

### Merit Simplifying Exponents #3

Write the following in the form  $b^a$ , where  $b$  is a single integer and  $a$  is a simplified expression.

1.  $3^x \times 3^x$

2.  $\sqrt{16^{2x}}$

3.  $\frac{2^{3x}}{4^x}$

4.  $49 \times 7^k$

5.  $\frac{24}{3 \times 2^x}$

6.  $9^x \times 27^{x+1}$

7.  $\frac{1}{27} \times 3^a$

8.  $\frac{125}{25^{x+1}}$

Solve the following:

9.  $10 \times 3^x = 810$

10.  $2^{x-1} \times 3^{x-1} = 216$

11.  $16^x = 2$

12.  $2^{x-1} > 128$

13.  $\sqrt{9^{x+1}} = 27$

14.  $\frac{9}{3^a} = 3^{3a-6}$

15.  $49^{m+3} = 7^{8m}$

16.  $2^{x+2} \times 5^{2x} = 10\,000$

### Answers: Merit Simplifying and Solving Exponents #3

These are generally in terms of the lowest possible integer, but some might also be solved in terms of a larger integer.

$$1. \quad 3^x \times 3^x = 9^x \text{ or } = 3^{2x}$$

$$2. \quad \sqrt{16^{2x}} = 4^{2x} \text{ or } = 16^x \quad \text{since it is the reverse of Q1.}$$

$$3. \quad \frac{2^{3x}}{4^x} = \frac{8^x}{4^x} = 2^x \quad \text{or} \quad \frac{2^{3x}}{4^x} = \frac{2^{3x}}{2^{2x}} = 2^x$$

$$4. \quad 49 \times 7^k = 7^2 \times 7^k = 7^{k+2}$$

$$5. \quad \frac{24}{3 \times 2^x} = \frac{8}{2^x} = \frac{2^3}{2^x} = 2^{3-x}$$

$$6. \quad 9^x \times 27^{x+1} = (3^2)^x \times (3^3)^{x+1} = 3^{2x} \times 3^{3x+3} = 3^{5x+3} \quad \text{note that the } x+1 \text{ both triple}$$

$$7. \quad \frac{1}{27} \times 3^a = \frac{3^a}{3^3} = 3^{a-3}$$

$$8. \quad \frac{125}{25^{x+1}} = \frac{5^3}{(5^2)^{x+1}} = \frac{5^3}{5^{2x+2}} = 5^{1-2x}$$

$$9. \quad 10 \times 3^x = 810 \quad \Rightarrow \quad 3^x = 810 / 10 \Rightarrow \quad 3^x = 81 = 3^4 \Rightarrow \quad x = 4$$

$$10. \quad 2^{x-1} \times 3^{x-1} = 216 \Rightarrow \quad 6^{x-1} = 6^3 \Rightarrow \quad x-1 = 3 \Rightarrow \quad x = 4$$

$$11. \quad 16^x = 2 \quad \Rightarrow \quad (2^4)^x = 2^1 \Rightarrow \quad 2^{4x} = 2^1 \Rightarrow \quad 4x = 1 \Rightarrow \quad x = 0.25 \text{ [ or } 1/4]$$

$$12. \quad 2^{x-1} > 128 \Rightarrow \quad 2^{x-1} > 2^7 \Rightarrow \quad x-1 > 7 \Rightarrow \quad x > 8$$

$$13. \quad \sqrt{9^{x+1}} = 27 \Rightarrow \quad 3^{x+1} = 3^3 \Rightarrow \quad x+1 = 3 \Rightarrow \quad x = 2$$

$$14. \quad \frac{9}{3^a} = 3^{3a-6} \Rightarrow \quad 9 = 3^{3a-6} \times 3^a \Rightarrow \quad 3^2 = 3^{4a-6} \Rightarrow \quad 2 = 4a-6 \Rightarrow \quad a = 2$$

$$15. \quad 49^{m+3} = 7^{8m} \Rightarrow \quad (7^2)^{m+3} = 7^{8m} \Rightarrow \quad 7^{2m+6} = 7^{8m} \Rightarrow \quad 2m+6 = 8m \Rightarrow \quad m = 1$$

$$16. \quad 2^{x+2} \times 5^{2x} = 10\,000 \Rightarrow \quad 2^2 \times 2^x \times (5^2)^x = 10\,000 \Rightarrow \quad 2^x \times 25^x = 10\,000 / 4 \\ \Rightarrow \quad 50^x = 2500 \quad \Rightarrow \quad x = 2$$