

Cubes and Cube Roots

Question Paper, Set 06

Time: 1 hour 30 minutes

Maximum marks: 50

Name: _____ Class: _____ Date: _____

1. Answer all 20 questions. The marks for each question are shown in brackets.
2. Show your working for the 2, 3 and 5 mark questions.
3. The key sheet and worked solutions are at the end of this paper.

1. Write $m \times m \times m$ in short form using a power. [1 mark]
2. Write $3 \times 3 \times 3 \times 5 \times 5 \times 5$ in power form. [2 marks]
3. Find the next number: 64, 125, 216, 343, ... [1 mark]
4. Using the table of cubes, check whether 150 is a cube. [2 marks]
5. Sugar cubes are packed in a cube-shaped box, 8 along each edge. (i) How many sugar cubes are in the bottom layer? (ii) How many sugar cubes are there in the full box? [3 marks]
6. Fill in the boxes: $16^3 = 16 \times 16 \times 16 = \square \times 16 = \square$ [2 marks]
7. A shop arranges cube-shaped boxes into three big cubes, with 12, 16 and 30 boxes along each edge. How many boxes are in each big cube? [5 marks]
8. Fill in the blank: $\square^3 = -64$ [1 mark]
9. Ravi wrote $(-9)^3 = 729$. Is he right? Write the correct value. [2 marks]
10. Find the value of $(-13)^3$, showing the steps. [3 marks]
11. Find $7^3 + 7^3$. [1 mark]
12. Find $10^3 + 11^3 + 12^3$. [5 marks]
13. Find the value of $4^3 + (-3)^3$. [1 mark]
14. Without finding any cube, write the value of $23^3 + (-23)^3$. Give the reason. [2 marks]
15. Ravi found $3^3 - 9^3 = 702$. Is he right? Find the correct answer. [2 marks]
16. Arjun has exactly enough small cubes to build a cube with 9 small cubes along each edge. He builds a cube with 5 small cubes along each edge instead. How many small cubes are left over? [3 marks]
17. Find the value of $9^3 - 4^3 - 7^3$. [5 marks]
18. Find $-6^3 - (-6)^3$. [1 mark]

19. Find $10^3 \div 5^3$. [3 marks]

20. Find the value of $2^3 - 3^3 + 4^3 - 5^3 + 6^3$. [5 marks]

Key sheet

Q	Answer
1	m^3
2	$3^3 \times 5^3$
3	512
4	No, it lies between $5^3 = 125$ and $6^3 = 216$
5	(i) 64 (ii) 512
6	256 and 4096
7	1728, 4096, 27000 boxes
8	-4
9	No. $(-9)^3 = -729$
10	-2197
11	686
12	4059
13	37
14	0
15	No. $3^3 - 9^3 = -702$
16	604 small cubes
17	322
18	0
19	8
20	136

Solutions

1. Write $m \times m \times m$ in short form using a power. [1]

$$m \times m \times m = m^3$$

Read it as 'm cubed'.

Ans: m^3

2. Write $3 \times 3 \times 3 \times 5 \times 5 \times 5$ in power form. [2]

$$3 \times 3 \times 3 = 3^3$$

$$5 \times 5 \times 5 = 5^3$$

$$\therefore 3 \times 3 \times 3 \times 5 \times 5 \times 5 = 3^3 \times 5^3$$

Ans: $3^3 \times 5^3$

3. Find the next number: 64, 125, 216, 343, ... [1]

These are $4^3, 5^3, 6^3, 7^3$.

$\therefore$ the next number is $8^3 = 512$

Ans: 512

4. Using the table of cubes, check whether 150 is a cube. [2]

From the table: $5^3 = 125$ and $6^3 = 216$.

$125 < 150 < 216$, and no whole number lies between 5 and 6.

So 150 is not a cube.

Ans: No, it lies between $5^3 = 125$ and $6^3 = 216$

5. Sugar cubes are packed in a cube-shaped box, 8 along each edge. (i) How many sugar cubes are in the bottom layer? (ii) How many sugar cubes are there in the full box? [3]

(i) One layer has 8 rows of 8: $8 \times 8 = 64$

(ii) There are 8 layers: $64 \times 8 = 512$

So there are $8^3 = 512$ sugar cubes.

Ans: (i) 64 (ii) 512

6. Fill in the boxes: $16^3 = 16 \times 16 \times 16 = \square \times 16 = \square$ [2]

$$16 \times 16 = 256$$

$$256 \times 16 = 4096$$

$$\therefore 16^3 = 256 \times 16 = 4096$$

Ans: 256 and 4096

7. A shop arranges cube-shaped boxes into three big cubes, with 12, 16 and 30 boxes along each edge. How many boxes are in each big cube? [5]

$$\text{Edge 12: } 12 \times 12 = 144, 144 \times 12 = 1728$$

$$\text{Edge 16: } 16 \times 16 = 256, 256 \times 16 = 4096$$

$$\text{Edge 30: } 30 \times 30 = 900, 900 \times 30 = 27000$$

Ans: 1728, 4096, 27000 boxes

8. Fill in the blank: $\square^3 = -64$ [1]

$$(-4)^3 = -4^3 = -64$$

So -64 is the cube of -4 .

Ans: -4

9. Ravi wrote $(-9)^3 = 729$. Is he right? Write the correct value. [2]

$$(-9)^3 = (-9) \times (-9) \times (-9)$$

$$= 81 \times (-9) = -729$$

A negative number multiplied 3 times gives a negative answer, so Ravi is wrong.

Ans: No. $(-9)^3 = -729$

10. Find the value of $(-13)^3$, showing the steps. [3]

$$(-13) \times (-13) = 169$$

$$169 \times (-13) = -2197$$

$$\therefore (-13)^3 = -2197$$

Ans: -2197

11. Find $7^3 + 7^3$. [1]

$$7^3 + 7^3 = 343 + 343$$

$$= 686$$

Ans: 686

12. Find $10^3 + 11^3 + 12^3$. [5]

$$11 \times 11 = 121, 11^3 = 121 \times 11 = 1331$$

$$12 \times 12 = 144, 12^3 = 144 \times 12 = 1728$$

$$10^3 + 11^3 + 12^3 = 1000 + 1331 + 1728$$

$$= 4059$$

Ans: 4059

13. Find the value of $4^3 + (-3)^3$. [1]

$$4^3 + (-3)^3 = 64 + (-27)$$

$$= 64 - 27$$

$$= 37$$

Ans: 37

14. Without finding any cube, write the value of $23^3 + (-23)^3$. Give the reason. [2]

$$(-23)^3 = -23^3$$

$$\therefore 23^3 + (-23)^3 = 23^3 - 23^3 = 0$$

A cube and the cube of its negative always add up to 0.

Ans: 0

15. Ravi found $3^3 - 9^3 = 702$. Is he right? Find the correct answer. [2]

$$3^3 - 9^3 = 27 - 729$$

We take away the bigger number 729 from the smaller number 27, so the answer is negative.

$$27 - 729 = -702$$

Ravi subtracted the other way round; the correct answer is -702 .

Ans: No. $3^3 - 9^3 = -702$

16. Arjun has exactly enough small cubes to build a cube with 9 small cubes along each edge. He builds a cube with 5 small cubes along each edge instead. How many small cubes are left over? [3]

$$\text{At first: } 9^3 = 729$$

$$\text{At the end: } 5^3 = 125$$

$$\text{Difference} = 729 - 125 = 604$$

Ans: 604 small cubes

17. Find the value of $9^3 - 4^3 - 7^3$. [5]

$$9^3 - 4^3 - 7^3 = 729 - 64 - 343$$

$$= 322$$

Ans: 322

18. Find $-6^3 - (-6)^3$. [1]

$$(-6)^3 = -6^3$$

$$-6^3 - (-6)^3 = -6^3 + 6^3 = 0$$

Ans: 0

19. Find $10^3 \div 5^3$. [3]

$$10^3 = 1000, 5^3 = 125$$

$$1000 \div 125 = 8$$

Ans: 8

20. Find the value of $2^3 - 3^3 + 4^3 - 5^3 + 6^3$. [5]

$$2^3 - 3^3 + 4^3 - 5^3 + 6^3 = 8 - 27 + 64 - 125 + 216$$

$$= 136$$

Ans: 136
