

Name _____

Date _____

1.6 Square roots and cube roots — worksheet

Understand square numbers, cube numbers, square roots and cube roots, and estimate the square root of a number that is not a square number. · 60 questions · Show your working.

Remember

- Square numbers: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, ...
- Cube numbers: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, ...
- $\sqrt{}$ undoes squaring, and $\sqrt[3]{}$ undoes cubing — they are inverse operations.
- $\sqrt{144} = 12$ because $12^2 = 144$; $\sqrt[3]{125} = 5$ because $5^3 = 125$.
- To estimate $\sqrt{n}$ when n is not a square number, find the square numbers either side of it: $49 < 50 < 64$, so $7 < \sqrt{50} < 8$.
- 64 is special — it is both a square number (8^2) and a cube number (4^3).

A · Fluency — Squares, cubes and their roots.

1 $7^2 =$ _____

2 $12^2 =$ _____

3 $15^2 =$ _____

4 $9^2 =$ _____

5 $13^2 =$ _____

6 $20^2 =$ _____

7 $11^2 =$ _____

8 $14^2 =$ _____

9 $2^3 =$ _____

10 $4^3 =$ _____

11 $5^3 =$ _____

12 $3^3 =$ _____

13 $10^3 =$

14 $6^3 =$

15 $\sqrt{81} =$

16 $\sqrt{144} =$

17 $\sqrt{400} =$

18 $\sqrt{121} =$

19 $\sqrt{225} =$

20 $\sqrt{64} =$

21 $\sqrt{196} =$

22 $\sqrt{900} =$

23 $\sqrt[3]{27} =$

24 $\sqrt[3]{125} =$

25 $\sqrt[3]{1000} =$

26 $\sqrt[3]{8} =$

27 $\sqrt[3]{216} =$

28 $\sqrt[3]{343} =$

B · Reasoning — Combining roots and estimating.

29 Work out $\sqrt{(9 \times 16)}$.

30 Work out $5^3 - 3^3$.

31 Work out $\sqrt{121} + \sqrt[3]{64}$.

32 Work out $\sqrt[3]{125} - \sqrt[3]{27}$.

33 Work out $\sqrt{64} \div \sqrt[3]{64}$.

34 The cube root of a number is 4. What is the square root of that number?

35 The square root of a number is 9. What is the number?

36 $\sqrt{50}$ lies between which two whole numbers?

☐ 6 and 7

☐ 7 and 8

☐ 8 and 9

☐ 9 and 10

37 Which whole number is closest to $\sqrt{79}$?

38 $\sqrt{215}$ lies between two consecutive whole numbers. What is the smaller one?

39 Arun says " $\sqrt{36} = 6$, so $\sqrt[3]{36} = 3$ ". Is he right?

☐ Yes

☐ No

40 Write the first six square numbers, separated by commas.

C · Challenge — Patterns, counting and inverse problems.

41 Work out $(-3)^3 + \sqrt{64}$.

42 Work out $\sqrt{(144 \div 4)}$.

43 Work out $\sqrt[3]{(8 \times 27)}$.

44 Use the pattern $2^2 = 4$, $4^2 = 16$, $8^2 = 64$, $16^2 = 256$ to find 32^2 .

45 How many square numbers are there between 1 and 200 inclusive?

46 How many cube numbers are there between 1 and 200 inclusive?

47 Which number is both a square number and a cube number, is greater than 1 and less than 100?

48 $n^2 = 169$. What is n if n is positive?

D · Word problems — Areas, volumes and side lengths.

- 49** A square garden has an area of 144 m^2 . What is the length of one side, in metres?

- 50** A square patio is made of 225 identical square tiles arranged in a square. How many tiles are along one edge?

- 51** A cube has a volume of 125 cm^3 . What is the length of one edge, in cm?

- 52** A cubic water tank holds 1 000 litres, which is $1\,000\,000 \text{ cm}^3$. What is the length of one edge, in cm?

- 53** A square field has a side of 13 m. What is its area, in m^2 ?

- 54** A cube of side 6 cm is made of 1 cm cubes. How many small cubes are there?

- 55** A square poster has an area of 400 cm^2 . What is its perimeter, in cm?

- 56** A gardener wants a square lawn with an area as close as possible to 80 m^2 , using a whole number of metres for the side. What side length should she choose, in metres?

- 57** A box is a cube of side 7 cm. What is its volume, in cm^3 ?

- 58** A square carpet has an area of 196 m^2 . A border runs all the way around its edge. How long is the border, in metres?

- 59** A cubic crate has a volume of 343 m^3 . What is the area of one face, in m^2 ?

- 60** A square courtyard has an area of 500 m^2 . Between which two whole numbers does its side length lie? Give the smaller number, in metres.
