**PROBLEMS AND SOLUTIONS - POLYNOMIAL EXPRESSIONS**
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**PLEASE NOTE THAT YOU MUST BE ABLE TO DO THE FOLLOWING PROBLEMS WITHOUT A CALCULATOR!**

**Problem 1:**

Decide whether or not the following algebraic expressions are polynomials. Answer Yes or No!

a. $5x^3 + 2x + 5$

b. $6x + \dfrac{5}{x^2}$

c. $\dfrac{4}{3}x^2 - \dfrac{1}{2}x$

d. $5$

e. $3x - 1$

f. $-4x^3 + 3x^{-2}$

**Problem 2:**

Add $6x^3 + 7x^3$.

**Problem 3:**

Subtract $a^5 - 3a^5$.

**Problem 4:**

Combine $a^5 + 5a^2 - 4a^5 - 6a^2$ and write the terms in descending order of their exponents.

**NOTE: The word "combine" in mathematics often indicates that you are supposed to add or subtract!**

**Problem 5:**

Combine $a + a + a^2 - a^3$ and write the terms in descending order of their exponents.

**Problem 6:**

Combine $x^3 + 5x - (3x^3 + 5x)$ and write the terms in descending order of their exponents.

**Problem 7:**

Combine $9 + 3x + 5 + x^2 + x^2$ and write the terms in descending order of their exponents.

**Problem 8:**

Multiply $3(2a^2 + 3ab - 4b^2)$.

**Problem 9:**

Multiply $3x(7 + 3x^2)$ and write the terms in descending order of their exponents.

**Problem 10:**

Multiply $3x(7 - 3x^2)$ and write the terms in descending order of their exponents.

**Problem 11:**

Multiply $-3x(7 + 3x^2)$ and write the terms in descending order of their exponents.

**Problem 12:**

Multiply $-3x(7 - 3x^2)$ and write the terms in descending order of their exponents.

**Problem 13:**

Multiply $(x + 4)(x - 2)$. Combine like terms, if necessary and write the terms in descending order of their exponents.

**Problem 14:**

Multiply $(2x - 5x^2)(3x^3 + 9)$ and write the terms in descending order of their exponents.

**Problem 15:**

Use the **FOIL Method** to multiply $(x - 4)(x^2 + 2)$. Combine like terms, if necessary and write the terms in descending order of their exponents.

**Problem 16:**

Use the FOIL Method to multiply $(2x - 3)(x - 2)$. Combine like terms, if necessary and write the terms in descending order of their exponents.

**Problem 17:**

Use the FOIL Method to multiply $(x + 3)(x - 2)$. Combine like terms, if necessary and write the terms in descending order of their exponents.

**Problem 18:**

Use the FOIL Method to multiply $(kx + 3)(x - t)$.

**Problem 19:**

Simplify $(5 - x)^2$. Combine like terms, if necessary and write the terms in descending order of their exponents.

**The word "simplify" takes on many meanings in mathematics. Often you must figure out its meaning from the mathematical expression you are asked to "simplify." Here we will be asked to "simplify" instead of to squaring the term.**

**Problem 20:**

Simplify $(5 + x)^2$. Combine like terms, if necessary and write the terms in descending order of their exponents.

**Problem 21:**

Divide $\dfrac{8x^3 - 4x^2}{2x^2}$ and write the reduced terms in descending order of their exponents.

**Problem 22:**

Divide $\dfrac{18x^3y^2 + 9x^4y^3 - 24x^6y^3z^2}{-3xy^2}$ and reduce to lowest terms if possible.

**Problem 23:**

Divide $\dfrac{3a^4b^5 - 9ab}{9ab}$ and write the terms in descending order of their exponent.

**Problem 24:**

Multiply $\left(\dfrac{6a}{7b}\right)\left(\dfrac{b^3}{2a}\right)$ and reduce to lowest term, if possible.

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## SOLUTIONS
You can find detailed solutions below the link for this problem set!

| 1. a. Yes  b. No  c. Yes<br>d. Yes  e. Yes  f. No | 2. $13x^3$ | 3. $-2a^5$ |
|---|---|---|
| 4. $-3a^5 - a^2$ | 5. $-a^3 + a^2 + 2a$ | 6. $-2x^3$ |
| 7. $2x^2 + 3x + 14$ | 8. $6a^2 + 9ab - 12b^2$ | 9. $9x^3 + 21x$ |
| 10. $-9x^3 + 21x$ | 11. $-9x^3 - 21x$ | 12. $9x^3 - 21x$ |
| 13. $x^2 + 2x - 8$ | 14. $-15x^5 + 6x^4 - 45x^2 + 18x$ | 15. $x^3 - 4x^2 + 2x - 8$ |
| 16. $2x^2 - 7x + 6$ | 17. $x^2 + x - 6$ | 18. $kx^2 - ktx + 3x - 3t$ |
| 19. $x^2 - 10x + 25$ | 20. $x^2 + 10x + 25$ | 21. $4x - 2$ |
| 22. $-6x^2 - 3x^3y + 8\,x^5yz^2$ | 23. $\dfrac{a^3b^4}{3} - 1$  or  $\dfrac{1}{3}a^3b^4 - 1$ | 24. $\dfrac{3b^2}{7}$  or  $\dfrac{3}{7}b^2$ |