

GRADE 8 MATHEMATICS

Powers, Exponents & Scientific Notation

Complete Printable Worksheet Pack

6 Practice Worksheets • 6 Answer Keys

Standard mathematical superscripts are used throughout this pack.

Name: _____ Date: _____

Worksheet 1 — Understanding Powers & Exponents

Show your working and explain your reasoning where requested.

1. Write 2^6 as repeated multiplication.
2. Evaluate: 3^4 .
3. Evaluate: 10^5 .
4. Write $7 \times 7 \times 7 \times 7$ in power form.
5. Identify the base and exponent in 5^3 .
6. Complete: $4^3 = 4 \times 4 \times \underline{\quad} = \underline{\quad}$.
7. Which is greater: 2^7 or 3^5 ? Show your reasoning.
8. Find n : $5^n = 625$.
9. Explain why $1^{100} = 1$.
10. Challenge: Find two different powers with value 64.

Working space:

Answer Key 1 — Understanding Powers & Exponents

1. $2 \times 2 \times 2 \times 2 \times 2 \times 2$
2. 81
3. 100,000
4. 7^4
5. Base = 5; exponent = 3
6. 4; 64
7. 3^5 is greater because $243 > 128$
8. $n = 4$
9. Repeated multiplication of 1 always gives 1
10. 2^6 and 4^3

Worksheet 2 — Laws of Exponents

Show your working and explain your reasoning where requested.

1. Simplify: $2^3 \times 2^4$.
2. Simplify: $5^7 \div 5^3$.
3. Simplify: $(3^2)^3$.
4. Simplify: $10^4 \times 10^2$.
5. Write as a single power: $7^8 \div 7^5$.
6. Simplify: $4^2 \times 4^3 \div 4^1$.
7. Complete: $a^3 \times a^5 = a \underline{\hspace{1cm}}$.
8. Complete: $x^9 \div x^4 = x \underline{\hspace{1cm}}$.
9. Explain the rule used when multiplying powers with the same base.
10. Challenge: Simplify $2^5 \times 2^3 \div 2^4$.

Working space:

Answer Key 2 — Laws of Exponents

1. 2^7

2. 5^4

3. 3^6

4. 10^6

5. 7^3

6. 4^4

7. 8

8. 5

9. Add the exponents when multiplying powers with the same base

10. $2^4 = 16$

Worksheet 3 — Zero & Negative Exponents

Show your working and explain your reasoning where requested.

1. Evaluate: 7^0 .
2. Evaluate: 10^0 .
3. Write 2^{-3} as a fraction.
4. Write 5^{-2} as a fraction.
5. Evaluate: 10^{-3} .
6. Complete: $a^0 = \underline{\hspace{1cm}}$.
7. Explain why $3^{-2} = 1/3^2$.
8. Simplify: $2^3 \div 2^5$.
9. Which is greater: 2^{-2} or 2^{-3} ? Explain.
10. Challenge: Write 0.0001 as a power of 10.

Working space:

Answer Key 3 — Zero & Negative Exponents

1. 1

2. 1

3. $\frac{1}{8}$

4. $\frac{1}{25}$

5. 0.001

6. 1

7. A negative exponent means the reciprocal of the positive power

8. $\frac{1}{4}$

9. 2^{-2} is greater because $\frac{1}{4} > \frac{1}{8}$

10. 10^{-4}

Worksheet 4 — Scientific Notation

Show your working and explain your reasoning where requested.

1. Write 4,500,000 in scientific notation.
2. Write 0.000072 in scientific notation.
3. Write 3.6×10^5 in ordinary form.
4. Write 8.2×10^{-4} in ordinary form.
5. Express 72,000,000 as $a \times 10^n$, where $1 \leq a < 10$.
6. Express 0.0000095 as $a \times 10^n$.
7. Which is greater: 4.2×10^6 or 6.1×10^5 ?
8. A bacterium is 0.000003 m long. Write its length in scientific notation.
9. A planet is approximately 1.5×10^8 km from its star. Write this distance in ordinary notation.
10. Challenge: A number is 7.4×10^{-6} . How many zeros appear after the decimal point before the first non-zero digit?

Working space:

Answer Key 4 — Scientific Notation

1. 4.5×10^6
2. 7.2×10^{-5}
3. 360,000
4. 0.00082
5. 7.2×10^7
6. 9.5×10^{-6}
7. 4.2×10^6
8. 3×10^{-6} m
9. 150,000,000 km
10. Five zeros

Worksheet 5 — Powers in Real Life & Reasoning

Show your working and explain your reasoning where requested.

1. A square has side length 12 cm. Write its area using a power expression and find the area.
2. A cube has side length 5 cm. Write its volume using a power expression and find the volume.
3. A computer stores $2^6 = 64$ units in a block. How many units are stored in 8 such blocks?
4. A population triples every year. Starting at 2, write the population after 4 years as a power expression and calculate it.
5. A microscope enlarges an object by 10^3 times. What does 10^3 mean as repeated multiplication?
6. A distance is 6.2×10^7 m. Write it in ordinary form.
7. A measurement is 0.00000042 m. Write it in scientific notation.
8. Explain why scientific notation is useful for very large or very small numbers.
9. Compare 9×10^4 and 8×10^5 . Explain.
10. Challenge: Give a real-life quantity that could reasonably be written as 3×10^{-6} and explain the exponent.

Working space:

Answer Key 5 — Powers in Real Life & Reasoning

1. $12^2 = 144 \text{ cm}^2$
2. $5^3 = 125 \text{ cm}^3$
3. $64 \times 8 = 512 \text{ units}$
4. $2 \times 3^4 = 162$
5. $10 \times 10 \times 10$
6. 62,000,000 m
7. $4.2 \times 10^{-7} \text{ m}$
8. It gives a compact way to represent very large or very small values
9. 8×10^5 is greater
10. Example: $0.000003 \text{ m} = 3 \times 10^{-6} \text{ m}$

Worksheet 6 — Powers, Exponents & Scientific Notation Challenge

Show your working and explain your reasoning where requested.

1. Simplify: $(2^4 \times 2^3) \div 2^2$.
2. Simplify: $(5^2)^3 \div 5^4$.
3. Find n : $3^n = 729$.
4. Write 0.00000036 in scientific notation.
5. Write 5.08×10^7 in ordinary notation.
6. Which is larger: 2^{10} or 10^3 ? Show a comparison.
7. Simplify: $6^7 \div 6^2$.
8. Which is greater: 4.5×10^{-3} or 0.0042? By how much?
9. Explain the difference between 10^3 and 3^{10} .
10. Find positive integer n such that 2^n is between 1,000 and 2,000.

Working space:

Answer Key 6 — Powers, Exponents & Scientific Notation Challenge

1. $2^5 = 32$
2. $5^2 = 25$
3. $n = 6$
4. 3.6×10^{-7}
5. 50,800,000
6. $2^{10} = 1,024$, so 2^{10} is larger
7. $6^5 = 7,776$
8. $4.5 \times 10^{-3} = 0.0045$, greater by 0.0003
9. $10^3 = 1,000$, while $3^{10} = 59,049$
10. $n = 10$; $2^{10} = 1,024$