

GCSE Maths: Estimating roots and powers, and using a calculator (Higher): answers

GCSE Maths - Factors, Multiples and Primes - Higher - Lesson 2.9

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch02-factors-multiples-primes-powers/higher/estimating-roots-and-powers-and-using-a-calculator/

Exercise 2I Estimating roots and powers (non-calculator)

Non-calculator

1 Write down the two consecutive whole numbers between which each square root lies.

(a) $\sqrt{20}$

Answer: between 4 and 5

(b) $\sqrt{50}$

Answer: between 7 and 8

(c) $\sqrt{75}$

Answer: between 8 and 9

(d) $\sqrt{110}$

Answer: between 10 and 11

(e) $\sqrt{3}$

Answer: between 1 and 2

(f) $\sqrt{200}$

Answer: between 14 and 15

2 Write down the whole number that each square root is nearest to.

(a) $\sqrt{10}$

Answer: 3

(b) $\sqrt{20}$

Answer: 4

(c) $\sqrt{30}$

Answer: 5

(d) $\sqrt{40}$

Answer: 6

(e) $\sqrt{55}$

Answer: 7

(f) $\sqrt{90}$

Answer: 9

3 Write down the two consecutive whole numbers between which each cube root lies.

(a) the cube root of 10

Answer: between 2 and 3

(b) the cube root of 30

Answer: between 3 and 4

(c) the cube root of 70

Answer: between 4 and 5

(d) the cube root of 200

Answer: between 5 and 6

4 Find each square root to 1 decimal place. Use trial and improvement. Do not use the $\sqrt{\quad}$ key.

(a) $\sqrt{10}$

Answer: 3.2

(b) $\sqrt{20}$

Answer: 4.5

(c) $\sqrt{30}$

Answer: 5.5

(d) $\sqrt{50}$

Answer: 7.1

(e) $\sqrt{75}$

Answer: 8.7

(f) $\sqrt{12}$

Answer: 3.5

5 Estimate the value of each power by rounding the base to the nearest whole number.

(a) 2.9^2

Answer: 9

(b) 4.1^2

Answer: 16

(c) 6.8^2

Answer: 49

(d) 3.1^3

Answer: 27

(e) 4.9^2

Answer: 25

(f) 1.9^3

Answer: 8

- 6 A square field has an area of 70 m^2 . Find the length of one side of the field, to 1 decimal place.

Answer: 8.4 m

- 7 A rectangle is 3 cm by 5 cm. Its diagonal has length $\sqrt{3^2 + 5^2}$ cm. Find the whole number that the length of the diagonal is nearest to.

Answer: 6 cm

- 8 Explain why $\sqrt{50}$ is nearer to 7 than to 8, without using a calculator.

Answer: $7^2 = 49$ is only 1 below 50, but $8^2 = 64$ is 14 above

- 9 Is $\sqrt{40}$ bigger than 6.5, or smaller than 6.5? Show how you know.

Answer: Smaller, because $6.5^2 = 42.25$, which is bigger than 40

- 10 Alex says that $\sqrt{30} = 15$, because $30 \div 2 = 15$. Show that Alex is wrong.

Answer: $15^2 = 225$, not 30. $\sqrt{30}$ is between 5 and 6.

- 11 Estimate the value of $\sqrt{49.3 + 2.9^2}$ by rounding each number to a value that is easy to work with.

Answer: about 16

- 12 Find each cube root to 1 decimal place.

(a) the cube root of 20

Answer: 2.7

(b) the cube root of 50

Answer: 3.7

(c) the cube root of 100

Answer: 4.6

(d) the cube root of 30

Answer: 3.1

- 13 Show that $\sqrt{7}$ lies between 2.6 and 2.7.

Answer: $2.6^2 = 6.76 < 7$ and $2.7^2 = 7.29 > 7$

- 14 Find the whole number n such that $\sqrt{n}$ is between 6.5 and 6.6.

Answer: 43

Exercise 2J Powers and roots with a calculator

Calculator allowed

1 Use a calculator to work out each power.

(a) 1.7^4 (2 d.p.)

Answer: 8.35

(b) 2.3^3 (1 d.p.)

Answer: 12.2

(c) 0.85^2 (3 d.p.)

Answer: 0.723

(d) 12.5^3 (3 s.f.)

Answer: 1950

(e) 3.2^5 (1 d.p.)

Answer: 335.5

(f) 1.05^{10} (3 d.p.)

Answer: 1.629

2 Use a calculator to work out each root.

(a) $\sqrt{77}$ (2 d.p.)

Answer: 8.77

(b) $\sqrt{150}$ (2 d.p.)

Answer: 12.25

(c) the cube root of 250 (1 d.p.)

Answer: 6.3

(d) $\sqrt{2}$ (3 d.p.)

Answer: 1.414

(e) the cube root of 90 (2 d.p.)

Answer: 4.48

(f) $\sqrt{1000}$ (1 d.p.)

Answer: 31.6

3 Use a calculator to work out each of these. Write down the estimate you used to check.

(a) $(2.5 + 1.3)^2$ (1 d.p.)

Answer: 14.4

(b) $\sqrt{(6.4^2 - 3.2^2)}$ (2 d.p.)

Answer: 5.54

(c) the cube root of $(2.5^3 + 1.5^3)$ (2 d.p.)

Answer: 2.67

(d) $1.2^3 \times 4.5$ (2 d.p.)

Answer: 7.78

4 A square has an area of 250 cm^2 . Work out the length of one side. Give your answer to 1 decimal place.

Answer: 15.8 cm

5 A cube has a volume of 500 cm^3 . Work out the length of one edge. Give your answer to 1 decimal place.

Answer: 7.9 cm

6 A single cell splits into two every 20 minutes. After 24 splits (8 hours), the number of cells is 2^{24} . Work out this number.

Answer: 16777216

7 Zoe uses her calculator to work out -4^2 and gets -16 . Max works out $(-4)^2$ and gets 16. Zoe says: "We did the same sum, so one of us is wrong." Explain what is happening.

Answer: They are different calculations: $-4^2 = -16$ and $(-4)^2 = 16$

8 Show that 2^{100} is bigger than 10^{30} .

Answer: $2^{10} = 1024 > 10^3$, so $2^{100} = (2^{10})^{10} > (10^3)^{10} = 10^{30}$

9 Find the smallest whole number n for which 1.5^n is bigger than 1000.

Answer: $n = 18$