



KENDRIYA VIDYALAYA  
SANGATHAN

केन्द्रीय विद्यालय संगठन

ERNAKULAM REGION

एर्नाकुलम संभाग

MATHEMATICS  
WORKSHEETS

FOR CLASS VIII

SESSION 2025 - 26



LEARNING MATHS IS NOT JUST KNOWING ABOUT SOME SHORTCUTS AND FOLLOWING PROCEDURES BUT ABOUT UNDERSTANDING 'WHY' SOMETHING WORKS.

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## **Chapter 1.A Square and a Cube**

### **Worksheet No. 1**

#### **Section A-MCQ**

1. Square of 5 is.....  
A. 25.      B.10.      C . 15.      D. 100
2. Cube of 10 is...  
A. 100.      B. 1000.      C. 10000.      D.10
3. The volume of a cube with edge length 4 cm is...  
A. 64.      B. 12.      C. 40.      D. 16
4. The number of zeros in the square of 500 is:  
A. 2.      B. 3.      C. 4.      D. 5
5. If a number ends in 3 ,then it's cube ends in  
A. 7      B. 3.      C. 9      D. 1
6. Which of the following is not a perfect cube  
A. 1331      B. 10648      C.729      D. 21600
7. The one's digit of the cube of the number 111 is:  
A. 1      B. 3.      C. 7      D. 6
8. Find the smallest number by which the number 200 must be multiplied to obtain a perfect cube.  
A. 2.      B. 10.      C. 5.      D. 100
9. Each prime factor appears \_\_\_\_\_ times in its cube?  
A.2.      B. 3.      C. 5.      D. 100
10. How many natural numbers lie between  
.       $9^2$  and  $10^2$ ?  
A. 17.      B. 18.      C. 19.      D. 20

### **Section B-2 mark questions**

11. How many numbers lie between squares of the 12 and 13.
12. The square of a number is 81.what is it's cube?
- 13.Find the square root of 729 using factorisation method.
14. Find the square roots of 169 by the method of repeated subtraction.
15. Find the cube of 3.5.

### **Section C-3 mark questions**

16. Is 392 a perfect cube? If not, find the smallest natural number by which 392 should be multiplied so that the product is a perfect cube.
17. Renu makes a cuboid of plasticine of sides 5 cm, 2 cm, 5 cm. How many such cuboids will he need to form a cube?
18. Write the cubes of all natural numbers between 1 and 10 and verify the following statements:  
(i) Cubes of all odd natural numbers are odd.  
(ii) Cubes of all even natural numbers are even.
19. Use the identity and find the square of 189  
$$(a - b)^2 = a^2 - 2ab + b^2$$
- 20.Find the smallest square number that is divisible by each of the numbers 7, 14 and 21.

### **Section D-Case study**

21. Manu wants to design a square box of area  $1225\text{m}^2$ .He went to market and purchased a big cardboard .He had to cut the cardboard for making the square box.
  - A. What is the perimeter of the square box
  - B. Write the side of square box.
  - C. Write any two properties of a square number
22. Smart watches are a big innovation in the wearable industry, performing too many functions. The most common now a days is to count the number of steps. This has a big impact on health. Adarsha noticed the number of steps she walked on her smart watch in the evening and found it to be '10976'.
  - A. Is the given number a perfect cube ?
  - B.If not then what is the smallest number to be multiplied to make it a perfect cube ?  
  
Or  
what is the cube root of the resulting number.
  - C . Write any two properties of cube numbers.

## Answers

1. 25.
  2. 1000
  3. 64
  4. 4
  5. 7
  6. 21600
  7. 1
  8. 5
  9. 3
  10. 18.
  11. 24
  12.  $9^3=729$
  13.  $3 \times 3 \times 3 \times 3 \times 3$
  14.  $\sqrt{169}= 13$
  15. 42.875
  16. 392 is not a perfect cube, multiply by 7 to get a perfect cube.  $392 \times 7 = 2744=14^3$
  17. 20
  18. –
  19.  $189= (200-11)^2= 35721$
  20. 1764
  21. A.140cm    B.35 cm. C. –
  22. A. No , not a perfect cube
- B. 2    or 28
- C---

## **Chapter 1.A Square and a Cube**

### **Worksheet No. 2**

#### **Section A-MCQ**

1. Find Unit digit of  $47^2$ : (A) 9 (B) 7 (C) 6 (D) 1
2. Find Unit digit of  $33^3$ : (A) 7 (B) 3 (C) 9 (D) 1
3. 784 belongs to:  
(A) Perfect cube (B) Prime number (C) Perfect square (D) Composite only
4. 729 relates to:  
(A) Odd and perfect cube (B) Even and perfect square (C) Prime and cube (D) Odd and perfect square
5. Number with odd count of factors always:  
(A) Prime (B) Square (C) Cube (D) Even
6. 125 classifies as \_\_\_\_\_  
(A) Cube and odd number (B) Square and even number (C) Odd but not cube (D) None of these
7. Find  $\sqrt[3]{2197}$ : (A) 12 (B) 13 (C) 14 (D) 15
8. Find  $\sqrt{1156}$ : (A) 33 (B) 34 (C) 35 (D) 36
9. 36 classifies as \_\_\_\_\_  
: (A) Square and triangular (B) Cube and triangular (C) Prime and cube (D) None
10. Select Smallest number which is both square and cube:  
(A) 64 (B) 1 (C) 216 (D) 729

#### **Section B – 2 Marks Questions ( $5 \times 2 = 10$ marks)**

1. Write any three numbers that can be identified as not squares by their unit digit.
2. Decide if 900 is a perfect square using prime factorisation.
3. Find the smallest number by which 768 must be multiplied to make it a perfect cube.
4. Find  $\sqrt[3]{512}$  by prime factorisation.
5. Find two consecutive triangular numbers whose sum is a perfect square.

### **Section C – 3 Marks Questions ( $5 \times 3 = 15$ marks)**

1. Show with the first five odd numbers that adding consecutive odd numbers gives perfect squares.
2. Find the smallest square number divisible by 4, 6, and 9.
3. Decide whether 2450 is a perfect square using prime factorisation.
4. Find the count of whole numbers between  $25^2$  and  $26^2$ .
5. Check whether 1728 is a perfect cube and find its cube root using prime factors.

### **Section D – Case Study Questions (4 marks $\times$ 2 = 8 marks)**

#### **Case Study 1: The Garden Fence**

A square lawn has side 15 m. A uniform path around it makes an outer square of area  $400 \text{ m}^2$ .

- 1) Find the side of the outer square.
- 2) Find the width of the path.
- 3) Find the number of  $1 \text{ m}^2$  tiles needed for the path.
- 4) Decide if the tile count is a perfect square.

#### **Case Study 2: The Cube Box Factory**

A cube-shaped box has volume  $512 \text{ cm}^3$ . Boxes are packed into a larger cube carton.

- 1) Find the side of one small cube box.
- 2) 8 boxes fit exactly along one edge of the larger cube. Find the volume of the larger cube.
- 3) Find the cube root of the larger cube's volume.
- 4) Decide if the larger volume is a perfect cube.

### **Answers**

#### **Section A – MCQs**

1. 9 (Unit digit  $7^2=49 \rightarrow 9$ )
2. 7 ( $3^3=27 \rightarrow 7$ )
3. Perfect square ( $28^2=784$ )
4. Odd and perfect cube ( $729=9^3$ )
5. Square (only perfect squares have odd number of factors)
6. Cube and odd number ( $125=5^3$ )

7. 13 ( $2197=13^3$ )

8. 34 ( $34^2=1156$ )

9. Square and triangular ( $36=6^2$  and  $T_8=36$ )

10. 1 ( $1=1^2=1^3$ )

### Section B – 2 Marks

1. 62, 103, 87 (Numbers ending with 2,3,7,8 not perfect squares)

2. Perfect square;  $\sqrt{900}=30$  (All prime exponents even)

3. Multiply by 18 (To make 768 a perfect cube)

4.  $\sqrt[3]{512}=8$  ( $512=2^9=(2^3)^3$ )

5. 6 and 10 give 16 ( $T_3=6$ ,  $T_4=10$ ,  $\text{sum}=16=4^2$ )

### Section C – 3 Marks

1.  $\text{Sum}=25=5^2$  ( $1+3+5+7+9=25$ )

2. 36 ( $\text{LCM}(4,6,9)=36$ )

3. Not a perfect square ( $2450=2^1 \times 5^2 \times 7^2$ )

4. 50 numbers ( $676-625-1=50$ )

5. Perfect cube;  $\sqrt[3]{1728}=12$  ( $1728=(2^3 \times 3)^3$ )

### Section D – Case Studies

Case Study 1:

1. Side=20 m ( $\sqrt{400}=20$ )

2. Width=2.5 m ( $15+2w=20 \rightarrow w=2.5$ )

3. Tiles=175 ( $400-225=175$ )

4. Not a perfect square ( $13^2=169, 14^2=196$ )

Case Study 2:

1. Side=8 cm ( $\sqrt[3]{512}=8$ )

2. Volume= $64^3=262144 \text{ cm}^3$

3. Cube root=64 ( $\sqrt[3]{64^3}=64$ )

4. Perfect cube ( $262144=64^3$ )

## Chapter 2.Power Play

### Worksheet No. 1

#### Section A-MCQ

- 1) A machine A produces  $3^5$  units of energy per day, and machine B produces  $3^3$  units. If both machines run for 3 days, find total energy produced together  
A)  $3^5 + 3^3$ , B)  $3(3^5 + 3^3)$ , C)  $3^8$ , D)  $3^5 \times 3^3$
- 2) A company manufactures  $2.5 \times 10^5$  pencils daily. Each pencil weighs  $2 \times 10^{-2}$  kg. Calculate the total weight of pencils produced daily?  
A)  $5 \times 10^3$  kg B)  $5 \times 10^2$  kg C)  $5 \times 10^4$  kg D)  $5 \times 10^1$  kg
- 3) The population of a bacteria colony doubles every hour. Initially, there were  $2^3$  bacteria. After 1 hour, the population becomes  $2^4$ ; after 2 hours, it becomes  $2^5$ , and so on. What will be the population after 4 hours?  
A)  $2^5$  B)  $2^6$  C)  $2^7$  D)  $2^8$
- 4) Astronomers compare the brightness of two stars:  
Star A emits  $4^7$  lumens, while Star B emits  $2^{15}$  lumens. Which star is brighter?  
A) Star A B) Star B C) Both equal D) Cannot be compared
- 5) What is the value of  $3^0 + 4^0 + 5^0$ ?  
A) 3 B) 1, C) 12 D) 0
- 6) Scientists are studying the DNA of a newly discovered virus.  
They find that the DNA strand is extremely small — its length is 0.0000000021 meters.  
To record and compare such small measurements easily, they use scientific notation (powers of 10). The DNA's length 0.0000000021m can be written in scientific notation as  
A)  $2.1 \times 10^{-9}$  , B)  $2.1 \times 10^9$  C)  $2.1 \times 10^{-10}$  D)  $0.21 \times 10^8$
- 7) A company designs a small digital storage device for experiments.  
The device has a total capacity of  $2^{40}$  bytes. Each small data file created by the software occupies  $2^{10}$  bytes of storage space. How many such files can be stored on the device?  
A)  $2^{30}$  B)  $2^{10}$  C)  $2^{40}$  D)  $2^{50}$
- 8) A mathematician is studying patterns in exponential numbers. He writes a very large number:  $5^{100}$ . Since this number is extremely large, he uses exponent notation to represent it compactly. Which of the following is equivalent to  $5^{100}$ ?  
A)  $(5^{10})^9$  B)  $(5^{20})^5$  C)  $(5^{10})^{100}$  D)  $(5^5)^{10}$
- 9) A student observes the equation:  $3^{2x} = 81$   
He knows that 81 can also be written as a power of 3.  
Using the laws of exponents, he tries to find the value of x. The value of x is  
A) 3 B) 2 C) 4 D) 1

10) A scientist is observing a cell that divides into two new cells every 20 minutes. If the scientist starts with a single cell, how many cells will there be after 2 hours?

A)  $2^6$

B)  $2^5$

C)  $6^2$

D)  $2^{20}$

### **Section B- 2 marks Question**

1) A data centre stores  $3 \times 10^{12}$  bytes per day.

Each file is about  $6 \times 10^6$  bytes. Find approximate number of files stored per day.

2) The population of a city is  $1.25 \times 10^7$ . If each person consumes  $10^3$  litres of water per year, what is the total water consumption in a year? Express your answer in standard form.

3) Electricity is transmitted over long distances using high-tension power lines before it reaches homes. The voltage on a high-tension power line is  $2^8$  volts, while the voltage used in homes is  $2^5$  volts. Find how many times the power line voltage is greater than the home voltage.

4) In a physics laboratory, two microscopic particles are being studied. First particle has a mass of  $5.2 \times 10^{-12}$  kg. Another particle has a mass of  $3.5 \times 10^{-12}$  kg. Find the total mass of the two particles?

5) A new Digital Locker system is designed to store students' important certificates safely online. To keep the data secure, every user must create a 5-character alphanumeric passcode.

Each passcode can include any capital letter (A–Z) or any digit (0–9). How many different 5-character alphanumeric passcodes can be created in total?

### **Section C- 3 marks Question**

1) A student observes that  $11^2 = 121$ . He wonders how the square of a number changes when the number is made 10 times larger or smaller. If  $11^2 = 121$ , find the values of:

1.  $(1.1)^2$

2.  $(0.11)^2$

3.  $(110)^2$

4.  $(0.011)^2$

5.  $(.0011)^2$

6.  $(1.10)^2$

2) A student is exploring square and cube numbers. While examining different numbers, she notices that 729 can be expressed both as a perfect square and as a perfect cube. Show how 729 can be written as both a square number and a cube number.

3) A student named Riya is learning about expressing numbers as products of powers in different ways. She takes the number  $(256)^4$ . Express  $(256)^4$  as the product of powers in three different ways. Show your working clearly.

4) A group of students in class 8 created a power line of 7 to understand the exponents better. Use the power line for 7 to answer the questions.

|          |                  |                                        |
|----------|------------------|----------------------------------------|
| $7^7$    | 823543           |                                        |
| $7^6$    | 117649           |                                        |
| $7^5$    | 16807            |                                        |
| $7^4$    | 2401             |                                        |
| $7^3$    | 343              | $343 \times 2,401 =$                   |
| $7^2$    | 49               | $\frac{16,807}{49} =$                  |
| $7^1$    | 7                | $\frac{7}{343} =$                      |
| $7^0$    | 1                | $\frac{16,807}{8,23,543} =$            |
| $7^{-1}$ | $\frac{1}{7}$    | $1,17,649 \times \frac{1}{343} =$      |
| $7^{-2}$ | $\frac{1}{49}$   | $\frac{1}{343} \times \frac{1}{343} =$ |
| $7^{-3}$ | $\frac{1}{343}$  |                                        |
| $7^{-4}$ | $\frac{1}{2401}$ |                                        |

5) Roxie loves dressing up for different occasions. She has 7 dresses, 2 hats, and 3 pairs of shoes in her wardrobe. Every day, she chooses one dress, one hat, and one pair of shoes to wear. In how many different ways can Roxie dress up?

### **Section D – Case Study Questions (4 marks $\times$ 2 = 8 marks)**

1) An architect is designing a large-scale housing project. The design is based on a pattern of blocks. The number of blocks in each layer increases exponentially. The first layer has 5 blocks. Each subsequent layer has 5 times the number of blocks as the previous layer. The total number of blocks in the final building will be  $5^{10}$ .

(i) Write an expression for the number of blocks in the 4th layer.

(ii) The total number of blocks in a building is calculated as the sum of blocks in all layers. The architect wants to build a 3-layer building. What is the total number of blocks?

(iii) If another building has a design where the number of blocks triples each layer, starting with 3 blocks, how many blocks will be in the 4th layer?

(iv) The architect decides to use smaller blocks, with a volume of  $5^{-2} \text{ m}^3$ . How many such smaller blocks are required to construct a structure with a total volume of  $5^3 \text{ m}^3$ ?

2) A king decides to distribute his gold coins among his three ministers.

- Each minister receives 3 large chests.
- Each large chest contains 3 medium-sized boxes.
- Each medium-sized box holds 3 small pouches.
- Each small pouch contains 3 gold coins.

- Express the number of gold coins each minister receives in exponential form.
- How many gold coins were distributed in total by the king? Express your answer in exponential form.
- If there were 4 ministers instead of 3 (all other counts unchanged), how many total coins would have been distributed?.
- The king takes back a portion of the total coins equal to  $3^4$ . What is the number of coins remaining with the ministers? Express your answer in exponential form.

### ANSWER

#### MCQ

- 1), B)  $3(3^5 + 3^3)$
- 2) A)  $5 \times 10^3 \text{ kg}$
- 3)  $2^7$
- 4) B) Star B
- 5) A) 3
- 6) A)  $2.1 \times 10^{-9}$
- 7) A)  $2^{30}$
- 8) B)  $(5^{20})^5$
- 9) B) 2
- 10) A)  $2^6$

#### Section B

1) Number of files per day =  $3 \times 10^{12} / 6 \times 10^6 = \frac{3}{6} \times 10^{12-6} = 0.5 \times 10^6 = 5 \times 10^5$

$$2) \text{ Total water consumption} = (1.25 \times 10^7) \times (10^3) \\ = 1.25 \times 10^{7+3} = 1.25 \times 10^{10}$$

$$3) \text{ Ratio of voltages} = 2^8 / 2^5 = 2^{8-5} = 2^3$$

The power line voltage is  $2^3 = 8$  times greater than the home voltage.

$$4) \text{ Total mass} = (5.2 \times 10^{-12}) + (3.5 \times 10^{-12}) \\ = (5.2 + 3.5) \times 10^{-12} = 8.7 \times 10^{-12}$$

$$5) \text{ Number of possible characters} = 26 \text{ (letters)} + 10 \text{ (digits)} = 36$$

Each of the 5 positions can be filled in 36 ways

$$= \text{Total passcodes} = 36^5$$

### Section C

1)

$$1. \quad (1.1)^2 = 1.21$$

$$2. \quad (0.11)^2 = .0121$$

$$3. \quad (110)^2 = 12100$$

$$4. \quad (0.011)^2 = .000121$$

$$5. \quad (.0011)^2 = .00000121$$

$$6. \quad (1.10)^2 = 1.21$$

|   |     |
|---|-----|
| 3 | 729 |
| 3 | 243 |
| 3 | 81  |
| 3 | 27  |
| 3 | 9   |
| 3 | 3   |
|   | 1   |

2)

$$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$729 = 9^3 = (3^2)^3 = 3^6$$

$$729 = 27^2 = (3^3)^2 = 3^6$$

$729 = 9^3$  shows it is a perfect cube.

$729 = 27^2$  shows it is a perfect square

3)

$$1) (256)^4 = (2^8)^4 = 2^{8 \times 4} = 2^{32}$$

$$2) (256)^4 = (4^4)^4 = 4^{4 \times 4} = 4^{16}.$$

$$3) (256)^4 = (16^2)^4 = 16^{2 \times 4} = 16^8$$

4)

$$343 \times 2,401 =$$

$$7^3 \times 7^4 = 7^7 = 823543$$

$$\frac{16,807}{49} =$$

$$7^{5-2} = 7^3 = 343$$

$$\frac{7}{343} =$$

$$7^{1-3} = 7^{-2} = 1/49$$

$$\frac{16,807}{8,23,543} =$$

$$7^{5-7} = 7^{-2} = 1/49$$

$$1,17,649 \times \frac{1}{343} =$$

$$\frac{1}{343} \times \frac{1}{343} =$$

$$7^6 \times 7^{-3} = 7^3 = 343$$

$$7^{-3} \times 7^{-3} = 7^{-6} = 1/117649$$

5) Number of ways to choose:

Dresses = 7, Hats = 2, Shoes = 3

$$\text{Total ways} = 7 \times 2 \times 3 = 42$$

### Case Study

1) i)  $5^4 = 625$  blocks.

ii)  $5 + 25 + 125 = 155$ , 3-layer building uses 155 blocks.

iii)  $3^4 = 81$ .

iv) Number required =  $\frac{\text{total volume}}{\text{volume per small block}} = \frac{5^3}{5^{-2}} = 5^{3-(-2)} = 5^5 = 3125$ .

2 ) i)  $3^4 = 81$ .

ii)  $3^5 = 243$ .

iii) Total =  $4 \times 3^4$ .

iv) The king takes back  $3^4$  coins.

Remaining coins =  $3^5 - 3^4 = 3^4(3 - 1) = 2 \times 3^4$ .

## Chapter 2.Power Play

### Worksheet No. 2

#### Section A-MCQ

1. What is the value of  $(2^0 + 3^0 + 4^0)$ ?
  - a) 1
  - b) 3
  - c) 9
  - d) 24
2. The standard form of 0.0000000085 is:
  - a)  $8.5 \times 10^9$
  - b)  $8.5 \times 10^{-9}$
  - c)  $85 \times 10^{-10}$
  - d)  $85 \times 10^8$
3. If  $\left(\frac{3}{5}\right)^{-4} = \left(\frac{5}{3}\right)^x$  what is the value of  $x$ ?
  - a) 4
  - b) -4
  - c)  $\frac{1}{4}$
  - d)  $-\frac{1}{4}$
4. Which of the following is equal to  $(5^2 \times 5^2)^2$ ?
  - a)  $5^{10}$
  - b)  $5^8$
  - c)  $5^{12}$
  - d)  $25^{10}$
5. If  $2^x = 32$ , then  $2^{x-3}$  is equal to:

a) 16

b) 8

c) 4

d) 2

6. The mass of a dust particle is  $7.5 \times 10^{-12}$  kg. This number is closest to:

a) 7.5 billionth of a kg

b) 75 trillionths of a kg

c) 75 ten-billionths of a kg

d) 75 hundred-billionths of a kg

7. The reciprocal of  $\left(\frac{2}{3}\right)^{-5}$  is:

a)  $\left(\frac{3}{2}\right)^5$

b)  $\left(\frac{2}{3}\right)^{-5}$

c)  $\left(-\frac{2}{3}\right)^5$

d)  $\left(\frac{3}{2}\right)^{-5}$

8. Which statement is Always True?

a) A square number is also a cube number.

b) The product of two fifth powers is a tenth power.

c) A number raised to the power 6 is a perfect cube.

d) A negative base raised to an odd power gives a positive result.

9.  $\frac{3^m}{3^{-2}} = 3^5$ , then  $m$  equals:

a) 3

b) 7

c) -3

d) -7

10. If the thickness of a paper is 0.001 cm and it is folded n times, its final thickness is given by:

a)  $n \times 0.001$

b)  $0.001^n$

c)  $0.001 \times 2^n$

d)  $0.001 \times n^2$

### **SectionB- 2 Marks Questions**

1. Simplify:  $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$
2. Express the number 1728 as a product of powers of its prime factors in exponential form.
3. Find the value of m for which  $5^m \div 5^{-3} = 5^{10}$
4. Write the approximate diameter of the Sun, which is 1,392,000,000 meters, in standard form.
5. By what number should  $(-8)^{-1}$  be multiplied to get  $10^{-1}$ ?

### **SectionC- 3 Marks Questions**

1. A newly formed colony of bacteria doubles its population every hour. If the initial population is  $10^5$ , what will be the population after 5 hours? Express your answer in standard form.
2. Simplify and express the result as a power with a positive exponent:  $\left(\frac{3^2}{4^3}\right)^2 \times \left(\frac{4^3}{3^2}\right)^3$
3. If  $a = 2$ ,  $b = -2$ , and  $c = 3$ , verify the identity  $(a \times b)^c = a^c \times b^c$ .
4. The distance between Earth and Mars is approximately  $5.46 \times 10^{10}$  meters. The distance between Earth and the Moon is approximately  $3.84 \times 10^8$  meters. Find the difference between these two distances and write the result in standard form.
5. Simplify:  $\frac{4^4 \times 5^3 \times 2^2}{10^3 \times 8^2}$

### **Section D- Case Study Questions**

#### **Case Study 1: The Paper Folding Challenge**

Estu and Roxie are exploring how fast the thickness of a paper grows when it's repeatedly folded in half. The initial thickness of a sheet of paper is 0.002 cm.

| Number of Folds (n) | Thickness in cm (Exponential Form) | Thickness in cm (Decimal) |
|---------------------|------------------------------------|---------------------------|
| 1                   | $0.002 \times 2^1$                 | 0.004                     |
| 2                   | $0.002 \times 2^2$                 | 0.008                     |
| 3                   | $0.002 \times 2^3$                 | 0.016                     |

|       |                    |       |
|-------|--------------------|-------|
| 4     | $0.002 \times 2^4$ | 0.032 |
| ..... | .....              | ..... |
| n     | $0.002 \times 2^n$ | ..... |

Based on the information above, answer the following questions:

1. What is the thickness of the paper after 7 folds?
2. Express the initial thickness (0.002 cm) in standard form.
3. If  $2^{10} \approx 1024$ , estimate the thickness of the paper after 10 folds and express it in a simplified form (fraction or decimal).

### **Case Study 2: Exploring Scientific Notation**

A science magazine published the size and speed of various objects in the universe using powers of 10.

| Object         | Diameter / Speed     | Standard Form        |
|----------------|----------------------|----------------------|
| Virus          | 0.00000002 m         | $2 \times 10^{-8}$ m |
| Starship Speed | 300,000,000 m/s      | $3 \times 10^8$ m/s  |
| Planet X       | 1,500,000,000 m      | $1.5 \times 10^9$ m  |
| DNA Strand     | $1 \times 10^{-9}$ m | $1 \times 10^{-9}$ m |

Based on the table, answer the following questions:

1. How many times larger is the diameter of Planet X compared to the diameter of a virus?
2. The speed of the Starship is  $3 \times 10^8$  m/s. If light travels at approximately  $3 \times 10^8$  m/s, what does this comparison imply?
3. Express the diameter of the DNA Strand ( $1 \times 10^{-9}$  m) in usual form (decimal notation).

### **ANSWERS**

#### **Section A**

1.  $(2^0 + 3^0 + 4^0) = (1+1+1) = 3 \rightarrow b$
2.  $0.0000000085 = 8.5 \times 10^{-9} \rightarrow b$
3.  $4 \rightarrow a$
4.  $(5^2 \times 5^2)^2 = 5^8 \rightarrow b$
5.  $2^x = 32 \rightarrow x=5 \rightarrow 2^{x-3} = 4 \rightarrow c$
6.  $7.5 \times 10^{-12} = 7.5$  trillionths  $\rightarrow b$
7.  $\left(\frac{3}{2}\right)^5 \rightarrow a$
8. Always true  $\rightarrow c$

$$9. m+2 = 5, m=3 \rightarrow a$$

$$10. 0.001 \times 2^n \rightarrow c$$

### **Section B**

$$1. \text{Simplify: } \left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$$

$$= 2^2 + 3^2 + 4^2$$

$$= 4+9+16$$

$$= 29$$

$$2. 1728 = 2^6 \times 3^3$$

$$3. m - (-3) = 5$$

$$m + (3) = 5$$

$$m = 2$$

$$4. 1.392 \times 10^9 \text{ m}$$

$$5. \frac{1}{10} \times (-8)$$

$$= -0.8$$

### **Section C**

$$1. 2^5 \times 10^5 = 3.2 \times 10^6$$

$$2. \left(\frac{3^2}{4^3}\right)^2 \times \left(\frac{4^3}{3^2}\right)^3 = \left(\frac{4^3}{3^2}\right)^{-2} \times \left(\frac{4^3}{3^2}\right)^3 = \left(\frac{4^3}{3^2}\right)$$

$$3. [2x(-2)]^3 = (-4)^3 = -64$$

$$[2^3 \times (-2)^3] = 8 \times (-8) = -64$$

4. We must subtract:

$$(5.46 \times 10^{10}) - (3.84 \times 10^8)$$

Step 1: Convert both numbers to the same power of 10

$$3.84 \times 10^8 = 0.0384 \times 10^{10}$$

$$3.84 \times 10^8 = 0.0384 \times 10^{10}$$

$$3.84 \times 10^8 = 0.0384 \times 10^{10}$$

Step 2: Subtract

$$(5.46 \times 10^{10}) - (0.0384 \times 10^{10}) = 5.4216 \times 10^{10} \text{ m}$$

$$5. \frac{4^4 \times 5^3 \times 2^2}{10^3 \times 8^2}$$

$$= \frac{2^8 \times 5^3 \times 2^2}{(2 \times 5)^3 \times 2^6} = \frac{2^8 \times 5^3 \times 2^2}{5^3 \times 2^6 \times 2^3} = \frac{5^3 \times 2^{10}}{5^3 \times 2^9} = \frac{2^{10}}{2^9} = 2$$

### **Section D-Case Study1**

1. After 7 folds = 0.256 cm
2.  $0.002 = 2 \times 10^{-3}$
3. After 10 folds = 2.048 cm

### **Case Study 2**

1. Planet X is  $7.5 \times 10^{16}$  times larger
2. Starship travels nearly at speed of light
3. DNA strand = 0.000000001 m

## **Chapter 2.Power Play**

### **Worksheet No. 3**

#### **Section A-MCQ**

1.A certain bacterial culture begins with 30 bacteria. If the number of bacteria in the culture doubles every hour, what will the bacterial count be at the end of the 8th hour?

- (a)240                      (b) 480                      (c) 120                      (d) 8100

2.Which of the following equals  $25 \times 3565$  ?

- (a)1                      (b) 55                      (c) 25                      (d) 65

3.If  $a = 2$  and  $b = 3$  , find the value of  $(a^2 \times b^2)$  .

- (a)6                      (b) 12                      (c) 18                      (d) 36

4.Which of the following can replace  $-7-2$ ?

- a) 149                      (b) 1-49                      (c) 1-7                      (d) 1-7-2

5.An invasive type of algae covers an area of 4 square meters in a pond. If the area it covers multiplies by 3 every week, what is the area covered after 5 weeks?

- (a) $4 \times 3$                       ( b)  $4 \times 5^3$                       (c)  $4 \times 3^5$                       (d)  $4 \times 3 \times 5$

6.If  $a^m \times a^n = a^{12}$  and  $m = 7$  , find n.

- (a)5                      (b)12                      (c)19                      (d)4

7.What will come next in the sequence : 31 ,32,33,34 , \_\_\_\_\_

- a) 92                      (b)35                      (c)36                      (d)53

8.The area of a large square is  $a^6$  and that of a smaller square is  $a^2$ . Find the ratio of their areas using law of exponents.

- a)  $a^2$                       (b) $a^3$                       (c) $a^4$                       (d) $a^5$

9.If a computer's processing power doubles every year, and its initial power is  $p$ , express its power after 6 years.

- a)  $p \times 26$     (b)  $p^{6 \times 2}$     (c)  $p^2$     (d)  $p^6$

10 Which of the following statement(s) is /are true?

(i)  $40 + 30 \times 23 = 24$

(ii)  $(40 + 30) \times 23 = 4 + 3 \times 8$

(iii)  $(40 + 30) \times 23 = 16$

a) Statements (i) and (ii)

b ) Statements (ii) and (iii)

C ) Statements (i) and (iii)

D) Statements (ii) only

### **Section B -2 Marks Questions**

11.A scientist is working with very large quantities while calculating distances between planets. To make the numbers easier to handle, he decides to write all the values in standard form. Help him rewrite the following numbers in standard form:

- (i) 48,600    (ii) 92,75,000    (iii) 7,25,00,00    (iv) 53,00,00,00,000

12.A student is practicing writing numbers in expanded form with powers of 10, including both whole numbers and decimals.

Express the following numbers as a sum of each digit multiplied by its corresponding power of 10:

(i) 5391.24

(ii) 806.075

13. There are 5 bottles in a container. Every day, a new container is brought in. How many bottles would be there after 40 days?

14. Estu bought 4 T-shirts, 3 caps, and 2 pairs of shoes. In how many different ways can she choose one T-shirt, one cap, and one pair of shoes to make a combination?

15.A local savings scheme promises to double any investment every 5 years. If you invest ₹500, what will the value of your investment be after 20 years? Also write the value in exponential form.

### **Section C -3 Marks Questions**

16.A student is learning to break numbers into prime factors and represent them using exponents. Express the number 54,000 as a product of its prime factors and write the prime factorization in exponential form.

17.A digital locker has an alphanumeric (it can have both digits and letters) passcode of length 5. Some example codes are G89P0, 38098, BRJKW, and 003AZ. How many such codes are possible?

18..Calculate and write the answer in scientific notation:

(i) There are about 8 billion people in the world. If each person drinks 2 litres of water per day, find the total amount of water (in litres) consumed by all people in a day.

(ii) There are approximately 120 million trees in a large forest. If each tree produces 2,500 leaves, find the total number of leaves in the forest.

(iii) A factory produces about 1.2 million chocolates every day. Find the total number of chocolates produced in 30 days.

19.If  $152=225$  what is

(i) $(1.5)^2$  (ii) $(0.15)^2$  (iii) $(0.015)^2$

20.Two friends, Ravi and Meena, started saving money in different ways.

Ravi saves 100 Rs. every week

Meena starts with 100 Rs. and doubles her savings every week.

| Week | Ravi's savings | Meena's savings |
|------|----------------|-----------------|
| 1    | 100            | 100             |
| 2    | 200            | 200             |
| 3    | 300            | 400             |
| 4    | 400            | 800             |
| 5    | 500            | 1600            |

(i)Identify which pattern shows linear growth and which shows exponential growth

(ii)Predict whose savings will be greater after 7 weeks and justify your answer.

(iii)If both continue the same pattern, after how many weeks will Meena's savings become more than 10 times Ravi's savings?

### **Section D-Case Study Questions**

21.There is a magical pond in a village. Every day, the number of lotus flowers in the pond doubles. On the 1st day, there is only 1 lotus.

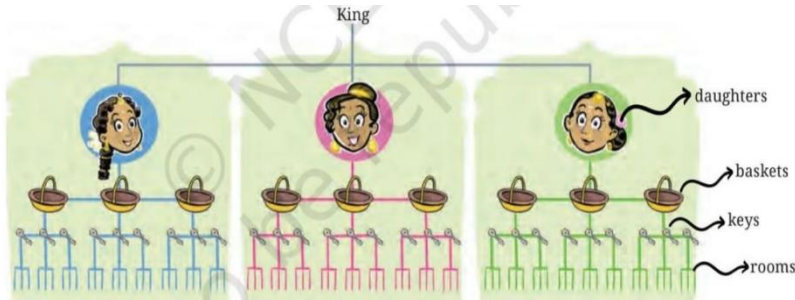
On the 10th day, the pond is half filled with lotuses.

(i)On which day will the pond be completely filled with lotuses?

(ii)How many lotuses will be there in the pond on the 5th day?

(iii)If the pond has a total capacity of 1024 lotuses, on which day will it first exceed 500 lotuses?

22. Three princesses with curious eyes  
 Each got three baskets- a kingly prize  
 Each baskets had three silver keys  
 Each open three big rooms  
 Each room had three tables  
 Each table had three diamond necklace  
 Each necklace had three diamonds on it



Find out the total number ( in exponential form) of

1. Baskets
2. Tables
3. (iii) Diamonds
4. Keys.

How many necklaces were found in each room?

OR

How many big rooms can the princesses unlock in total?

If the total diamonds were divided equally among the three princesses, how many diamonds would each princess received

## Answers

### Section A

- 1 (b ) 480
- 2 ( a ) 1

- 3 (d) 36  
 4 (a) 149  
 5 (c)  $4 \times 3^5$   
 6 (a) 5  
 7 (b) 35  
 8 (c)  $a^4$   
 9 (a)  $p \times 26$   
 10 (c) Statements (i) and (iii)

### Section B

- 11 (i)  $48600 = 4.86 \times 10^4$   
 (ii)  $9275000 = 9.275 \times 10^6$   
 (iii)  $72500000 = 7.25 \times 10^7$   
 (iv)  $53000000000 = 5.3 \times 10^{10}$   
 12 (i)  $5391.24 = 5 \times 10^3 + 3 \times 10^2 + 9 \times 10^1 + 1 \times 10^0 + 2 \times 10^{-1} + 4 \times 10^{-2}$   
 (ii)  $806.075 = 8 \times 10^2 + 6 \times 10^0 + 7 \times 10^{-2} + 5 \times 10^{-3}$   
 13 No. of bottles in a container = 5  
 No. of bottles brought in every day = 5  
 No. of bottles after 40 days =  $40 \times 5 = 200$   
 14 Number of T-shirts = 4  
 Number of caps = 3  
 Number of pairs of shoes = 2  
 Number of different combinations Estu can make by choosing one of each item.  
 Total combinations =  $4 \times 3 \times 2 = 24$   
 15 
$$\text{Number of Doubling Periods} = \frac{\text{Total Years}}{\text{Doubling Period}} = \frac{20 \text{ years}}{5 \text{ years}} = 4 \text{ periods}$$
  
 Investment be after 20 years =  $\text{₹}500 \times 2^4 = \text{₹}8000$

### Section C

- 16  $54000 = 24 \times 3353$   
 17 No. of letters (A-Z) = 26  
 No. of digits (0-9) = 10  
 So, each character in the passcode can be any of the 36 alphanumeric characters.  
 Also, each of the 5 position has 36 options.  
 Total codes = 365  
 18 (i) Total water consumed per day =  $8,000,000,000 \times 2 = 16,000,000,000$  litres  
 In scientific notation:  $1.6 \times 10^{10}$   
 (ii) Total leaves in the forest =  $120,000,000 \times 2,500 = 300,000,000,000$   
 In scientific notation;  $3 \times 10^{11}$  leaves  
 (iii) Total chocolates in 30 days =  $1,200,000 \times 30 = 36,000,000$   
 In scientific notation;  $3.6 \times 10^7$  chocolates  
 19 (i)  $1.52 = (15 \times 10^{-1})^2 = 152(10^{-1})^2 = 225 \times 10^{-2}$   
 (ii)  $(0.15)^2 = 15210^{-4}$   
 (iii)  $(0.015)^2 = 15210^{-6}$

- 20 (i) Ravi – linear , Meena- exponential  
(ii) After 7 weeks; Meena – Rs. 6400 , Ravi- Rs.700  
Meena's savings is greater.  
(iii) Let, number of weeks= n  
Ravi's savings =  $100n$   
Meena's savings= $100 \times 2^{(n-1)}$   
We need  $100 \times 2^{n-1} > 10 \times 100n$   
It implies  $2^{n-1} > 10n$   
Try values; for  $n=5 \rightarrow 2^4=16 > 50$ ?no  
For  $n=8 \rightarrow 2^7=128 > 80$ ?yes

#### Section D

- 21 (i) on 11 th day  
(ii) day 1= 1  
Day 2=  $1 \times 2=2$   
Day 3=  $2 \times 2= 4$   
Day 4=  $4 \times 2=8$   
Day 5=  $8 \times 2=16$   
(iii) Day 6=  $16 \times 2= 32$   
Day 7=  $32 \times 2= 64$   
Day 8 =  $64 \times 2= 128$   
Day 9 =  $128 \times 2= 256$   
Day 10 =  $256 \times 2= 512$   
On 10<sup>th</sup> day no. of lotus first exceeds 500 lotus.

22

Total number ( in exponential form) of

Baskets = 32, Tables = 35

Diamonds = 37 Keys. =36

In Exponential Form) = 3 tables  $\times 3$  necklaces =  $3^2$

In Standard Form = 9 necklaces

OR

The princesses can unlock a total of 81 rooms.

$37/3 = 36 = 729$  diamonds.

## **Chapter 3.A Story of Numbers**

### **Worksheet No. 1**

#### **Section A-MCQ**

1. The oldest known tally stick, the Ishango bone, has a series of notches believed to represent which of the following?  
(a) The number of days in a year  
(b) The number of hunting trips  
(b) A lunar calendar  
(d) The total number of items in a collection
2. Which of the following numbers would be the most difficult to perform subtraction on using the Roman number system?  
(a) V – I                      (b) L – X                      (c) M – I                      (d) D - C
3. The number system of the Gumulgal people, who counted in twos, would likely have a landmark number of 8, which could be represented as:  
(a) four groups of two  
(c) eight ones  
(b) three groups of two and a one  
(d) a special symbol for eight
4. A number system that relies on repeating symbols to add up to a value is called a(n): (a) subtractive system (b) positional system (c) additive system (d) base-n system
5. The number 10101 in a binary (base-2) system is equivalent to what number in the decimal system?  
(a) 10                      (b) 12                      (c) 21                      (d) 16
6. The Roman numeral for the number 900 is CM. This is an example of which principle?  
(a) an additive principle.  
(c) a place value system.  
(b) a subtractive principle.  
(d) a decimal system.
7. In the number 8,629, the value of the digit 6 is determined by its position. This is an example of which concept?  
(a) a base-n system  
(c) a tally system  
(b) a positional number system  
(d) a landmark number
8. A group of archaeologists discover an ancient bone with 35 notches carved into it. This is an example of which counting method?  
(a) a tally system  
(b) a base-10 system

(c) one-to-one mapping

(d) both (a) and ©

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. Assertion (A): The Roman numeral XLV is 45. Reason (R): The Roman number system uses both the additive and subtractive principles.

10. Assertion (A): The Hindu number system is a positional number system.

Reason (R): The Hindu number system uses a base of 10.

### **Section B- 2 marks Question**

11. An ancient Egyptian uses a system where a single symbol represents a value. He has 8 symbols for 100, and 12 symbols for 1. What is the total number he has? Show your working.

12. What is the Roman numeral for the year 1995? Show your working.

13. In a fictional number system with a base of 8, what would be the first three landmark numbers?

14. Convert the binary number 1101 to its decimal equivalent.

15. What are the first three landmark numbers in a base-7 number system?

### **Section C- 3 marks Question**

16. Explain how the Hindu number system's use of zero allows for the unambiguous writing of all numbers. Use the numbers 3, 30, and 300 as examples.

17. The Roman numeral system is not as efficient for complex calculations as the Hindu number system. Explain why this is so, using the subtraction of LXXX from C as an example.

18. A Mesopotamian scribe uses two vertical wedges to represent 2, and four horizontal wedges to represent 40. How would the scribe represent the number 164? Explain the process of grouping.

19. Convert the Roman numeral DLX to the Hindu number system. Explain the logic for each component.

20. How does the use of the symbol V (5) and L (50) make the Roman number system more efficient than a

simple tally system?

### **Section D – Case Study Questions (4 marks × 2 = 8 marks)**

#### **21. Case Study-1: The Abacus Master**

Rohan's grandfather, a retired accountant, shows him an old abacus. He tells Rohan, "This was my calculator before you had a phone." He explains that the abacus is a form of a place value system. On the board, the first line from the right represents ones (100), the next line represents tens (101), and so on. A single bead on a line has a value of one times the line's value, while a special bead, a "five-bead," has a value of 5 times the line's value. He challenges Rohan to represent numbers on the abacus. Rohan realizes how this simple tool made complex calculations possible for people who did not have calculators.



- (i) On this abacus, what is the value of a bead on the fifth line from the right? (1)
- (ii) How would you represent the number 39 on this abacus, using the beads described? (1)
- (iii) If there is one five-bead on the thousands line, what is its value? (1)
- (iv) How would you represent the number 17 on this abacus? (1)

#### **20. Case Study-2: The Hindu Numerals**

A historian, Dr. Priya, is researching the spread of the Hindu numeral system. She finds that the system, with its ten digits, including zero, was so powerful that it enabled a new way of doing mathematics. Unlike the Roman system, it was perfect for performing multiplication and division. She discovers that the word "algorithm" is named after the Persian mathematician Al-Khwarizmi, who wrote a book explaining the system. This system's efficiency ultimately led to it becoming the global standard for mathematics and science,



- (i) What is the base of the Hindu number system? (1)
- (ii) What is a key arithmetic operation that the Hindu numeral system made easy, but was difficult in the Roman system? (1)
- (iii) Convert the number 4,321 to the Roman number system. (1)
- (iv) The word "algorithm" is named after which mathematician? (1)

12.To find the Roman numeral for 1995, we break it down:  $1000 = M$ ,  $900 = CM$ ,  $90 = XC$ ,  $5 = V$  So, the Roman numeral is MCMXCV.

13.In a base-8 system, the landmark numbers are powers of 8, starting with  $8^0$ . The first three landmark numbers would be:  $8^0 = 1$ ,  $8^1 = 8$  and  $8^2 = 64$ .

14.To convert 1101 from binary to decimal, we use its place value: The first digit 1 is in the  $2^3$  (or 8) place. Value =  $1 \times 8 = 8$ . The second digit 1 is in the  $2^2$  (or 4) place. Value =  $1 \times 4 = 4$ . The third digit 0 is in the  $2^1$  (or 2) place. Value =  $0 \times 2 = 0$ . The fourth digit 1 is in the  $2^0$  (or 1) place. Value =  $1 \times 1$

= 1. The sum is  $8 + 4 + 0 + 1 = 13$ .

15.To convert 5 to binary (powers of 2: 4, 2, 1):  $5 = (1 \times 4) + (0 \times 2) + (1 \times 1)$ . The binary equivalent is 101.

16. The Hindu number system's use of zero allows for the unambiguous writing of all numbers by acting as a placeholder. Without it, numbers could be misinterpreted. For example: 3 represents three. If we did not have a zero, the number 30 could not be distinguished from 3. The zero holds the place of the ones column, signifying there are no ones, and moving the digit 3 into the tens column, giving it a value of thirty. Similarly, 300 has zeros in the ones and tens columns, clearly placing the digit 3 in the hundreds column, giving it the value of three hundred.

17.The Roman numeral system is inefficient for complex calculations because it lacks a consistent base and a symbol for zero, making it difficult to use a place value system for multiplication and division. For example, to subtract LXXX from C, you would have to convert the numbers:  $C = 100$  and  $LXXX$

= 80.  $100 - 80 = 20$ . You then convert 20 back to Roman numerals, XX. This requires conversion to another system, which shows its inefficiency.

18.To represent 164 in the Mesopotamian system, which has a base of 60, the scribe would group it as follows:  $164 = (2 \times 60) + 44$ . So, we would use two symbols for 60. The remaining 44 would be represented by four symbols for 10 and four symbols for 1.

19.The number 560 is DLX: Additive Principle (D): 500. Additive Principle (L): 50. Additive Principle (X): 10. Additive Principle: The final number is the sum of these parts:  $500 + 50 + 10 = 560$ .

20.The symbols V (5) and L (50) make the Roman numeral system more efficient than a simple tally system because they reduce the number of marks needed to represent larger quantities. Instead of writing many individual tallies, single symbols like V and L simplify writing, make numbers easier to read, and speed up counting and record-keeping.

21.Answers:

a.The fifth line from the right would be the ten thousands line ( $10^4$ ), so the value of a bead on that line is 10,000.

b.To represent 39, you would place three beads on the tens line and one five-bead and four regular beads on the ones line.

c.The value of a five-bead on the thousands line would be  $5 \times 1000 = 5000$ .

d.To represent 17, you would place one bead on the tens line and one five-bead and two regular beads on the ones line.

22.Answers:

a.The base of the Hindu number system is 10.

b.The Hindu numeral system made multiplication and division easy, which were difficult in the Roman system.

c.To convert 4,321 to the Roman number system, we break it down: 4000 = MMMM, 300 = CCC, 20 = XX, 1 = I. The final number is MMMMCCCXXI.

d.The word "algorithm" is named after the Persian mathematician Al-Khwarizmi.

## **Chapter 3.A Story of Numbers**

### **Worksheet No. 2**

#### **Section A-MCQ**

1. Which ancient civilisation first used the base-60 number system?  
a) Egyptian b) Mesopotamian c) Chinese d) Mayan
2. The Hindu numeral system originated in:  
a) Greece b) India c) Rome d) China
3. The Roman numeral for 27 is:  
a) XXIX b) XXXVII c) XXVII d) XXV
4. The Mayan civilisation used a symbol that looked like a seashell to represent:  
a) 10 b) 20 c) 0 d) 100
5. The base of the Egyptian number system is:  
a) 5 b) 10 c) 12 d) 60
6. The oldest mathematical artefact, the Lebombo bone, was found in:  
a) Egypt b) South Africa c) Mesopotamia d) China
7. The Hindu numeral '0' was first treated as a number by:  
a) Aryabhata b) Brahmagupta c) Fibonacci d) Al-Khwarizmi
8. The Mesopotamian system influenced our modern measure of:  
a) Distance b) Weight c) Time d) Temperature
9. The Chinese rod numerals used a \_\_\_\_\_ system.  
a) Base-5 b) Base-8 c) Base-10 d) Base-60
10. The term "algorithm" is derived from the name of:  
a) Al-Kindi b) Al-Khwarizmi c) Fibonacci d) Aryabhata
- 11.

#### **Section B- 2 marks Question**

1. Write the first four landmark numbers of the base-7 system.
2. Mention any two contributions of Indian mathematicians to the development of numerals.
3. State two differences between the Roman and Hindu number systems.
4. What do we mean by a *base-n* number system? Give an example.
5. Why was the invention of zero so important in mathematics?

### **Section C- 3 marks Question**

1. Explain the advantages of having a number system with a base.
2. Write 2367 in Roman numerals and explain the steps.
3. Compare the Egyptian and Hindu number systems.
4. How did Fibonacci popularise Hindu numerals in Europe?
5. What are the main features that make the Hindu number system the most efficient?

### **Section D – Case Study Questions (4 marks × 2 = 8 marks)**

#### **Case Study 1:**

A manuscript found in India from 3rd century CE used a dot to denote zero. Later, it was used by Aryabhata and Brahmagupta for computations.

#### **Questions:**

- a) What is the name of this manuscript?
- b) What was the significance of this dot?
- c) How did it transform mathematics?
- d) What term do we use for this numeral system today?

#### **CASE STUDY -2**

Ancient Egyptians used separate symbols for 1, 10, 100, and so on. They wrote 324 as three symbols of 100, two of 10, and four of 1.

#### **Questions:**

- a) What base did Egyptians use?
- b) Write 784 in this system (explain grouping).
- c) What was the main limitation of this system?
- d) How is our Hindu system more efficient than theirs?

### **Answers**

| MCQ |                 |
|-----|-----------------|
| 1   | b) Mesopotamian |
| 2   | b) India        |
| 3   | c) XXVII        |
| 4   | c) 0            |
| 5   | b) 10           |
| 6   | b) South Africa |
| 7   | b) Brahmagupta  |
| 8   | c) Time         |

| 9                                       | c) Base-10                                                                                                                                                                                                                                                                              |          |       |                                         |                 |                            |                    |         |                               |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|-----------------------------------------|-----------------|----------------------------|--------------------|---------|-------------------------------|
| 10                                      | b) Al-Khwarizmi                                                                                                                                                                                                                                                                         |          |       |                                         |                 |                            |                    |         |                               |
| <b>Section B</b>                        |                                                                                                                                                                                                                                                                                         |          |       |                                         |                 |                            |                    |         |                               |
| 1                                       | 1, 7, 49, 343                                                                                                                                                                                                                                                                           |          |       |                                         |                 |                            |                    |         |                               |
| 2                                       | Invention of zero (Brahmagupta).<br>Development of positional decimal system (Aryabhata).                                                                                                                                                                                               |          |       |                                         |                 |                            |                    |         |                               |
| 3                                       | Roman system has no zero and is non-positional.<br><br>Hindu system uses zero and place value, making it efficient for computation.                                                                                                                                                     |          |       |                                         |                 |                            |                    |         |                               |
| 4                                       | A base-n system is one in which each landmark number is obtained by multiplying the previous one by $n$ .<br>Example: In base-5, landmark numbers are 1, 5, 25, 125, 625.                                                                                                               |          |       |                                         |                 |                            |                    |         |                               |
| 5                                       | Zero acts as a placeholder in positional systems and as a number in operations, making representation and calculation easier.                                                                                                                                                           |          |       |                                         |                 |                            |                    |         |                               |
| <b>Section C</b>                        |                                                                                                                                                                                                                                                                                         |          |       |                                         |                 |                            |                    |         |                               |
| 1.                                      | It allows easy grouping of numbers.<br>Simplifies arithmetic operations like addition and multiplication.<br>Uses fewer symbols to represent all numbers.                                                                                                                               |          |       |                                         |                 |                            |                    |         |                               |
| 1.                                      | $2367 = 1000 + 1000 + 100 + 100 + 100 + 50 + 10 + 5 + 1 + 1$<br>→ MMCCCLXII                                                                                                                                                                                                             |          |       |                                         |                 |                            |                    |         |                               |
| 2.                                      | <table> <tr> <th>Egyptian</th><th>Hindu</th></tr> <tr> <td>Used separate symbols for 1,10,100 etc.</td><td>Used digits 0–9</td></tr> <tr> <td>Base-10 but non-positional</td><td>Base-10 positional</td></tr> <tr> <td>No zero</td><td>Used zero as digit and number</td></tr> </table> | Egyptian | Hindu | Used separate symbols for 1,10,100 etc. | Used digits 0–9 | Base-10 but non-positional | Base-10 positional | No zero | Used zero as digit and number |
| Egyptian                                | Hindu                                                                                                                                                                                                                                                                                   |          |       |                                         |                 |                            |                    |         |                               |
| Used separate symbols for 1,10,100 etc. | Used digits 0–9                                                                                                                                                                                                                                                                         |          |       |                                         |                 |                            |                    |         |                               |
| Base-10 but non-positional              | Base-10 positional                                                                                                                                                                                                                                                                      |          |       |                                         |                 |                            |                    |         |                               |
| No zero                                 | Used zero as digit and number                                                                                                                                                                                                                                                           |          |       |                                         |                 |                            |                    |         |                               |
| 3.                                      | Through his book <i>Liber Abaci</i> (1200 CE).<br>He demonstrated that Hindu numerals simplified trade calculations.<br>His work led to gradual replacement of Roman numerals.                                                                                                          |          |       |                                         |                 |                            |                    |         |                               |
| 4.                                      | Use of only ten digits (0–9).<br>Place value concept.<br>Inclusion of zero as both a digit and a number.<br>Easy for all arithmetic operations.                                                                                                                                         |          |       |                                         |                 |                            |                    |         |                               |
| <b>Case Study</b>                       |                                                                                                                                                                                                                                                                                         |          |       |                                         |                 |                            |                    |         |                               |

- |  |                                                                                                                                                                                                                                                                   |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"><li><b>a)</b> Bakhshali manuscript</li><li><b>b)</b> It represented zero (placeholder).</li><li><b>c)</b> Enabled positional representation and calculations.</li><li><b>d)</b> Hindu or Hindu-Arabic numeral system.</li></ul> |  |
|  | <ul style="list-style-type: none"><li><b>a)</b> Base-10</li><li><b>b)</b> 7 symbols for 100, 8 for 10, 4 for 1.</li><li><b>c)</b> Required many symbols; not positional</li><li><b>d)</b> Use place value and zero; fewer symbols needed</li></ul>                |  |

## **Chapter 3.A Story of Numbers**

### **Worksheet No. 3**

#### **Section A-MCQ**

- 1) The oldest known tally stick, the Ishango bone, has a series of notches believed to represent which of the following?  
a) The number of days in a year      b) A lunar calendar  
c) The number of hunting trips      d) The total number of items in a collection
- 2) The number 10101 in a binary (base-2) system is equivalent to what number in the decimal system?  
a) 10                      b) 12                      c) 21                      d) 16
- 3) The landmark numbers in the Hindu number system are powers of which number?  
a) 2                      b) 5                      c) 10                      d) 60
- 4) Which ancient civilization used a number system based on the base of 60 (sexagesimal)?  
a) Roman              b) Egyptian              c) Mesopotamian (Babylonian)              d) Indian
- 5) The oldest known mathematical artefact, the Lebombo bone, has how many notches?  
a) 15                      b) 29                      c) 44                      d) 60
- 6) A number system whose landmark numbers are 1, 3, 9, 27, etc., is a base:  
a) 1 system              b) 3 system              c) 9 system              d) 27 system
- 7) In the Hindu number 7,082, the value of the digit 0 is:  
a) 0                      b) 10                      c) 100                      d) 1000
- 8) The system of numerals used throughout the world today is the:  
a) Roman number system.                      b) Egyptian number system.  
c) Hindu number system.                      d) Mayan number system.
- 9) In the number 8,629, the value of the digit 6 is determined by its position. This is an example of which concept?  
a) a base-n system                      b) a positional number system  
c) a tally system                      d) a landmark number
- 10) The number system of the Gumulgal people, who counted in twos, would likely have

a landmark number of 8, which could be represented as:

- a) four groups of two
- b) three groups of two and a one
- c) eight ones
- d) a special symbol for eight

### **SECTION B : 2 MARKS**

- 11) In a base-10 number system, what would be the value of the landmark number  $10^5$
- 12) In a fictional number system with a base of 8, what would be the first three landmark numbers?
- 13) Convert the binary number 1101 to its decimal equivalent.
- 14) Convert the Roman numeral LXX to its equivalent in the Hindu number system.
- 15) An ancient Egyptian uses a system where a single symbol represents a value. He has 8 symbols for 100, and 12 symbols for 1. What is the total number he has? Show your working.

### **SECTION C : 3 MARKS**

- 16) A Mesopotamian scribe uses two vertical wedges to represent 2, and four horizontal wedges to represent 40. How would the scribe represent the number 164? Explain the process of grouping.
- 17) Explain how the Hindu number system's use of zero allows for the unambiguous writing of all numbers. Use the numbers 3, 30, and 300 as examples.
- 18) An Egyptian scribe adds two groups: Group 1 has 5 symbols for 10, and Group 2 has 6 symbols for 10 and 3 symbols for 1. What is the total sum in the Hindu number system?
- 19) Calculate the difference between the Roman numerals L and XXX. Write the answer in Roman numerals and Hindu numerals.
- 20) A tailor has C meters of fabric. He sells LXX meters. How many meters of fabric does he have left? Write your final answer in both Roman and Hindu numerals.

### **SECTION D : Case Study Questions**

21)



### Case Study-1: The Tally Counter

An ancient shepherd uses a tally system to count his flock of 15 goats. He makes a single mark on a stick for each goat. To make counting easier, he uses a simple five-grouping method.

- a) How many total marks (symbols) will the shepherd use to count his 15 goats?
- b) Draw or describe how the marks would look using the shepherd's five-grouping method.
- c) If the shepherd saw 5 more goats, how many total marks would he have?
- d) The shepherd's method demonstrates which fundamental counting principle?

22)

### Case Study-1: The Abacus Master

Rohan's grandfather, a retired accountant, shows him an old abacus. He tells Rohan, "This was my calculator before you had a phone." He explains that the abacus is a form of a place value system.

On the board, the first line from the right represents ones ( $10^0$ ), the next line represents tens ( $10^1$ ), and so on.

A single bead on a line has a value of one time the line's value, while a special bead, a "five-bead," has a value of 5 times the line's value.

He challenges Rohan to represent numbers on the abacus. Rohan realizes how this simple tool made complex calculations possible for people who did not have calculators.



- a) On this abacus, what is the value of a bead on the fifth line from the right?
- b) How would you represent the number 39 on this abacus, using the beads described?
- c) If there is one five-bead on the thousands line, what is its value?
- d) How would you represent the number 17 on this abacus?

## Answers

### Section A

- 1) b      6) b
- 2)c      7) a
- 3) c      8) c
- 4) c      9) b
- 5) b      10) a

### Section B

11) The value of the landmark number 105 is 100,000 (One Hundred Thousand).

12) In a base-8 system, the landmark numbers are powers of 8, starting with  $8^0$ . The first three landmark numbers would be:  $8^0 = 1$  ,  $8^1 = 8$  ,  $8^2 = 64$

13) To convert 1101 from binary to decimal, we use its place value:

The first digit 1 is in the  $2^3$  (or 8) place. Value =  $1 \times 8 = 8$ .

The second digit 1 is in the  $2^2$  (or 4) place. Value =  $1 \times 4 = 4$ .

The third digit 0 is in the  $2^1$  (or 2) place. Value =  $0 \times 2 = 0$ .

The fourth digit 1 is in the  $2^0$  (or 1) place. Value =  $1 \times 1 = 1$ .

The sum is  $8 + 4 + 0 + 1 = 13$ .

14) LXX represents  $50+10+10=70$

15) The Egyptian has 8 symbols for 100, which is  $8 \times 100 = 800$ . He also has 12 symbols for 1, which is  $12 \times 1 = 12$ . The total number is  $800 + 12 = 812$ .

### **Section C**

16) To represent 164 in the Mesopotamian system, which has a base of 60, the scribe would group it as follows:  $164 = (2 \times 60) + 44$ . So, we would use two symbols for 60. The remaining 44 would be represented by four symbols for 10 and four symbols for 1.

17) The Hindu number system's use of zero allows for the unambiguous writing of all numbers by acting as a placeholder. Without it, numbers could be misinterpreted.

3 represents three.

If we did not have a zero, the number 30 could not be distinguished from 3. The zero holds the place of the one's column, signifying there are no ones, and moving the digit 3 into the ten's column, giving it a value of thirty.

Similarly, 300 has zeros in the ones and tens columns, clearly placing the digit 3 in the hundred's column, giving it the value of three hundred.

18) The total sum is calculated by adding the Hindu values:

Group 1:  $5 \times 10 = 50$

Group 2:  $6 \times 10 + 3 \times 1 = 60 + 3 = 63$

Total Sum:  $50 + 63 = 113$

19) The difference (L and XXX) is  $50 - 30 = 20$ .

Answer in Roman numerals: XX AND Hindu numerals: 20

20) The problem is  $C - LXX$ . Convert to Hindu numerals:  $C = 100$  and  $LXX = 70$ . Subtraction:  $100 - 70 = 30$ . Final answer in Hindu numerals: 30 Final answer in Roman numerals: XXX

### **Section D**

21) a) The shepherd will use 15 total marks (symbols), as it is a one-to-one mapping method.

b) The marks would look like: (Three groups of 5)

c) The shepherd would have  $15 + 5 = 20$  total marks.

d) The shepherd's method demonstrates one-to-one mapping (and a simple tally system).

22) a) The fifth line from the right would be the ten thousands line ( $10^4$ ), so the value of a bead on that line is 10,000.

b) To represent 39, you would place three beads on the tens line and one five-bead and four regular beads on the ones line.

c) The value of a five-bead on the thousands line would be  $5 \times 1000 = 5000$ .

d) To represent 17, you would place one bead on the tens line and one five-bead and two regular beads on the ones line.

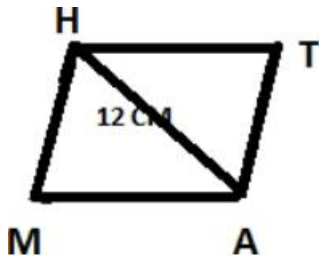
## Chapter 4. Quadrilaterals

### Worksheet No. 1

#### Section A-MCQ

1. A quadrilateral has angles  $80^\circ$ ,  $100^\circ$ ,  $70^\circ$  and  $x^\circ$ . What is the value of  $x$ ?
- (a)  $100^\circ$                       (b)  $110^\circ$                       (c)  $120^\circ$                       (d)  $90^\circ$
2. If ABCD is a rectangle ,then
- (a)  $\angle B = 90^\circ$               (b)  $AC = BD$               (c)  $AB = CD$               (d) All are true
3. Which of the following quadrilaterals has both pairs of opposite sides parallel and all angles equal?
- (a) Rhombus                      (b) Parallelogram              (c) Square                      (d) Trapezium
4. Which of the following statement is FALSE about a Rhombus?
- a) Opposite sides are equal                      b) Opposite angles are equal
- c) All angles are equal                      d) Opposite sides are parallel

5.



Consider the parallelogram MATH shown below in which  $AH = 12$  cm

For the parallelogram to be a rectangle, what should be the length of TM?

- a)  $TM = 12$  cm                      b)  $TM$  is less than 12 cm
- c)  $TM$  is greater than 12 cm                      d) none of these
- 
6. The measure of two adjacent angles of a parallelogram are in the ratio 2:3. Find the measure of each of the angles of a parallelogram.
- (a)  $72^\circ$ ,  $108^\circ$                       (b)  $54^\circ$ ,  $112^\circ$                       (c)  $68^\circ$ ,  $99^\circ$                       (d)  $86^\circ$ ,  $114^\circ$
7. Identify the quadrilateral with the following properties:

(i) One pair of opposite sides are parallel

ii) Diagonals are unequal

(a) Parallelogram

(b) Trapezium

(c) Rectangle

(d) Rhombus

8. In a parallelogram, which pair of angles is always supplementary?

(a) Opposite angles (b) Adjacent angles (c) Alternate angles (d) Corresponding angles

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. **Assertion (A):** A kite has one pair of opposite angles equal.

**Reason (R):** Adjacent sides of a kite are unequal.

10. **Assertion (A):** All the parallelogram are rectangles.

**Reason(R):** All the rhombuses are parallelogram

### **Section B- 2 Marks Question**

1. One angle of a quadrilateral is  $120^\circ$  and the remaining three angles are equal. Find the measure of each of the three equal angles.

2. Construct a KITE whose diagonals are of lengths 6cm and 8 cm.

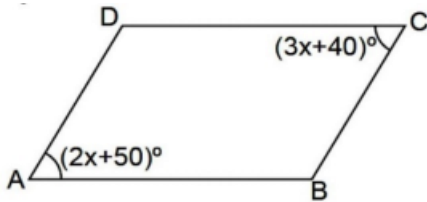
3. One angle of a parallelogram is of measure  $70^\circ$ . Find the measure of the remaining angles of the parallelogram.

4. The angles of a quadrilateral are  $x, 2x, 4x, 5x$ . Find the value of  $x$  and also all the angles.

5. Draw a quadrilateral whose one pair of opposite sides are parallel and the other two non parallel

sides are equal. Name the quadrilateral.

### Section C- 3 Marks Question



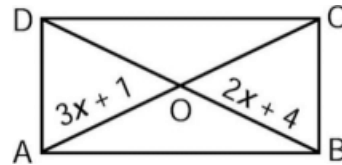
1. ABCD is a parallelogram where  $\angle A = (2x + 50^\circ)$  and  $\angle C = (3x + 40^\circ)$ .

(i) Find the value of  $x$

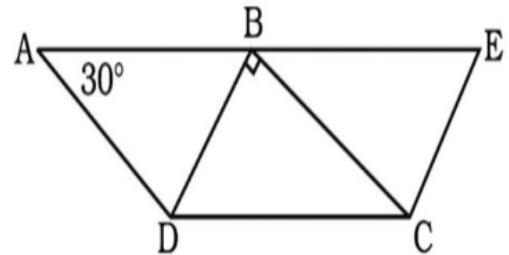
(ii) Find the measure of each angle.

2. ABCD is a rectangle. Its diagonals meet at O.

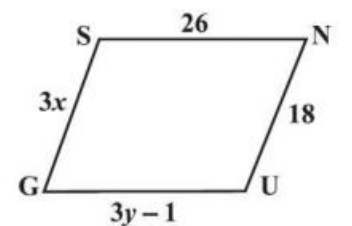
Find  $x$ , if  $OA = 3x + 1$  and  $OB = 2x + 4$



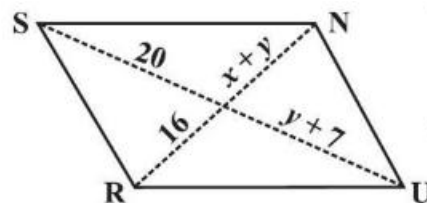
3. In the given figure, ABCD and BDCE are parallelograms with common base DC. If  $BC \perp BD$ , then find  $\angle BEC$ .



4. GUNS is a parallelogram; Find  $x$  and  $y$



5. In the parallelogram RUNS, Find  $x$  and  $y$



### Section D-Case Study Questions

### CASE STUDY 1

1. A renowned flooring company is developing designer tiles shaped as special quadrilaterals. One new tile design has four equal-length sides, and when measured, its diagonals intersect at right angles but differ in length. The company's production engineer must classify this shape correctly for consistency in manufacturing and cataloging.



- What is the name of this quadrilateral?
- Mention any two properties of this shape.
- Could this tile be a square? Why or why not?
- Name another quadrilateral with perpendicular diagonals and unequal side lengths.

### CASE STUDY 2



2. A Carpenter is designing a wooden photo frame.
- He decides to make it in the shape of a parallelogram instead of a rectangle to make it look more stylish.
- One side of frame is 12 cm and adjacent side is 8 cm.
- One interior angle is  $80^\circ$ .

Help him to calculate the following if he wants to finish the frame properly.

- The other three angles of the frame.
- Perimeter of the frame.
- What is the specialty of diagonals of parallelogram?
- If all sides of frame are equal, name the quadrilateral.

## ANSWERS

### MCQ

1. Sum of interior angles of a quadrilateral =  $360^\circ$ .

$$\Rightarrow 80^\circ + 100^\circ + 70^\circ + x = 360^\circ \Rightarrow x = 110^\circ.$$

(b)  $110^\circ$

2. (d) All are true

3. (c) Square

4. (c) All angles are equal

5. a) TM = 12 cm

6. (a)  $72^\circ$ ,  $108^\circ$

7. (b) Trapezium

8. (b) Adjacent angles

9. (c) A is true but R is false

10. (d) A is false but R is true

### Section B

1. One angle of a quadrilateral is  $120^\circ$ .

Let the measure of each of the three equal angles be  $x$ .

According to the question,  $120^\circ + x + x + x = 360^\circ$  (by angle sum property)

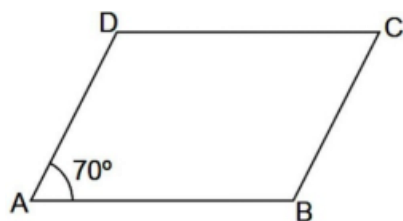
$$\Rightarrow 120^\circ + 3x = 360^\circ \Rightarrow 3x = 360^\circ - 120^\circ$$

$$\Rightarrow x = 240/3 = 80^\circ$$

Therefore, measure of each of the remaining three equal angles is  $80^\circ$ .

2. Correct construction by drawing perpendicular bisectors

3. One angle of a parallelogram is of measure  $70^\circ$ . Find the measure of the remaining angles of the parallelogram.



Ans: Let ABCD be a parallelogram and  $\angle A = 70^\circ$ .

Since opposite angles of a parallelogram are equal,

$$\therefore \angle C = \angle A = 70^\circ$$

Now  $AD \parallel BC$  and  $AB$  is a transversal which intersects them at  $A$  and  $B$  respectively,

$$\therefore \angle A + \angle B = 180^\circ$$

[ $\because$  Sum of the interior angles on the same side of the transversal is  $180^\circ$ ]

$$\Rightarrow 70^\circ + \angle B = 180^\circ$$

$$\Rightarrow \angle B = 180^\circ - 70^\circ = 110^\circ$$

Also  $\angle D = \angle B$  [ $\because$  Opposite angles of a parallelogram are equal] So,  $\angle D = 110^\circ$

$$4 \quad x + 2x + 4x + 5x = 360^\circ$$

$$x = 30^\circ$$

Angles  $30^\circ, 60^\circ, 120^\circ, 150^\circ$

#### 5. Isosceles Trapezium

### Section C

1. We know that opposite angles of a parallelogram are equal in measure.

$$\therefore \angle A = \angle C$$

$$\Rightarrow 2x + 50^\circ = 3x + 40^\circ$$

$$\Rightarrow 2x - 3x = 40^\circ - 50^\circ$$

$$\Rightarrow -x = -10^\circ \Rightarrow x = 10^\circ$$

(ii) Since  $x = 10^\circ$ , then  $\angle A = 2x + 50^\circ = 2(10^\circ) + 50^\circ = 20^\circ + 50^\circ = 70^\circ$

$$\angle C = 3x + 40^\circ = 3(10^\circ) + 40^\circ = 30^\circ + 40^\circ = 70^\circ$$

Also  $\angle A + \angle B = 180^\circ$  [ $\because$  Sum of the interior angles on the same side of the transversal is  $180^\circ$ ]

$$\Rightarrow 70^\circ + \angle B = 180^\circ$$

$$\Rightarrow \angle B = 180^\circ - 70^\circ = 110^\circ$$

Now  $\angle B = \angle D$  [ $\because$  Opposite angles of a parallelogram are equal] As  $\angle B = 110^\circ$ , so  $\angle D = 110^\circ$

2. Since, the diagonals of a rectangle are equal, therefore,  $AC = BD$  ... (i) Also, the diagonals of a rectangle bisect each other at  $O$ .

Therefore,  $OA = \frac{1}{2} \times AC$  and  $OB = \frac{1}{2} \times BD$  ... (ii) From (i) and (ii), we get  $OA = OB$

$$\Rightarrow 3x + 1 = 2x + 4$$

$$\Rightarrow 3x - 2x = 4 - 1 \Rightarrow x = 3$$

3. From the given figure,

$$\angle BAD = 30^\circ$$

$\angle BCD = 30^\circ \dots$  [ $\because$  opposite angles of parallelogram are equal] Now, let us consider the triangle CBD

From angle sum property,  $\angle DBC + \angle BCD + \angle CDB = 180^\circ$   $90^\circ + 30^\circ + \angle CDB = 180^\circ$

$$120^\circ + \angle CDB = 180^\circ$$

$$\angle CDB = 180^\circ - 120^\circ$$

$$\Rightarrow \angle CDB = 60^\circ$$

$\therefore \angle BEC = 60^\circ$ , because opposite angles of parallelogram are equal.

4. GUNS is a parallelogram and we know that opposite sides of a parallelogram are equal. Hence,  $GU = SN$  and  $GS = UN$

$$\Rightarrow 3y - 1 = 26$$

$$\Rightarrow 3y = 26 + 1$$

$$\Rightarrow 3y = 27 \Rightarrow y = 27/3 \Rightarrow y = 9 \text{ Now, } GS = UN$$

$$\Rightarrow 3x = 18 \Rightarrow x = 18/3 \Rightarrow x = 6 \text{ Hence, } \mathbf{x = 6, y = 9}$$

5 RUNS, is a parallelogram and we know that diagonals of a parallelogram bisect each other. US and RN are diagonals

$$\therefore RO = ON \text{ and } SO = OU$$

$$\Rightarrow SO = OU$$

$$\Rightarrow 20 = x + 7$$

$$\Rightarrow x = 20 - 7 \Rightarrow x = 13 \text{ } RO = ON$$

$$\Rightarrow 16 = x + y$$

$$\Rightarrow 16 = 13 + y$$

$$\Rightarrow 13 + y = 16$$

$$\Rightarrow y = 16 - 13 \Rightarrow y = 3 \text{ Hence, } \mathbf{x = 13, y = 3}$$

### **CASE STUDY**

1. (a) The tile is a rhombus.

(b) Two properties:

(i) All sides are equal in length.

ii) Diagonals bisect each other at  $90^\circ$ , but they are not of equal length.

(c) No, it cannot be a square because although a square also has equal sides and perpendicular diagonals, a square's diagonals are always equal.

(d) A kite is another quadrilateral with perpendicular diagonals, but its adjacent sides are only equal in pairs, not all sides.

2 1.  $80^\circ, 100^\circ, 100^\circ$

2. Perimeter =  $12 + 12 + 8 + 8 = 40\text{cm}$

3. Diagonals bisect each other

4. Rhombus

---

## **Chapter 4. Quadrilaterals**

### **Worksheet No. 2**

#### **Section A-MCQ**

- A. Multiple Choice Questions (1 mark each)
1. Name the quadrilateral whose diagonals bisect each other at right angles →  
(a) Rhombus (b) Rectangle (c) Square (d) Kite
  2. A quadrilateral with one pair of opposite sides parallel and equal →  
(a) Parallelogram (b) Trapezium (c) Kite (d) Rhombus
  3. In a rhombus, opposite angles are —  
(a) equal (b) supplementary (c)  $90^\circ$  (d) unequal
  4. In an isosceles trapezium, diagonals are —  
(a) equal (b) perpendicular (c) bisect each other (d) unequal
  5. A quadrilateral with all sides equal and one right angle is called ..... →  
(a) Square (b) Rhombus (c) Kite (d) Rectangle
  6. Diagonals of a kite are —  
(a) equal (b) perpendicular (c) not bisecting (d) equal and bisecting
  7. If diagonals of a parallelogram are equal, the parallelogram is a —  
(a) Rectangle (b) Rhombus (c) Kite (d) Trapezium
  8. Which shape has both diagonals equal and perpendicular?  
(a) Square (b) Rhombus (c) Parallelogram (d) Rectangle
  9. If one angle of a parallelogram is right, the figure is a —  
(a) Rectangle (b) Square (c) Rhombus (d) Kite
  10. The diagonals of a rhombus divide it into —  
(a) congruent triangles (b) unequal triangles (c) scalene triangles (d) none

#### **Section B- 2 Marks Question**

1. A rhombus has diagonals 24 cm and 10 cm. Find its side.
2. Draw a rough figure of a kite and mark the equal sides and right-angle intersection of diagonals.
3. In a rectangle, the diagonal is 10 cm and one side is 6 cm. Find the other side.
4. A trapezium has parallel sides 12 cm and 8 cm, height 5 cm. Find its area.
5. Explain why a parallelogram is not necessarily a rectangle.

#### **Section C- 3 Marks Question**

1. A square has side 8 cm. Find its diagonals and area. Show that the diagonals bisect each other at  $90^\circ$ .

2. Prove that a rhombus with one right angle is a square.
3. The diagonals of a kite are 15 cm and 10 cm. Find its area and show triangles formed are congruent.
4. In a parallelogram, show that the sum of any two adjacent angles is  $180^\circ$  using parallel lines.
5. A painter makes a frame in the shape of a trapezium with parallel sides 20 cm and 30 cm and height 10 cm. Find area and comment if the frame can be made rectangular.

### **Section- D -Case Study Questions**

Case 1: A park is shaped like a rhombus with diagonals 40 m and 30 m.

- a) Find the area of the park. b) Find each side. c) If grass costs ₹10/m<sup>2</sup>, find total cost. d) Which properties make it a rhombus?

Case 2: A rectangular classroom floor measures 9 m × 12 m. A carpet in shape of a square covers the centre leaving equal gaps on all sides.

- a) Find the side of the carpet if gap = 1.5 m. b) Find carpet area. c) Find uncovered floor area. d) Is the carpet similar to the floor? Why?

### **Answers**

#### **MCQ:**

- 1.a 2.a 3.a 4.a 5.a 6.b 7.a 8.a 9.a 10.a

#### **Section-B.**

- 1) 13 cm
- 2) figure with adjacent equal sides &  $\perp$  diagonals
- 3) other side=8 cm
- 4)  $\frac{1}{2} \times (12+8) \times 5 = 50 \text{ cm}^2$
- 5) because all angles may not be  $90^\circ$ .

#### **Section-C.**

- 1) diagonal= $8\sqrt{2}$  cm; area= $64 \text{ cm}^2$ ; diagonals  $\perp$  and bisect each other.
- 2) Right angle  $\rightarrow$  all sides equal  $\rightarrow$  all angles  $90^\circ \Rightarrow$  square.
- 3) Area= $\frac{1}{2} \times 15 \times 10 = 75 \text{ cm}^2$ ; triangles congruent by RHS.
- 4)  $\angle A + \angle B = 180^\circ$  (alternate interior angles).
- 5) Area= $\frac{1}{2} \times (20+30) \times 10 = 250 \text{ cm}^2$ ; cannot be rectangle as sides  $\neq$  equal.

#### **Section-D (Case Study).**

1) Area =  $\frac{1}{2} \times 40 \times 30 = 600 \text{ m}^2$ ; side =  $\sqrt{(20^2 + 15^2)} = 25 \text{ m}$ ; cost =  $600 \times 10 = ₹6000$ ; sides equal, diagonals  $\perp \Rightarrow$  rhombus.

2) Carpet side =  $12 - 2 \times 1.5 = 9 \text{ m}$ ; carpet area =  $81 \text{ m}^2$ ; uncovered =  $108 - 81 = 27 \text{ m}^2$ ; yes, both rectangular  $\rightarrow$  similar shapes.

## **Chapter 4. Quadrilaterals**

### **Worksheet No. 3**

#### **Section A-MCQ**

1. A carpenter is building a rectangular door frame. To ensure the frame is a perfect rectangle (and not a parallelogram), he checks two properties. Which combination of properties is essential to guarantee the frame is a rectangle?
  - a) Opposite sides are equal and all four angles are  $90^\circ$ .
  - b) All four sides are equal and diagonals are perpendicular.
  - c) Opposite sides are parallel and diagonals are equal.
  - d) Diagonals bisect each other and adjacent sides are equal.
  
2. A surveyor measures the boundary of a small land plot shaped like a trapezium where two opposite sides are parallel. If one non-parallel side makes an angle of  $110^\circ$  with the parallel base, what is the measure of the adjacent angle on the same non-parallel side?
  - a)  $110^\circ$
  - b)  $90^\circ$
  - c)  $70^\circ$
  - d)  $180^\circ$
  
3. A carpenter cuts a wooden board into the shape of a parallelogram. What remains constant if he slants it further?
  - a) Angle
  - b) Length of sides
  - c) Height
  - d) None
  
4. In a children's park, a walking track is shaped like a parallelogram. If two opposite turning angles are  $(2x + 10)$  and  $(3x - 50)$ , what is the measure of one of these angles?
  - a)  $60^\circ$
  - b)  $130^\circ$
  - c)  $70^\circ$
  - d)  $90^\circ$
  
5. Which of the following is always a property of a parallelogram? a) A piece of fabric is cut in the shape of a square. Which of the following statements about the fabric piece is false?
  - a) It is a rectangle.
  - b) It is a rhombus.
  - c) Its diagonals are perpendicular bisectors of each other.
  - d) Its diagonals are unequal.

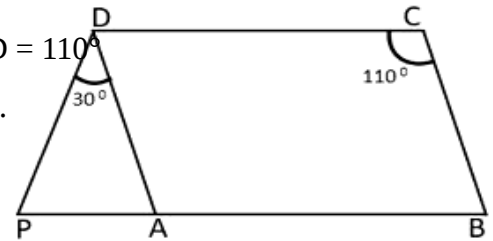
6. A jeweler is cutting a precious stone into a shape that is both a rhombus and a rectangle. What shape must the cut stone be?

- a) Trapezium                      b) Parallelogram                      c) Square                      d) Kite

7. In a parallelogram ABCD,  $\angle A$  is 4 times  $\angle B$ . Find the value of  $\angle A$  and  $\angle B$ .

- a)  $\angle A = 136^\circ$  and  $\angle B = 45^\circ$                       b)  $\angle A = 125^\circ$  and  $\angle B = 55^\circ$   
c)  $\angle A = 140^\circ$  and  $\angle B = 40^\circ$                       d)  $\angle A = 144^\circ$  and  $\angle A = 36^\circ$

8. In the below given figure ABCD is a parallelogram,  $\angle BCD = 110^\circ$  and BA is extended to point P such that  $\angle ADP = 30^\circ$ . Find  $\angle APD$ .



- a)  $72^\circ$                       b)  $62^\circ$   
c)  $80^\circ$                       d)  $52^\circ$

9. A construction team lays out four posts in a quadrilateral shape. They check that the opposite sides are equal 5 m and 8m but they find that the diagonals are *not* equal. Which quadrilateral shape did they form?

- a) Square                      b) Rectangle                      c) Rhombus                      d) Parallelogram

10. In a warehouse layout, a path is marked in a parallelogram shape. If one angle of the parallelogram is exactly half the size of its adjacent angle, what is the measure of the smaller angle?

- a)  $45^\circ$                       b)  $90^\circ$                       c)  $60^\circ$                       d)  $120^\circ$

### **Section B ( 2 marks questions)**

11. A rectangular garden has two opposite lamps exactly across from each other. How can you prove the path between them passes through the garden's center without measuring?

12. A farmer marks the boundary of his field using ropes in a quadrilateral shape. He finds opposite sides parallel. What shape is the field, and how can he confirm it without measuring all sides?

13. Two parallel railway tracks are intersected by a connecting service road, forming a trapezium section. If the angle formed between the service road and the first track is  $125^\circ$ , find the measure of the interior angle formed between the service road and the second track on the same side.

14. A municipal team uses custom tiles shaped like a rhombus for a pavement design. If one corner (internal angle) of a tile measures  $105^\circ$ , what is the measure of the opposite corner angle of the same tile? Justify your answer with a property.

15. A metal worker is welding the corner braces for a rectangular frame that has accidentally warped into a parallelogram. He measures one acute interior angle as  $75^\circ$ . What is the measure of the adjacent obtuse angle? Show the property used.

### **Section C (3 marks questions)**

16. A reading lamp stand is built with an adjustable arm that maintains a parallelogram shape, PQRS. The diagonal supports PR and QS intersect at O. If  $PO = 4x - 1$  and  $OR = 3x + 5$ , and the total length of the diagonal QS is 34 cm, find: a) The value of x. b) The length of the diagonal PR.

17. A decorative metal truss is built in the shape of a parallelogram, ABCD, with its diagonals AC and BD intersecting at point O. Given that  $\angle DAB = 110^\circ$  and  $\angle CAB = 30^\circ$ . Find the measure of  $\angle DBC$ .

18. A roof support structure forms an isosceles trapezium where the non-parallel sides are equal. The parallel supports are AB and DC. If  $\angle DAB = 5y - 20$  and  $\angle ADC = 3y + 40$ , find the value of y and the measure of  $\angle DAB$ .

19. Draw a Venn diagram showing the set of parallelograms, kites, rhombuses, rectangles, and squares. Then, answer the following questions—

(i) What is the quadrilateral that is both a kite and a parallelogram?

(ii) Can there be a quadrilateral that is both a kite and a rectangle?

(iii) Is every kite a rhombus? If not, what is the correct relationship between these two types of quadrilaterals?

20. A decorator designs a series of banner flags shaped like a parallelogram, DEFG and a diagonal DF is drawn.

Given:  $\angle EDF = 35^\circ$  and  $\angle DFE = 45^\circ$ .

a) Find the measure of  $\angle DEF$ .

b) Find the measure of  $\angle EDG$ .

c) Find the measure of  $\angle DGF$  and  $\angle GFE$ .

### Section D ( CASE STUDY)

21. A carpenter is designing an adjustable gate ABCD in the shape of a rhombus . The adjacent sides AB and BC are 1.5 m long. The gate is fixed such that AC is the main support diagonal, which is 2.4m. Based on the properties of a rhombus, answer the following questions:



- What is the length of side CD and the diagonal BD? (1Mark)
- If the diagonals AC and BD intersect at point O, what is the length of AO? (1Marks)
- What is the measure of the angle  $\angle AOB$ ? (2Marks)

22. Riya uses an adjustable laptop stand whose main support structure PQRS is always maintained as a Parallelogram to ensure stability when adjusting the height. The links PQ and RS are parallel, and PS and QR are parallel. The diagonal links PR and QS intersect at O.

Based on the properties of the parallelogram structure, answer the following questions:

- If  $PQ = 25\text{cm}$  and  $QR = 15\text{ cm}$ , what are the lengths of the opposite sides RS and PS? (1 Marks)
- If  $\angle SPQ = 115^\circ$ , find the measure of  $\angle PQR$  . (1Marks)
- If the diagonal  $PR = 40\text{ cm}$ , what is the length of the segment OR? (2 Marks)



### ANSWERS

#### **Section A**

- a) Opposite sides are equal and all four angles are  $90^\circ$ .
- c)  $70^\circ$ .
- b) Length of sides.
- b)  $130^\circ$ .
- d) Its diagonals are unequal.
- c) Square.

7. d)  $\angle A = 144^\circ$ ,  $\angle B = 36^\circ$ .

8. c)  $80^\circ$ .

9. d) Parallelogram.

10. c)  $60^\circ$ .

### **Section B**

11. In a rectangle, diagonals bisect each other and meet at the centre, so the path passes through the garden's centre.

12. Opposite sides parallel  $\Rightarrow$  parallelogram. Confirm by checking diagonals bisect each other.

13. Angles on same side of transversal are supplementary  $\Rightarrow 180^\circ - 125^\circ = 55^\circ$ .

14. Opposite angles of a rhombus are equal  $\Rightarrow$  opposite angle =  $105^\circ$ .

15. Adjacent angles of a parallelogram are supplementary  $\Rightarrow 180^\circ - 75^\circ = 105^\circ$ .

### **Section C**

16. (a)  $4x - 1 = 3x + 5 \Rightarrow x = 6$ . (b) PO = 23 cm, PR = 46 cm.

17.  $\angle DAB = 110^\circ$ ,  $\angle CAB = 30^\circ$ ,  $\angle ABC = 70^\circ$ .  $\angle DBC = 80^\circ$ .

18.  $(5y - 20) + (3y + 40) = 180 \Rightarrow y = 20 \Rightarrow \angle DAB = 80^\circ$ .

19. (i) Rhombus (both kite and parallelogram). (ii) Square (both kite and rectangle). (iii) Not every kite is a rhombus.

20. a) Find  $\angle DEF$  (in triangle DFE)

In triangle DFE:

$$\angle DEF = 180^\circ - (\angle EDF + \angle DFE) = 180^\circ - (35^\circ + 45^\circ) = 100^\circ$$

So,  $\angle DEF = 100^\circ$ .

b) In parallelogram DEFG:  $DE \parallel FG$  and  $EF \parallel DG$ .

Opposite angles are equal and adjacent angles are supplementary.

$\angle DGF$  (angle at G) is opposite  $\angle DEF$ . So,  $\angle DGF = \angle DEF = 100^\circ$ .

Also, adjacent angles are supplementary, so:

$$\angle EDG + \angle DEF = 180^\circ$$

$$\angle EDG = 180^\circ - 100^\circ = 80^\circ$$

So,  $\angle EDG = 80^\circ$ .

c) Finally,  $\angle GFE$  (angle at F) is opposite  $\angle EDG$ .

Hence,  $\angle GFE = 80^\circ$ .

### **Section D – Case Study Questions**

21. (a) CD = 1.5 m, BD = 1.8 m. (b) AO = 1.2 m. (c)  $\angle AOB = 90^\circ$

22. (a) RS = 25 cm, PS = 15 cm. (b)  $\angle PQR = 65^\circ$ . (c) OR = 20 cm.

## **Chapter 5. Number Play**

### **Worksheet No. 1**

#### **Section A-MCQ**

1. The sum of any four consecutive numbers is always  
(a) odd (b) even (c) prime (d) zero
2. Which of the following arithmetic expression is even?  
(a)  $119 \times 303$  (b)  $513^3$  (c)  $4 \times 347 \times 3$  (d)  $708 - 477$
3. What is the remainder when  $491 + 353$  is divided by 7?  
(a) 1 (b) 2 (c) 3 (d) 4
4. The sum of five consecutive numbers is 210. What is the middle number?  
(a) 40 (b) 35 (c) 30 (d) 25
5. I am the smallest number divisible by both 12 and 16 but not by 7? Who am I?  
(a) 32 (b) 48 (c) 96 (d) 36
6. A number leaves a remainder 4 when divided by 7 and leaves a remainder 2 when divided by 9. Which of the following could be that number?  
(a) 53 (b) 58 (c) 60 (d) 56
7. If  $87x45$  is divisible by 3, then what is the smallest value of  $x$ ?  
(a) 0 (b) 1 (c) 2 (d) 3
8. The sum of three consecutive even numbers will be divisible by:  
(a) 4 (b) 5 (c) 6 (d) 7
9. What is the digital root of the number 984637?  
(a) 1 (b) 2 (c) 3 (d) 4
10. The expression  $9(5p+7) - 6(7p+10)$  is a multiple?  
(a) 5 (b) 2 (c) 3 (d) 4

#### **Section B -2 Marks Questions**

11. Write an algebraic expression for a number that leaves remainder 4 when divided by 6?
12. The sum of four consecutive numbers is 42. What are these numbers?
13. Find out any two numbers, one is divisible by 4 and one is divisible by 7 such that their sum is 48.

14. Find the multiple of 9 that is closest to the number 8000.
15. Find the smallest three digit multiple of 6 with no odd digits.

### Section C -3 Marks Questions

16. How many multiples of 8 are there between the numbers 7500 and 7600?
17. If  $GH \times H = 9K$ , then find the values of  $G, H$  and  $K$ .
18. If  $48a23b$  is a multiple of 18, list all possible pairs of values for  $a$  and  $b$ .
19. Draw a Venn diagram showing the relationship between the multiples of 3, 6 and 18.
20. Find three consecutive numbers such that the first number is a multiple of 7, the second number is a multiple of 8 and the third number is a multiple of 9.

### Section D -Case Study Questions

#### 21. Finding the Password

Rimon, a student of class 8 uses smartphone a lot. Her dad put a 4-digit password so that she can't unlock and use it. Rimon requested her dad to tell her the password. Her dad was a maths teacher. He gave her the details of the password and asked her to find out the password on her own.



The details of the password are given below:

One's digit: The digital root of 451873.

Tens digit: The smallest value of  $y$  in  $8965y6$  divisible by 4.

Hundreds digit: LCM of smallest prime number and smallest composite number.

Thousands digit: I am a two digit number whose sum of digits is 8 and 7 is one of its factors. The other factor is the thousands digit. What is the other factor?

Answer the following questions based on the above details:

What is the fifth multiple of the hundreds digit?

- (i) What is the reciprocal of the thousands digit?
- (ii) What is the password?
- (iii) What is the sum of the digits of the password?

## 22. Lottery Game

A lottery game was conducted to decide the class monitor, deputy class monitor, uniform monitor and whiteboard monitor among four most eligible students of class 8. Each of them were given four different numbers randomly.



Rules for the game are given below:

| POST                 | Criteria                         |
|----------------------|----------------------------------|
| Class monitor        | Number should be divisible by 7  |
| Deputy Class monitor | Number should be divisible by 3  |
| Uniform monitor      | Number should be divisible by 4  |
| Whiteboard monitor   | Number should be divisible by 11 |

Details of the numbers received by the candidates are given below:

| Name of the student | Lottery Number |
|---------------------|----------------|
| Neslan              | 45196          |
| Tovino              | 109703         |
| Dalquer             | 33897          |
| Kalyani             | 679            |

Based on the above information, answer the following questions:

- (i) Who will become the class monitor?
- (ii) Who will become the deputy class monitor?
- (iii) Who will become the uniform monitor?
- (iv) Who will become the whiteboard monitor?

## **Chapter 5. Number Play**

### **Worksheet No. 2**

#### **Section A-MCQ**

1. If  $4x7y$  is divisible by 36, what are the possible pairs for  $x$  and  $y$ ?  
a. (1, 8)                      b. (2, 4)                      c. (1, 6)                      d. (3, 9)
2. Find three consecutive numbers such that the first is a multiple of 7, the second is a multiple of 2, and the third is a multiple of 5. What is the smallest such set?  
a. 14, 15, 16                      b. 20, 21, 22                      c. 28, 22, 30                      d. 35, 36, 37
3. What is the remainder when 8723 is divisible by 9?  
a. 2                                      b. 3                                      c. 4                                      d. 5
4. Which of the following sums of digits will always be divisible by 3?  
a.  $5+9+3$                       b.  $4+7+8$                       c.  $3+6+9$                       d.  $2+5+7$
5. If the product of two numbers is a multiple of 10 and one number is 5, what can be said about the other number?  
a. Must be even                      b. Must be odd                      c. Must be multiple of 3                      d. Cannot be determined
6. The sum of five consecutive numbers is 95. What is the middle number?  
a. 17                                      b. 18                                      c. 19                                      d. 20
7. The digital root of the number is 8. What is the digital root of the number plus 12?  
a. 2                                      b. 3                                      c. 7                                      d. 9
8. A number leaves a remainder of 5 when divided by 7 and a remainder of 2 when divided by 9. Which of the following could be?  
a. 39                                      b. 47                                      c. 53                                      d. 61
9. Which of the following numbers is divisible by 11?  
a. 4686                                      b. 5678                                      c. 3742                                      d. 5416
10. Find the smallest number divisible by 6 and 8 but not by 5.  
a. 24                                      b. 48                                      c. 36                                      d. 60

### Section B-2 Marks Questions

1. Find four consecutive numbers whose sum is 94.
2. Write an algebraic expression for a number that leaves remainder 3 when divided by 5.
3. What is the smallest number divisible by 14 and 18?
4. When divided by 8, the number leaves a remainder of 5. Write an expression for such number.
5. Find the digital root of 8372.

### Section C-3 Marks Questions

1. Determine whether the statements below are “Always True”, “Sometimes True” or “Never True.” Explain your answer with examples and non-examples:
  - a. The sum of two multiples of 8 is always a multiple of 16.
  - b. If a number is divisible by 10 and 14, it is divisible by 140.
  - c. The sum of three consecutive even numbers is divisible by 6.
2. The middle number in a sequence of seven consecutive odd number is 43. Express the other numbers in terms of this middle number and find their sum.
3. Deepak claims, “There are several multiples of 13 which, when squared, are still multiples of 13. However, not all multiples of 13 when squared give multiples of 169.” Examine if Deepak’s claim is true and explain why.
4. Write five multiples of 42 between 30,000 and 40,000. Write down your approach to get the answer.
5. Find three consecutive integers such that the first number is a multiple of 8, the second number is two more than a multiple of 5, and the third number is a multiple of 19. Are there more such triplets? How often do they occur?

### Section D- Case Study Questions



She

1. Riya has a small bag of marbles. She plays a sorting game with them and observes something interesting:  
When she tries to group the marbles in **2s**, **one marble** is left over.  
When she groups them in **3s**, **two marbles** are left over.  
When she groups them in **5s**, **none are left** — the marbles fit perfectly.  
also knows the total number of marbles is **less than 80**.

**Answer the following questions:**

**(a)** Write down the mathematical conditions that represent Riya's observations.

(1 mark)

**(b)** What is the least number of marbles that satisfies the first two conditions (grouping by 2 and 3)?

(1 mark)

**(c)** Using all the conditions, find the total number of marbles Riya has. Show your reasoning clearly.(2 marks)

**Case study2**



2.

The students of PM SHRI KV Kollam collected **12,468 tickets** for their annual fair. They plan to divide the tickets equally among different stalls without leaving any remainder.

To decide how to divide them, they use **divisibility rules**.

**(a)** Using the rule of divisibility, check whether **12,468** is divisible by **2**.  
(1 mark)

**(b)** Using the rule of divisibility, check whether **12,468** is divisible by **3**.  
(1 mark)

**(c)** If the tickets are to be divided equally among **4 stalls**, will it be possible without any remainder? Justify your answer using the **divisibility rule of 4**.  
(2 marks)

**ANSWER**

**Multiple Choice Questions**

1. C
2. C
3. A
4. C
5. A
6. C
7. A
8. B
9. A

10. A

## **Section B**

1. 22, 23, 24, 25
2.  $5k + 3$
3. 126
4.  $8m + 5$
5. 2

## Section C

- |                                        |                   |                |
|----------------------------------------|-------------------|----------------|
| 1. a. Sometimes True                   | b. Sometimes True | c. Always True |
| 2. 37, 39, 41, 43, 45, 47, 49. Sum=301 |                   |                |
| 3. True                                |                   |                |
| 4. 30030, 30072, 30114, 30156, 30198   |                   |                |
| 5. 56, 57, 58; 280                     |                   |                |

## Case Study

1. a.  $2x + 1$ ,  $3y + 2$ ,                      b. 5, 11, 17, 23, 29, ...                      c. 65  
2. Yes, yes, yes

## Chapter 6. We Distribute, Yet Things Multiply

### Worksheet No. 1

#### Section A-MCQ

1.

Which of the following is an example of the distributive property of multiplication over addition?

- A)  $(a + b = b + a)$
- B)  $(a(b + c) = ab + ac)$
- C)  $((a + b) + c = a + (b + c))$
- D)  $(ab = ba)$

**Answer: B**

---

2.

Simplify using distributive property:  $(7(5 + 2))$

- A)  $35 + 2$
- B)  $7 \times 7$
- C)  $35 + 14$
- D) 49

**Answer: D**

---

3.

Which expression is equivalent to  $(3(x + 4) + 2(x + 4))$ ?

- A)  $(5x + 20)$
- B)  $(5(x + 4))$
- C)  $(3x + 8)$
- D)  $(x + 6)$

**Answer: B**

---

4.

Simplify:  $(6(2x - 3))$

- A)  $(12x + 3)$
- B)  $(12x - 3)$
- C)  $(12x - 18)$
- D)  $(8x - 9)$

**Answer: C**

---

5.

Which of the following shows the distributive property over subtraction?

- A)  $(a(b - c) = ab + ac)$
- B)  $(a(b - c) = ab - ac)$
- C)  $(a(b - c) = (a - b)c)$
- D)  $(a(b - c) = (b - c)a)$

**Answer: B**

---

**6.**

Simplify:  $(9 \times 105)$  using the distributive property.

- A)  $(9 \times (100 + 5) = 900 + 45 = 945)$
- B)  $(9 \times (100 + 5) = 905)$
- C)  $(9 \times (100 + 5) = 950)$
- D)  $(9 \times (100 + 5) = 1045)$

**Answer: A**

---

**7.**

Find the value of  $(25 \times 68 + 25 \times 32)$  using the distributive law.

- A)  $(25 \times 100 = 2500)$
- B)  $(25 \times 36 = 900)$
- C)  $(25 \times 40 = 1000)$
- D)  $(25 \times 60 = 1500)$

**Answer: A**

---

**8.**

Which of these correctly applies the distributive property to  $(4(3x + 2y - 5))$ ?

- A)  $(12x + 8y - 20)$
- B)  $(12x + 2y - 5)$
- C)  $(7x + 10y)$
- D)  $(12x - 8y - 5)$

**Answer: A**

---

**9.**

The distributive property helps to:

- A) Divide large numbers
- B) Simplify expressions and perform mental calculations
- C) Add fractions
- D) Subtract decimals

**Answer: B**

---

10. Simplify:  $(8(25 + 75))$  using distributive property.

- A)  $(8 \times 100 = 800)$
- B)  $(8 \times 50 = 400)$
- C)  $(8 \times 25 = 200)$
- D)  $(8 \times 150 = 1200)$

**Answer:** A

### **Section B-2 marks Questions**

1. Given that  $25 \times 39$  is 725. Without actual multiplication, find the product if

- (a) 25 is increased by 1
- (b) 29 is increased by 1
- (c) both 29 and 35 are increased by 1

2. Find the increment in the product of 36 and 48 if

- (a) 36 is increased by 2 and 48 is increased by 3
- (b) 36 is decreased by 3 and 48 is increased by 2
- (c) 36 is increased by 4 and 48 is increased by 12
- (d) 36 is decreased by 6 and 48 is decreased by 8.

(use identity 1)

3. Using the identity  $(a+b)^2$ , find the area of a square with side 45 cm.

4. Using the identity  $(a-b)^2$ , find the area of a square with side length 49 cm.

5. Using the identity  $(a + b)(a - b)$ , find the area of a rectangle with length 62 cm and breadth 58 cm.

6. a and b are any two integers. Check if,

- (i)  $(a+b)^2$  is always greater than  $a^2 + b^2$
- (ii)  $(a-b)^2$  is always smaller than  $a^2 + b^2$

### **Section C-3 marks Questions**

7. Take a pair of natural numbers. Calculate the sum of their squares. Write twice this sum as a sum of two squares.

8. Check each of the multiplication and see if there is a mistake. If you find it wrong, then write the correct expression.

(i)  $\frac{1}{3}(3x + 6) + 5 = x + 7$

(ii)  $(4m + 3n)^2 = 16m^2 + 9n^2$

(iii)  $5a(3b \times 4c) = 15ab \times 4c$

(iv)  $11u^2 + 5u = 16u^2$

9. For each statement, write an appropriate algebraic expression;

(a) Three more than a square number

(b) The sum of the squares of three consecutive numbers.

10. A number leaves a remainder 2 when divided by 5 and another number leaves a remainder 3 when divided by 5. Find the remainder when their sum, difference and product are divided by 5?

11. Which is larger? Find out without fully computing the product.

$15 \times 25$  or  $16 \times 23$

12. Find three examples where the product of two numbers remains unchanged when one of them is increased by 4 and the other is decreased by 2.

13. Apply distributive property to find;

(a)  $524 \times 1001$

(b)  $471 \times 999$

(c)  $258 \times 401$

14. Find  $106^2$  and  $999^2$  using appropriate identity

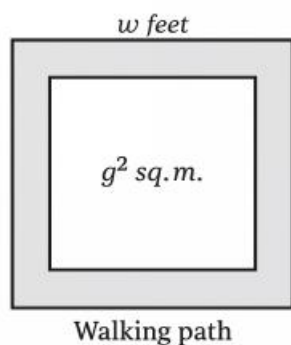
### Section D- Case Study Questions

15. A park is coming up in a city. The plan is shown in the figure. A square plot, of area  $g^2$  sq.m, will have a green cover. All the remaining area is a walking path  $w$  feet wide that needs to be filled.

(a) Write an expression for the side of the park

(b) Write an expression for the area of the park.

© Write an expression for the area that needs to be filled.



### Case Study: Building a Wall

A contractor is building a rectangular wall using small **bricks**.

Each brick is of size **l cm × b cm**, and the wall has **(p + q)** rows and **(r + s)** columns of bricks.

To find the **total area covered by the wall**, using algebraic expressions.

**Answer the following questions:**

**Q1.** Expand  $((p + q)(r + s))$  using the **distributive property**.

**Q2.** If  $(p = 10)$ ,  $(q = 2)$ ,  $(r = 8)$ , and  $(s = 3)$ , find the total number of bricks

**Q3.** If each brick is of size 20cm and 10 cm, Find the **total area** of the wall.

**Q4.** If the cost of plastering is ₹0.25 per sq. cm, find the **total cost of plastering** the wall.

**Q5.** Explain in your own words how the distributive property helps in **quick calculation** of total area in such construction work.

---

### ANSWERS

1. (a) 764

(b) 750

(c) **790**

2.

(A) **210**

(b) -78

(C) **672**

(D) -528

3. To find the area, we need:  $45^2$  We will use the identity:  $(a + b)^2 = a^2 + 2ab + b^2$

Choose numbers that add up to 45.

A convenient choice is:  $45 = 40 + 5$

So let

$a = 40$  and  $b = 5$

**Using the identity**

$$45^2 = (40 + 5)^2$$

$$= 40^2 + 2(40)(5) + 5^2$$

Now calculate step-by-step:

- $40^2 = 1600$

- $2(40)(5) = 400$

- $5^2 = 25$

Add them:  $45^2 = 1600 + 400 + 25 = 2025$

**Area of the square = 2025 cm<sup>2</sup>**

4.)  $49 = 50 - 1$

$$49^2 = (50 - 1)^2$$

Apply the identity:  $(50 - 1)^2 = 50^2 - 2(50)(1) + 1^2$

Compute step-by-step:  $50^2 = 2500$

- $2 \times 50 \times 1 = 100$
- $1^2 = 1$

Now substitute:  $49^2 = 2500 - 100 + 1 = 2401$

**Area of the square = 2401 cm<sup>2</sup>**

5).  $62 \times 58 = (60 + 2)(60 - 2) = 60^2 - 2^2$   $62 \times 58 = 3600 - 4 = 3596$

6). Let **a** and **b** be any two integers.

We need to check: **(i) Is  $(a + b)^2$  always greater than  $a^2 + b^2$ ?**

Expand using the identity:

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

Compare with  $a^2 + b^2$ :  $(a + b)^2 = a^2 + b^2 + 2ab$

So,  $(a + b)^2 > a^2 + b^2$  iff  $2ab > 0$

That means: If  **$ab > 0$**   $\rightarrow$  both a and b have same sign  $\rightarrow$  **YES,  $(a + b)^2$  is greater**

- If  **$ab = 0$**   $\rightarrow$  one of them is zero  $\rightarrow (a + b)^2 = a^2 + b^2$
- If  **$ab < 0$**   $\rightarrow$  opposite signs  $\rightarrow (a + b)^2$  is smaller

**Conclusion:**

**No,  $(a + b)^2$  is not always greater than  $a^2 + b^2$ .**

It depends on the sign of ab.

---

**(ii) Is  $(a - b)^2$  always smaller than  $a^2 + b^2$ ?**

Expand:

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

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

So,  $(a - b)^2 < a^2 + b^2$  iff  $-2ab < 0 \Rightarrow ab > 0$

Meaning:

- If **a and b have same sign**, then  **$(a - b)^2$  is smaller**
- If  **$a = b$** ,  $(a - b)^2 = 0 < a^2 + b^2$  (true)

- If **a** and **b** have opposite signs, then  $(a-b)^2$  becomes **greater**

**Conclusion:**

**No,  $(a-b)^2$  is *not always* smaller than  $a^2 + b^2$ .**

Again, it depends on whether  $ab > 0$  or  $ab < 0$ .

**Final Summary**

**Condition  $(a + b)^2$  vs  $a^2 + b^2$   $(a - b)^2$  vs  $a^2 + b^2$**

|                               |         |                  |
|-------------------------------|---------|------------------|
| <b><math>ab &gt; 0</math></b> | Greater | Smaller          |
| <b><math>ab = 0</math></b>    | Equal   | Greater or equal |
| <b><math>ab &lt; 0</math></b> | Smaller | Greater          |

**7.) Step 1: Take any pair of natural numbers**

Let's choose a simple pair:

$$a=3, b=4$$

**Step 2: Calculate the sum of their squares**

$$a^2 + b^2 = 3^2 + 4^2 = 9 + 16 = 25$$

**Step 3: Write twice this sum**

$$2(a^2 + b^2) = 2 \times 25 = 50$$

**Step 4: Express this number as a sum of two squares**

We will use a known identity:  $2(a^2 + b^2) = (a+b)^2 + (a-b)^2$

Now calculate:

$$(a + b)^2, (3+4)^2 = 7^2 = 49$$

$$(a - b)^2, (3-4)^2 = (-1)^2 = 1$$

$$\text{Now add: } 49 + 1 = 50$$

So we have expressed 50 as a sum of two squares.

**Final Answer**

For the natural numbers **3 and 4**:

- Sum of squares = 25
- Twice this sum = 50
- Written as a sum of two squares:

$$50 = 7^2 + 1^2$$


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## Chapter 6. We Distribute, Yet Things Multiply

### Worksheet No. 2

#### Section A-MCQ

1. The distributive property of multiplication over addition is represented by which of the following?

- A)  $a(b + c) = ab + ac$
- B)  $a(b + c) = ab - ac$
- C)  $a(b + c) = (a + b)c$
- D)  $a(b + c) = b(a + c)$

**Answer: A)  $a(b + c) = ab + ac$**

2. Simplify using distributive property:  $18 \times 12 + 18 \times 8$ .

- A) 360
- B) 540
- C) 300
- D) 420

**Answer: A) 360**

3. Which of these is the correct expansion of  $(a + b)^2$ ?

- A)  $a^2 + b^2$
- B)  $a^2 + 2ab + b^2$
- C)  $a^2 - 2ab + b^2$
- D)  $a^2 - b^2$

**Answer: B)  $a^2 + 2ab + b^2$**

4. The identity  $(a + b)(a - b)$  equals which expression?

- A)  $a^2 + b^2$
- B)  $a^2 - b^2$
- C)  $(a + b)^2$
- D)  $a^2 + 2ab + b^2$

**Answer: B)  $a^2 - b^2$**

5. The product  $(x + 3)(x - 2)$  expands to:

- A)  $x^2 + x - 6$

B)  $x^2 - x - 6$

C)  $x^2 + 6x - 6$

D)  $x^2 - 5x + 6$

**Answer: A)  $x^2 + x - 6$**

6. Which of the following is NOT a valid algebraic identity?

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

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

C)  $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

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

**Answer: D)  $(a + b)^2 = a^2 + b^2 + 2a$**

7. Use a suitable identity to find  $102 \times 98$ . Which identity is most suitable?

A)  $(a + b)^2$

B)  $(a - b)^2$

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

D)  $(a + b)(c + d) = ac + ad + bc + bd$

**Answer: C)  $(a + b)(a - b) = a^2 - b^2$**

8. The expansion of  $(2x + 3y)^2$  equals:

A)  $4x^2 + 12xy + 9y^2$

B)  $4x^2 + 6xy + 9y^2$

C)  $4x^2 - 12xy + 9y^2$

D)  $2x^2 + 9y^2 + 12xy$

**Answer: A)  $4x^2 + 12xy + 9y^2$**

9. If  $(x + 4)(x - 6) = 0$ , then the values of  $x$  are:

A) 4 and 6

B) -4 and 6

C) -4 and 6

D) -4 and 6

**Answer: C) -4 and 6**

10. Which identity helps compute  $99 \times 101$  quickly?

A)  $(a + b)^2$

B)  $(a - b)^2$

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

D)  $(a + b)^3$

**Answer: C)  $(a + b)(a - b) = a^2 - b^2$**

### **Section B – 2-Mark Questions**

11. Use the distributive property to evaluate  $125 \times 96$ .
12. Expand and simplify  $(x + 7)(x - 3)$ .
13. Simplify  $(a + b)^2 - (a - b)^2$  using a suitable identity.
14. If the side of a square is  $(x + 4)$  m, find its area.
15. Using a suitable identity, find  $(98)^2$ .

### **Section C – 3-Mark Questions**

16. A rectangular garden has length  $(3x + 2)$  m and breadth  $(x + 4)$  m. Find its area and perimeter in terms of  $x$ .
17. Verify the identity  $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$  for  $a = 4$ ,  $b = 3$ .
18. A path of 1 m width runs around a square park of side  $(x + 3)$  m. Find the area of the path.
19. The cost of a notebook is ₹ $(x + 2)$  and that of a pen is ₹ $(x - 1)$ . Find the total cost of 4 notebooks and 3 pens.
20. Two numbers are each decreased by 2. If the original product was  $ab$ , find how much the new product decreases.

### **Section D – Case based Questions**

21. A teacher arranges algebra tiles in square shape. She increased the one of the side of square by 2 units and other side by 3 units.

Write the expression for the total area.

(a) Expand it.

(c) If  $x=4$ , find numerical value.

22. An array of boxes: label number of boxes  $(n+2)$  and per-box items  $(x+3)$ . School prepares  $(n+2)$  gift boxes, each containing  $(x+3)$  items.

(a) Write total items and expand.

(b) If there are  $n=3, x=4$  compute total.

(c) If 1 extra item is added to every box, write new total and compute.

Answers :

$$(a) \text{ Total} = (n+2)(x+3) = nx + 3n + 2x + 6.$$

$$(b) n=3, x=4: \text{ total} = (3+2)(4+3) = 5 \cdot 7 = 35 \text{ items.}$$

$$(c) \text{ New per box} = x+4 \Rightarrow \text{ new total } (n+2)(x+4).$$

For given values:  $5 \times 8 = 40$ , an increase of 5 items.

## Answers

### Section B

$$11). 96 = (100 - 4).$$

$$125 \times 96 = 125 \times (100 - 4) = 125 \times 100 - 125 \times 4.$$

$$125 \times 100 = 12500 \text{ and } 125 \times 4 = 500.$$

$$12500 - 500 = 12000.$$

$$12) x + 7)(x - 3) = x \times x + x \times (-3) + 7 \times x + 7 \times (-3).$$

$$= x^2 - 3x + 7x - 21.$$

$$= x^2 + 4x - 21.$$

$$13). \text{Use identities: } (a + b)^2 = a^2 + 2ab + b^2 \text{ and } (a - b)^2 = a^2 - 2ab + b^2.$$

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

$$= 2ab - (-2ab) = 4ab.$$

$$14). \text{Area of square} = (\text{side})^2.$$

$$\text{Area} = (x + 4)^2 = x^2 + 8x + 16.$$

$$= x^2 + 8x + 16.$$

$$15). 98 = (100 - 2).$$

$$(98)^2 = (100 - 2)^2 = 100^2 - 2 \times 100 \times 2 + (2)^2.$$

$$= 10000 - 400 + 4 = 9604$$

### **Section C**

$$16.) \text{Area} = \text{length} \times \text{breadth} = (3x + 2)(x + 4).$$

$$= 3x \times x + 3x \times 4 + 2 \times x + 2 \times 4$$

$$= 3x^2 + 12x + 2x + 8.$$

$$= 3x^2 + 14x + 8.$$

$$\text{Perimeter} = 2(\text{length} + \text{breadth})$$

$$= 2[(3x + 2) + (x + 4)]$$

$$= 2(4x + 6) = 8x + 12.$$

$$17.) (a + b)^2 = (4 + 3)^2 = 7^2 = 49.$$

$$(a - b)^2 = (4 - 3)^2 = 1^2 = 1.$$

$$\text{LHS} = 49 + 1 = 50.$$

$$\text{RHS} = 2(a^2 + b^2) = 2(16 + 9) = 2 \times 25 = 50.$$

$$\text{LHS} = \text{RHS} = 50.$$

Identity verified.

$$18.) \text{Outer side} = (x + 3) + 2 \times 1 = x + 5.$$

$$\text{Area of outer square} = (x + 5)^2 = x^2 + 10x + 25.$$

$$\text{Area of inner square} = (x + 3)^2 = x^2 + 6x + 9.$$

$$\begin{aligned} \text{Area of path} &= \text{outer} - \text{inner} = (x^2 + 10x + 25) - (x^2 + 6x + 9) \\ &= 4x + 16. \end{aligned}$$

$$19.) \text{Cost of 4 notebooks} = 4(x + 2) = 4x + 8$$

$$\text{Cost of 3 pens} = 3(x - 1) = 3x - 3$$

$$\text{Total cost} = (4x + 8) + (3x - 3) = 7x + 5$$

$$\text{New product} = (a - 2)(b - 2) = ab - 2a - 2b + 4$$

$$20.) \text{Change} = \text{New} - \text{Original} =$$

$$= (ab - 2a - 2b + 4) - ab = -2a - 2b + 4.$$

$$\text{The product decreases by } 2a + 2b - 4.$$

### **Section D-Case Study Questions**

Answers: 21

$$(a) \text{Area} = (x+2)(x+3)$$

(b)  $\text{Area} = (x+2)(x+3) = x^2 + 5x + 6.$

(c) Substitute  $x=4 \Rightarrow 16 + 20 + 6 = 42.$

Answers :22

(d)  $\text{Total} = (n+2)(x+3) = nx + 3n + 2x + 6.$

(e)  $n=3, x=4: \text{total} = (3+2)(4+3) = 5 \cdot 7 = 35 \text{ items}.$

(f)  $\text{New per box} = x+4 \Rightarrow \text{new total} (n+2)(x+4).$

For given values:  $5 \times 8 = 40$ , an increase of 5 items.

## **Chapter 7. Proportional Reasoning**

### **Worksheet No. 1**

#### **Section A-MCQ**

1. The ratio of 6 books to 15 books is  
(a) 3:5 (b) 2:10 (c) 2:5 (d) 1:5
2. In a box the ratio of red balls to blue balls is @:5. Which of the following could be the total number of marbles in the box?  
(a) 12 (b) 14 (c) 15 (d) 20
3. There are a ladies and b men in a club. The ratio of number of ladies to total number of people in the club is  
(a)  $\frac{a}{a+b}$  (b)  $\frac{b}{a+b}$  (c)  $\frac{a}{b}$  (d)  $\frac{b}{a}$
4. A car travels 120km in 3hours. How much time is required to cover 30km with same speed?  
(a) 20 minutes (b) 30 minutes (c) 90minutes (d) 45 minutes
5. If x:20::4:16, then the value of x is  
(a) 5 (b) 4 (c) 3 (d) 16
6. If a:b::c:d, then ad = .....  
(a) ac (b) bc (c) cd (d) ad
7. If the cost of 6 dolls is Rs..54, then the cost of 10 dolls is  
(a) 90 (b) 60 (c) 50 (d) 54
8. The ratio of number of sides of a rectangle to the number of edges of a cuboid is  
(a) 1:2 (b) 3:2 (c) 4:1 (d) 1:3
9. The simplest form of 64:48 is  
(a) 4:3 (b) 3:4 (c) 12:24 (d) 1:4
10. The sides of a rectangle are in the ratio 2:5. If its length is 10cm, the width of the rectangle will be  
(a) 5cm (b) 2cm (c) 4cm (d) 10cm

#### **Section B-2 marks Questions**

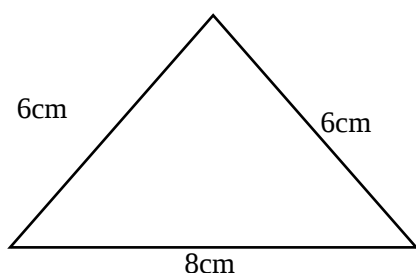
11. The marked price of a table is Rs.550 and its sale price is Rs. 500. Find the ratio of the sale price to marked price.
12. A line segment 63cm long is divided into 2 parts in the ratio 2:5. Find the length of each part.
13. Find the numbers whose sum is 340 and ratio is 8:9.
14. The earth rotates  $360^\circ$  about its axis in about 24 hours. By how much degree will it rotate in 2 hours?
15. Give two ratios that are proportional to 9:16

### **Section C-3 marks Questions**

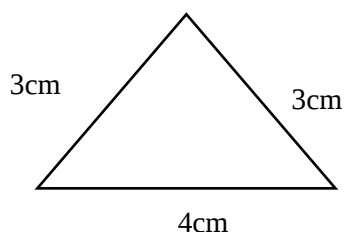
16. The earth travels 940 million km around the sun in a year. Find the distance it travels in a month.
17. Find out which ratio is larger  
10:23 or 22:69
18. A train takes 2 hours to travel from the place **A** to **B**, which are 130km apart. Find the time taken to travel from the place **C** to **D** which are 780km apart if the train is travelling at the uniform speed.
19. The ratio of girls to that of boys in a school is 5:7. If the number of girls in the school is 520, find:
- (i) The number of boys in the school
  - (ii) Total number of students in the school
20. A map is given with a scale of 1cm = 500km. Find the actual distance between the two places in km, if the distance on the map is 2.5cm.

### **Section D -Case Study Questions**

21. Two friends Munna and Jia were playing with cardboards. They were trying to make some 2D shapes out of it. The figures made by them are shown below. Analyze the figures and answer the questions followed by it.



**Shape made by Munna**



**Shape made by Jia**

- (i) Identify the shapes made by Munna and Jia
  - (ii) Check and write whether the two figures are in proportion
  - (iii) Find the ratio of the perimeters of the figure made by Munna to that of Jia.
22. Water is often called the “molecule of life” because it is essential for all living organisms and plays a crucial role in chemical reactions, digestion, energy production, and hydration. If you have ever asked “what is the ratio of hydrogen and oxygen in water,” the simple answer is that by mass, it is 1:8.
- (i) Write the ratio of hydrogen to oxygen in a water molecule by mass?
- A) 1:2 B) 2:1 C) 1:8 D) 8:1

(ii) Find the weight of water if 1 gram of hydrogen combines with 8 grams of oxygen

A) 9 grams B) 10 grams C) 2 grams D) 4 grams

(iii) Find the weight of oxygen to form 18 grams of water if it combines with 2 grams of hydrogen

### Answers

1. 2:5
2. 20
3.  $\frac{a}{a+b}$
4. 45 minutes
5. 5
6. bc
7. 90
8. 1:3
9. 4:3
10. 4cm
11. 10:11
12. 18cm and 45cm
13. 160 and 180
14.  $30^\circ$
15. Any 2 equivalent ratios, eg: 18:32,27:48
16. 78.33 million km
17. 10:23
18. 12hours
19. (i) 728 (ii) 1248
20. 1250km
21. (i) triangle (ii) yes (iii) 2:1
22. (i) 1:8 (ii) 9 grams (iii) 16grams

## **Chapter 7. Proportional Reasoning**

### **Worksheet No. 2**

#### **Section A-MCQ**

1. The ratio of 5 km to 20 km is:  
A. 1:2  
B. 1:3  
C. 1:4  
D. 1:5
2. The simplest form of the ratio 40:20 is:  
A. 1:2  
B. 2:1  
C. 2:3  
D. 4:1
3. If  $a:b :: c:d$ , then which of the following is true?  
A.  $ad = bc$   
B.  $ab = cd$   
C.  $ac = bd$   
D.  $a/c = b/d$
4. If 8 notebooks cost ₹160, what is the cost of 1 notebook?  
A. ₹15  
B. ₹20  
C. ₹25  
D. ₹30
5. If a car travels 90 km in 150 minutes, what is the distance covered in 1 hour at the same speed?  
A. 36 km  
B. 45 km  
C. 60 km  
D. 90 km
6. If a fixed number is added to both terms of a ratio, does the ratio remain proportional to the original ratio?  
A. Always yes  
B. Always no  
C. Sometimes yes, sometimes no  
D. Cannot be determined
7. If two quantities X and Y are in direct proportion, which of the following is correct?  
A.  $X + Y = \text{constant}$   
B.  $X - Y = \text{constant}$   
C.  $X * Y = \text{constant}$   
D.  $X / Y = \text{constant}$
8. 70 people are working in an office. If the number of females is 26 and the remaining are males, what is the ratio of the number of males to the number of females?  
A. 22:13  
B. 13:22  
C. 44:26  
D. 35:13
9. Which of these ratios is not proportional to 3:4?  
A. 6:8

- B. 9:12
  - C. 12:16
  - D. 12:15
10. If 8 workers can build a wall in 15 days, how many days will 12 workers take to build the same wall (assuming same efficiency)?
- A. 10 days
  - B. 12 days
  - C. 15 days
  - D. 20 days

### **Section B: 2 Marks Questions**

11. Simplify the ratio 72:96 to its simplest form.
12. A and B's monthly incomes are in the ratio 3:4. If B earns ₹28,000, find A's income.
13. A recipe uses flour and sugar in a 5:2 ratio. If 1.4 kg of sugar is used, determine the amount of flour needed.
14. Determine if the ratios 25:30 and 40:48 are in proportion by simplifying them.
15. If 6 notebooks cost ₹162, calculate the cost of 14 such notebooks.

### **Section C: 3 Marks Questions**

16. The ratio of two friends' ages is 7:9. If the younger friend is 21, find the age of the elder friend.
17. Two numbers have a ratio of 4:5 and a sum of 180. Find the two numbers.
18. Manjunath makes coffee with different decoction-to-milk ratios: 15 mL:35 mL for regular and 20 mL:30 mL for stronger coffee. Use simplified ratios to explain which coffee is stronger.
19. A car travels 90 km in 150 minutes. Calculate the distance it covers in 4 hours at the same speed, ensuring consistent units.
20. A school needs 15 kg of rice for 120 students' mid-day meal. If only 80 students attend, how much rice is required to avoid waste?

### **Section D: Case Study**

21. A city map uses a scale of 1:50,000, where 1 cm on the map equals 50,000 cm in reality.  
Question (2 Marks): If the map distance between two landmarks is 5 cm, what is the actual distance in kilometers?  
Question (3 Marks): A real-life bridge is 2 km long. What will its length be on the map in centimeters?
22. 4 painters can paint a house in 12 days. The number of painters and the time taken are inversely proportional.  
Question (2 Marks): How many days will 6 painters take to paint the house at the same efficiency?  
Question (3 Marks): To paint the house in 8 days, how many painters are needed in total?

## **Chapter 7. Proportional Reasoning**

### **Worksheet No. 3**

#### **Section A-MCQ**

1. If 3 pens cost Rs.15.what is the cost of 5 pens?  
a) Rs.20      b)Rs.25      c)Rs.30      d)Rs.40
2. A car travels 420km in 7 hours. How far will it travel in 10 hours.  
a)500km      b)550km      c)600km      d)700km
3. A water tank is filled in 12 hours and can hold 600litres of water. How many litres will it hold in 8 hours  
a)300 litres      b)400 litres      c)500litres      d)600litres
4. If the distance travelled by a rickshaw in one hour is 10km.then the distance travelled by the same rickshaw with same speed in one minute is  
a)  $\frac{250}{9}$  m      b)  $\frac{500}{9}$  m      c)1000m      d)  $\frac{500}{3}$ m
5. The scale of a map is 1:20000000. If two cities are 6cm apart on the map ,then the actual distance between them is  
  
a)200km      b)600km      c)120km      d)1200km
6. A truck needs 54 litres of diesel for covering a distance of 297km. The diesel required by the truck to cover a distance of 550km is  
a) 100 litres      b) 50 litres      c)25.16 litres      d)25 litres
7. The ratio of 90cm to 1.5m is given by  
a)5:3      b)3:5      c)60:1      d)none of these
8. In the proportion 14:21:: 6:x the value of x is  
a)13      b)4      c)9      d)none of these
9. If 30 cupcakes are prepared using 500 grams of flour ,how many cup cakes can be prepared by using 750grams of flour assuming each cupcake is equal in size  
a)15      b)25      c)36      d)45
10. A truck runs at the speed of 36 km/h . how far does it go in 12 seconds  
a)300m      b)72m      c)100m      d)120m

### **Section B-2 Marks Questions**

11. In a class there are 30 boys and 15 girls. What is the ratio of girls to the total number of students
12. The length of a house lizard is 20cm and the length of a crocodile is 3m .what is the ratio of their lengths
13. Divide Rs 10,000 in two parts in the ratio 11:9
14. Give three ratios that are proportional to 3:2
15. If  $60:40::30:a$ , find the value of a

### **Section C-3Marks Questions**

16. To make soft idlis ,you need to mix rice and urad dal in the ratio of 2:1.if you need 12 cups of this mixture to make idlis tomorrow morning ,how many cups of rice and urad dal will you need
17. Are the ratios 25:30 and 40:48 in proportion
18. Ram and Mohan started a business and invested money in the ratio 2:3.after one year the total profit was Rs.40000. What is the share of Mohan in the profit
19. A father divided Rs.99,99,900 amongst his three sons Jack ,John,and Sam in the ratio 2:4:3.how much does each get
20. A recipe for a fruit juice mix uses 54 ml of orange juice and 72 ml of apple juice .
  - (a) Express the ratio of orange juice to apple juice in its simplest form
  - (b) If you want to prepare 1.4 litre of the same mix ,how much each juice will you need
  - (c)

### **Section D-Case Study Questions**

21. Monica noticed the calories and carbohydrates in some food items and formed a chart given below

| Food item                    | Carbohydrates(grams) | calories |
|------------------------------|----------------------|----------|
| White bread (4 slices)       | 48                   | 244      |
| Cereal, ready to eat(2 cup)  | 48                   | 220      |
| Potato(2 large ,baked,plain) | 100                  | 440      |
| Carrot (3 medium)            | 24                   | 93       |
| Apple (1 medium)             | 21                   | 80       |

Based on above information answer the following question

- (i) Monica 's daughter ate 2 slices of white bread .How much calories did she take
  - (ii) Monica prepared 3 cups of cereal . How much carbohydrate does it contain
  - (iii) Sukhanya had an intake of 120 calories by having apples.how many apples did she eat
- 
22. The Rs.10 coin is an alloy of copper and nickel called cupro-nickel .copper and nickel are mixed in a 3:1 ratio to get this alloy. The mass of the coin is 7.74grams.  
The cost of copper is Rs. 1000 per kg ,and the cost of nickel is Rs.1500 per kg
    - (i) Find the weight copper in 10 coins
    - (ii) Find the weight of nickel in 100 coins

(iii) Find the cost of metal used in making 10000 coins

### **Answers**

1. Rs.25
2. 600km
- 3.400 litres
4.  $\frac{500}{3}$ m
- 5.1200*km*
- 6.100*lires*
- 7.3: 5
8. 9
- 9.45
- 10.120m

### **Section B**

- 11).1:3
- 12.)1:15
- 13).Rs 5500 and Rs.4500
- 14).6:4,9:6,12:8
- 15).a=20

### **Section C**

- 16). 8 cups of rice and 4 cups of urad dal
- 17.)Yes
- 18).Rs.24000
- 19).Rs.22,22,200, Rs.44,44,400,Rs.33,33,300
- 20).a)3:4  
b)600ml,800ml

### **Section D-Case Study**

- 21).(i)122 calories  
(ii)72gm  
(iii) $1\frac{1}{2}$  apples
- 22).  
(i)58.05grams  
(ii)193.5grams  
(iii)Rs.87075