes it easier to read, write, and compare measurements in scientific studies, where such tiny values are common.

Solution 8 $3^4x4^{-3}x3^2/3^{-5}x5^{-3}x4^5$

$=3^4x3^2x3^5x5^3/4^3x4^5$

$=3^{4+2+5}x5^3/4^{3+5}$

$=3^{11}x5^3/4^8$

Solution 9

1. Total dose $=2\times10^{-2}+5\times10^{-3}+1\times10^{-2}=0.02+0.005+0.01=0.035$ L
2. Afternoon dose (5×10^{-3}) is the smallest.
3. Decimal forms:

- Morning: 0.02
- Afternoon: 0.005
- Night: 0.01

Solution 10: (a) The prime factorization of 648 is $2^3 \times 3^4$.
(b) A bigger block is made by combining 5 such blocks.
The total number of small cubes is 648 × 5
So the prime factorization of the total small cubes in the big block: $2^3 \times 3^4 \times 5^1$.

SECTION D (CASE STUDY BASED) (4 MARKS)

Q 1. ISRO is testing a new satellite system. During the tests, engineers are analyzing signal speeds and component sizes using **scientific notation** to manage very large and very small numbers efficiently.

Here are some values from their report:

- The signal travels at a speed of **300,000,000 m/s**.
- The thickness of the signal wire is **0.0000045 meters**.
- The satellite sends **15,000,000 signals per hour**.

a) Help scientists to convert these data into their standard form.
b) According to you, why is scientific notation useful in space engineering?

Q2. If a pond doubles its lotus flowers every day and is fully covered on the 30th day.

(i) On which day was it half-covered?
(ii)Express the number of lotuses on 30th day using exponents, if there was 1 lotus on 1st day

Q3 Scientists often use very large numbers while studying astronomy, computers, and the universe. A famous very large number is called a **Googol.**
Give answer of following questions:

(a) Which number is called Googol?
(b) How many zeroes are in a Googol?
(c) If Earth has about 10^{20} grains of sand, compare this number with a googol. Which is larger and by how many powers of 10?

Q4. Maths teacher gives following challenge to students:

- "You have a number 117649, you are asked to multiply it by the reciprocal of 343. But instead of doing direct multiplication you must do solve it using concept of powers of 7"
- There is a power line of 7.

7^7	823543
7^6	117649
7^5	16807
7^4	2401
7^3	343
7^2	49
7^1	7
7^0	1
7^{-1}	$\frac{1}{7}$
7^{-2}	$\frac{1}{49}$
7^{-3}	$\frac{1}{343}$
7^{-4}	$\frac{1}{2401}$

Using the power line of 7, Answer the following questions:

(a) solve the above challenge.
(b) Observe the pattern of power of 7. Write the relationship between 7^{-n} and 7^n?
(c) How many times larger than 7^{-2} is 7^2?

Q5. You buy a tiny LED bulb whose brightness halves every year due to wear. Its initial brightness is 100 units.

a) Write an expression for brightness after **n** years.
b) What is the brightness after 4 years?
c) After how many years will the brightness drop below 10 units?

SOLUTION

Solution 1: **Conversions :**

- Speed of signal:
  $300,000,000=3\times10^8$ m/s
- Thickness of wire:
  $0.0000045=4.5\times10^{-6}$ meters
- Signals per hour:
  $15,000,000=1.5\times10^7$

(b) Scientific notation helps engineers work with very large or very small numbers easily and reduces calculation errors, especially in fields like space research where precision matters.

Solution 2 : Pond fully covered on the 30th day.
We know double of half is 1. So, the pond was half covered just before 1 day of fully covered.
Therefore it half covered on 29th day
(ii) Number of lotus on 1 day =$1=2^0$
On 2nd day=$1x2=2=2^1$
On 3rd day=$2x2=4=2^2$
On 4th day=$4x2=8=2^3$…..
On 30th day=2^{29}

Solution 3:

(a) A googol is 10^{100}.
(b) Number of zeroes in Googol=100
(c) The number of grains of sand on Earth is estimated to be around 10^{20}.
Finding the Difference in Powers of 10:
To compare them, divide the larger number by the smaller number: $10^{100} / 10^{20}$.
Using the rule of exponents ($a^m / a^n = a^{(m-n)}$, this becomes $10^{100-20} = 10^{80}$.
This means a googol is larger than the number of grains of sand on Earth by a factor of 10^{80}.

Solution 4: (a) $117649x1/343=7^7x7^{-3}=7^4=2401$
(b) $7^{-n}=1/7^n$
They are reciprocals of each other.
(c) There are 4 steps from 7^{-2} to 7^2
So,7^2 is 7^4 times larger than 7^{-2}.

Solution 5 :a) Each year brightness becomes half: factor = 1/2
Starting brightness = 100.
After n years: $100x(½)^n$
b) For n=4
$100\times(1/2)^4=100\times1/16=6.25$
c) we want $100x(½)^n<10$
$(½)^n<0.1$
Compute:
$(1/2)^1=0.5$
$(1/2)^2=0.25$
$(1/2)^3=0.125$
$(1/2)^4=0.0625$
Here, at n=4, brightness= $100\times(1/2)^4\approx 6.25$ which is < 10. So after **4 years** brightness drops below 10.

POWER PLAY

CLASS TEST

Section A(1x4=4)

Q.1 Sonika says $(⅓)^{-3}= 1/(-27)$, but Mohan says $(⅓)^{-3}=27$. Reena says $(⅓)^{-3}= -27$ and Seema says $(⅓)^{-3}=27^{-1}$. Who is correct?

(A) Sonika (B) Mohan (C) Reena (D) Seema

Q.2 Reema has a number 5^2 and Amit has a number 5^3. Seema gives them a challenge to multiply both numbers. Solve this challenge and write your answer.

(A)5^1 (B) 5^6 (C) 5^5 (D)25^6

Q.3 Niyuta =.....

(A)10^{10} (B) 10^{11} (C) 10^{12} (D)10^{13}

Q.4 what is value of $3^5/3^9$

(A)3^{-4} (B) 3^6 (C) 3^{-3} (D)3^4

Section B(2x3=6)

Q.5 A pond gets fully covered in 30 days by lotuses that double every day. On which day was the pond half full?

Q.6 How many unique 5-digit passwords are possible if each digit can be anything from 0–9?

Q.7If an individual weighs 60 kg and a 1-rupee coin weighs 5 g, estimate how many 1-rupee coins equal that person's weight

Section C(3X2=6)

Q.8Express the height of a bundle of 500 papers placed on each other if the thickness of one paper is 0.0016 cm, in standard form.

Q.9 A researcher is studying radioactive decay. A sample has 1000 atoms. The decay reduces the number of atoms by a factor of 1/3 every hour.

a) Write a formula for the number of atoms after" t" hours.

b) After 3 hours, how many atoms remain (approx., round to nearest integer)?

c) After how many hours will less than 100 atoms remain?

Section D CBA (4 marks)

Q. 10 A scientist is working in a laboratory and discovers a special kind of bacteria that doubles in number every hour. She starts with just 1 bacterium at 8 AM in the morning.

a) Write an expression using exponents to show how many bacteria will be present after 10hours.

b) Calculate the exact number of bacteria present at 6 PM.

c) The scientist's jar can only hold $[2^{12}]$ bacteria, at what time will the jar first get full?

d) At what time does a scientist's jar fill half with bacteria?

Answer key

Ans1. option B: Mohan is correct. $(⅓)^{-3}=27$

Ans2. Option C: 5^5

Ans3. Option B

Ans4. Option A

Ans5. Day 29

Ans 6. 100,000

Ans7. 12000 coins

Ans 8: 8×10^{-1} cm.

Ans 9(a):$N(t)=1000\times(1/3)^t$

9(b) ≈37.037. Rounded ≈ 37 atoms remain.

9(c) at t = 3 hours

Ans 10(a):2^{10}

10(b): 2^{10}

10(c): 8PM

10(d): 7PM

CHAPTER 3: A STORY OF NUMBERS

SECTION A (1 MARK)

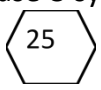
1. In ancient Rome, a historian was calculating the total distance of his journey. If he travelled LXXX miles each for XXV days, what was the total distance he travelled? Express in Roman numerals?

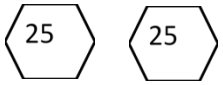
a) MM b) MMC c) MMCC d) MMXXX

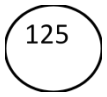
2. A teacher is introducing the base 5 number system to her class. She explained that landmark numbers are the powers of the base. To make it more engaging, she asked the students to identify third landmark number of base 5.

(a) 5 (b) 10 (c) 100 (d) 25

3. A teacher is introducing the base 5 number system to her class. She explained that landmark numbers are the powers of the base. What is the largest landmark number smaller than 143 in the base-5 system?

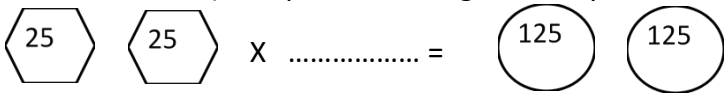
(a) 

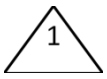
(b) 

(c) 

(d) 

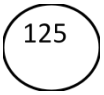
4. Fill in the blanks (multiplication using base-5 system using symbols) where



a) 

(b) 

(c) 

(d) 

5. In a classroom discussion on the history of numbers, the teacher explained that man ancient numeral systems such as Roman and Mayan are no longer used in daily life, but some number systems are still in used in modern times. Name two number systems which are still in use.

(a) Roman and Mayan b) Babylonian and Egyptian
c) Roman and Mesopotamian d) Hindu and Binary

6. A group of indigenous people in Australia called Gumulgals counts a group of animals as "ukasar-urapon". Then they found another group with same number of animals that is counted as "ukasar-urapon." What is the total count of the animals of both groups?

a) ukasar-ukasar-urapon b) ukasar-ukasar

c) ukasar-ukasar-ukasar d) ukasar-urapon

7. The Mesopotamian Sexagesimal system, a base-60 system, has influenced modern time measurements. Which of the following statements best explains this influence?

a) This system was the first to use a base-60 structure for measuring time, which was adopted by subsequent civilizations and still in use.

b) The use of 60 minutes in an hour and 60 seconds in a minute is a modern invention that coincidentally aligns with the Mesopotamian system.

c) The Mesopotamian people were the first to accurately calculate the number of seconds in a day, which they determined to be a multiple of 60.

d) The system's use of 60 was limited to astronomical calculations and has no historical link to our modern time units.

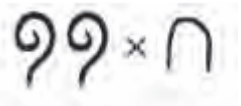
8. What is the base of the Egyptian number system?

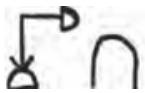
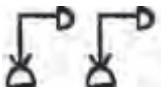
(a) 10 (b) 20 (c) 60 (d) 50

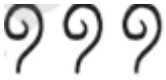
9. A Roman number inscribed on the stone that is found on roman tombstone that describes about the year (**MCMLXXXII**). What is the number in Hindu numerals?

a) 1982 b) 1972 c) 1882 d) 1872

10. Find the product of the numbers in the Egyptian system



(a)  (b) 

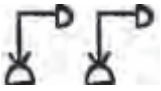
(c)  (d) 

ANSWERS

1. (a) ☐ 2. (d) 25 3. (c) 125 4. (b) 5. (d) Hindu and Binary

6. ukasar-ukasar-ukasar

7. (a) This system was the first to use a base-60 structure for measuring time, which was adopted by subsequent civilizations and preserved in our current units

8. (a) 10 9. (a) 1982 10. (b) 2000 

SECTION B (2 marks QUESTIONS)

1. A monument was built in the year MDCCXLIV in Rome.

(a) Write your answer in Hindu-Arabic numerals.

(b) How old is the monument today (as on date)? Write your answer in Roman numerals.

2. An old coin has **MCMXLVII** inscribed on it.

(i) Convert it into Hindu-Arabic numeral.

(ii) Is the year an important event in Indian history. Find the event connected to it.

3. In ancient Rome, the years of an emperor's reign were often recorded using roman numerals. For example, Augustus ruled from **XXIV** BCE to **XIV** CE. Suppose you are a historian trying to analyse the timeline of these emperors. You are given information in Roman numerals, and your task is to interpret, compare, and calculate the durations of the rule using both Roman and Hindu-Arabic numerals.

(i) Find the total duration of his reign in years and express it in Roman numerals.

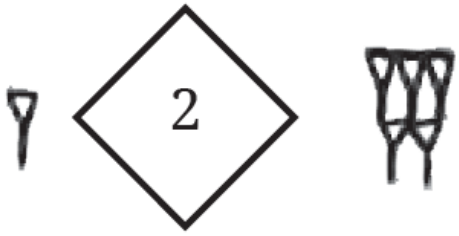
(ii) Express the period of his reign in Hindu numerals.

4. The year of birth of Aryabhata is **CDLXXVI**.

(i) Convert it into Hindu-Arabic numerals.

(ii) If Aryabhata lived for **LXXV** years, in which year did he die? Write the year both in Hindu-Arabic and Roman numerals.

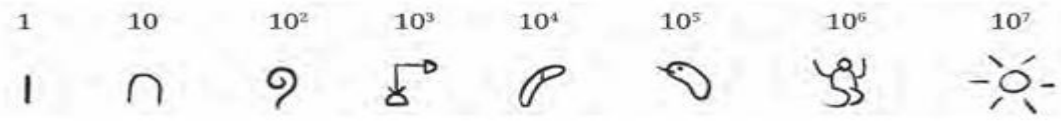
5. The cost of an antique written in Mesopotamian system as:



(a) Write it in Hindu-Arabic numerals.

(b) If your give Rs. 4000, how much money the shopkeeper will return. Write your answer in Mesopotamian system.

6. The landmark number in Egyptian Number system is 10 times the previous one. The following are the symbols that are used in Egyptian number system.



Represent the following number in Egyptian System: -

(a) 10458 (b) 1023

7. Convert the following rod numeral representations into Hindu-Arabic numerals:
(a) 2 (Heng), 6 (Zong), 3 (Heng), 4 (Zong)
(b) 4 (Heng), 1 (Zong), 8 (Heng), 2(Zong)

8. While studying ancient civilizations, Arjun read that the Mayans used wedge-shaped marks on clay tablets. When he noticed the different ways of grouping numbers. Compare Mayan and Mesopotamian numeral systems with respect to base.

9. The Mayans used dots for 1 and bars for 5. How many symbols used to represent the number 13?

10. A merchant records the price of silk using rod numerals as: 8 (Zong), 5 (Heng) and 3 (Zong)

(i) Convert it into Hindu-Arabic numbers.

(ii) If he sells 3 such bundles, what is the total cost?

ANSWERS:

1. (a) Ans:- MDCCXLIV = **1744**

(b) Ans:- CCLXXXI years (281 years .)

2. (i) 1947

(ii) Yes, India got its independence.

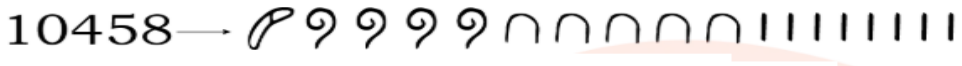
3. Reign: 38 years , in roman numerals XXXVIII

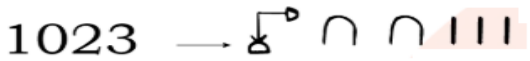
4. Birth: CDLXXVI = **476**
Lifespan: LXXV = **75 years** → Death year = **551** = **DLI**

5. (a) Rs 3605.

(b) Write answer in Mesopotamian system:

6. Ans: -





7. (a) 2634 (b) 4182

8. Both used place value, both used zero as placeholder, but Mesopotamian was base-60 and Mayan was near base-20.

9. **Ans: use 2** bars (10) + 3 dots = 13.

10. (a)853 (b) 2559 [2 (Heng), 5 (Zong), 3 (Heng), 9 (Zong)]

SECTION C (3 MARKS QUESTION)

Question1. A student is trying to add numbers written in Roman numerals. He places LXXXVII and LXXVIII side by side and feels confused about how to add them directly. His friend suggests converting into Hindu numerals first, add, and then convert back to Roman.
Help the student by showing the process step-by-step and give the final sum in both systems.

Question 2. During an activity, students were asked to represent 77 using Mayan numerals. One student grouped the number into twenties, another used dots and bars. The teacher said both are fine if positional rules are followed.
Represent 77 in Mayan numerals and explain the grouping clearly.

Question 3. In the Egyptian system every landmark number is a power of 10. A student wants to write 324 using Egyptian symbols and explains it as 300 + 20 + 4. His friend reminds him to use repeated symbols for each landmark. Show how 324 is written in the Egyptian numerals and explain why it is far more efficient than tally marks.

Question 4. A teacher asks her class to convert 25 into base-8 and base-5 using repeated division (record remainders).
Perform both conversions and explain briefly how the representations differ from base-10.

Question 5. The Gumulgal tribe counted in 2s: e.g., 3 = 2+1 and 4 = 2+2. A student is asked to express 5 and 6 in their notation. Where they called 2 as ukasar and 1 as urapon.
Write those representations and comment briefly on efficiency vs tally marks.

Question 6. While visiting a museum, Riya noticed ancient Egyptian writing carved on a stone tablet. The guide explained that these carvings were numbers used thousands of years ago. Riya was surprised to see that Egyptians had separate symbols for 1, 10, 100, 1000, and so on, and they would repeat these symbols to form larger numbers. Later in her class Riya shared her experience.

(i) What was the base of the Egyptian number system.

(ii) If Egyptian wanted to write the number 243, which symbols and how many of each would they use?

Question 7. A student is asked to write 200 using the Mesopotamian (Sexagesimal) system. He divides by 60 and writes the quotient and remainder.
Show the division and explain how 200 is represented in Mesopotamian notation.

Question 8. A student reading Mesopotamian tablets confused 60 with 3600 because spacing between groups was unclear. The teacher said the problem was solved later by introducing a special symbol.
Identify that symbol and explain with an example why it was important.

Question 9. Two students argue: “Base-10 is natural because of fingers” vs “Base-5 works too (counting in groups of five).”

Compare the landmark numbers (place values) of base-10 and base-5 and explain which system gives more compact representations – give an example.

Question 10. Aryabhata and Brahmagupta both influenced the idea of zero but in different ways. A student asks you to summarize each of their contributions.
Write a short, precise explanation of how Aryabhata and Brahmagupta advanced the idea of zero.

ANSWERS

Question 1. Convert each Roman numeral to decimal:
- LXXXVII = 87
- LXXVIII = 78

Add: 87 + 78 = 165

Convert back: 165 = CLXV in Roman.
Final: HINDU= 165; Roman = CLXV.

Question 2. Step 1: Understand the Mayan Numeral System

The Mayan numeral system is Vigesimal (base-20), using a combination of dots (representing 1) and bars (representing 5). The system also has a positional notation, where the rightmost position represents units (1-19), the next position to the left represents 20s, and the next represents 400s (20^2), and so on.
Step 2: Convert 77 to Mayan Numerals
To represent 77 in Mayan numerals, we first divide 77 by 20 to find out how many 20s and units we have.
77 ÷ 20 = 3 remainder 17.
This means 77 = 3 * 20 + 17.
Step 3: Represent 3 * 20 in Mayan Numerals
For the 20s place, we have 3 twenties. In Mayan numerals, 3 would be represented by 3 dots.
Step 4: Represent 17 in Mayan Numerals
For the units place, we have 17. In Mayan numerals, 17 would be represented by 3 bars (3_5 = 15) and 2 dots (2_1 = 2), because 15 + 2 = 17.
Step 5: Combine the Representations

The Mayan numeral representation of 77 would have 3 dots in the 20s place and 3 bars and 2 dots in the unit place.

77 ÷ 20 = 3 remainder 17 → 77 = (3×20) + 17.
- 20s place: 3 → three dots.
- 1s place: 17 → three bars (15) + two dots (2).

Final Mayan representation: top – 3 dots; bottom – three bars + two dots.

Question 3. 324 = 3×100 + 2×10 + 4×1.
- Write three 100-symbols, two 10-symbols, four 1-symbols.

Compared to 324 tally marks, Egyptian numerals need only 9 symbols, making them efficient and easy to compute with.

Question 4. Step 1: Convert 25 to Base-8
To convert 25 to base-8, we perform repeated division by 8 and record the remainders.
25 ÷ 8 = 3 remainder 1
3 ÷ 8 = 0 remainder 3
So, 25 in base-8 is 31.
Step 2: Convert 25 to Base-5
To convert 25 to base-5, we perform repeated division by 5 and record the remainders.
25 ÷ 5 = 5 remainder 0
5 ÷ 5 = 1 remainder 0
1 ÷ 5 = 0 remainder 1
So, 25 in base-5 is 100.
Step 3: Compare Representations
In base-10, 25 is represented as 25. In base-8, it's 31, and in base-5, it's 100. The representations differ because each base has a different set of digits and place values. Base-8 uses digits 0-7, while base-5 uses digits 0-4. The place values also change accordingly (e.g., 8^1 in base-8 and 5^1 in base-5).
The final answer is:

Base-8: 25 ÷ 8 = 3 remainder 1 → 31_8.
Base-5: 25 ÷ 5 = 5 r0, 5 ÷ 5 = 1 r0 → 100_5.
Base-10 uses powers of 10, but here digits represent powers of 8 or 5.

Question 5. Ans: 5 = ukasar-ukasar-urapon (2+2+1).
6 = ukasar-ukasar-ukasar (2+2+2).
This grouping is more efficient than tally marks but still less compact than positional systems.

Question 6. – (i) the Egyptian number system was built on 10(decimal system). However, unlike our system, it was additive and non-positional.
(ii) Egyptians would write it using

- 2 × (100 symbol)
- 4 × (10 symbol)
- 3 × (1 symbol)

Question 7. 200 ÷ 60 = 3 remainder 20.
So 200 = 3×60 + 20.

Written with 3 symbols in the 60s place and 20 in the 1s place. Much shorter than 200 tally marks.

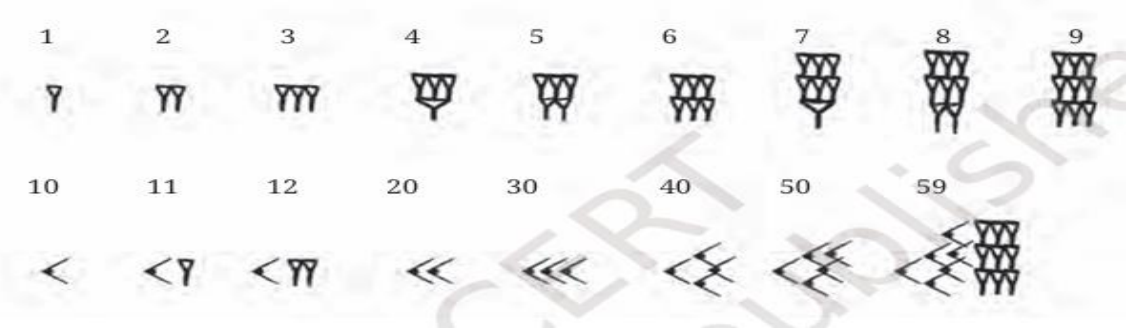
Question 8. The special symbol was zero as a placeholder.
Without it, a symbol '1' could mean 1, 60 or 3600. Zero marked empty positions and removed ambiguity. Example: 101 vs 11 – zero fixes meaning.

Question 9. Base-10: 1, 10, 100,
Base-5: 1, 5, 25,
Higher bases give more compact representations. Example: 125 → '125' in base-10, but '1000_5' in base-5 (four digits). So base-10 is more compact.

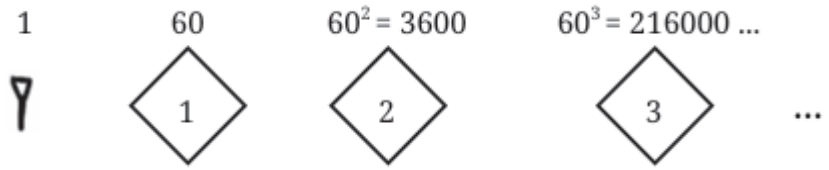
Question 10. - Aryabhata: used zero as placeholder in place value; showed its power in calculations.
- Brahmagupta: treated zero as a number; defined rules like 0+a=a, 0×a=0.
Thus Aryabhata focused on notation; Brahmagupta on arithmetic laws.

SECTION D (4 MARKS QUESTIONS)

Question 1. Long ago, people in Mesopotamia used a number system based on 60. This is why we still measure time in 60 seconds make a minute and 60 minutes make an hour. The Babylonians could write big numbers using combinations of wedges and lines. This system used the following symbols to represent the number. Their number system influenced later civilizations.



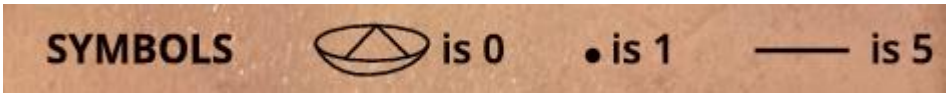
They also use the following symbols to represent their landmark numbers:-



Now answer the following questions based on above information.
(i) Which base was used in the Mesopotamian number system?
(ii) How many seconds make an hour in our modern system?
(iii) Name one-way Mesopotamian numbers are still influencing us today.
(iii) Represent 36002 in this system.

Question 2. The Mayans developed a number system with almost a base 20 system. They used dots and bars to represent numbers. A single dot stood for 1, while a bar represented 5. Unlike others, they used 360 instead of 400 for the third-place value, as their calendar was based on 360 days in a year. In this system symbols are placed vertically to represent a number.

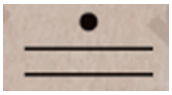
Following landmark numbers are in this system.



Now answer the following questions: -

(i) Which base was used in the Mayan number system?

(ii) A number in the Mayan system is represented by the given symbol

. What number it represent? 

(iii) Represent 100 and 361 in the Mayan system.

Question 3. The Romans did not use place value but symbols like I, V, X, L, C, D, and M. For example, the number 9 was written as IX (10 – 1). Although Roman numerals were useful in their time, they were not very convenient for calculations. That is why Roman numerals are now used only in special cases like clocks, book chapters, and names of kings or queens.

Answer the following questions based on this system.

(i) Which symbol represents 1000 in Roman numerals?

(ii) Rohan Writes 400 as CCCC. Is it correct? If Not, then correct it.

(iii) How many seconds are in one hour? Write it in Roman Numerals?

(iv) If you buy a shirt in Rs 425 and a paint in Rs 950. How much amount you pay the shopkeeper. Write all details in Roman Numerals.

Question 4. The Indian number system brought two revolutionary ideas to mathematics — zero and place value. These concepts made it possible to write and calculate with very large numbers in a simple way. Before this, number systems were complicated and less efficient. With zero and place value, addition, subtraction, multiplication, and division became much easier. Today, the Hindu–Arabic number system, which is used worldwide, is based on the Indian number system.

Now answer the following questions: _

(i) What new idea did the Indian number system introduce?

(ii) Why are zero and place value regarded as turning points in the history of mathematics?

(iii) Write the following numbers in word (In Indian number system)

(a) 36,90,45,548 (b) 90,00,00,009

Question 5. Trade Across Civilizations (Math + History + Economics)

A Roman merchant bought a necklace in Rome for **XLV (Roman coins)**. He sailed to Mesopotamia and sold it there for  **(in the Mesopotamian place-value notation)**, in base-60. During

a cross-border transaction an extra tax of **VIII (8 Roman coins)** was levied. The merchant then converted all accounts to the Hindu-Arabic system for final record-keeping.

Table: Given representations (use this for solving).

System	Representation	Value (Hindu-Arabic)
Roman (purchase)	XLV	
Mesopotamian (sale)		
Roman (tax)	VIII	

Questions:

i. Convert all given values into Hindu-Arabic numerals.
ii. Find the final cost of the necklace after adding the tax (express in Hindu-Arabic numerals).

Question 6. A group of indigenous people in Australia called the Gumulgal had the following words for their numbers.
Gumulgal (Australia)
1. urapon
2. ukasar
3. ukasar-urapon
4. ukasar-ukasar
5. ukasar-ukasar-urapon
6. ukasar-ukasar-ukasar
Consider the extension of the Gumulgal number system beyond 6 in the same way of counting by 2s. Come up with ways of performing the different arithmetic operations (+, –, ×, ÷) for numbers occurring in this system, without using Hindu numerals.

Use this to evaluate the following:

(i) (ukasar-ukasar-ukasar-ukasar-urapon) + (ukasar-ukasar ukasar-urapon)

(ii) (ukasar-ukasar-ukasar-ukasar-urapon) – (ukasar-ukasar ukasar)

(iii) (ukasar-ukasar-ukasar-ukasar-urapon) × (ukasar-ukasar)

(iv) (ukasar-ukasar-ukasar-ukasar-ukasar-ukasar-ukasar-ukasar) ÷ (ukasar-ukasar)

ANSWERS

Ans 1:-

(i) base 60 (sexagesimal system)

(ii) 3600

(iii) Time measurement (60 seconds = 1 minute, 60 minutes = 1 hour).

(iv) 

Ans 2(i) 20 (ii) 11

100 = 5*20+0 	361=1*360+0+1 

Ans 3:-

(i) M
(ii) No, correct form = CD (400 = 500-100)
(iii) 3600 = MMMDC
(iv) Shirt = CDXXV, Pant = CML, Total = MCCCLXXV

Ans4:-

(i) The ideas of **zero** and **place value**.

(ii) Because they made it possible to write very large numbers easily,

Perform arithmetic operations (addition, subtraction, multiplication, division) more quickly,

Distinguish numbers clearly (e.g., 15 and 105).

(iii) (a) Thirty-six crore ninety lakh forty-five thousand five hundred forty-eight.

(b) Ninety crore nine.

Answer 5— (Trade Across Civilizations)
i. Conversions to Hindu-Arabic numerals (stepwise):

- • Roman: XLV = XL + V = (50 − 10) + 5 = 40 + 5 = 45.
- • Mesopotamian: 1,2 means 1×60 + 2×1 = 60 + 2 = 62 (sexagesimal decomposition).
- • Roman tax: VIII = V + I + I + I = 5 + 1 + 1 + 1 = 8.

ii. Final cost after adding the tax (interpretation: sale price + tax):

- Sale price (in Hindu) = 62
- Tax (in Hindu) = 8
- Final cost (sale + tax) = 62 + 8 = 70 (Hindu-Arabic numerals).

Answer 6:-

- (i) ukasar-ukasar-ukasar-ukasar-ukasar-ukasar-ukasar-ukasar (ukasar comes 8 times)
- (ii) ukasar-urapon
- (iii) ukasar-ukasar-ukasar-... (ukasar repeated eighteen times).
- (iv) ukasar-ukasar

CLASS TEST (20 Marks)

Chapter: A Story of Numbers

Section A – 1 Mark Questions (MCQs) (4 × 1 = 4 Marks)

Q1. A Roman clock in a museum shows the time as "VIII". A child asks what this means in Hindu-Arabic numerals.

a) 6 b) 7 c) 8 d) 9

Q2. A farmer keeps records of his harvest using the Gumulgal system. He writes "ukasar-urapon" for one group of fruits and then doubles it. What number of fruits does he finally record?

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

Q3. A digital watch displays "60 minutes = 1 hour." A guide explains to students that this idea came from an ancient numeral system. Which system is being referred to?

a) Roman b) Hindu–Arabic c) Mesopotamian (Sexagesimal) d) Mayan

Q4. A book has the year "MCM" printed on its cover. Convert the year in to Hindu-Arabic numerals?

a) 1800 b) 1900 c) 2000 d) 2100

Section B – 2 Mark Questions (3 × 2 = 6 Marks)

Q5. A student visits a science museum and sees the number "143" written in base-5. His teacher asks him to convert it into base-10 to check how many exhibits were counted.

Q6. A king's reign was carved on a stone in Roman numerals as "XIV years". If another king ruled for "XXV years", how many more years did the second king rule than the first? Write your answer in both Hindu-Arabic and Roman numerals.

Q7. A historian is comparing the Egyptian system with tally marks. She shows that 243 can be written with fewer symbols in Egyptian numerals. Explain briefly how Egyptians symbols would represent 243.

Section C – 3 Mark Questions (2 × 3 = 6 Marks)

Q8. During an activity, a teacher asked students to compare base-10 and base-5 systems. One student wrote "25 in base-10 = 100 in base-5." Another wrote "25 in base-10 = 31 in base-8." Explain how both are correct, show steps.

Q9. In a cultural exchange, a Roman merchant calculated the total cost of two goods: XLV coins for a necklace and LXX coins for a ring. Find the total in Hindu-Arabic numerals. Then, convert the result back into Roman numerals.

Section D – 4 Mark Question (1 × 4 = 4 Marks)

Q10. The Mayan numeral system was based on 20 but used 360 for their calendar place value. A student wants to represent the year "361."

(i) Identify the base used in the Mayan system.

(ii) Explain why 360 was used instead of 400.

(iii) Show how 361 is written in Mayan numerals.

(iv) Compare briefly how this differs from our Hindu-Arabic system.

Answer Key

Section A – 1 Mark (MCQs):

Q1. (c) 8

Q2. (b) 5

Q3. (c) Mesopotamian (Sexagesimal)

Q4. (b) 1900

Section B – 2 Marks:

Q5. $143_5 = 1\times5^2 + 4\times5^1 + 3\times5^0 = 25 + 20 + 3 = 48$ (base 10 system). (Place value $5^0 = 1$, $5^1 = 5$, $5^2 = 25$)

Q6. XIV = 14, XXV = 25 → Difference = 25 – 14 = 11years → XI years in Roman.

Q7. 243 = 2×100 + 4×10 + 3×1 → Egyptians used 2 hundred symbols, 4 ten symbols, and 3 one symbols (9 total).

Section C – 3 Marks:

Q8. Base-5:

25 ÷ 5 = 5 remainder 0,

5 ÷ 5 = 1 remainder 0

1 ÷ 5 = 0 remainder 1 → 100_5. (remainders from the bottom 1,0,0)

Base-8: 25 ÷ 8 = 3 remainder 1,

3 ÷ 8 = 0 remainder 3 → 31_8. (remainders from the bottom 3,1)

Both are correct representations of 25 in different bases.

Q9. XLV = 45, LXX = 70 → Total = 115 → In Roman = CXV.

Section D – 4 Marks:

(i) Base = 20.

(ii) 360 used for calendar (360 days in a lunar year).

(iii) 361 = 1×360 + 1 = top dot (360) + bottom dot (1).

(iv) Unlike Hindu-Arabic (positional base-10), Mayan used vertical symbols with 360-adjustment.

CHAPTER 4: QUADRILATERALS

SECTION A (1 MARK QUESTIONS)

1. A window glass is in the shape of a regular quadrilateral. The window must be in the shape of
a) Rhombus b) Rectangle c) Trapezium d) Square

2. A park is made in the shape of a trapezium with exactly one pair of parallel sides. The sum of its interior angles is always:
a) 90° b) 180° c) 270° d) 360°

3. A carpenter makes a frame whose opposite sides are equal and parallel, but no angle is 90°. The frame is a:
a) Rectangle b) Parallelogram c) Square d) Trapezium

4. A notice board is in the shape of a rhombus. Its diagonals are always:
a) Equal and not perpendicular b) Unequal but perpendicular
c) Equal but perpendicular d) Unequal and not perpendicular

5. The top of a garden bench is in the shape of a quadrilateral with opposite sides are equal and all angles are right angles. The bench top is a:
a) Rectangle b) Rhombus c) Trapezium d) Kite

6.A building plot is in the shape of a parallelogram. Which of the following is *always true*?
a) All sides equal b) Opposite sides equal and parallel
c) Diagonals are equal d) All angles are 90°

7.A wall clock is designed in the shape of a square. Which statement about its diagonals is correct?
a) They are equal but not perpendicular b) They bisect each other at right angles
c) They are unequal and perpendicular d) They do not bisect each other

8. The diagonals of a playground in the shape of quadrilateral bisect each other at right angles. The playground must be
a) Trapezium b) Rectangle c) Parallelogram d) Rhombus

9.An artist cuts a paper in the shape of quadrilateral where all sides are equal but angles are not right angles. The shape is a:
a) Square b) Rhombus c) Rectangle d) Trapezium

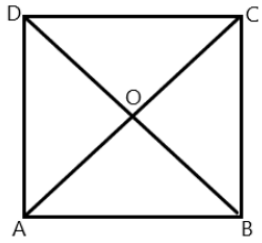
10.The board is in the form of a trapezium. The non-parallel sides are equal in length. This trapezium is called:
a) Right trapezium b) Parallelogram c) Scalene trapezium d) Isosceles trapezium

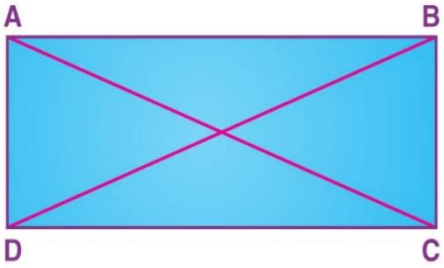
Solutions:

1 (d) 2(d) 3 (b) 4 (b) 5 (a) 6 (b) 7 (b) 8 (d) 9 (b) 10 (d)

SECTION B (2 MARKS QUESTIONS)

1. State two special property of a square that differentiates it from a rectangle.





2. A park is surrounded by four street lights at its corners. The street light are positioned such that they do not form 90° at each corner. If each pair of opposite sides of the park are equal, what type of quadrilateral is the park? Justify your answer.

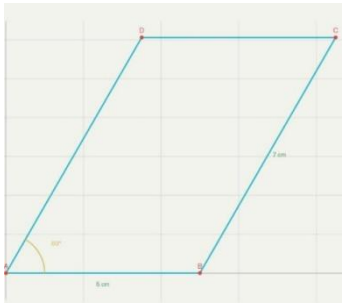
3. Construct a parallelogram with adjacent sides of 5cm and 7 cm and an angle of 60° between them.
4. Construct a rhombus PAIR, given that PA = 6 cm and angle ∠A = 110°.
5. Explain why every square is also a rhombus or a rectangle.
6. The two adjacent angles of a parallelogram are the same. Find the measure of each angle.
7. A farmer fenced his land in the shape of a quadrilateral where opposite sides are parallel and equal, but the angles are not 90°. Identify the shape of his land and state one property of its opposite angles.
8. Meena drew a quadrilateral where only one pair of opposite sides is parallel. What kind of quadrilateral it is? Write any one property of it.
9. A photo frame is made in the form of a quadrilateral with both diagonals are equal and bisecting each other at 90˚. Name the quadrilateral and justify.
10. The three angles of a quadrilateral are 100°, 50°, and 40°. Find the fourth angle.

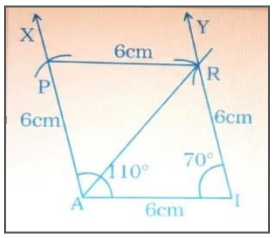
SOLUTIONS

1. (a) A square is having all four sides are equal, whereas a rectangle only requires opposite sides to be equal.

(b) Diagonals of a square bisect at 90 degrees, while diagonals of a rectangle bisect at different angles.

2. It is a parallelogram because both pairs of opposite sides are parallel and equal.

3. 

4. 

5. Square has all sides equal and diagonal bisect at 90˚ as rhombus. Similarly, Square has opposite sides equal and all angles 90˚ as rectangle.

6. In a parallelogram, adjacent angles are supplementary and ∠ A = ∠ B

∠ A + ∠ B = 180˚

∠ A + ∠ A = 180 ˚

2 ∠ A = 180 ˚

∠ A = 90 ˚

7. The land is a parallelogram. In a parallelogram, opposite angles are equal.

8. In a trapezium, the sum of the angles on the same side of a transversal is 180° and opposite angle at not equal.

9. It is a square because diagonals are equal and bisect each other at 90°.

10.Sum of all the angles of quadrilaterals = 360°

$\Rightarrow \quad 100^0 + 50^0 + 40^0 + \quad x = 360^0$

$\Rightarrow \quad 190^0 + x = 360^0$

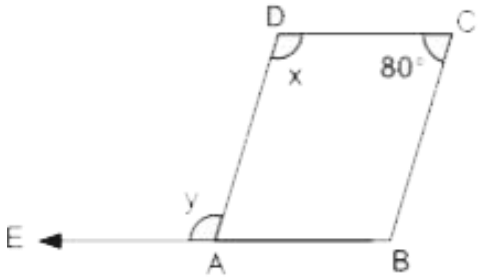
$\Rightarrow \quad x = 360^0 \quad - 190^0$

$\Rightarrow \quad x \quad = 170^0$

SECTION C (3 MARKS QUESTIONS)

Q1) In the given figure, a diagonal is dividing a parallelogram into two triangles. Find any three equal corresponding parts of two triangles formed. Can we say $\Delta ABD \cong \Delta CDB$?

Q2. In the given parallelogram, find the values of x and y.



Q 3) Represent the relation among a square, a rectangle and a parallelogram using a Venn diagram. Answer the following questions:

a) Is a square a rectangle? b) Is a rectangle a parallelogram?

Q 4) Raju has a field whose sides measure 70m, 50m, 70m and 50m. Identify the name of the possible shapes of his field. Write any two common properties of the possible shapes.

Q 5) Find the measure of all the angles of the quadrilateral obtained by joining two equilateral triangles with sides 5cm. Name the quadrilateral formed and write a property that make it different from square.

Q6) A carpenter needs to put together two thin strips of wood diagonally, as shown in the fig.1, so that when a thread is passed through their endpoints, it forms a rectangle. She already has one 8cm long strip.

a) What should be the length of the other strip?

b) Name the point of intersection of the two diagonals.

c) Find the length of OD and OB.

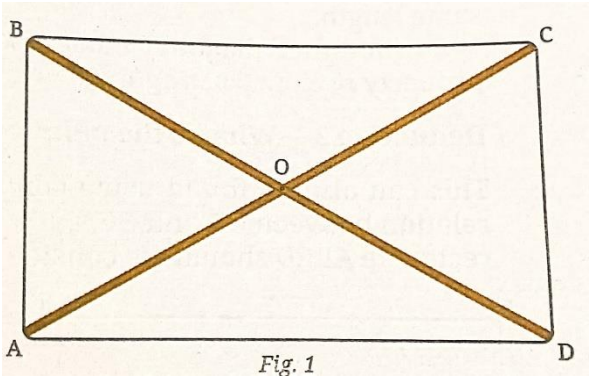
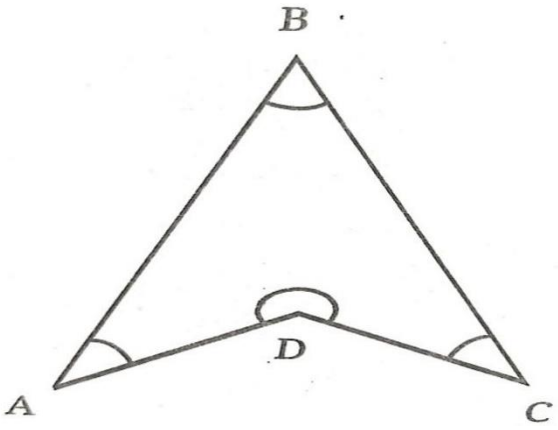
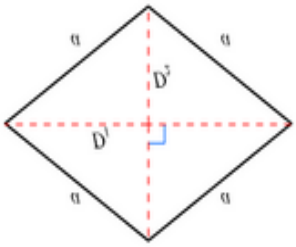


Fig. 1

Q 7) What is the sum of all interior angles of a quadrilateral? If $\angle A = 58^0$, $\angle B = 42^0$ and $\angle C = 40^0$, then find the value of reflex $\angle ADC$ and $\angle ADC$.



Q 8) A Math teacher gave a project to his student Aayush, to cut a paper in the shape of a rhombus with diagonals 24cm and 10cm. He wants to paste four different color's laces on each part of the diagonals divided after intersection to decorate it. Find the length of the 4 laces he has to buy for decoration. Also each side of rhombus is 13cm and he wants to decorate border too. Find the total length of the lace to be pasted .



Q 9) Rohit has a task to fence a park of quadrilateral shape with diagonals 8m and 6m bisecting each other perpendicularly but the angles at the corners are not a right angle. Can you identify the shape of the park? Draw a sample park and tell the length of its one side.

Q 10) A carpenter wants to make a rectangular display board with sides 12m and 5m. He wants to give extra support by putting two more strips joining its two opposite vertices as shown in the figure. Can you say $\Delta ABD \cong \Delta CDB$. Justify.

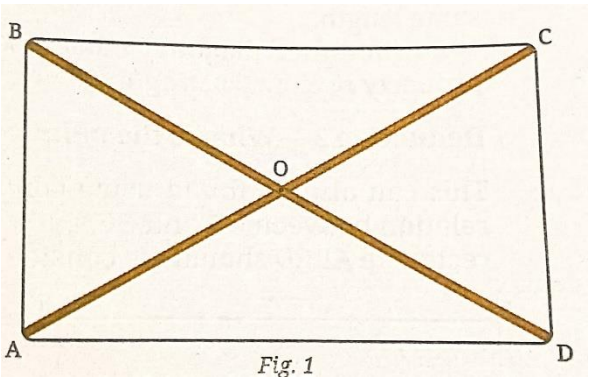


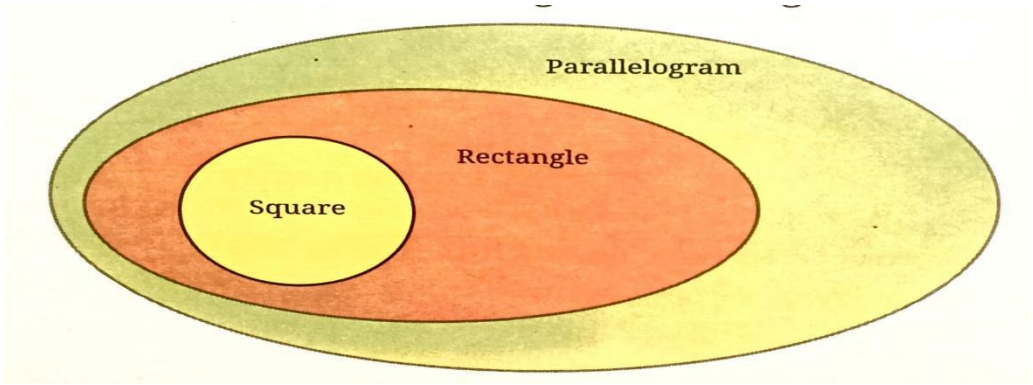
Fig. 1

SOLUTIONS:

1) Here ABCD is a parallelogram and BD is a diagonal.
   In $\Delta ABD \text{ and } \Delta CDB$, we have
   AD = BC [Opposite sides of a parallelogram]
   DC = AB [Opposite sides of a parallelogram]
   BD = DB [Common side]
   Yes, now we can say that $\Delta ABD \cong \Delta CDB$ by SSS Criteria.

2) In the figure, we have
   ABCD is a parallelogram.
   $\angle DAB = 180^0 - y$ [linear pair]
   $\Rightarrow \angle DAB + \angle CDA = 180^0$ [sum of adjacent angles of a parallelogram is 180^0]
   $\Rightarrow 180^0 - y + x = 180^0$ .....(1)
   Also, $\angle DAB = \angle DCB = 80^0$ (opposite angles of a parallelogram are equal)
   Then, $180^0 - y = 80^0$
   Therefore, $y = 100^0$ .....(2)
   Using eq.2 in eq.1
   $\Rightarrow 180^0 - y + x = 180^0$
   $\Rightarrow 180^0 - 100^0 + x = 180^0$
   Then $x = 100^0$

3)



Yes, a square is a rectangle.
Yes, a rectangle is a parallelogram.

4) Here, the shape has four sides, hence it is a quadrilateral and its opposite sides are equal. Hence the quadrilateral is a parallelogram. If it's all angles are equal then we can say that it is a rectangle.

The two common properties are:

I. Opposite sides are equal

II. Opposite sides are parallel

5) Two equilateral triangles having each side 5cm will form a rhombus when joined together of each side 5cm.

All sides measure 5 cm

Since each angle of an equilateral triangle is 60^0.

$\angle ACD = 60^0 + 60^0 = 120^0$

$\angle D = 60^0$

$\angle B = 60^0 + 60^0 = 120^0$

$\angle A = 60^0$

Since all the angles formed in this figure are not 90°, that's why it is not a square.

6) (a)We know that diagonals of a rectangle are equal in length, hence other strip also measures 8cm.

(b)The point of intersection is the midpoint of both the diagonals.

(c)Diagonals of a rectangle bisect each other. Therefore, OD and OB both measure 4cm each.

7) In the figure,

if $\angle A = 58^0$, $\angle B = 42^0$ and $\angle C = 40^0$

we know that sum of all angles of a quadrilateral is 360^0.

i.e., reflex $\angle ADC + \angle A + \angle B + \angle C = 360^0$

then, reflex $\angle ADC = 360^0 - (\angle A + \angle B + \angle C)$

$= 360^0 – (58^0 + 42^0 + 40^0)$

$= 360^0 – 140^0$

$= 220^0$

Now, $\angle ADC = 360^0 – 220^0$

$= 140^0$

8) Given,

$D_1 = 24cm$ and $D_2 = 10cm$.

We know that, diagonals of a rhombus bisect each other. Hence their halves are 12cm and 5cm.

Perimeter = 4×13

= 52cm

Hence, he will buy two laces of 12cm, two laces of 5cm and one of 52cm.

9) Yes, the shape of the park is Rhombus.

Since the diagonal are bisecting perpendicularly, it means it is a rhombus.

We can find its side by using Pythagoras theorem.

$H^2 = P^2 + b^2$

Where, P = 8/2 = 4m

B= 6/2 = 3m

Then, side= $\sqrt{4^2 + 3^2}$

= 5m

10) Yes, $\Delta ABD \cong \Delta CDB$

We have,

AB=CD [Opposite sides of a rectangle]

$\angle A = \angle C = 90^0$

AD = CB [Opposite sides of a rectangle]

By SAS Criteria, $\Delta ABD \cong \Delta CDB$

SECTION D (4 MARKS)

Q.1 A carpenter uses two wooden strips as diagonals to form a rectangle. One strip is 8 cm long, and the other must be adjusted so that the figure becomes a rectangle.

(a) What should be the length of the second diagonal so that the figure forms a rectangle? (1)

(b) Where should the diagonals intersect? (1)

(c) Δ AOB ≅ Δ COD. why ? (2)

Q.2 A farmer in Assam uses bamboo sticks to form the base of a hut . The diagonals are equal, bisect each other but no right angle is found at the point of intersection.

(a) What type of quadrilateral is formed? (1)

(b) If the diagonals intersect at 90°, what type of quadrilateral will be formed? (1)

(c) Write the sum of adjacent angles in both cases. (2)

Q.3 In a school park, a gardener is designing a flower bed in the shape of a quadrilateral. The shape has two opposite sides placed parallel to each other, while the other two sides are slanting but not parallel. To make the design look neat, he also marks one corner angle as 110°.

(a) Name the quadrilateral if two of it's adjacent angles are 110° and 70°, also find the sum of remaining two angles.

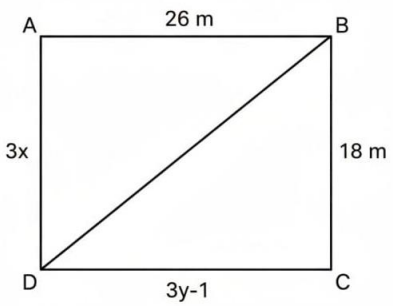
(b) If one of the remaining angles is 75°, find the measure of the fourth angle.

Q.4 In a park, children are playing on a square-shaped swing frame. When observed closely, the metallic frame of the swing is not exactly a square but slightly tilted, forming a slanted diamond-like shape. This frame has all its sides of the same length. Inside the frame, two rods are fixed from corner to corner (as diagonals), and they cross each other at the middle of the frame. Interestingly, these rods meet at a right angle, forming four equal parts.

(a) If all four sides of the metallic frame are of the same length and the opposite sides run parallel to each other, what will be shape of the frame?

(b) If one of the angles of the frame is 80^0.Find the measure of the adjacent angle and its opposite angle.

Q.5 A farmer wants to build a parallelogram-shaped plot of land for fencing purposes. He places four wooden poles at the corners to form the shape. The length of one pair of opposite sides of the plot is 26 meters and (3y-1) meters and the length of another pair of opposite sides are 3x meters and 18meters.



(a) By using the property of parallelogram, find x and y. (2)

(b)If one of the angles at a corner is 110°, what is the measure of remaining three angles? (2)

SOLUTIONS

Q.1 (a) Since diagonals of a rectangle are equal, the second diagonal should also be 8 cm.

(b) The diagonals of a rectangle bisect each other. Hence, they must intersect at their midpoints.

(c) Triangles are congruent because AO=CO , BO= DO

Because diagonals of a rectangle bisect each other.

AB=DC Because opposite sides of a rectangle are equal.

Q.2 (a) : It is a rectangle, because diagonals of equal length that bisect each other always form a rectangle, regardless of the angle between them.

(b) It will be a square, because in addition to rectangle properties, the diagonals also bisect each other at right angles.

(c) In first case quadrilateral is rectangle hence sum of adjacent angles is 180˚

In second case quadrilateral is a square hence sum of adjacent angles is 180˚

Q.3 (a) We know that the sum of all interior angles of any quadrilateral = 360°.

Given two angles = 110° and 70°.

Their sum = 110° + 70° = 180°.

Remaining sum of other two angles = 360° - 180° = 180°.

(b) The sum of the remaining two angles = 180°.

If one angle = 75°, then the other angle = 180° - 75° = 105°.

Q.4 (a) Since all four sides are equal in length and opposite sides are parallel, the frame is a rhombus. This property makes the swing frame stable and balanced because the equal side lengths distribute the tension and weight evenly.

(b) In rhombus sum of adjacent angles is 180˚.

So adjacent angle is 180˚- 80˚ = 100˚

As we know opposite angles of a rhombus are equal so opposite angle will be 80˚.

Q.5 (a) 3x = 18 m (opposite sides of parallelogram are equal)

$x = \frac{18}{3} = 6$ m

$3y - 1 = 26$

$3y = 26 + 1$

$3y = 27$

$y = \frac{27}{3} = 9$ m

(b) . In such a plot, adjacent angles add up to 180°.
So, adjacent angle = 180° – 110° = 70°.
Opposite angles are always equal.
So, the opposite angle = 110°.
Thus, the angles of the plot are: 110°, 70°, 110°, and 70°.

CLASS TEST

QUADRILATERALS

1 MARK QUESTIONS

1. The football ground is shaped like a parallelogram. The diagonals intersect at point O. Which of these is true about point O?
   a) O is equidistant from all four vertices b) O is the midpoint of each diagonal
   c) O lies on only one diagonal d) O divides one diagonal in 2:1 ratio
2. A square clock is hung in such a way that one diagonal is vertical. What is the angle between its diagonals?
   a) 45° b) 60° c) 90° d) 120°
3. The support structure of a flyover is in the shape of a quadrilateral with one pair of opposite sides parallel. The structure is a:
   a) Kite b) Trapezium c) Rhombus d) Rectangle
4. When a rectangular sheet is folded along its diagonal, two triangles are formed. These triangles are:
   a) Scalene b) Isosceles c) Right-angled d) Equilateral

2 MARKS QUESTIONS

1. Draw a rhombus NUTS such that one side is 4cm and m∠N = 75˚
2. The four angles of a quadrilateral are in the ration 3:5:7:9. Find the angles.
3. ABCD is a parallelogram in which ∠A = 110. Find the measures of the angles B,C, D respectively.

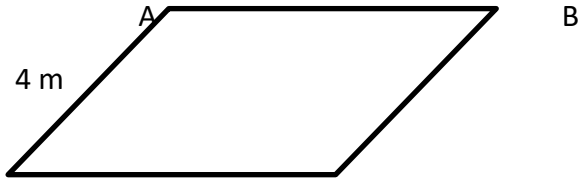
3 MARKS QUESTIONS

1. Find the measure of all the angles of the quadrilateral obtained by joining two equilateral triangles with sides 5cm. Name the quadrilateral formed and write a property that make it different from square.

Q2. Is it possible to construct a quadrilateral with three angles equal to 90^o and the fourth angle not equal to 90^o? Justify your answer why and why not?

CASE BASED QUESTIONS (4 MARKS)

Q.1 A land surveyor marks a plot in the form of a parallelogram (ABCD). The adjacent sides measure 5 m and 4 m, and the angle between them is 30°.



D 5 m C

(a) Find the measures of all the angles of the parallelogram.

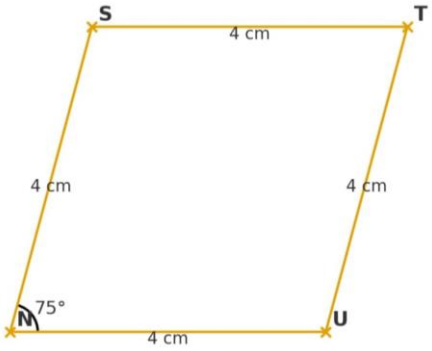
(b) Write the length of the sides AB and BC with justification.

SOLUTIONS

1 MARK QUESTIONS

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

2 MARK QUESTIONS



(1) (2) 45°, 75°, 105°, 135° (3) 70°, 90°, 90°

3 MARKS QUESTIONS

(1)$\angle ACD = 120^0$, $\angle D = 60^0$, $\angle B = 120^0$,$\angle A = 60^0$

(2) No, because sum of all angles of a quadrilateral is 360^0.

4 MARKS QUESTIONS

Q.1 (a) $\angle A = 30°$, $\angle B = 150°$, $\angle C = 30°$, $\angle D = 150°$, since opposite angles are equal and adjacent angles are supplementary.

(b) Opposite sides of a parallelogram are equal

Hence AB=DC=, 5m

AD=BC=4m

CHAPTER 5: NUMBER PLAY

SECTION A (1 MARK QUESTIONS)

Q1. What can be said about the expressions formed by placing + and - signs between four consecutive numbers?

A. The resulting expressions always have even parity.

B. The resulting expressions always have odd parity.

C. The parity of the resulting expressions varies.

D. The resulting expressions are always divisible by 4.

Q2. How can you prove that all expressions of the form a±b±c±d have the same parity?

A. By showing that switching a sign changes the value by an odd number.

B. By showing that switching a sign changes the value by an even number.

C. By showing that the sum of the numbers is always even.

D. By showing that the product of the numbers is always even.

Q3. Which of the following algebraic expressions will *always* evaluate to an even number for any integer values of the variables?

A. $3g+5h$ B. x^2+2 C. $2u-4v$ D. $6m-3n$

Q4. What is the divisibility rule for 9?

A. A number is divisible by 9 if its units digit is 9 or 0.

B. A number is divisible by 9 if the sum of its digits is divisible by 9.

C. A number is divisible by 9 if it is an even number.

D. A number is divisible by 9 if its last two digits are divisible by 9.

Q5. When will the sum of two even numbers be a multiple of 4?

A. When both numbers are multiples of 4.

B. When both numbers are not multiples of 4.

C. When one number is a multiple of 4 and the other is not.

D. Both A and B are correct.

Q6. Which of the following statements is **always true**?

A. If a number is divisible by 8, then 8 also divides any two numbers that add up to it.

B. If a number is divisible by 7, then it is also divisible by any multiple of 7.

C. If a number is divisible by 12, then it is also divisible by all the factors of 12.

D. When you add an odd number to an even number you get a multiple of 6.

Q7. How can a number that leaves a remainder of 3 when divided by 5 be expressed algebraically?

A. 3k+5 B. 5k+3 C. 5k−3 D. 3k−5

Q8. What is the remainder when the number 7309 is divided by 9?

A. 0 B. 1 C. 7 D. 9

Q9. What is the general rule for determining divisibility by 11 using place values?

A. The sum of the digits at all places must be divisible by 11.

B. The difference between the sum of digits at even places and the sum of digits at odd places must be divisible by 11.

C. The difference between the sum of digits at place values that are 'one more than a multiple of 11' and the sum of digits at place values that are 'one less than a multiple of 11' must be a multiple of 11.

D. The last digit must be 1.

Q10. What can be said about the statement: "The sum of a multiple of 6 and a multiple of 3 is a multiple of 9"?

A. Always true. B. Sometimes true. C. Never true. D. Insufficient Data

ANSWER KEY

ANS 1. Correct Answer: A. The resulting expressions always have even parity.

Explanation: When four consecutive numbers are chosen, regardless of how + and - signs are placed between them, the resulting expressions always have an even parity.

ANS 2. Correct Answer: B. By showing that switching a sign changes the value by an even number.

Explanation: One of the explanations provided in the text is that when a sign is switched in an expression like a+b−c−d, the value changes by an even number (e.g., changing +b to -b results in a change of 2b). This means the parity of the expression remains the same, leading to the conclusion that all such expressions have the same parity.

ANS 3. **Correct Answer:** C. 2u−4v

Explanation: The expression 2u−4v can be factored as 2(u−2v), which shows that 2 is always a factor of the expression, making the result an even number for any integer values of u and v.

ANS 4. **Correct Answer:** B. A number is divisible by 9 if the sum of its digits is divisible by 9.

Explanation: "A number is divisible by 9 if and only if the sum of its digits is divisible by 9".

ANS 5. **Correct Answer:** D. Both A and B are correct.

Explanation: There are two cases:-

1. Adding two even numbers that are multiples of 4 (e.g.,

   4p+4q) will always result in a multiple of 4, as the sum can be written as 4(p+q).

2. Adding two even numbers that are

   not multiples of 4 (e.g., (4p+2)+(4q+2)) will also always result in a multiple of 4, because their remainders of 2 add up to 4, and the sum can be written as 4(p+q+1).

ANS 6. **Correct Answer:** C. If a number is divisible by 12, then it is also divisible by all the factors of 12.

Explanation: This statement is "always true," and in general, if A is divisible by k, then A is divisible by all the factors of k.

ANS 7. **Correct Answer:** B. 5k+3

Explanation: Numbers which leave a remainder of 3 when divided by 5 are "3 more than multiples of 5". Since multiples of 5 can be represented as

5k, the expression is 5k+3.

ANS 8. **Correct Answer:** B. 1

Explanation: To find the remainder when a number is divided by 9, you can add its digits repeatedly until a single digit is obtained. For 7309, the sum of the digits is 7+3+0+9=19. The digits of 19 can be added as well: 1+9=10. Repeating the step for 10, we get 1+0=1. Therefore, the remainder is 1.

ANS 9. **Correct Answer:** B. The difference between the sum of digits at even places and the sum of digits at odd places must be divisible by 11.

Explanation: The difference between the sum of digits at even places and the sum of digits at odd places must be divisible by 11.

ANS 10. **Correct Answer:** B. Sometimes true.

Explanation: The sum of a multiple of 6 (which is a multiple of 3) and a multiple of 3 is always a multiple of 3. However, it is not always a multiple of 9. For example,

6+3=9 (a multiple of 9), but 12+6=18 (a multiple of 9), while 6+6=12 (not a multiple of 9). Therefore, the statement is only sometimes true.

2-MARK QUESTIONS

Q1. Find the value of A and B:

$$\begin{array}{r} A\ B \\ \times\ A\ 7 \\ \hline 2\ 1\ 1\ B \\ \hline \end{array}$$

Q.2 If 31y5 is a multiple of 3, where y is a single digit, what could be the value of y?

Q.3 “I take a number that leaves a remainder of 8 when divided by 12.I take another number, which is 4 short of a multiple of 12. Their sum will always be a multiple of 8”, claims Sonal, is she right?

Q.4 Prove that the sum of a 2- digit number and the number obtained by reversing their digits is always divisible by 11.

Q.5 Prove that the difference of a- 2- digit number and the number obtained by reversing their digits is divisible by 9.

Q.6 If a, b, and c are three digits of a three-digit number, find the largest prime number, by which abc + cab + bca is divisible ?

Q.7 Mr. Faheem announced the 3 prizes (1^{st}, 2^{nd} and 3^{rd}) for the mathematics quiz organized under STEM week, he told that the students of class 8, having consecutive roll number are the winners and the sum of their roll number is 24. Also the first prize won by the student whose roll number comes in the middle of these three roll number. Which roll number is the winner?

Q.8 The students from all India schools participated in a Programme. A tent house provided 6000 chairs which were arranged in such a way that there are 9 chairs in each row, but it was found that a few students left without chairs, due to incomplete last row. How many least chairs need to be arranged to complete last row, and how many rows are there.

Q.9 Suppose 'M' is the greatest of 4 consecutive numbers. Describe the other three numbers in terms of 'M'.

Q.10 Rahul has written several numbers that leave a remainder of 2 when divided by 6. He claims, "If you add any three such numbers, the sum will always be a multiple of 6." Is Rahul's claim true?

ANSWER KEY (2 MARKS)

ANS 1. EXPLANATION:- Step 1: Here, we have B × 7 = B; this is only possible when either B = 0 or B = 5.
Step 2: If A = 1 and B = 0, then 10 × 17 = 170 ≠ 2110,
and if A = 1 and B = 5, then 15 × 17 = 255 ≠ 2115.
Step 3: If A = 2 and B = 0, then 20 × 27 = 540 ≠ 2110,
and if A = 2 and B = 5, then 25 × 27 = 675 ≠ 2115.
Step 4: If A = 3 and B = 0, then 30 × 37 = 1110 ≠ 2110,
and if A = 3 and B = 5, then 35 × 37 = 1295 ≠ 2115.
Step 5: If A = 4 and B = 0, then 40 × 47 = 1880 ≠ 2110,
and if A = 4 and B = 5, then 45 × 47 = 2115.
Thus, A = 4 and B = 5.

ANS 2. **EXPLANATION**: - The sum of the digits of a number 31y5 = 3 + 1 + y + 5 = 9 + y
The number is divisible by 3 if the sum of its digits, i.e., (9 + y) is divisible by 3.
This is possible only when y = 0, 3, 6, or 9.
Thus, y could have either value of 0, 3, 6, or 9.

ANS 3. **EXPLANATION**: - A number that leaves a remainder of 8.
when divided by 12: 12k + 8, where k ≥ 1.
Also, another number 4 short of a multiple of 12: 12k – 4

Their sum will be (12k+8) + (12k-4) = 24k+4 = 4(6k+1)

The number will always be a multiple of 4, but it will not be a multiple of 8 always.

ANS 4. **EXPLANATION**: - Given number = ab = 10a + b
Number obtained by reversing the digits = 10b + a
Sum = (10a + b) + (10b + a)
= 10a + b + 10b + a
= 11a + 11b
= 11(a + b) ÷ 11
= a + b
Hence proved.

ANS 5. **EXPLANATION**: - Given number = xy = 10x + y
Number obtained by reversing the digits = 10y + x
Difference = (10x + y) – (10y + x)
= 10x + y – 10y – x
= 9x – 9y
= 9(x -y) ÷ 9
= x – y
Hence proved.

ANS 6. **EXPLANATION**: - We have abc + cab + bca
abc = 100a +10b + c
cab = 100c + 10a + b
bca = 100b + 10c + a
Adding abc + cab + bca = 111a + 111b + 111c
= 111(a + b + c)
= 37 × 3(a + b + c), which is a multiple of 37.

That prime number is 37.

ANS 7. **EXPLANATION**: - Let the roll numbers be x, x + 1, and x + 2.
⇒ x + (x + 1) + (x + 2) = 24
⇒ 3x + 3 = 24
⇒ 3x = 24 – 3 = 21
⇒ 3x = 21
⇒ x = 7
∴ x + 1 = 7 + 1 = 8
∴ x + 2 = 7 + 2 = 9
Thus, the roll numbers are 7, 8, and 9, where roll number 8 comes in the middle, so 'roll number 8 student' won the first prize.

ANS 8. **EXPLANATION: -** For this we need to find the multiple of 9, nearest to 6000.
Given, 6000
Sum of the digits = 6 + 0 + 0 + 0 = 6
we know that, if the number is divisible by 9, then the sum of the digits is divisible by 9.
If we add 3 to the number 6000.
6000 + 3 = 6003, it is divisible by 3.
Thus, the multiple of 9 that is closest to the number 6000 is 6003.
So at least 3 more chairs need to be arranged, to complete last row.

Also total rows are 6003/9= 667 rows.

ANS 9. **EXPLANATION**: - The other three numbers in term of M are, M-1, M-2, M-3

Where M-1 is the second largest number

M-2 is the third largest number.

M-3 is the smallest number.

M > (M-1) > (M-2) > (M-3)

ANS 10. **EXPLANATION**: - The expression has been written by Rahul = 6k + 2
where, k = 1, 2, 3, 4, 5, 6,…
6 × 1 + 2 = 8
6 × 2 + 2 = 14
6 × 3 + 2 = 20
6 × 4 + 2 = 26
The sum of three numbers
8 + 14 + 20 = 42, it is a multiple of 6.
14 + 20 + 26 = 60, it is a multiple of 6.

Also if we add 6k+2, 3 times. (6k+2) + (6k+2) + (6k+2) = 18k + 6= 6(3k+1)

So it will always be the multiple of 6
Yes, Rahul's claim is true.

3- MARKS QUESTIONS

Q1. A student picks four consecutive numbers 7, 8, 9, and 10. She places '+' and '–' signs in between them to form expressions.
Verify that whatever combination of signs she chooses, the result is always even.

Q2. Two even numbers 'm' and 'n' are added.
Will their sum always be a multiple of 4? Justify.

Q3. A number 12345 is checked for divisibility by 5.
Use algebraic reasoning (place values) to explain why the test for divisibility by 5 works.

Q4. The digital root of number 489710 is calculated.
Find the digital root and explain its connection with divisibility by 9.

Q5. A farmer has 47 pebbles. He groups them in 5s.
What remainder does he get? Which general algebraic form represents such numbers?

Q6. Sita says, "If a number is divisible by 12, then it must also be divisible by all the factors of 12."
Check whether her claim is always true.

Q7. Find the remainder when 427 is divided by 9 without actual division.

Q8. A 6-digit number 48a23b is divisible by 18. Find possible pairs of (a, b).

Q9. Ravi claims: "The product of two consecutive integers is always a multiple of 2 but not always a multiple of 6."
Examine the correctness of his statement.

Q10. Draw a Venn diagram which captures the relationship between the multiples of 4, 8, and 32?

ANSWER KEY (3-MARKS)

ANS 1. General form of 4 consecutive numbers: a, (a+1), (a+2), (a+3).

- Any expression looks like ±a, ±(a+1), ±(a+2), ±(a+3).
- Changing a sign changes result by an even number (e.g., switching +b to –b changes by 2b).
- Thus, all results have the same parity.
- Example with given numbers:
  - 7 + 8 + 9 + 10 = 34 (even)
  - 7 + 8 – 9 – 10 = −4 (even)
  - 7− 8 – 9 + 10 = 0 (even)

    Hence, **all results are even**.

    Marks: (1 for general rule + 1 for example + 1 for conclusion).

ANS 2.

Step 1: General form of even numbers

Any even number can be written as 2k, where k is an integer.
So, m = 2a, n = 2b, where a, b are integers.

Step 2: Their sum

m + n = 2a + 2b = 2(a + b)

So, the sum is always a **multiple of 2** (i.e., always even).

Step 3: Check divisibility by 4

Now, whether it is always divisible by 4 depends on the values of a + b.

- If a + b is even → 2(a + b) is a multiple of 4.
- If a + b is odd → 2(a + b) is **not** a multiple of 4.

Step 4: Example check

- Example 1: m = 6, n = 10 ⇒ m + n = 16 (multiple of 4).

- Example 2: m = 2, n = 6 ⇒ m + n = 8 (multiple of 4).
- Example 3: m = 2, n = 4 ⇒ m + n = 6 (not multiple of 4).

The sum of two even numbers is **always even**, but it is **not always a multiple of 4**.

ANS 3. General form: … + 1000d + 100c + 10b + a.

- Every term except unit's place is multiple of 10.
- Only the last digit matters for divisibility by 5.
- If unit digit a = 0 or 5, the number is divisible by 5.
- Here, last digit = 5, so divisible.
  Marks: (1 for algebra explanation + 1 for reasoning + 1 for conclusion).

ANS 4. Add digits: 4 + 8 + 9 + 7 + 1 + 0 = 29 → 2 + 9 = 11 → 1 + 1 = 2.

- Digital root = 2.
- Since it is not 9, the number is not divisible by 9.
- Rule: A number is divisible by 9 iff its digital root is 9.
  Marks: (1 for working + 1 for digital root + 1 for divisibility conclusion).

ANS 5. Divide 47 by 5 → 47 = 5×9 + 2 → remainder = 2.

- General form of numbers leaving remainder 2 on division by 5 = 5k + 2.
- Here, k = 9 gives 47.
  Marks: (1 for division + 1 for remainder + 1 for general form).

ANS 6. Factors of 12 = 1, 2, 3, 4, 6, 12.

- Example: 36 is divisible by 12.
- 36 ÷ 2=18 , 36 ÷ 3 = 12, 36 ÷ 4 = 9, 36 ÷ 6 = 6, 36 ÷ 12 = 3. All exact.
- By definition, if a number is divisible by n, then divisible by all factors of n.
  Hence, claim is **Always True**.
  Marks: (1 for factors + 1 for example + 1 for conclusion).

ANS 7.

- Add digits: 4 + 2 + 7 = 13.
- Add again: 1 + 3 = 4.
- Hence remainder = 4.
  Marks: (1 for digit sum + 1 for reducing + 1 for final remainder).

ANS 8.

- Divisible by 18 ⇒ divisible by 2 and 9.
- For divisibility by 2 → b must be even (0, 2, 4, 6, 8).

- Sum of digits = 4 + 8 + a + 2 + 3 + b = 17 + a + b must be multiple of 9.
- Case b = 0 → 17 + a must be multiple of 9 → a = 1 (since 18).
- Case b = 2 → 19 + a must be multiple of 9 → a = 8 (27).
- Case b = 4 → 21 + a multiple of 9 → a = 6 (27).
- Case b = 6 → 23 + a multiple of 9 → a = 4 (27).
- Case b = 8 → 25 + a multiple of 9 → a = 2 (27).

  Thus, pairs: (1,0), (8,2), (6,4), (4,6), (2,8).

  Marks: (1 for rule + 1 for stepwise check + 1 for pairs).

ANS 9.

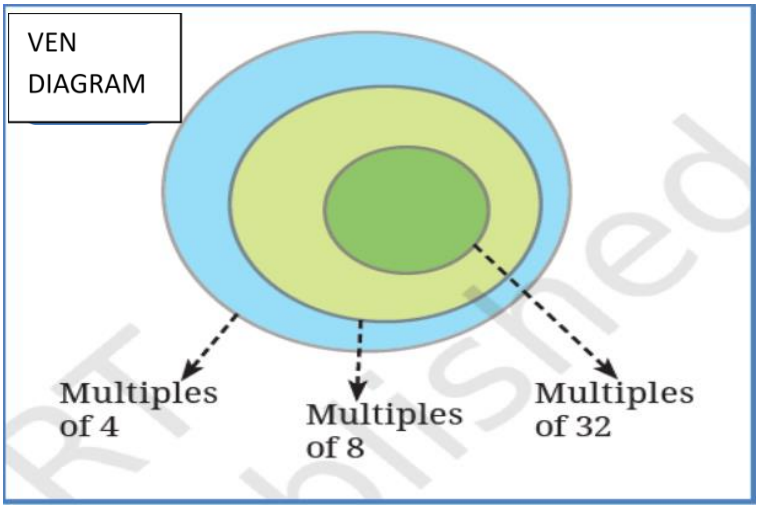
- Two consecutive integers: n and n+1.
- One of them must be even → product always multiple of 2.
- For multiple of 6 → need factor 2 and 3.

  Example: 2 × 3 = 6 (multiple of 6).

  Example: 4 × 5= 20 (not multiple of 6).
- Hence, statement is **correct**.

  Marks: (1 for factor 2 proof + 1 for multiple of 6 check + 1 for conclusion).

ANS 10.



SECTION D (4 marks questions)

Q1. The school has 5 buses A, B, C, D, E numbered 132, 225, 450, 720 and 835 respectively.

The head master says the bus having the number divisible by 3 have red stickers; buses having number divisible by 5 have green stickers.

(i) Which buses get red stickers?
(ii) Which buses get green stickers?
(iii) Can any bus get both stickers, if possible then identify those buses?

Q2. A farmer keeps eggs in crates of 4 each. He has the following number of eggs on different days.

DAY	NO. OF EGGS
Monday	236
Tuesday	412
Wednesday	768
Thursday	995

On which days the eggs can be placed in crates of 4 eggs each (with no eggs left over)?

Q3. Aman is designing a number puzzle. He asks players to find a **3-digit number** such that:

- The number is divisible by **9**.
- The digits of the number are in **ascending order**.
- The sum of the digits is **18**.

a) What rule helps us check if a number is divisible by 9?
b) Find the possible 3-digit even number that satisfies all the conditions.

Q4. A fruit seller has 21 oranges. He wants to arrange them either in two baskets or in three baskets, such that each type of arrangement has consecutive natural numbers of oranges. Find both the possible ways.

Q5. Mary has some number cards. She asked John to choose such numbers from number cards that have remainder 3 when divided by 5.

i) Write two such numbers.

ii) Which algebraic expressions capture all such numbers?

a) 3k+5 b) 3k-5 c) $\frac{3k}{5}$ d) 5k+3

iii) Write another algebraic expression for the numbers divided by 5 leaves remainder 3.

ANSWER KEY (4 MARKS)

ANS 1.

- Divisibility by 3 → sum of digits divisible by 3.
  132 → 1+3+2 = 6 divisible
  225 → 2+2+5 = 9 divisible
  450 → 4+5+0 = 9 divisible
  720 → 7+2+0 = 9 divisible
  835 → 8+3+5 = 16 not divisible
  So, **Red stickers: 132, 225, 450, 720**

- Divisibility by 5 → last digit 0 or 5.
  132 → ends with 2
  225 → ends with 5
  450 → ends with 0
  720 → ends with 0
  835 → ends with 5
  So, **Green stickers: 225, 450, 720, 835**

- Both stickers → buses divisible by 3 **and** 5 → divisible by 15.
  225, 450, 720 satisfy both.

Final Answer:
Red: 132, 225, 450, 720
Green: 225, 450, 720, 835
Both: 225, 450, 720

ANS 2. **Numbers given:** 236, 412, 768, 995
Check divisibility by 4 (last two digits divisible by 4).

- 236 → 36 ÷ 4 = 9 divisible

- 412 → 12 ÷ 4 = 3 divisible
- 768 → 68 ÷ 4 = 17 divisible
- 995 → 95 ÷ 4 = not divisible

Final Answer: 236, 412, 768 can be exactly divided into crates.

ANS 3. **Conditions:**

- Divisible by 9 → sum of digits divisible by 9.
- Digits in ascending order.
- Sum = 18.

Step 1: Rule
Divisibility by 9 → sum of digits divisible by 9.

Step 2: Find number
Digits must be increasing → possible triplets summing 18:
(4, 6, 8) → number 468 ✔ divisible by 9 (4+6+8=18).

Final Answer: 468

SOLUTION 4. We need consecutive natural numbers whose sum = 21.

- Case 1: 10 + 11 = 21
- Case 2: 6 + 7 + 8 = 21

Final Answer: Two ways → (10, 11) and (6, 7, 8).

SOLUTION 5. i) 48, 78

ii) d) 5k+3

iii) 5k-2.

SELF ASSESSMENT (M.M. 20)

(MCQ- 1 MARK EACH)

Q1. Without computing them, find out which of the following arithmetic expressions are even.

(i) 567 + 262 (ii) 19405 – 2130 (iii) 37503 + 28307 (iv) 69312 – 28323

Q2. A number 39x52 is divisible by 3, where 'x' is a single digit. What is the maximum value of 'x'?

(i) 9 (ii) 8 (iii) 0 (iv) 7

Q3. A number 48xy7 is divisible by 9. What is the difference of maximum value of 'x' and minimum value of 'y'?

(i) 8 (ii) 9 (iii) 1 (iv) 3

Q4. Anuradha uses a 6-digit pin for her suitcase, which is 987342; its digital root is-

(i) 3 (ii) 33 (iii) 9 (iv) 6

Q5. The sum of 5 consecutive natural numbers is 35. What is the largest number?

(i) 6 (ii) 10 (iii) 11 (iv) 9

(VERY SHORT ANSWER- 2 MARKS EACH)

Q.6 A shopkeeper gives lucky draw coupons numbered 234, 345 and 456 to three customers. By using divisibility rules, check which of these numbers is divisible by 9. (Show working)

Q.7 The sum of 4 consecutive numbers is 30, what are these numbers.

(SHORT ANSWER TYPE- 3 MARKS EACH)

Q.8 Find three consecutive numbers such that the first number is a multiple of 2, the second number is a multiple of 3, and the third number is a multiple of 4.
Are there more such numbers? How often do they occur?

Q.9 A railway ticket number is 5483.
The checker uses digital roots to quickly check divisibility.

i.	Find the digital root of 5483.
ii.	Using the digital root, check whether 5483 is divisible by 9.

(LONG ANSWER TYPE)

Q.10 Mr. Suryakanta received electricity bills for four months, May, June, July and August. The bill amount is: 5832, 5745, 6180, and 5233, respectively.

(a) Find the digital root of each bill number. (2)
(b) Using the pattern, tell which bills are divisible by 9. (1)
(c) Give one reason why digital roots are useful in checking arithmetic calculations. (2)

SOLUTIONS

ANSWER 1. (iii) 37503 + 28307

ANSWER 2. (ii) 8

ANSWER 3. (i). 8

ANSWER 4. (iv). 6

ANSWER 5. (iv) 9

ANSWER 6: 234

ANSWER 7: 6, 7, 8 AND 9.

ANSWER 8: there are infinitely many such numbers. They occur after every **12 numbers**.
The sets are: (2,3,4), (14,15,16), (26,27,28), (38,39,40), …

ANSWER .9:

i.	The digital root of 5483 is 2.
ii.	5483 is not divisible by 9.

ANSWER 10:

(a) The digital root of each bill number is 9, 3, 6 and 4 respectively. (2)
(b) 5832 is divisible by 9. (1)
(c) Digital roots are useful because they help in **quickly verifying the correctness of arithmetic calculations** without redoing the entire work. (2)

CHAPTER 6: WE DISTRIBUTE, YET THINGS MULTIPLY

Section A(1 mark questions)

1. Riya buys 6 boxes containing 4 pencils and 2 erasers each. How many items does she have in total?

(a) 30 (b) 36 (c) 24 (d) 18

2. A farmer divides his field into x equal plots, each plot grows a kg wheat and b kg rice. What is the total produce for all plots?

(a) x(a+b) kg (b) a(x+b) kg (c) b(a+x) kg (d) x + a+ b kg

3. What comes next to complete the pattern. 1x3, 2x4, 3x5, 4x6, ...

(a) 5 x 7 (b) 6 x 8 (c) 4 x 9 (d) 5 x 6

4 Given that 35X75 =2625: if 75 is increased by 1, the product will increase by

(a) 45 (b) 75 (c) 35 (d) 85

5. What will be the nth term of the pattern 2^2-1, 3^2-1, 4^2-1, 5^2-1.....

(a) n^2-1 (b) $(n+2)^2-1$ (c) $(n+1)^2-1$ (d) 6^2-1

6. Find the odd one out?

(a) k^2+2k (b) $(k+1)^2-1$ (c) k(k+1) (d) k(k+1) +k

7. Maya wants to buy 9 bags. Each bag costs ₹120 and she also buys 4 purses together at ₹80 each. What is the total sum spent by Maya?

(a) ₹1,400 (b) ₹1,280 (c) ₹1,360 (d) ₹1,080

8. Which identity is suitable to find the product 397 x403:

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

(c) $a^2-b^2 = (a+b)(a-b)$ (d) none of the above

9. A square garden has its side equal to the sum of the width of two smaller paths of p and q metre respectively. What is its area ?

(a) p^2-q^2 (b) p^2+q^2 (c) $(p+q)^2$ (d) $(p-q)^2$

10. **Assertion :** 225(175+375) = 225 x 175 + 225 x 375

Reason : Addition is distributive over multiplication

(a) Both Assertion & Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion & Reason are true and Reason is not the correct explanation of Assertion.
(c) Assertion is true and Reason is false.
(d) Assertion is false and Reason is true.

Solution of Section A

1. Option:-b

Total items per box = 4 + 2 = 6

Total items = 6 boxes × 6 items = 36

2. Option:-a x(a+b) Kg

3. Option:- a Pattern is k(k+2)

4. Option:- c 35X(75+1) = 35X75+35

5. Option:- c The pattern is $(n+1)^2 - 1$

6. Option:- c k(k+1)

other options are $k^2 + 2k$ when simplified the algebraic expression.

7. Option:- a

Price for bags = 9 × 120 = ₹1,080

- Price for purses = 4 × 80 = ₹320

- Total = ₹1,080 + ₹320 = ₹1,400

8. Option:- c $a^2 - b^2$

$(400+3)(400 -3) = 400^2 - 3^2$

9. Option:- c $(p+q)^2$

Side of square = p + q , hence area of square = $side^2 = (p+q)^2$

10. Option:- c

Assertion is true and Reason is false (Multiplication is distributive over addition)

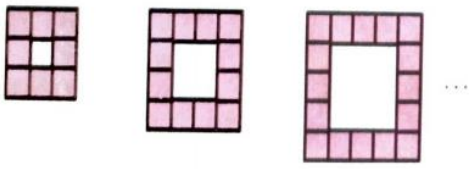
Section- B(2 MARK QUESTIONS)

11. Find the product of 318 x 1002 using distributive property.

12. A shopkeeper sells 15x boxes of biscuits, and in each box there are 6p chocolate biscuits and 4q vanilla biscuits. Find the total biscuits.

13. A sports coach buys 24 kits. Each kit has 2 pairs of shoes and 3 T-shirts. Each boy is given a pair of shoes and a T – shirt. In that afternoon the coach has distributed shoes & T -shirt to 20 boys. How much T – shirts are left ?

14. Draw the next two figures to continue the pattern.

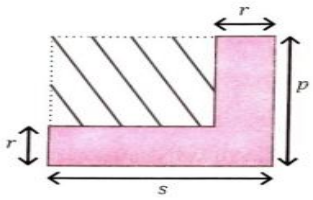


_____, _____ .

15. Find the square of the followings using a suitable identity.

(a) 1005 (b) 98

16. Write an expression for the area of dashed region in the given figure.



17. We know that the difference of the product of dates lying along each diagonal of any 2 x 2 square is 7. For example 11 x 5 – 12 x4 = 55 -48 = 7 . Explain why it is always 7.

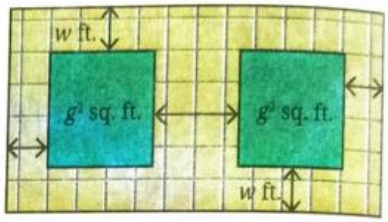
February

Su	M	Tu	W	Th	F	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

18. A number leaves a remainder of 2 when divided by 9 and another number leaves a remainder of 5 when divided by 9. What is the remainder when their sum and their difference are divided by 9?

19. Express 36 as the difference of two squares.

20. A tiny park is coming up in Dhauli. The plan is shown in the figure. The two plots , each of area g^2 sq.ft. will have a green cover. All the remaining area is a walking path w ft.wide that needs to be tiled. Write an expression for the area that needs to be tiled.



Solution of Section B

11. 318 x 1002 = 318 (1000+2) = 318 x1000 + 318 x 2 =318000 + 636 =318636

12. Total biscuits per box = 6p + 4q

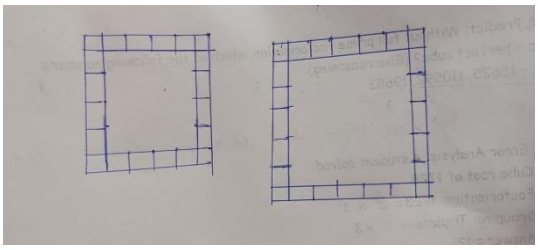
Total biscuits = 15x (6p+4q) = 90 x p + 60 x q

13. Total T -shirts in kit = 24 x 3 = 72

T -shirts distributed = 20 × 1 = 20

T -shirts left = 72 -20 = 52

14.



15. (a) $1005^2 = (1000 + 5)^2 = 1000^2 + 2 \times 1000 \times 5 + 5^2$ $[(a+b)^2 = a^2 + 2ab + b^2]$

$= 1000000 + 10000 + 25 = 1010025$

(b) $98^2 = (100 - 2)^2 = 100^2 - 2 \times 100 \times 2 + 2^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 10000 - 400 + 4 = 9604$

16. Length of rectangle = s - r

Breadth of rectangle = p – r

Area of rectangle = (s-r)(p-r) = sp – sr -pr $+r^2$

17. Let first date is x, Other dates are x+1, x+7 and x+8

When we multiply diagonally $(x + 1)(x+7) = x^2 + 8x + 7$

$x(x+8) = x^2 + 8x$

Difference = $\{x^2 + 8x + 7\} - \{x^2 + 8x\} = 7$

18. First number = 9x +2

Second number = 9y +5

Sum = 9x +2 +9y +5 = 9(x+y) +7

So remainder will be 7

Difference = (9y + 5) – (9x+ 2) = 9(y-x) +3

So remainder will be 3

19. 36 is the square of 6. It is to express as the difference of two squares. So we have to find a Pythagorean triplet.

2n, $n^2 + 1$ and $n^2 - 1$

As 2n = 6, n =3

Hence $n^2+1 = 3^2+1 = 10$ and $n^2-1 = 3^2-1 = 8$ So.. $36 = 10^2 - 8^2$

20. Length of rectangle = 2(g+2w) = 2g + 4w

Breadth of rectangle = g + 2w

Required area = $(2g+4w)(g+2w) - 2g^2 = 8wg + 8w^2$

SECTION-C (3 MARK QUESTIONS)

21. A farmer has a rectangular field. He wants to divide the field into smaller plots such that the length and breadth of each plot are in the ratio 3:2. If the total field area is 3600 m^2, find the dimensions of each smaller plot when he divides it into 6 equal plots.

22. A container is divided into 4 equal parts. Each part is filled with water that is twice the volume of the previous part. If the smallest part has 2 liters, find the total amount of water in the container.

23. Two numbers p and q are multiplied**.** The product is pq**.** If p is increased by 3 and q is decreased by 2, what is the product? Find also the difference of two products.

24. A businessman advertises his product in layers where each layer's sales are 3 times the previous layer's sales. If the first layer sells 50 units and overall sales are 6050 units, find how many layers are there.

25. Find three examples where the product of two numbers remain unchanged when one of them is increased by 6 and other number is decreased by 2 .

26. Let us take a 4-digit number *dcba*.

$$dcba \times 101 = dcba \times (100 + 1) = dcba \times 100 + dcba.$$

This becomes

	d	*c*	*b*	*a*	*o*	*o*
+			*d*	*c*	*b*	*a*
	d	*c*	$(b+d)$	$(a+c)$	*b*	*a*

Use the above process to find 3874 x 101 in one line.

27. A company produces 100 gadgets first month, and production doubles every month. After x months 6400 gadgets will be produced. Find the value of x?

28. To pack candies, boxes are arranged such that each subsequent box contains thrice the candies of the previous one. If the first box has b candies , if total candies in 7 boxes are 13116. Find the candies in first box?

29. A number leaves a remainder of 3 when divided by 7, and another number leaves a remainder of 5 when divided by 7. What is the remainder when their sum, difference, and product are divided by 7?

30. Find the square of the followings using suitable identity.

a) 3q + r

b) 2a – 3b

c) 605

Solution of Section C

21. Total area of the rectangular field = 3600 m²

Number of smaller plots = 6

Area of each smaller plot = Total area / 6 = 3600 / 6 = 600 m²

Let length = 3x , breadth = 2x

So area = 3x X 2x = $6x^2$

$6x^2 = 600$

$x^2 = 100$

x = 10

3x =30m and 2x = 20m

22.1st part = a=2 liters,
2nd part = 2a=2 x 2 =4 liters,
3rd part = 2×2a= 2× 4 =8 liters,
4th part = 2×8 =16 liters.

The total amount of water in the container is the sum:
2+4+8+16=30 liters.

So, the total amount of water in the container is 30 liters.

23. new product = (p +3) (q -2) = pq +3q – 2p -6

Difference = (pq +3q – 2p -6) – pq = 3q – 2p -6

24. Total no.of sales=

1^{st} sales =50

2^{nd} sales=3x50=150

3^{rd} sales=3x150=450

4^{th} sales 3x450=1350

5^{th} sales 3x1350=4050

Total sales = 50 + 150 +450+1350 +4050 =6050

So there are 5 layers.

25. ATQ (p+6)(q-3) = pq

pq + 6q – 3p – 18 = pq

6q – 3p – 18 = 0

When q = 4 , p =2

When q = 5 , p =4

When q = 6 , p =6

26. 3 8 7 4 0 0

3 8 7 4

3 8 (10) (12) 7 4 = 391274

27 The number of gadgets produced in each month is:

- Month 1: 100 gadgets
- Month 2: 100 × 2 = 200 gadgets
- Month 3: 200 × 2 = 400 gadgets
- Month 4: 400 × 2 = 800 gadgets
- Month 5: 800 × 2 = 1600 gadgets
- Month 6: 1600 × 2 = 3200 gadgets
- Month 7: 3200 × 2 = 6400 gadgets

So, at the end of 7 months, the company will produce 6400 gadgets in the 7th month .The value of x=7

28. . The number of candle in the 1st box=b

2nd box=bx3=3b

3rd box=3bx3=9b

4th box=9bx3=27b

5th box=27bx3=81b

6th box=81bx3=243b

7th box=243bx3=729b

Total no. of candies=13116

b + 3b +9b + 27b +81b +243b +729b =13116

1093b = 13116

. b = 12

The candies in first box is are 12.

29. First number leaves remainder **3** when divided by 7.

First number=7k+3

Second number leaves remainder 5 when divided by 7.

Second number=7m+5

Remainder when their sum is divided by 7:

(7k+3)+(7m+5)=7(k+m)+8 =7(k+m)+7 +1 =7(k+m+1)+1

So, remainder = 1

Difference = 7m + 5 – (7k+3) = 7m + 5 – 7k – 3 =7m – 7k+5-3 =7 (m-k) +2

So, remainder = 2

Now product = (7k+3)(7m+5) =49 km + 21m +35 k +15 = 49 km + 21m +35 k +2 x 7 +1

= 7 (7km + 3m +5k +2) +1

So, remainder = 1

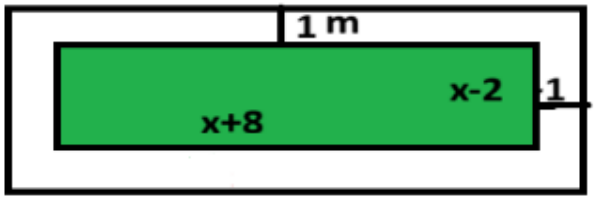
30. a) $(3q + r)^2 = 9q^2 + 6qr+r^2$

b) $(2a – 3b)^2 = 4a^2 – 12\ ab + 9b^2$

c) $605^2 = (600 +5)^2 = 600^2 + 2 \times 600 \times 5 + 5^2 = 360000 +6000 +25 = 366025$

SECTION-D (4 MARK QUESTIONS)

31. A rectangular garden has length $(x + 8)$ meters and breadth $(x - 2)$ meters. If both the length and breadth are increased by 1 meter. Refering the data answer the following questions.



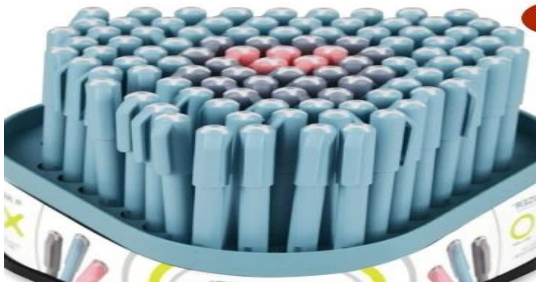
a) Find the area of the original rectangular garden. 1M
b) What is the area of the current rectangular garden after increase of 1m ? 2M
c) How much area increased ? 1M

32. A factory produces refrigirators in two sections: section A produces (3x+5) refrigirators and section B produces (5x−2) refrigirators daily.

a) What is the total production of refrigirators in the month of January? 2M

b) Calculate total production of refrigirators for x=10 in that month. 2M

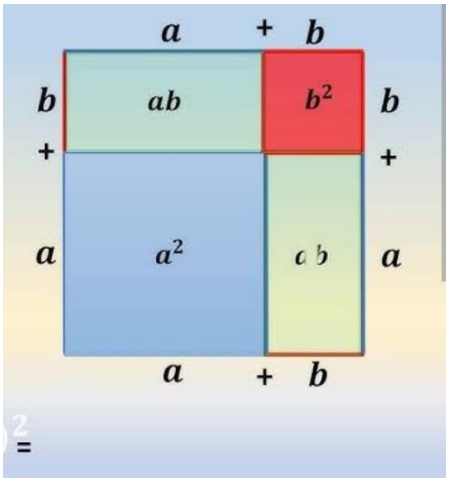
33. A shopkeeper has a set of (7−x) pens and the cost of each pen is Rs. (7+x) .



a) What is the total cost all his pens ? 2M

b) Find the cost pens in the above case if x=4. 2M

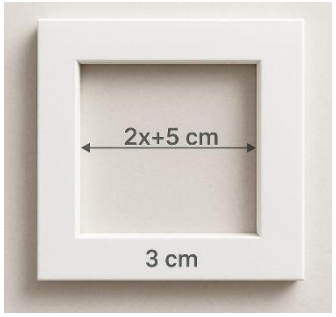
34. A gardener wants to make a square garden whose side is (a+b) meters, where a meters is the length of the lawn and b meters is the width of the flower bed placed along the lawn.



Q1. Express the total area of the garden in terms of a and b. 2M

Q2. If a=10 m and b=5 m, find the total area. 2M

35. Ramesh got many gifts on his 13th Birthday. On the next day he opened his gifts and found a nice photo frame which is square in shape as shown in figure. His elder brother asked him the following questions to solve.



1. What is the area of the photo which can be framed inside it ? 1M
2. What is the total area of the photo frame ? 2 M
3. What is the total area of the photo frame if x = 10 cm ? 1M

Solution of Section D

31. Solution

a) $(x+8)(x-2)= x^2-2x+8x-16= x^2+6x-16$

b) Area(new)=$(x+8+2)(x-2+2)= x(x+10) = x^2+10x$

c) increase in area = $(x^2+10x) – (x^2+6x-16) =4x +16$

32. Solution:-

A) The total daily production =$(3x+5)+(5x-2) = 8x+3$

So, the expression for total production in January =$31 (8x + 3) =248x+93$

B) Total production = 248 x10 +93 = 2573

33. a) **Using distributive property to write the product:**

The product of these two quantities is:

$(7-x)(7+x)$

Use the distributive property

$(7-x)(7+x)=7\times7+7\times x-x\times7-x\times x=49+7x-7x- x^2=49+7x-7x- x^2$

The middle terms $7x7x$ and $-7x-7x$ cancel out, so:

$=49- x^2$

B) $49 – 4^2 = 49 -16 = 33$

34.

a) Area of square garden=$A = (a + b)^2 = a^2 + 2ab + b^2$

b) a+b=10+5=15

area=$15x15=225m^2$

35. Solution

a)Area of photo to be framed = $(2x +5)^2 = 4x^2 +20 x +25$ cm^2

b) Side of outer square = 2x +5 +2 x3 =2x + 11

area of square = $(2x +11)^2 = 4x^2 + 44x+ 121$ cm^2

c) area = $4x^2 + 44x+ 121$

$= 4 x 3^2 + 44 x3 +121$ cm^2

= 289 cm^2

Class -Test Maximum Marks: 20

Section A consists of 4 questions of 1 mark each

Q.1 A shopkeeper calculates the total cost of 8 packets, each costing ₹45. If he gets 2 more packets for free, what is the total cost?

a) ₹360 b) ₹460 c) ₹400 d) ₹360 + ₹90

Q.2 You buy a rectangular plot of land with length (x + 8) metres and breadth (x – 2) metres. What is its area?

a) $x^2 + 8x – 2x$ b) $x^2 + 6x – 16$ c) $x^2 + 10x – 16$ d) $x^2 – 16$

Q.3 If a farmer has x mango trees and each yields 20 mangoes, which expression gives the total number of mangoes?

a) x + 20 b) x × 20 c) x – 20 d) x ÷ 20

Q.4 A baker has 100 cookies and packs them into bags of 8 cookies each. How many full bags will he get?

a) 11 b) 12 c) 13 d) 14

SECTION -B

Q.5 A painter needs to paint two walls: one is 12 meters wide, the other is 15 meters wide. If the cost per meter is ₹25, calculate the total cost using the distributive property, not direct addition.

Q.6 During a trip, students travel 50 km by bus and 30 km by train each day for 5 days. Use the distributive property to find the total distance travelled. Show the steps.

Q.7 A school has 5 sections, each with 32 boys and 28 girls. Use distributive property to find the total number of students in the school. Show working.

SECTION -C

Q.8 A farmer wants to fence a rectangular field with length (2x + 4) m and breadth (x – 2) m. Find the area and perimeter using algebraic formulae, and explain each step

Q.9 If you add ₹100 to both price and quantity, how does the distributive property help you quickly find the total price?

SECTION -D

Q.10 A school plans a trip where students will travel by bus and train. The cost per student for the bus ride is ₹450 and for the train ride is ₹700. If the number of students going on the trip is represented by 'n', answer the following:

(a) Use distributive property to write an expression for the total transport cost for all students.

(b) Calculate the total cost for 40 students.

(c) Explain why the distributive property is helpful in budgeting and planning trips, especially when the number of students changes.

Answer key

Q.1 a) ₹360

Q.2 b) $x^2 + 6x – 16$

Q.3 b) $x \times 20$

Q.4 a) 11

Q.5 ₹675

Q.6 $5 \times (50 + 30) = 400$ km

Q.7 $5 \times (32 + 28) = 300$ students

Q.8 Area = $2x^2 – 12$; Perimeter = $6x + 4$

Q.9 $(p+100)(q+100) = pq + 100p + 100q + 10000$

Q.10 (a) $n(450 + 700) = 1150n$

(b) ₹46,000

(c) Helps simplify changing numbers, quick accurate calculation, find the the trip total cost , using distribution property marking Trip budget, if the number of students change then easy find out Total cost

CHAPTER 7:PROPORTIONAL REASONING -1

SECTION A (1 Mark Questions)

Q1. The ratio of two numbers is 3 : 5. If their sum is 64, what is the smaller number?

a) 20 b) 24 c) 40 d) 44

Q2. A child was asked by his teacher to bring red and blue coloured marbles in the ratio 7 : 3. If he has brought 30 blue marbles, how many red marbles have he brought?

a) 49 b) 60 c) 70 d) 100

Q3. ₹500 is being divided between two friends A and B in the ratio 2 : 3. How much will B get?

a) ₹100 b) ₹200 c) ₹300 d) ₹400

Q4. A recipe requires flour, sugar and butter in the ratio 4 : 2 : 1. If 28 cups of ingredients are used, how many cups of sugar are needed?

a) 4 b) 6 c) 8 d) 12

Q5. The ratio of boys to girls in a class is 3 : 2. If there are 45 boys, how many girls are there?

a) 20 b) 25 c) 30 d) 40

Q6. A drink mix requires water and syrup in the ratio 5 : 2. A student by mistake adds 10 cups of water and 6 cups of syrup. What should he do to make the ratio correct?

a) Add 1 cup of syrup b) Add 2 cups of water
c) Add 5 cups of water d) Add 3 cups of syrup

Q7. The number of students in classes A and B are in the ratio 4 : 5. If 8 students are shifted from class B to A, the ratio becomes 1 : 1.
How many students were there in class B initially?

a) 65 b) 72 c) 80 d) 90

Q8. A solution contains sugar and water in the ratio 3 : 7. If 4 liters of water is added, the ratio becomes 3 : 11. How much sugar is there in the solution?

a) 3 L b) 4 L c) 6 L d) 8 L

Q9. If the ratio of Amit's age to his father's age is 2 : 5 and their total age is 42 years, what is Amit's age?

a) 14 years b) 12 years c) 16 years d) 18 years

Q10. Two friends divide ₹840 in the ratio 4 : 3. Later they decide to divide it equally. How much money should the one who got more give to the other?

a) ₹30 b) ₹40 c) ₹60 d) ₹70

ANSWERS

1. Answer: b) 24

SOLUTION:-

Let the numbers 3x and 5x

3x + 5x = 64

8x= 64

X = 8

Smaller number = 3x= 3 X 8 = 24

2. Answer: c) 70

Solution:-

Let number of red and blue marbles are 7x and 3x respectively.

3x = 30

X= 10

So red marbles = 7x = 7 x10 = 70

3. Answer: c) ₹300

Solution:-

Let A and B get rupees 2x and 3x respectively

2x + 3x = 500

5x = 500

X = 100

So B will get = 3x = 3 X 100 = 300

4. Answer: c) 8

SOLUTION:-

Flour: Sugar: Butter = 4:2:1. Total parts = 4+2+1=7.

Sugar = $\frac{2}{7} \times 28 = 2 \times 4 = 8$.

5. Answer: c) 30

SOLUTION:-

Boys: Girls =3:2. Boys =45

Let number of boys and girls be 3k and 2k respectively

So, 3k = 45

$\Rightarrow$ k = 45÷3=15.

Girls = 2k = 2×15=30.

6. Answer: c) Add 5 cups of water

SOLUTION:- Mix requires water: syrup = 5:2 Student added 10 cups water and 6 cups syrup.

We want final amounts W:S=5:2. Current W:S=10:6 → 5:3. We need second part to be 2, but currently it is 3 (relative terms). We can either remove syrup or add water to restore 5:2. Removing syrup would make syrup smaller — not an offered choice. Check adding water: Suppose we add x cups water,

new ratio (10+x):6=5:2

Or, $\frac{10+x}{6} = \frac{5}{2}$

Or, 2 (10+x) = 6 x 5

Or, 20+2x = 30

Or, 2x=30 - 20

Or, X = 5

So add 5 cups of water.

7. Answer: c) 80

SOLUTION:- Students in classes A and B are in ratio 4:5. If 8 students moved from B to A, the ratio becomes 1:1 (equal).

Let initial A = 4x, B = 5x. After shifting 8 from B to A:
New A = 4x+8. New B = 5x−8. Given these are equal:

4x+8= =5x−8

Or, 5x – 4x = 8 + 8

Or, X = 16

So, initial B = 5x=5×16=80

8. Answer: a) 3 L

SOLUTION:-

The solution has sugar : water = 3:7. If 4 liters of water is added, the ratio becomes 3:11.

Let sugar = 3x, water = 7x. After adding 4 L water: new water = 7x+4.

Ratio 3x : 7x+4=3:11.

Or, $\frac{3x}{7x+4} = \frac{3}{11}$

Or, 11 X 3x = 3(7x+4)

Or, 33x = 21x +12

Or, 33x-21x = 12

Or, 12x = 12

Or, X= 1

So sugar = 3x = 3 X 1 = 3 L

9. Answer: b) 12 years

Ratio of Amit's age to father's age = 2:5. Total ages = 42.

Let Amit = 2x, father = 5x. Sum: 2x+5x = 7x = 42

So, x = 42÷7 = 6.

Amit's age = 2x=2×6=12

10. Answer: c) ₹60

SOLUTION:-

Two friends divide ₹840 in ratio 4:3. Later they decide to split equally.

Total = 840. Shares initially: let A=4x & B=3x

So, 4x + 3x = 840

Or, 7x = 840

Or, X = 840/7=120

Person A = 4x= 4 X 120 = 480

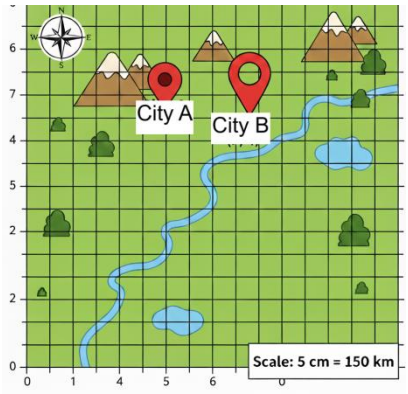
Person B = 3x = 3 X 120 = 360

If split equally, each should get 840÷2=420

A currently has 480, should have 420 → must give 480−420=60 to B.

SECTION B (2 Marks Type Questions)

Q1. On a map, a distance of 5 cm represents an actual distance of 150 km. If two cities are 12.5 cm apart on the map, what is the actual distance between them?



Q2. If 8 people can paint a wall in 6 days, how many people are needed to paint the same wall in 4 days?

Q3. A Juice seller sells juice by adding a certain amount of water in the juice. The ratio of water to juice in the drink is 5 : 2. If he has 15 litres of water, how much juice does he need to maintain the ratio?

Q4. A car takes 3 hours to cover a distance at a speed of 60 km/h. How long will it take to cover the same distance if its speed is reduced to 45 km/h?

Q5. Aman and Ravi decided to go for a picnic for which they contributed 1800 in the ratio 2:1 respectively. What was the contribution of Ravi ?

Q6. The cost of 15 identical notebooks is ₹ 375. How many such notebooks can be bought for ₹ 600?

Q7. The scale of a model car is 1 : 18. If the model is 12 cm long, what is the actual length of the car?

Q8. A hostel has enough food for 240 students for 30 days. How long would the food last if 60 more students join the hostel?

Q9. To make concrete for a construction work cement, sand, and gravel are mixed in the prescribed ratio 1 : 3 : 4 by volume. If 12 cubic metres of sand is used, how much cement and gravel is needed?

Q10. A school event includes 24 students from all three sections A,B,C of class 8 in the ratio 2:4:6. What is the total number of students taken from section A and C ?

ANSWERS

1. Solution: This is a case of direct proportion. Let the actual distance be x km. The ratio of map distance to actual distance is constant.

So, $\frac{5}{150} = \frac{12.5}{x}$

Cross-multiplying:

5x = 150 x 12.5

Or, 5x = 1875

Or, x = $\frac{1875}{5}$ = 375 Answer: The actual distance between the cities is 375 km.

2. Solution:

This is a case of inverse proportion. More people will take fewer days.

Let the number of people needed be x .

So, 8 people X 6 days = *x* people X 4 days

Or, 48 = 4x

Or, x = $\frac{48}{4}$ = 12 Answer: 12 people are needed to paint the wall in 4 days.

3. Solution:

Let the quantity of juice needed be x litres.

The ratio must be maintained,

So, $\frac{Water}{Juice} = \frac{5}{2} = \frac{15}{x}$

Cross-multiplying:

5 X x = 2 X15 Or, 5x = 30

Or, x = $\frac{30}{5}$ = 6 Answer: 6 litres of juice is needed.

4. Solution:

This is inverse proportion. Lower speed means more time.

Let the required time be t hours.

Since Distance = Speed × Time, and distance is constant:

$Speed_1 \times Time_1 = Speed_2 \times Time_2$

60 × 3 = 45 × t => 180 = 45t

t = $\frac{180}{45}$ = 4 Answer: It will take 4 hours to cover the distance.

5. Solution:

Total parts = 2+1 = 3 Value of each part = $\frac{1800}{3}$ = ₹ 600

So, Ravi share = 1 × 600 = ₹ 600

6. Solution:

This is direct proportion. More money can buy more notebooks.

Let the number of notebooks be x .

Or, $\frac{15}{375} = \frac{x}{600}$

Cross-multiplying: $15 \times 600 = 375 \times x \Rightarrow 9000 = 375x$

Or, $x = \frac{9000}{375} = 24$ Answer: 24 notebooks can be bought for ₹ 600.

7. Solution:

The scale 1:18 means 1 cm on the model represents 18 cm in reality.

Let the actual length be x cm.

So, $\frac{1}{18} = \frac{12}{x}$

Cross-multiplying: $1 \times x = 18 \times 12 \Rightarrow x = 216$ cm

We can convert this to metres: 216cm = 2.16 m

Answer: The actual length of the car is 2.16 metres.

8. Solution:

This is inverse proportion. More students, fewer days the food will last.

Let the number of days the food will last be d .

Total students now = 240 + 60 = 300.

So, $240 \times 30 = 300 \times d$

$7200 = 300d$

$d = \frac{7200}{300} = \frac{72}{3} = 24$

Answer: The food will last for 24 days.

9. Solution:

The given ratio is Cement: Sand: Gravel = 1: 3: 4

Let the common factor be x.

So, Sand used = 3x = 12 cubic metres.

Therefore, 3x = 12 => x = 4

Cement needed = 1 × x = 1 × 4 = 4 cubic metres.

Gravel needed = 4 × x = 4 × 4 = 16 cubic metres.

Answer: 4 m^3 of cement and 16 m^3 of gravel are needed.

10. Solution: Total number of students = 24

Ratio given is 2:4:6 ;and Total part = 12

So part of section A and C = 8

So total students from A and C = $\frac{8}{12}$x 24 = 16

SECTION C (3 Marks Type Questions)

Q1. Rina and her family are organizing a school picnic for her younger brother's class. As part f the preparation, they have decided to prepare fruit juice for all the students. Rina follows a special recipe given by her mother, which requires exactly 3 liters of water to be mixed with 2 kilograms of fruit concentrate. This quantity is enough to make juice for 15 students. On the day of the picnic, the teacher informs Rina that instead of the expected 15 students, 45 students will attend because several students from other classes are joining in. Rina now needs to prepare enough fruit juice for all the students without any wastage, and she must plan carefully to buy the right quantity of ingredients. She also wants to avoid purchasing too much concentrate or water to save money.

Questions:

i) How many litres of water will Rina need to prepare juice for all 45 students?

ii) How many kilograms of fruit concentrate will she need for the same?

Q2. Arjun is planning a long weekend road trip with his friends. His car's fuel efficiency is such that it consumes 5 litres of petrol to travel 60 kilometers. He has mapped out a scenic route covering a total distance of 240 kilometers and wants to ensure he does not run out

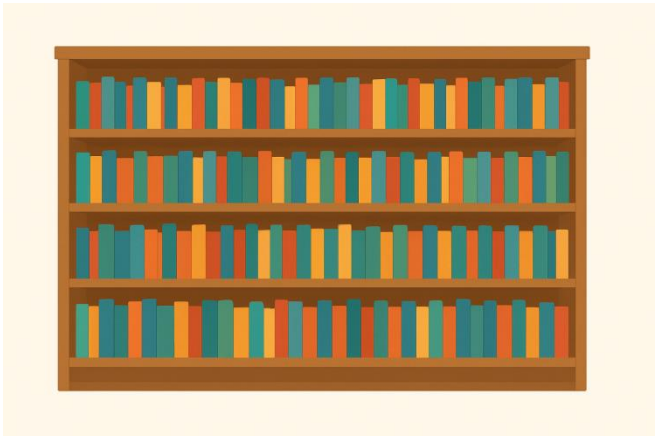
of fuel midway. He also wants to avoid unnecessary stops for refuelling to save time. Before starting the journey, Arjun decides to calculate the exact amount of petrol required and check if he needs to purchase extra petrol. (Efficiency = $\frac{Distance\ Travelled}{Fuel\ Used}$)

Questions:

i) How many litres of petrol will Arjun need to travel 240 kilometers?

ii) If he already has 10 litres of petrol in the tank, how many more litres should he purchase?

Q3. The school library has 120 books neatly arranged across 4 shelves, with an equal number of books on each shelf. One day, the librarian receives a generous donation of 66 additional books. She wants to distribute all the books equally among 6 shelves to keep the arrangement tidy. The librarian also wants to know how much more space each shelf will require and how the new arrangement compares to the old one to ensure that students can easily find and access books.



Questions:

i) How many books will there be on each shelf after the donation is added and redistributed?

ii) How many more books does each shelf get compared to before the donation?

Q4. An ice-cream shop in the city centre sells 10 ice cream cones for Rs 250. During a summer festival, the shop expects a large crowd and estimates that 100 cones will be sold in a single day. The shop owner wants to calculate potential earnings to plan for extra supplies of cones and ice cream. Additionally, the owner wishes to determine the price of one cone to set a fair price for customers buying individually.

Questions:

i) How much will the shop earn by selling 100 cones?
ii) What is the price of one ice cream cone?

Q5. A gardener is responsible for maintaining a small garden in the school courtyard. Every day, he waters 8 plants using 4 litres of water. One morning, the principal informs him that 20 plants in total need watering each day to keep the garden healthy and thriving. The gardener must calculate the amount of water required and plan accordingly. He also wants to know how many plants he can water if he only has 10 litres of water on a particular day.

Questions:

i) How many litres of water are needed for 20 plants in a day?
ii) If he has only 10 litres of water, how many plants can he water?

Q6. The school is organizing an annual day celebration in the main hall, which has 5 rows of chairs with 20 chairs in each row. For a special event, the school expects 300 guests, which is more than the existing seating capacity. The event coordinator needs to calculate how many additional rows of chairs are required to accommodate all guests comfortably. The coordinator also wants to find out the total number of chairs after adding the necessary rows to ensure everyone has a seat.

Questions:

i) How many more rows of chairs are required to seat all 300 guests?
ii) How many chairs will there be in total after adding the required rows?

Q7. Maya loves baking and is preparing for her friend's birthday party. Her recipe for baking 12 muffins require 3 cups of flour. She plans to bake 36 muffins to ensure that all the guests get enough to eat. Maya also wants to check how many muffins she can make if she has only 6 cups of flour available, so she can plan whether she needs to buy more flour.

Questions:

i) How many cups of flour will Maya need to bake 36 muffins?
ii) If Maya has only 6 cups of flour, how many muffins can she bake?

Q8. A local farmer sells 15 kilograms of apples for Rs. 30 in his village market. During a festival, he expects a larger crowd and wants to sell 50 kilograms of apples at the same rate. The farmer wishes to calculate his potential earnings and also determine the cost per kilogram to inform his customers accurately. This will help him plan his sales and ensure he earns enough to cover the cost of extra apples.

Questions:

i) How much will the farmer earn by selling 50 kilograms of apples?
ii) What is the price per kilogram of apples?

Q9. A school bus travels 90 kilometers in 3 hours while taking students on regular field trips. For an upcoming school trip, the total distance is 270 kilometers. The bus driver wants to calculate how many hours the journey will take if the bus maintains the same speed. Additionally, he wants to calculate the average speed of the bus to inform the teachers and parents about the expected arrival time.

Questions:

i) How many hours will the bus take to complete the 270 kilometers journey at the same speed?
ii) What is the average speed of the bus in km/h?

Q10. A painting contractor usually paints 8 walls in 4 hours using a fixed number of painters. He has recently received a new project that requires painting 24 walls. The contractor wants to estimate the total hours required under the same working conditions. He also considers using twice the number of painters to finish the project faster. He wants to calculate the time it would take if he doubles the workforce to plan resources efficiently.

Questions:

i) How many hours will it take to paint all 24 walls under the same conditions?
ii) If the contractor uses twice the number of painters, how long will it take to paint 24 walls?

ANSWERS

Q1. Fruit Juice for a School Picnic

Given:

- 3 litres water + 2 kg concentrate → juice for 15 students
- Students attending = 45

Solution:

i) Water needed:

Water per student = 3 ÷ 15 = 0.2 litres/student

Water for 45 students = 0.2 × 45 = 9 litres

ii) Fruit concentrate needed:

Concentrate per student = 2 ÷ 15 Concentrate for 45 students = $\frac{2}{15}$× 45 = 6 kg

Answer: 9 litres water, 6 kg fruit concentrate

Q2. Petrol for a Road Trip

Given:

- 5 litres petrol → 60 km
- Distance = 240 km

Solution:

i) Petrol needed:

Petrol per km = 5 ÷ 60 ≈ 0.0833 litres/km

Petrol for 240 km = 0.0833 × 240 = 20 litres

ii) Additional petrol needed:

Already has = 10 litres

More needed = 20 − 10 = 10 litres

Answer: 20 litres total, 10 litres more needed

Q3. Library Book Distribution

Given:

- 120 books across 4 shelves → 30 books/shelf
- Donation = 66 books
- New total shelves = 6

Solution: i) Total books after donation = 120 + 66 = 186 books

Books per shelf = 186 ÷ 6 = 31 books/shelf

ii) Increase per shelf = 31 − 30 = 1 book

Answer: 31 books per shelf, 1 more books

Q4. Ice Cream Shop Earnings

Given:

- 10 cones → 250 rupees
- Expected sales = 100 cones

Solution:

i) Earnings per cone = 250 ÷ 10 = 25 rupees
Earnings for 100 cones = 25 × 100 = 2500 rupees

ii) Price per cone = 25 rupees

Answer: 2500 rupees total, 25 rupees per cone

Q5. Watering Plants

Given:

- 4 liters water → 8 plants/day
- Required for 20 plants

Solution:

i) Water per plant = 4 ÷ 8 = 0.5 liters/plant
Water for 20 plants = 0.5 × 20 = 10 liters

ii) Plants that can be watered with 10 liters = 10 ÷ 0.5 = 20 plants

Answer: 10 liters for 20 plants, 20 plants can be watered

Q6. Arranging Chairs

Given:

- 5 rows × 20 chairs = 100 chairs
- Guests = 300

Solution:

i) Extra rows needed = (300 − 100) ÷ 20 = 200 ÷ 20 = 10 rows

ii) Total chairs after adding rows = (5 + 10) × 20 = 15 × 20 = 300 chairs

Answer: 10 more rows, total 300 chairs

Q7. Baking Muffins

Given:

- 12 muffins → 3 cups flour
- Target = 36 muffins

Solution:

i) Flour per muffin = 3 ÷ 12 = 0.25 cups/muffin

Flour for 36 muffins = 36 × 0.25 = 9 cups

ii) Muffins with 6 cups flour = 6 ÷ 0.25 = 24 muffins

Answer: 9 cups flour for 36 muffins, 24 muffins can be baked with 6 cups

Q8. Selling Apples

Given:

- 15 kg → 30 dollars
- Selling 50 kg

Solution: i) Price per kg = 30 ÷ 15 = 2 dollars/kg

Earnings for 50 kg = 50 × 2 = 100 dollars

ii) Price per kg = 2 dollars

Answer: 100 dollars total, 2 dollars per kg

Q9. Bus Trip Duration

Given:

- 90 km → 3 hours
- Distance = 270 km

Solution:

i) Time per km = 3 ÷ 90 = 0.0333 hours/km

Time for 270 km = 0.0333 × 270 = 9 hours

ii) Average speed = Distance ÷ Time = 90 ÷ 3 = 30 km/h

Answer: 9 hours, 30 km/h

Q10. Painting Walls

Given:

- 8 walls → 4 hours
- New project = 24 walls

Solution:

i) Time per wall = 4 ÷ 8 = 0.5 hours/wall

Time for 24 walls = 24 × 0.5 = 12 hours

ii) With double painters → time halves = 12 ÷ 2 = 6 hours

Answer: 12 hours with same painters, 6 hours with double painters

SECTION D - (4 Marks Type Questions):

Q1. A four days scout and guide camp were arranged by the school for class 8 students. The students were so excited to go for the camp. Based on this context, answer the following questions. (2+2)

i) The school arranged 6 buses to take 150 students to the camp. If 75 more students are joined, how many buses are required in all?

ii) In the camp, they assigned some jobs to the students. 45 students complete a job in 20 minutes. How many minutes will 30 students take to complete the same job?

Q2. Nita invited four friends for her birthday party. She ordered Red velvet cake, pizza and coke.(1+2+1)

i) The cost of 2 kg cake is ₹ 190. If Nita ordered 5kg cake, how much she paid for it?

ii) She planned to buy 10 bottles of coke for the party. After sometimes 7 more friends joined with her party. So, how many bottles of coke she has to order?

iii) The rent of party hall for ₹ 1200 for 2 hours. Nita's party started at 5:00 pm and ended by 8:30 pm. what amount did she pay for the party hall?

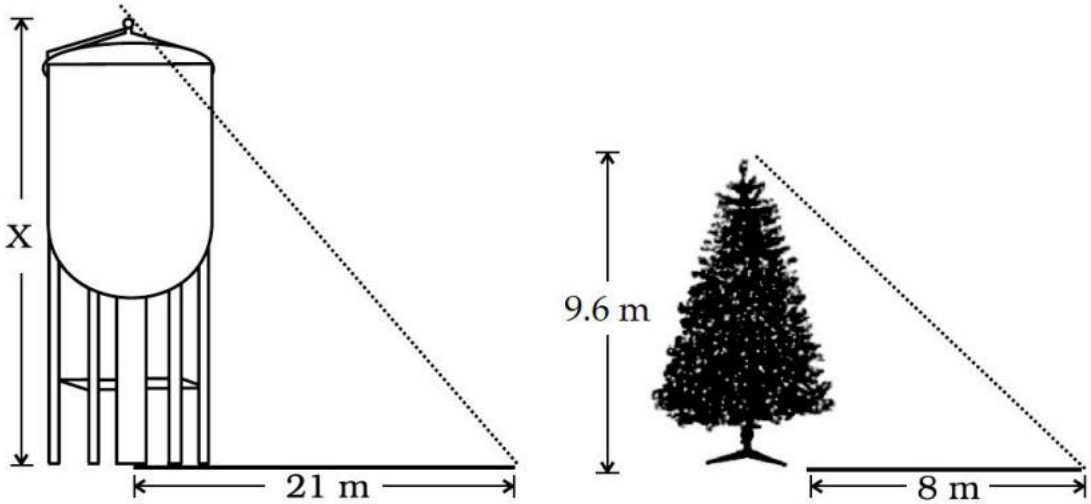
Q3. A hostel has enough food for 300 students for 30 days. Due to a cultural program few students join the hostel . (2+2)

i) How long would the food last if 60 more students join the hostel?

ii) How long would the food last if instead of joining the hostel 60 students left the hostel?

Q4. When Trisha was 4 years old, her mother's age was 10 times her age. What is the ratio of Trisha's age to her mother's age? What would be the ratio of their ages when Trisha is 12 years old? Would it remain the same?

Q5. One day Maths teacher explaining about Direct and Inverse proportion with the help of many examples. He has given the example of relation between the length of shadow and height of the water tank and height. A water tank casts a shadow 21 m long. A tree of height 9.6 m casts a shadow 8 m long at the same time.



(a) Find the height of the water tank in the above situation.

(b) In a different situation a water tank casts a shadow 27 m long. A tree of height 10.5 m casts a shadow 9 m long at the same time. The lengths of the shadows are directly proportional to their heights. Find the height of the tank.

ANSWERS

1. Solutions:

i) Number of buses is directly proportional to number of students.

Let us assume number of buses required is x

Now number of students will be (150+75) =225

$\therefore \frac{150}{6} = \frac{225}{x} \Rightarrow x = \frac{225\times6}{150} \Rightarrow x = 9$

∴Total number of buses required is 9.

ii) Here number of students are inversely proportional to number of days required to complete a job.

Let us assume 30 students will take y minutes to complete the job.

$\therefore 45 \times 20 = 30 \times y \Rightarrow y = \frac{45 \times 20}{30} \Rightarrow y = 30$

∴ Total 30 minutes will be required by 30 students to complete the job.

2. Solution:

i) Here cost of cake is directly proportional to weight of cake.

$\therefore \frac{190}{2} = \frac{x}{5} \Rightarrow x = \frac{5 \times 190}{2} \Rightarrow x = 475$

∴She paid ₹475 for 5kg cake.

ii) Initially Nita had 4 friends in the party, now she has (4+7)=11 friends

∴initially there were total 5 persons (including Nita) , now there are total 12 persons in the party

Number of coke bottles are directly proportional to number of friends

$\therefore \frac{10}{5} = \frac{x}{12} \Rightarrow x = \frac{12 \times 10}{5} \Rightarrow x = 24$

∴ Total number of coke bottles required is 24.

iii) Rent is directly proportional to duration of the party .

Duration of the party was 8:30 pm-5 pm= 3hrs and 30 mins.= $\frac{7}{2}$ Hours

$\therefore \frac{1200}{2} = \frac{x}{7/2} \Rightarrow x = \frac{7 \times 1200}{2 \times 2} \Rightarrow x = 2100$

∴ Nita had to pay total ₹2100 for the party as the rent of the party hall.

3. Solution:

i) This is an inverse proportion scenario. The more the students, the fewer days the food will last.

Let the number of days the food will last be D.

Total number of students now = 300 + 60 = 360.

So, 300 × 30 = 360 × D

9000 = 360D

D = 9000/360 =25

Answer: The food will last for 25 days.

ii) This is an inverse proportion scenario. The more the students, the fewer days the food will last.

Let the number of days the food will last be D.

Total number of students now = 300 - 60 = 240.

So, 300 × 30 = 240 × D

9000 = 240D

D = 9000/240 =37.5

Answer: The food will last for 37 days.

4. Solution:

The ratio of Trisha's age to her mother's age when Trisha is 4 years old is 4 : 40 (her mother's age is 10 times Trisha's age). In the simplest form, it is 1 : 10.

When Trisha is 12 years old (i.e., 8 years later), the ratio of their ages will be 12 : 48 (8 years later, her mother would be 48 years old). In the simplest form, it is 1 : 4.

When we add (or subtract) the same number from the terms of a ratio, the ratio changes and is not necessarily proportional to the original ratio**.**

5. Solutions: . (a) According to the given condition in the question, the length of the shadows are in direct proportion.

$$\therefore \frac{8}{9.6} = \frac{21}{x} \Rightarrow x = \frac{21 * 9.6}{8} = 25.2\ m$$

b) According to the given condition in the question, the length of the shadows are in direct proportion

$$\therefore \frac{9}{10.5} = \frac{27}{x} \Rightarrow x = \frac{27 * 10.5}{9} = 31.5\ m$$

SELF ASSESSMENT

SECTION A (1 MARK)

Q1. A car travels 120 km in 3 hours. If the speed remains constant, the distance travelled in 5 hours will be: (1)

a) 150 km b) 180 km c) 200 km d) 240 km

Q2. It takes 12 workers 15 days to complete a task. How many workers are required to complete the same task in 10 days, assuming constant efficiency? (1)

a) 18 b) 20 c) 15 d) 12

Q3. If the cost of 4 pens is ₹60 and the cost of 6 pens is ₹90, then the relationship between cost and number of pens is: (1)

a) Inverse Proportion b) Direct Proportion c) Neither a nor b d) Can't be determined

Q4. A tap fills a tank in 8 hours. If three such taps are opened together, how long will it take to fill the same tank? (1)

a) 2 hours b) 2 hours 40 minutes c) 3 hours d) 3 hours 20 minutes

SECTION B (2 MARKS)

Q5. On a map, 1 cm represents 8 km. If two towns are 6.5 cm apart on the map, find the actual distance between them. (2)

Q6. A mixture contains water and milk in the ratio 3:2. If there are 15 liters of milk, find the amount of water in the mixture. (2)

Q7. The marks obtained by two students in Mathematics and Science are given below:

Riya: 36 (Maths), 45 (Science) Sita: 48 (Maths), 60 (Science)

Are their marks in Maths and Science in the same proportion? Justify your answer.(2)

SECTION C (3 MARKS)

Q8. 15 painters can paint a building in 28 days. (3)

a) How many days will 21 painters take to paint the same building?

b) If 7 painters leave after 10 days, how many more days will it take for the remaining painters to finish the work?

Q9. A work can be completed by 18 workers in 20 days. If 6 workers leave after 10 days, how many more days will the remaining workers take to finish the work? (3)

SECTION D (4 MARKS)

Q10. A company planned to complete a road construction project in 50 days using 40 workers. After 20 days, 10 workers left the job. The remaining workers continued to work at the same rate. (4)

Answer the following questions:

a) How much of the work was completed in the first 20 days?

b) How many workers were left after 20 days?

c) How many more days will the remaining workers take to complete the remaining work?

d) Identify whether this situation is a direct or inverse proportion and justify your answer.

ANSWER KEY

1. c **2. a** **3. b** **4. b** **5. 52 km**

6. 22.5 ltrs **7. Yes because both ratios are equal** **8. a) 20 days** **b) 33 days 18 hours**

9. 15 days **10. a)** $\frac{2}{5}$**b) 30** **c) 40 days** **d) Inverse Proportion**

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