



SKILL 20: Evaluating Expressions with Exponents

To evaluate expressions with exponents, it is necessary to extend the order of operations rules to include exponents.

1. Do operations inside parentheses.
2. Evaluate terms with exponents.
3. Multiply and divide from left to right.
4. Finally, do all additions and subtractions from left to right.

To evaluate an expression that contains variables, first replace each variable in the expression with its value. Then use the order of operations.

Example 1

Evaluate $1 + 7(-3 + 5)^2$.

$$1 + 7(-3 + 5)^2 = 1 + 7 \cdot (2)^2$$

Do the operations within parentheses.

$$= 1 + 7 \cdot (4)$$

Evaluate 2^2 .

$$= 1 + 28$$

Multiply.

$$= 29$$

Add. So, $1 + 7(-3 + 5)^2 = 29$

Example 2

Evaluate $x^2 + 15$ for $x = 5$.

$$x^2 + 15 = 5^2 + 15 \quad \text{Replace the variable with its value.}$$

$$= 25 + 15 \quad \text{Evaluate } 5^2.$$

$$= 40 \quad \text{Add. For } x = 5, \text{ the value of } x^2 + 15 \text{ is } 40.$$

Guided Practice

1. Evaluate $1 + 2^3 \cdot (7 - 13)$.

$$1 + 2^3 \cdot (7 - 13)$$

$$= 1 + 2^3 \cdot (\underline{\quad})$$

$$= 1 + \underline{\quad} \cdot (\underline{\quad})$$

$$= 1 + (\underline{\quad})$$

$$= \underline{\quad}$$

$$1 + 2^3 \cdot (7 - 13) = \underline{\quad}$$

2. Evaluate $5x^2 + 1$ for $x = -2$.

$$5x^2 + 1$$

$$= 5 \cdot (\underline{\quad})^2 + 1$$

$$= 5 \cdot (\underline{\quad}) + 1$$

$$= \underline{\quad} + 1$$

$$= \underline{\quad}$$

$$\text{For } x = -2, \text{ the value of } 5x^2 + 1 \text{ is } \underline{\quad}.$$

SKILL 20: Practice

Evaluate each expression.

1. $(4 + 6)^3 =$ _____
2. $(-8 + 5)^2 =$ _____
3. $4 + 6^3 =$ _____
4. $1 + 5^3 =$ _____
5. $40 + 3 \cdot 2^2 =$ _____
6. $16 - 7 \cdot 2^3 =$ _____
7. $(12 - 5)^3 =$ _____
8. $(16 - 7) \cdot 2^3 =$ _____
9. $(2 + 3)^2 - 7 =$ _____
10. $(16 - 7 \cdot 2)^3 =$ _____
11. $48 + (-2)^3 =$ _____
12. $(2^3 + 4^2) \div 4 =$ _____
13. $(1 + 6)^2 \cdot 3 =$ _____
14. $2^3 + 4^2 \div 4 =$ _____
15. $(3 + 3^2) \div 3 =$ _____
16. $2^5 - 1 =$ _____

Evaluate each expression. Use the given value for each variable.

17. $41 + m^2$ for $m = 3$ _____
18. $(17 - k)^3$ for $k = 12$ _____
19. $(x + 4)^2$ for $x = 8$ _____
20. $(5 + 2n)^5$ for $n = -2$ _____

Solve.

21. A company plans to assign a 5-digit ID number to each employee. The first digit will never be 0. The expression $9 \cdot 10^4$ represents the number of possible ID numbers. How many ID numbers are possible? _____
22. If you have two dice of different colors, there are $6^2 - 6$ ways to roll two different numbers. In how many ways can you roll two different numbers? _____

TEST PREP23. Evaluate $(1 + 3 \cdot 2)^2$.

- A 13 C 49
B 37 D 56

Skill 20

24. What is the standard form for $(-2)^3$?

- F -6 H 6
G -8 J 8

Skill 19