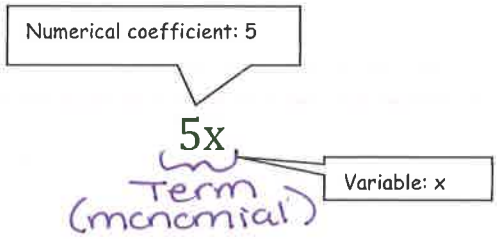
Polynomials: Key Terms

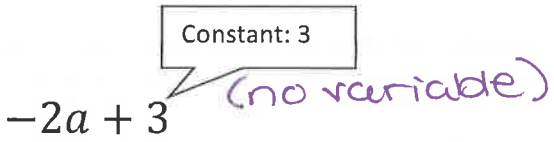
Term	Definition	Example
Term		
Coefficient		
Variable		
Constant		
Monomial		
Binomial		
Trinomial		
Polynomial		
Degree of a term		
Degree of a Polynomial		
Algebra Tiles		
Combine like-terms		
Area Model		
Distribution (Expanding)		
FOIL		
GCF vs LCM		
Factoring using a GCF		
Factoring by Grouping		
Factoring $ax^2 + bx + c$ when $a = 1$		
Factoring $ax^2 + bx + c$ when $a \neq 1$		
Difference of Squares		
Perfect Square Trinomial		

What is a Polynomial?

What is a Term? The "things that make up an expression"

A **term** is a number and/or variable connected by multiplication or division. One term is also called a **monomial.**





The following are terms: 5, x, 3x, $5x^2$, $\frac{3x}{4}$, $-2xy^2z^3$

Each term may have a **coefficient, variable(s) and exponents**. One term is also called a **monomial.**

If there is no variable present...we call the term a **constant.**

Answer the questions below.

1. What is/are the coefficients below?

$5xy^2 - 7x + 3$

number in front of the variable

5, -7 "sign belongs" to coefficient

2. What is/are the constant(s) below?

$12x^2 - 5x + 13$

number "alone" no variable

13

3. What is/are the variable(s) below?

$5xy^2 + 3$

letters.

x, y

A **polynomial** is an expression made up of **one or more terms** (1+) connected to the next by addition or subtraction.

"poly" = means many

We say a polynomial is any expression where the **coefficients are real** numbers and all **exponents are whole** numbers. That is, no variables under radicals (rational exponents), no variables in denominators (negative exponents).

↳ $\sqrt{x}$ ↳ $\frac{1}{x}$ or x^{-1}

The following are polynomials: ✓

x, $2x - 5$, $5 + 3x^2 - 12y^3$, $\frac{x^2+3x+2}{2}$, $\sqrt{3}x^2 + 5y - z$

The following are **NOT** polynomials: ✗

x^{-2}, $3\sqrt{x}$, $4xy + 3xy^{-3}$, $12xz + 3^x$

Polynomial:
- 1+ terms
- coefficient ER
- exponents EW

Degree to constant term = 0

Degree° — The "order"

Term: $4x^2y^2z$, $2+2+1 = 5°$

Polynomial: $4x^2y^2 - 3x^3 - 17 + 8x$, $2+2$, 3, 0, 1

4

we say: $\deg(4x^2y^2 - 3x^3 - 17 + 8x) = 4$

The largest degree of the terms is the degree of the polynomial.

Which of the following are not polynomials? Indicate why.

4. $3xyz - \frac{2}{x}$ X
no variable in the denominator

5. $\frac{1}{-5}x^3 - 5y$
Yes

6. $2x - 4y^{(-2)}$ X
no neg. exponents

7. $(3x+2)^{\frac{1}{3}}$ X
no exponent that isn't a whole number

8. $\sqrt{3} + x^2 - 5$
yes

9. $\frac{5}{3}x - 2^x$ X
no variable exponents (must be EW)

Classifying polynomials:

By Number of Terms:

- **Monomial**: one term. Eg. $7x$, 5, $-3xy^3$
- **Binomial**: two terms Eg. $x+2$, $5x-3y, y^3+\frac{5x}{3}$
- **Trinomial**: three terms Eg. x^2+3x+1, $5xy-3x+y^2$
- **Polynomial**: four terms Eg. $7x+y-z+5$, $x^4-3x^3+x^2-7x$

By Degree:
To find the degree of a *term*, add the exponents within that term.

Eg. $-3xy^4$ is a 5th degree term because the sum of the exponents is 5.
$5z^1y^5x^3$ is a 9th degree term because the sum of the exponents is 9.

To find the degree of a polynomial first calculate the degree of each term. The highest degree amongst the terms is the degree of the polynomial.

Eg. $x^4 - 3x^3 + x^2 - 7x$ is a 4th degree polynomial. The highest degree term is x^4.
$3xyz^4 - 2x^2y^3$ is a 6th degree binomial. The highest degree term is $3xyz^4$ (6th degree)
1+1+4=6

Classify each of the following by degree and by number of terms.

10. $2x+3$
Degree: 1
Name: Binomial

11. $x^3 - 2x^2 + 7$
Degree: 3
Name: Trinomial. (3 terms)

12. $2a^3b^4 + a^2b^4 - 27c^5 + 3$
Degree: 7
Name: Polynomial (4 terms)

13. 7
Degree: 0
Name: monomial

14. Write a polynomial with one term that is degree 3.
$2x^2y$

15. Write a polynomial with three terms that is degree 5.
$5x^2y^3 + 2y^3 + 10$

Algebra Tiles

The following will be used as a legend for algebra tiles in this guidebook.

1	-1	x	-x	x^2	$-x^2$
					

Write an expression that can be represented by each of the following diagrams.

Pay close attention to +/- when writing expressions

16.

$x\ x\ x\ x\ x$

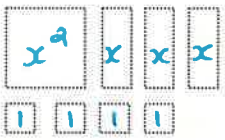
$= 5x$

17.

$-x^2\ -x^2\ -x^2$

$= -3x^2$

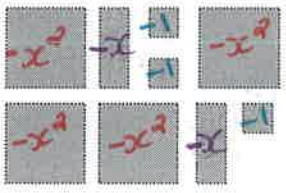
18.



$= x^2 + 3x + 4$

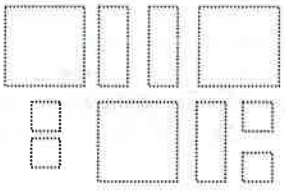
group like terms

19.



$-4x^2 - 2x - 3$

20.



$3x^2 + 3x + 4$

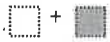
21. Draw a diagram to represent the following polynomial.

$3x^2 - 5x + 6$

22. Draw a diagram to represent the following polynomial.

$-3x^2 + x - 2$

23. What happens when you add the following?

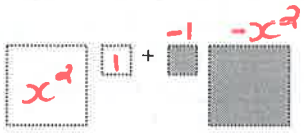


$+1 + (-1)$

$1 - 1 = 0$

"zero principle"

24. What happens when you add the following?

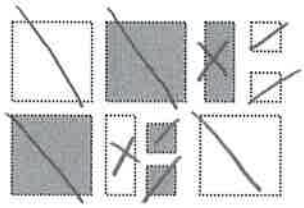


$x^2 + 1 - 1 - x^2$

$= 0$

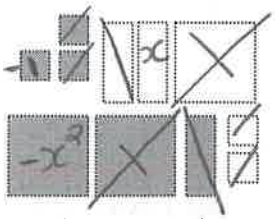
(zero principle

25. Simplify by cancelling out tiles that add to zero. Write the remaining expression.



$= 0$

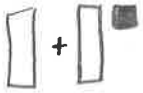
26. Simplify by cancelling out tiles that add to zero. Write the remaining expression.



$-x^2 + x - 1$

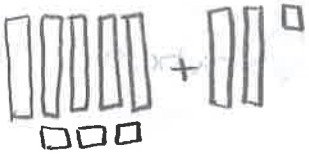
27. Represent the following addition using algebra tiles. Do not add.

$x + (x - 1)$



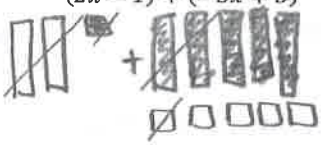
28. Represent the following addition using algebra tiles. Do not add.

$(5x + 3) + (2x + 1)$



29. Use Algebra tiles to add the following polynomials. (collect like-terms)

$(2x - 1) + (-5x + 5)$



$-3x + 4$

30. Use Algebra tiles to add the following polynomials. (collect like-terms)

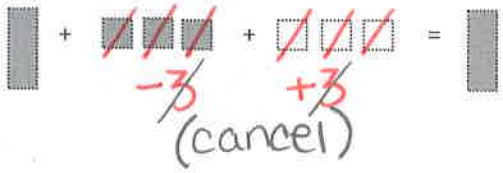
$(2x^2 + 5x - 3) + (-3x^2 + 5)$

$-x^2 + 5x + 2$

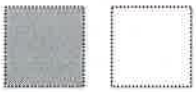
The Zero Principle:

The idea that opposites cancel each other out and the result is zero.

Eg. $x + 3 + (-3) = x$ The addition of opposites did not change the initial expression.

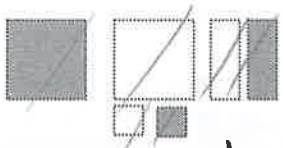


31. What is the sum of the following tiles?



Sum 0

32. If you add the following to an expression, what have you increased the expression by?



all cancel
= 0

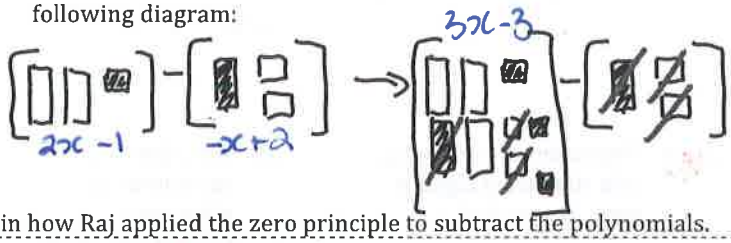
33. Represent the following subtraction using algebra tiles.

$(2x - 1) - (-x + 2)$

34. Why can you not simply "collect like-terms" when subtracting the two binomials in the previous question?

Because the $-(-x$ outside the bracket changes the signs $+x$

35. When asked to subtract $(2x - 1) - (-x + 2)$, Raj drew the following diagram:

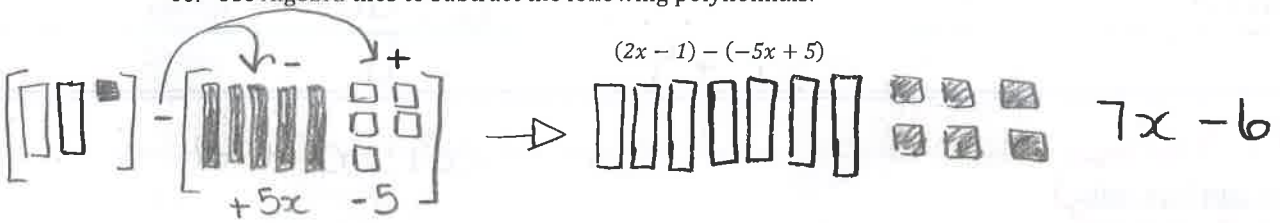


Explain how Raj applied the zero principle to subtract the polynomials.

He added a zero pair
added the opposite operation

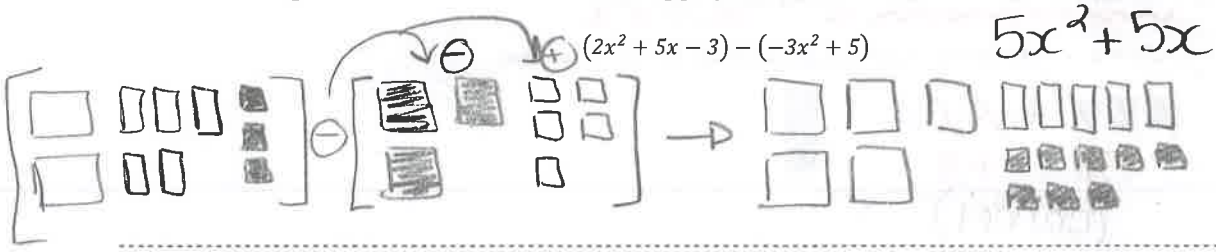
36. Use Algebra tiles to subtract the following polynomials.

$(2x - 1) - (-5x + 5)$



37. Use Algebra tiles to subtract the following polynomials.

$(2x^2 + 5x - 3) - (-3x^2 + 5)$



38. Use Algebra tiles to subtract the following polynomials.

$(-2x^2 - 4x - 3) - (-3x^2 + 5)$