



Grade 7/8 Math Circles
Wednesday, March 24, 2021
Squares & Radicals - Problem Set

1. Evaluate.

- | | | | |
|------------------------------------|--------------|--------------|--------------|
| (a) 5^3 | (c) 2^6 | (e) 4^4 | (g) 13^2 |
| (b) $\left(\frac{101}{4}\right)^0$ | (d) 1^{27} | (f) 0^{56} | (h) ϕ^1 |

2. Write the following as powers. (*Hint: For part (c), try factoring the number*)

- | | |
|---------------------------------|--|
| (a) $333 \times 333 \times 333$ | (d) 5 to the fourth power |
| (b) 91 to exponent 5 | (e) 100 squared |
| (c) 216 | (f) $7 \times 11 \times 11 \times 7 \times 11 \times 7 \times 7$ |

3. Use the given base to write the following numbers as powers.

- | | |
|---------------------|--------------------|
| (a) 4096, base = 4 | (d) 512, base = 2 |
| (b) 625, base = 5 | (e) 289, base = 17 |
| (c) 1000, base = 10 | (f) 81, base = 3 |

4. Express 1 as a power that has a base not equal to 1.

5. Evaluate.

- | | | | |
|---------------|-----------------|-----------------------------------|---------------------------------------|
| (a) $(-30)^4$ | (c) 2^{-6} | (e) $(15)^{-3}$ | (g) $(-88)^0$ |
| (b) 47^{-1} | (d) $(-1)^{38}$ | (f) $\left(-\frac{7}{6}\right)^5$ | (h) $\left(-\frac{4}{25}\right)^{-2}$ |

6. Fill in the table summarizing different properties of exponents.

Property	Explanation	Example
Base of 1		
Base of 0		
Exponent of 1		
Exponent of 0		
Negative Exponent		
Negative Base		

7. Consider the fraction $\frac{16}{81}$.

(a) Write $\frac{16}{81}$ as a power with a negative base.

(b) Write the fraction as a power with a negative base and exponent.

8. Fill in the blanks with $<$, $>$, or $=$ to complete the inequality.

(a) $2^4 \text{ — } 4^2$

(c) $99^0 \text{ — } 0^{45}$

(e) $7^{-3} \text{ — } 7^{-1}$

(b) $6^{-3} \text{ — } 6^3$

(d) $(-1)^{27} \text{ — } 1^{27}$

(f) $4^{-6} \text{ — } (-4)^{-7}$

9. The following table lists the first 20 perfect squares. Fill in the blanks. The table can be completed online at <https://www.geogebra.org/m/pkcuynv>.

x	1	2	3	4			7	8	9	
x^2	1			16	25	36				100
x	11	12	13		15					20
x^2				196		256	289	324	361	

10. Rubik's Cubes are popular puzzle toys made up of 3 by 3 miniature cubes or "cubelets". A cubelet on a Rubik's Cube has side length 1.9 cm.

(a) What is the area of one square surface on the cubelet?

(b) What is the surface area of the cubelet?

(c) What is the surface area of the Rubik's Cube?

11. A cube box has volume 125 cm^3 . What are the dimensions of the box?

12. Sunil claims that powers can be used to calculate the perimeter of squares in addition to the area. He says that the formula for the perimeter of a square can be expressed as $P = s^4$ where s is the side length of the square. Is he correct? How do you know?

13. Evaluate.

(a) $\sqrt[3]{4096}$

(c) $\sqrt{625}$

(e) $\sqrt[3]{3375}$

(g) $\sqrt[9]{512}$

(b) $\sqrt[8]{0}$

(d) $\sqrt[4]{1}$

(f) $\sqrt[6]{\frac{1}{64}}$

(h) $\sqrt{\frac{49}{256}}$

14. Simplify.

(a) $\sqrt{529}$

(c) $\sqrt{37}$

(e) $\sqrt{224}$

(g) $13\sqrt{168}$

(b) $\sqrt{675}$

(d) $\sqrt{156}$

(f) $\sqrt{\frac{5}{36}}$

(h) $\frac{1}{2}\sqrt{\frac{4}{25}}$

15. Is 2400 is a perfect square? Explain. (*Hint: Simplify the radical*)

16. The Titans football field is $98\sqrt{3}$ m by $42\sqrt{5}$ m. What is the area of the football field?

17. The surface area of a square cake is 564 cm^2 .

- (a) What is the side length of the cake?
- (b) Round the dimensions of the cake to the nearest whole number. What is the new surface area?
- (c) Jackie wants a cake that is $9\sqrt{30}$ cm by $9\sqrt{30}$ cm by 18 cm. What is the surface area of the cake? What is the volume?