MATHEMATICS
WORKSHEET_130425
CHAPTER 01 A SQUARE AND A CUBE (Ganita Prakashan)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : VIII **DURATION : 1½ hr**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. A locker is toggled an odd number of times. Based on the rules of the locker puzzle, which of the following statements must be true about the locker number?
(a) It is a prime number. (b) It has exactly three factors.
(c) It is a perfect square. (d) It is a perfect cube.

2. A number ends with 8 zeros. Can this number be a perfect square?
(a) Yes, because the number of zeros is even.
(b) Yes, if the non-zero part of the number is also a perfect square.
(c) No, because perfect squares cannot end with 8 zeros.
(d) Cannot be determined without more information.

3. Given that x is a natural number and x^2 is a perfect square. What is the total number of factors of x^2 if x is a prime number?
(a) 2 (b) 3 (c) 4 (d) An even number

4. A number N has 12 factors. If N is a perfect square, which of the following statements about N is true?
(a) N cannot be a perfect square.
(b) N must have an odd number of factors.
(c) N must have an even number of factors.
(d) The number of factors of N is irrelevant to whether it is a perfect square.

5. Without calculating, what is the units digit of 34^2?
(a) 4 (b) 6 (c) 8 (d) 2

6. A number is obtained by multiplying a number by itself three times. What can be concluded about its prime factors?
(a) They must appear in pairs. (b) They must appear three times.
(c) They must appear an even number of times. (d) They must be prime numbers.

7. Which of the following numbers cannot be a perfect cube?
(a) A number ending with 8. (b) A number ending with 7.
(c) A number ending with 2 zeroes. (d) A number ending with 9.

8. Based on the properties of cubes, what can be said about the sum
21 + 23 + 25 + 27 + 29?

(a) The sum is 4^3.

(b) The sum is a perfect square.

(c) The sum is 5^3.

(d) The sum is 216.

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 number 1156 is a perfect square.
Reason (R): The prime factorization of 1156 can be grouped into two identical sets of factors.

10. **Assertion (A):** The number 500 is not a perfect cube.
Reason (R): The prime factorization of 500 is 2 x 2 x 5 x 5 x 5, and the factors cannot be split into three identical groups.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the square root of 1296 by the prime factorisation method.

12. Find the cube root of 2197 by the prime factorisation method.

13. Find the smallest square number which is exactly divisible by 6, 8, and 15.

14. What is the smallest number by which 384 must be multiplied to get a perfect cube?

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the smallest number by which 1575 must be divided so that it becomes a perfect square. Also, find the square root of the quotient.

16. Find the smallest number which when multiplied with 1600 will make the product a perfect cube. Find the cube root of the product.

17. Find the smallest number by which 2048 must be divided so that the quotient has a cube root. Also, find the cube root of the quotient.

SECTION – D

Questions 18 carry 5 marks each.

18. A group of students can be arranged into rows of 18, 24, or 30 without any student being left out. What is the minimum number of students if they can also be arranged in a perfect square grid?

SECTION – E (Case Study Based Question)

Question 19 to 20 carry 4 mark

19. Case Study – 1 (Locker Puzzle Extended)
In a palace, 400 lockers are arranged. The same process is followed as in Queen Ratnamanjuri's puzzle: Person 1 toggles every locker, Person 2 toggles every 2nd, Person 3 toggles every 3rd, and so on, until all 400 have had their turn.
Raghav observed that only lockers numbered with perfect squares would remain open. He wanted to find patterns in their distribution.

Answer the following:
(a) How many lockers remain open?
(b) Write the numbers of the first five lockers that remain open.
(c) Find the largest locker number that remains open.
(d) Explain why locker number 289 is open.

20. Case Study – 2 (Cube Roots in Real Life)

An artisan was tasked with crafting wooden dice for a new board game. Starting with a large wooden cube of 10,648 cm^3, he planned to cut it into smaller cubical dice, each with an edge of 7 cm. He was curious about how many dice he could make and if there would be any wood left over from the original cube. This calculation was a critical first step in his design, as it would determine the final number of dice for the game.

Answer the following:
(a) Verify whether 10648 is a perfect cube.
(b) Find the cube root of 10648.
(c) How many dice of side 7 cm can be cut out from the big cube?
(d) If each die is painted at ₹2 per cm^2 of surface area, find the cost of painting one die.