## Introduction to Polynomials

A polynomial is an expression in which terms are added or subtracted.
e.g. $2 x^{2}+x-1$

## Polynomials are classified by the number of terms:

$$
\begin{gathered}
6 x^{2}=\text { one term }=\text { monomial } \\
2 x+3 y=\text { two terms }=\text { binomial } \\
4 x^{2}+3 x-7=\text { three terms }=\text { trinomial }
\end{gathered}
$$

A term is a mathematical expression using numbers and variables to indicate a product
e.g. $3 x, 5 x^{2} y,-7 y, x^{2}, 5 x^{3}$

## Example.

$3 x$ where $3=$ coefficient $\mathrm{x}=$ variable
$8 x+3$ where $8 x$ and 3 are terms $8 x=$ variable term
$8=$ coefficient of $x$
3 = constant

The degree of a term is the sum of the exponents of its variables

$$
\begin{aligned}
& \text { e.g. } 5 x^{3} \text { degree } 3 \\
& 6 x^{4} y^{3} \text { degree } 7
\end{aligned}
$$

The degree of a polynomial is the greatest degree of its terms after it has been simplified

$$
\begin{aligned}
& \text { e.g. } 3 x+7 y \text { degree } 1 \\
& \qquad 4 x^{5}+2 x^{2} \text { degree } 5
\end{aligned}
$$

A polynomial is written in standard form when it is written in descending order of its exponents by alphabetical order

Handout: DO TOGETHER AS A CLASS
A. How many terms are in each of the following expressions?

1. $2 x+3 y 2$ terms
2. $\mathrm{a}+\mathrm{b}-\mathrm{c} 3$ terms
3. $3 x^{2} \quad 1$ term
4. $(5 x)(2 y) 1$ term
5. $3 x^{2}+7 x+5 \quad 3$ terms
6. $-8 x^{3}+5 x^{2}-3 x+44$ terms
7. $(3 x)\left(-2 x^{2}\right) 1$ term
8. $\left(6 x^{2}\right) \div 2 \quad 1$ term
B. Circle the constant(s) in each of the expressions below.
9. $3 x+4$
10. $5 x+3 y$
11. $8 x^{2}-8$
12. $5 a-3 b+2 c+9$
13. $16 x^{2}-5+3 x$
14. $7 x^{2}-3 x+4$
15. $x-1.6$
8.(5) $+2 x-3 x^{2}$
C. Circle the yariable(s) in each of the expressions below.
16. 3 (a) $\div 5(b)-6$
17. $5 \times 2+15$
18. $32^{2}-4 y^{2}+272$
19. (2) $+(B)-4 C^{2}$
20. $x^{2} y^{2}-38 D+5$
21. $-7 y-5(2)$
22. $14(8-10$
23. (a) $\left.)^{3}+2\right)^{2}-3(a)+6$
D. Circle the numerical coefficient(s) in each expressions below.
24. (3ky
25. (3) $x^{2}+(4) y^{2}$
26. -4 abc
27. $2.6 x^{2}-3.0 y^{2}+7$
28. (14) $\mathrm{sy}^{3}$
29. $\left(4 a^{2} b+2 a b^{2}\right.$
6.118
30. $7 x$ € -12
E. Label each polynomial below as to whether it is a monomial, a binomial or a trinomial.
31. $3 x^{2}+5 x-7$ trinomial
32. 7 monomial
33. $\left(3 x^{2}\right)(2 x)(3)$ monomial
34. $a b+b c$ binomial
35. $2 a+3 b-4 c$ trinomial
36. $(7 x)(2 y)$ monomial
37. $\left(3 x^{2}\right)^{3}$ monomial
38. -7 monomial
F. State the degree of each of the following polynomials.
39. $3 x^{2}$ degree 2
40. $a^{5}$-degree 5 ..
41. $30 a^{4}+15 a^{3}$ degree 4
42. $5 x^{2}-3 x+2$ degree 2
43. $x^{3}-y^{2}$ degree 3
44. $-5 x^{3} \div 3 x^{2}$ degree 3
45. $x^{2} y^{3}$ degree 5
46. $5 x$ degree 1
47. $3 x^{2} y^{3}$ degree 5
48. $3 x^{5}+4 x^{2} y^{2}-5 y^{3}$ degree 5
G. Complete each of the following statements.
49. Name the end degree term in the expression $3 x^{3}+5 x^{2}-2 x$. $\qquad$
50. Write any th degree binomial. answers will vary, ex. $x^{2} y^{2}+7,4 x^{4}+x$
51. How many terms are in the expression $3-5 x y+3 x^{2} y^{3}$ ? $\qquad$ 3
52. Write out the constant (s) in the expression $3 x^{2}-5 x y+2$. $\qquad$ 2
53. Write the following polynomials in standard form:
$\square$
a) $7 x^{3}-5 x^{6}+2 x^{2}-8 x^{5}+23 \quad-5 x^{6}-8 x^{5}+7 x^{3}+2 x^{2}+23$
b) $8 x^{5}+7 x^{4}-6 x^{5} y^{3}+9 x^{9}$

$$
9 x^{9}+8 x^{5}-6 x^{5} y^{3}+7 x^{4}
$$

6. Write out the 2 nd degree term in the polynomial $6 x^{3}+3 x^{2} y^{2}+5 x y-7$. $\qquad$ $5 x y$ '
7. Write out the 3 rd degree term in th polynomial $4 x^{2} y^{3}-7 x^{3}+3 x^{2}$. $-7 x^{3}$
8. Write any ard degree trinomial in standard form. answers will vary, ex. $x^{3}+3 x-9$
9. Which is the numerical coefficient in the term $7 x^{2} y^{3} z^{4}$ ? $\qquad$
10. Using the expression $\left(-8 x^{2}+3 x-5\right)$, answer the following questions.
a) It contains $\qquad$ three terms, and is therefore called a $\qquad$ trinomial
b) The second terms contains $\qquad$ two factors and they are $\qquad$ 3 and $x$ -.
c) This polynomial is written in the $\qquad$ second degree.
d) The constant(s) in this expression is (are) $\qquad$ -5
e) The numerical coefficient of the 2nd term is $\qquad$ 3
11. Write any 5th degree monomial. answers will vary, ex. $5 x^{3} y^{2}$
12. Complete the polynomial by writing a 2nd degree term. $8 x^{7}+4 x^{5} \div 2 x^{2}$ $\div 9 x$.
13. Complete the polynomial by writing a Grd degree term. $7 x^{6}+5 x^{5}-7 x^{3}$ $+2 x$.

## HW: Worksheet \# 1-6

