Multiplication Property of Exponents

Name: _____	Date: _____	Score: _____ / 18

Quick Review and Helpful Hints

When you multiply powers with the *same base*, keep the base and *add* the exponents: $x^a \cdot x^b = x^{a+b}$. When a power is raised to another power, *multiply* the exponents: $(x^a)^b = x^{ab}$. When a product is raised to a power, the power goes to each factor: $(xy)^a = x^a y^a$.

▷ **Example:** Simplify $x^3 \cdot x^5$. **Work:** The base x is the same in both factors, so keep the base and add the exponents: $3 + 5 = 8$.

★ **Answer:** x^8

Practice Problems

Simplify each expression using the properties of exponents.

1. $x^2 \cdot x^4$ _____

2. $y^5 \cdot y^3$ _____

3. $2^3 \cdot 2^2$ _____

4. $(x^3)^4$ _____

5. $a^6 \cdot a$ _____

6. $(y^2)^5$ _____

7. $m^4 \cdot m^4$ _____

8. $(3^2)^3$ _____

9. $(xy)^3$ _____

10. $x^2 \cdot x^3 \cdot x^4$ _____

11. $(2x)^4$ _____

12. $b^7 \cdot b^2$ _____

13. $(a^3 b)^2$ _____

14. $p^5 \cdot p^0$ _____

Word Problems

15. A square garden has a side length of x^4 feet. Its area is side times side. Write the area as a single power of x.

_____

16. A cube has edges of length y^2 inches. Its volume is the edge cubed, $(y^2)^3$. Write the volume as a single power of y.

_____

17. A bacteria count can be written as $2^5 \cdot 2^3$. Write this as a single power of 2.

_____

18. A rectangle has length x^5 and width x^2. Write its area as a single power of x.

_____

Answer Keys

1. x^6	7. m^8	13. a^6b^2
2. y^8	8. 3^6	14. p^5
3. 2^5	9. x^3y^3	15. x^8 ft^2
4. x^{12}	10. x^9	16. y^6 in^3
5. a^7	11. $16x^4$	17. 2^8
6. y^{10}	12. b^9	18. x^7

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiplying powers of the same base just counts factors of x: two plus four makes six. Add the exponents to get x^6. So the final answer is x^6.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Same base, so add the exponents: $5 + 3 = 8$, giving y^8. So the final answer is y^8.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Keep the base 2 and add: $3 + 2 = 5$. The answer 2^5 equals 32 if you want a number. So the final answer is 2^5.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A power raised to a power multiplies the exponents: $3 \times 4 = 12$, so x^{12} – it's x^3 used as a factor four times. So the final answer is x^{12}.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A lone a means a^1, so add: $6 + 1 = 7$, giving a^7. So the final answer is a^7.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply the exponents for a power of a power: $2 \times 5 = 10$, so y^{10}. So the final answer is y^{10}.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Same base, add the exponents: $4 + 4 = 8$, giving m^8. So the final answer is m^8.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply the exponents: $2 \times 3 = 6$, so 3^6. So the final answer is 3^6.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A power on a product reaches every factor inside, so $(xy)^3 = x^3y^3$. So the final answer is x^3y^3.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Add all three exponents at once: $2 + 3 + 4 = 9$, giving x^9. So the final answer is x^9.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The power applies to both the 2 and the x: $2^4 = 16$ and x^4, so $16x^4$. So the final answer is $16x^4$.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Same base, so add: $7 + 2 = 9$, giving b^9. So the final answer is b^9.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Send the outer power to each factor: $(a^3)^2 = a^6$ and b^2, so a^6b^2. So the final answer is a^6b^2.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Anything to the zero power is 1, so $p^0 = 1$ and $p^5 \cdot 1 = p^5$. So the final answer is p^5.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Area is side times side: $x^4 \cdot x^4 = x^8$ square feet (add the exponents). So the final answer is x^8 ft^2.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Volume is the edge cubed: $(y^2)^3 = y^6$ cubic inches (multiply the exponents). So the final answer is y^6 in^3.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Same base, so add the exponents: $2^5 \cdot 2^3 = 2^8$. So the final answer is 2^8.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Area is length times width: $x^5 \cdot x^2 = x^7$. So the final answer is x^7.

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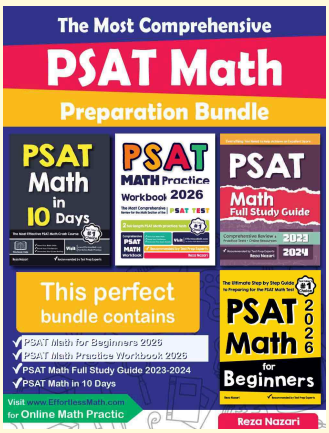

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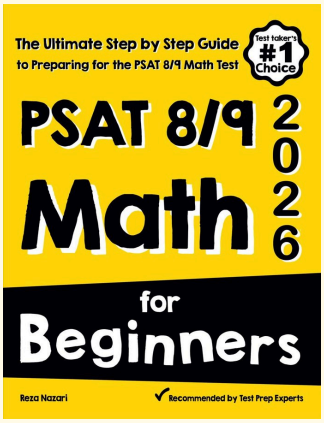

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