Chapter 4: Algebraic Expressions

A _____ is the Product of a Real number by a non-negative integer power of x.

ax^n

ex: Monomial or not?

1) $-2x^3$ 2) $3x^{-2}$ 3) $2x^{1/3}$

The _____ of a monomial corresponds to the exponent on the variable.

ex: Find the degree 1) $-2x^3=$
2) $4x^5=$
3) $64x^2=$

If there are many variables, the _____ is equal to the sum of the exponents.

ex: Find the degree 1) $-3x^2y^3$
2) $-4x^4y^6$
3) $5xy$

Two monomials are called _____ if they have the same variables with the same exponents.

ex: Are they 'like terms'?

1) $3x^2$, $5x^2$
2) $5x^2y^3$, $3x^2y^2$
3) $3x^2$, $5x^3$
4) $5x^2y^3$, $3x^3y^2$

A _____ is an expression where monomials are being added or subtracted together.

1 term called _____
ex: $3x^2$, 5, $2xy$

2 terms called _____
ex: $5x+2$, $3xy+2x$, $4x+7$

3 terms called _____
ex: $2x^2+4x-7$,
$3x^2+5x-6$

Adding Monomials

$$3x^2 + 5x^2 =$$

* Add coefficients, keep same variables + exp.

ex: $2x^2y + 3x^2y$
$4x^2z + 3x^2z$
$x^2y + x^2y$

Subtracting Monomials

$$3x^2y - 2x^2y =$$

* Subtract coefficients, keep same var. + exp.

ex: $3x^2yz - 2x^2yz$
$x^2y - x^2y$
$4xy - xy$

Constant times Monomial

$5(3x^2) =$
↑
invisible

* Multiply coefficients

ex: $6(2xy)$
$-5(3xy)$
$-\frac{2}{5}(-\frac{3}{4}x^2y)$

Grouping Like terms

Ex: 1) $-6x-2+3x+3$

2) $5x-(-5x)-6x+3(2x)$

3) $(-21x^2+13x-4)+(-12x^2-15x+6)$

4) $(-21x^2+13x-4)-(-12x^2-15x+6)$

5) $(20x^2+10x)-(10x^2-5x)$

Monomial times Monomial

$ax^m \cdot bx^n = (a \cdot b)x^{m+n}$

* Multiply coefficients, add exponents.

Ex: 1) $2x^2 \cdot 3x^4 =$

2) $3xy \cdot 4xy^2 =$

3) $-6x^2y^3 \cdot 2x^4y^4 =$

4) $\frac{3}{4}xy \cdot \frac{1}{2}x^2y^3 =$

5) $\frac{2}{5}xz^2 \cdot \frac{3}{4}xz^3 =$

6)

Distributive Property: Constant × Binomials

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

2) $6(2+3b)$

3) $5\left(\frac{3}{5}c-1\right)$

4) $(-2h+1)(3)$

5) $(3m-2)(-4)$

6) $3(3a+2)-2(5a-9)$

7) $5(2a-6)-2+3(5a)-1a$

Multiplying monomial × Binomials

1) $15x(2x-1)$

2) $4x(-2x+1)$

3) $(-2x+1)(4x^2)$

4) $-3x(2x^2-2x+1)$

5) $6x^3(x^2+1)$

6) $-2x^2(3xy+2y)$

FOIL

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

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

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

Divide

1) $\frac{-16x^4+32x^2}{-4x} =$

2) $\frac{80x^4+20x^2-10x}{5} =$

3) $\frac{30x^4-20x^3+10x^2}{5x^2} =$

4) $-\frac{6x^2+2x}{-x} =$

Order of Operations (Bedmas)

1) $6 \times 6 \div 4 - 1$

2) $5 - 14 \div 2$

3) $(8-5)^2 + (7-4)^2$

4) $\frac{55 \div 5}{7+4} + 1$

5) $30 \div 3 - (2-1)$

Evaluate

1) $y \div 2 + x$ $\quad x=3, y=-4$

2) $y - z + xz + 6$ $\quad x=4 \quad y=3 \quad z=6$

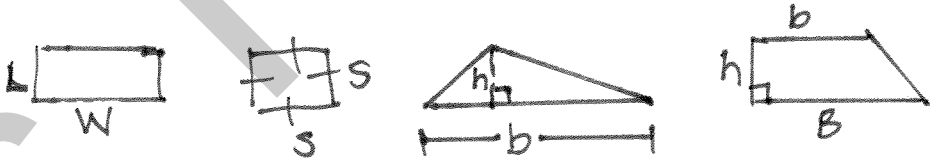
3) $x^3 \div 3 - y$ $\quad x=4 \quad y=-2$

4) $(a^2 - b) \div 6$ $\quad a=3 \quad b=-1$

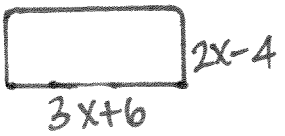
5) $p^2 m \div 4$ $\quad p=5 \quad m=-4$

AREA OF POLYGONS (ALGEBRA)

Review



ex: Find the area

1) 

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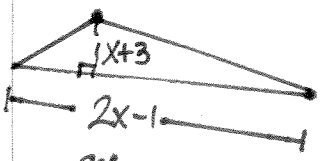

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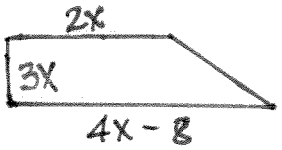
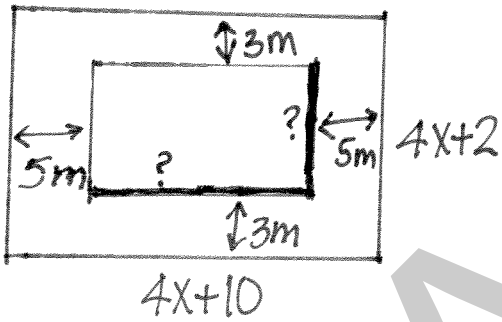


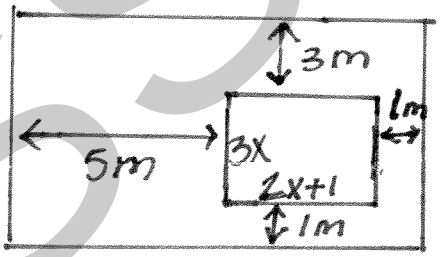
Geometric Area

Find the missing measurements.

1)

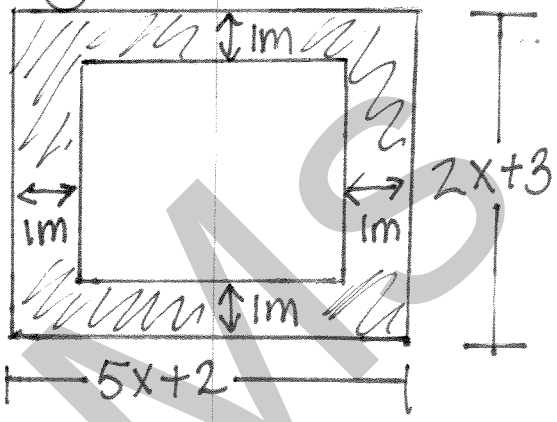


2)



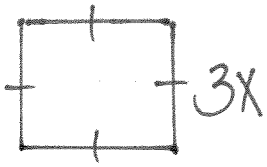
Find the area of shaded region

1)

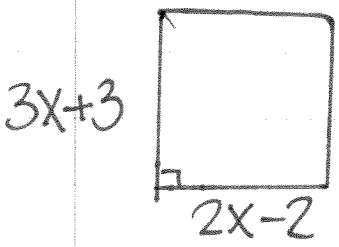


(2) The length of a rectangular park is 4m more than twice its width. A 3m sidewalk is installed around the park. If the area of the sidewalk is $168m^2$. Find the dimensions of the park.

③ The area of a square is 900 m^2. Find the value of x and the numerical length.



④ The perimeter of a rectangle measures 22m. Find the cost if $1m^2 = 50\$$



Removing the common factor.

$$ab + ac = a(b+c)$$

* You are removing the number or variable that is common in each monomial.

Factor by removing the greatest common factor

1) $5x + 10y - 15$

2) $12x^2 - 8x =$

3) $4x^2y + x^2y =$

4) $30x^2y + 60x^2y^e$

5) $18x^2y^3 - 24x^3y^2 + 12x^4y^2$

6) $-4x^2 + 8$

7) $-2x^2 + 4y^2 + 6z^2$

8) $-3xy^2 - 6xy$

9) $3(x+5) - 4x(x+5)$

Identities

Perfect Square Trinomial

$$(a+b)^2 = a^2+2ab+b^2$$

ex: $(2x+5y)^2 =$

$(-1x-3)^2 =$

$(2x-6)^2 =$

Square of a Difference

$$(a-b)^2 = a^2-2ab+b^2$$

ex: $(2x-5y) =$

$(3x-4)^2 =$

$(-x-6) =$

Difference of 2 Squares

$$(a+b)(a-b) = a^2-b^2$$

ex: $(7x+5)(7x-5) =$

$(3x-1)(3x+1) =$

$(x-3)(x+3) =$

Intervals and Inequalities

Any set of real numbers that is represented on the # line by a segment is called an _____.

Intervals are represented by brackets [or].

● closed dot
○ open dot

$[a,b]$ → $x \leq a$ $]-\infty, a]$ →

$[a,b[$ → $x < a$ $]-\infty, a[$ →

$]a,b]$ → $x \geq a$ $[a, \infty[$ →

$]a,b[$ → $x > a$ $]a, \infty[$ →

ex: Find the graphical representation

1) $[5,10]$ 2) $[0,20[$ 3) $]-5,10]$ 4) $]-\infty,8]$

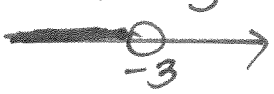
5) $x \geq 5$ 6) $x < -3$ 7) $]-2,\infty[$

ex: Find the interval

1) 

2) 

5) 

6) 

SOLVING INEQUALITIES

EQUALITY is ____

Inequality

$>$ $<$ $\geq$ $\leq$

ex 1) $x+3<7$ 2) $3x-4 \leq x-10$

DIVIDING OR MULTIPLYING BY NEGATIVE

ex 1) $2x-12. < 5x$ 2) $\frac{2x}{-3} \leq 6$

3) $5x+20<10x$

Chapter 3: Exponents

$a^n = \#$

$a^n = \underbrace{a \times a \times a \times \ldots \times a}_{n \text{ times}}$

Button is:

ex: $5^2 =$

$5^3 =$

$(-5)^2 =$

$(-5)^3 =$

★ $a^0 = 1$ ex: $(-5)^0 =$

★ $a^1 = a$ ex: $(-5)^1 =$

Rule 1: $a^m \times a^n = a^{m+n}$

When multiplying 2 quantities with the same base, keep the common base and add exponents.

examples: 1) $2^2 \cdot 2^3 =$

2) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 =$

3) $(-2)^2 \times (-2)^4 =$

4) $\frac{2b^2}{3} \times \frac{3b^3}{4} \times b =$

5) $\left(\frac{-3}{4}m^2n\right)\left(\frac{-5}{7}mn^7\right) =$

6) $m^2n^4m^3n^6 =$

7) $8m^3 \cdot 3m^2n \cdot 2mn =$

8) $8^6 \cdot 6^3$

How to put an answer into ⊕ exponents

Extra Rule : $a^{-n} = \frac{1}{a^n}$

examples:

1) $5^{-3} =$

2) $\frac{6^{-2}}{7^4} =$

3) $4^{-2}ab^{-2} =$

4) $\frac{7^{-2}}{3^{-1}} =$

5) $5^{-2} \cdot 5^{-1} =$

6) $3m^{-1} \cdot 2m^2 =$

7) $\frac{4x^2}{x^{-1}} =$

8) $\frac{1}{4^{-2}} =$

Rule 2: $\frac{a^m}{a^n} = a^{m-n}$

When dividing 2 quantities with the same base, keep the common base and subtract the exponents.

Examples:

1) $\frac{5^6}{5^4} =$

2) $\frac{5^3}{5^3}$

3) $\frac{5^{-4}}{5^{-6}}$

4) $\frac{4x^8y^9}{10x^5y^3}$

5) $(-3)^2 \div (-3)^{-1}$

6) $\frac{7x^2y^3x^{-1}}{3xyz}$

Rule 3: $(a^m)^n = a^{m \times n}$

If an exponential expression is raised to another power, keep the base, multiply the exponents.

:xamples:

1) $(2^2)^4 =$
2) $((-2)^2)^4 =$
3) $\dfrac{(a^3)^2 \cdot (b^2)^4}{(a^4)^5}$

Rule 4: $(a \cdot b)^m = a^m \cdot b^m$

If you have a product raised to a power, you can raise each factor in the product to that power.

xamples:

1) $(2x)^3 =$
2) $(4 \cdot 5)^2 =$
3) $(5^2 x^{-1} y^2)^3 =$
4) $(2x^2 \cdot 4x^{-1})^2 =$

Rule 5: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

examples: 1) $\left(\frac{9}{2}\right)^2 =$

2) $\left(\frac{3x}{2}\right)^2 =$

3) $\left(\frac{4x^2y^{-1}}{5x^3y^2}\right)^{-2} =$

4) $\left(\frac{5x^5}{20x^2}\right)^3 =$

Powers of ten

Power Form

$10^4 = 10 \times 10 \times 10 \times 10 = 10\,000$

$10^3 =$

$10^2 =$

$10^1 =$

$10^0 =$

$10^{-1} =$

$10^{-2} =$

$10^{-3} =$

$10^{-4} =$

Practice: Write in power form then solve.

1) $0.01 \times 1000 =$
2) $1000 \times 100 =$
3) $10\,000 \times 0.01 =$
4) $0.001 \times 100 =$

Large Numbers (positive powers of 10)

$4 \times 10^3 = 4\,x$

Short Cut

$4. \times 10^3$

$2.3 \times 10^5 =$

Practice

Write in Standard Form

1) 4.6×10^6
2) 7×10^4
3) 1.123×10^5
4) 5.2×10^3
5) 3.8×1000
6) $214.86 \times 10\,000$

Small Numbers (negative powers of 10)

$10^{-4} =$

$6.8 \times 10^{-4} =$

Practice: Write in Standard Form

1) 4.6×10^{-6}
2) 7×10^{-4}
3) 1.123×10^{-5}
4) 5289.8×10^{-2}
5) 5.342×0.01
6) 4.8×0.001
7) $2.83 \times \frac{1}{100}$

Scientific Notation (SN)

→ an easy way to write big numbers

$5.21 \times 10^{4} = 52100$

A number in SN is a number in the form:

$a \times 10^{n}$

ex: $5.33 \times 10^2 =$

$a \times 10^{-n}$ } The decimal point is moved
$a \div 10^{n}$ } n decimal places to the left.

Convert to SN.

SMALL #

ex: $0.0008305 =$

steps: 1) Move the decimal after the first nonzero digit.
2) Count how many spaces the decimal has moved.
3) The exponent is negative if the original number is small.

Practice: 1) 0.105
2) 0.00285
3) 0.0004867 5

BIG #

ex: $9876.39 =$

1) 4237.85
2) 3589642
3) 1423.2478

Find the exponent.

1) $3.5 \times 10^{\square} = 0.00035$
2) $12.45 \times 10^{\square} = 12450$
3) $478.2 \times 10^{\square} = 0.4782$
4) $124.17 \times 10^{\square} = 12417000$

Multiplication of SN

Calculate & put answer in SN.

1) $(6 \times 10^{-5}) \times (72 \times 10^{2}) =$

2) $(15 \times 10^{-8}) \times (1.3 \times 10^{4})$

3) $(3.2 \times 10^{-2}) \times (6.58 \times 10^{3})$