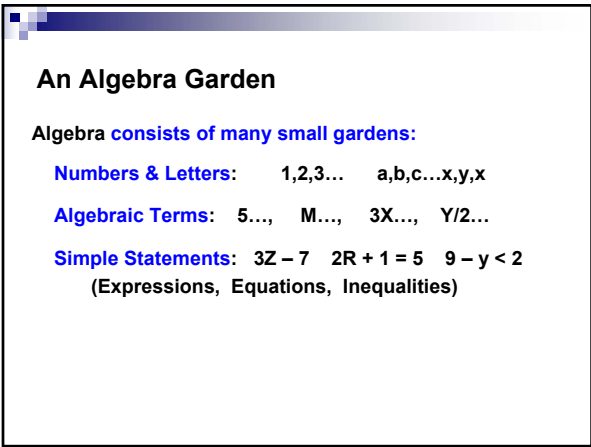


Algebra 1 / Es, Es, Is
Mathematics and Millennials – 6th



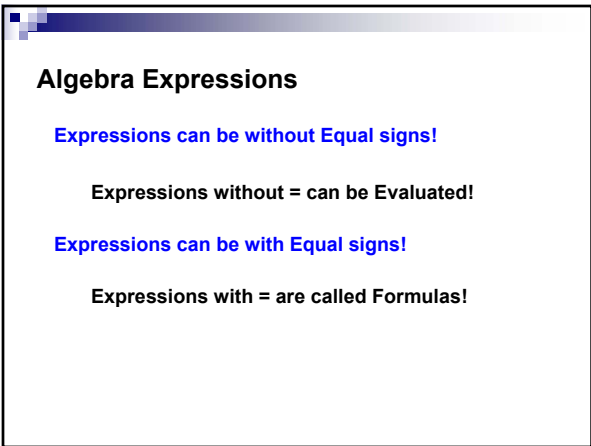
An Algebra Garden

Algebra consists of many small gardens:

Numbers & Letters: 1,2,3... a,b,c...x,y,x

Algebraic Terms: 5..., M..., 3X..., Y/2...

Simple Statements: $3Z - 7$ $2R + 1 = 5$ $9 - y < 2$
(Expressions, Equations, Inequalities)



Algebra Expressions

Expressions can be without Equal signs!

Expressions without = can be Evaluated!

Expressions can be with Equal signs!

Expressions with = are called Formulas!

Evaluate Expressions - 1

Simple expressions **complement** Arithmetic concepts.
Promote thinking **rather than** solutions by rules.
Substitute given then Evaluate. Finally, **check it!**

$N = 12 + M/2$ $M = 6$ $N = \underline{\quad}$	$Q = P/2 - 4$ $P = 8$ $Q = \underline{\quad}$
$F = 20 - 3E$ $E = 4$ $F = \underline{\quad}$	$H = 16 + 5G$ $G = 2$ $H = \underline{\quad}$

Evaluate Expressions - 2

Simple expressions **complement** Arithmetic concepts.
Promote thinking **rather than** solutions by rules.
Substitute given then Evaluate. Finally, **check it!**

$J = 18/H + 3$ $H = 9$ $J = \underline{\quad}$	$L = 15 - 21/K$ $K = 7$ $L = \underline{\quad}$
$B = 2A + 3$ $A = 5$ $B = \underline{\quad}$	$D = 4C - 5$ $C = 3$ $D = \underline{\quad}$

Evaluate Expressions - 3

Simple expressions **complement** Arithmetic concepts.
Promote thinking **rather than** solutions by rules.
Substitute given then Evaluate. Finally, **check it!**

$R = \sqrt{M - P}$ $M = 25$ $P = 2$ $R = \underline{\quad}$	$I = \sqrt{K + H}$ $K = 81$ $H = 4$ $I = \underline{\quad}$
$D = A^1 - B$ $A = 3$ $B = 1$ $D = \underline{\quad}$	$Z = X^0 + W$ $W = 1$ $X = 4$ $Z = \underline{\quad}$

Evaluate Expressions - 4

Simple expressions **complement** Arithmetic concepts.

Promote thinking **rather than** solutions by rules.

Substitute given then Evaluate. Finally, **check it!**

$S = T - \sqrt{G}$ G = 9 T = 7 S = __	$M = L + \sqrt{K}$ K = 4 L = 5 M = __
$Q = Z^2 - Y$ Z = 4 Y = 8 Q = __	$F = N + A^0$ N = 5 A = 3 F = __

Algebra Equations

Algebra Equations can be solved by Rules!

Rules promote Discipline **and** build Confidence!

Algebra Equations can be solved by Reasoning!

Reasoning encourages the use of Problem Solving!

Algebraic Equations - 1

Algebra equations **augment** Arithmetic concepts.

Promote thinking rather than **solutions by rules.**

Guess value of unknown! **Check** by substitution.

$$2P + 4 = 10 \quad P = \underline{\quad\quad} \quad 15 - 3M = 9 \quad M = \underline{\quad\quad}$$

$$7 - B/3 = 4 \quad B = \underline{\quad\quad} \quad V/2 + 1 = 3 \quad V = \underline{\quad\quad}$$

Algebraic Equations - 2

Algebra equations augment Arithmetic concepts.
Promote thinking rather than **solutions by rules**.
Guess value of unknown! **Check** by substitution.

$$C/4 + 1 = 2 \quad C = \underline{\quad\quad} \quad 9 - U/3 = 5 \quad U = \underline{\quad\quad}$$

$$9 - 4Q = 5 \quad Q = \underline{\quad\quad} \quad 5N + 3 = 23 \quad N = \underline{\quad\quad}$$

Algebraic Equations - 3

Algebra equations augment Arithmetic concepts.
Promote thinking rather than **solutions by rules**.
Guess value of unknown! **Check** by substitution.

$$2 + \sqrt{Z} = 5 \quad Z = \underline{\quad\quad} \quad 1 + \sqrt{G} = 5 \quad G = \underline{\quad\quad}$$

$$8 - D^0 = 7 \quad D = \underline{\quad\quad} \quad 9 - F^1 = 6 \quad F = \underline{\quad\quad}$$

Algebraic Equations - 4

Algebra equations augment Arithmetic concepts.
Promote thinking rather than **solutions by rules**.
Guess value of unknown! **Check** by substitution.

$$A^2 + 5 = 21 \quad A = \underline{\quad\quad} \quad E^0 + 4 = 5 \quad E = \underline{\quad\quad}$$

$$15 - \sqrt{X} = 12 \quad X = \underline{\quad\quad} \quad \sqrt{F} - 4 = 3 \quad F = \underline{\quad\quad}$$

Inequalities and Unending Solutions

Inequalities are special! Solution is a **Infinite Set**.
If Inequality $<$ or $>$ then **End Point** is not included!
If Inequality is \leq or \geq then **End Point** is included!

Change Words into Images & Symbols!

All Numbers less than 5! **All Numbers more than 7!**

Solutions: $<$ -----○ $A < 5$ $C > 7$ ○----- $>$

Solutions: $<$ -----● $B \leq 4$ $D \geq 6$ ●----- $>$

All N's less than and = 4! **All N's more than and = 6!**

Algebra Inequalities - 1

Guess value of unknown! **Check** by substitution!
Solve as an Equation **then** End Point & Direction!
Use **Test Points** to determine **Truth** of Solution!

$$W - 4 < 5 \quad W < \underline{\quad} \quad 5 + E > 9 \quad E > \underline{\quad}$$

$$2 + X \geq 8 \quad X \geq \underline{\quad} \quad F - 2 \leq 6 \quad F \leq \underline{\quad}$$

Algebra Inequalities - 2

Guess value of unknown! **Check** by substitution!
Solve as an Equation **then** End Point & Direction!
Use **Test Points** to determine **Truth** of Solution!

$$M - 2 < 6 \quad M < \underline{\quad} \quad 3 + R \geq 5 \quad R \geq \underline{\quad}$$

$$4 + N > 5 \quad N > \underline{\quad} \quad S - 3 \leq 4 \quad S \leq \underline{\quad}$$

Algebra Inequalities - 3

Guess value of unknown! Check by substitution!
Solve as an Equation then End Point & Direction!
Use Test Points to determine Truth of Solution!

$$2G \geq 6 \quad G \geq \underline{\quad} \quad 3S < 12 \quad S < \underline{\quad}$$

$$J/5 > 4 \quad J > \underline{\quad} \quad F/7 \leq 2 \quad F \leq \underline{\quad}$$

Algebra Inequalities - 4

Guess value of unknown! Check by substitution!
Solve as an Equation then End Point & Direction!
Use Test Points to determine Truth of Solution!

$$K/3 > 6 \quad K > \underline{\quad} \quad G/2 \leq 5 \quad G \leq \underline{\quad}$$

$$4H \geq 8 \quad H \geq \underline{\quad} \quad 6T < 18 \quad T < \underline{\quad}$$

Axioms of Algebra - 1

Equations & Inequalities are Algebraic statements!
The Axioms of Algebra are Rules for Fair treatment!
Equals Added to Equals results in Equals!
Equals Subtracted from Equals results in Equals!
Equals Multiplied by Equals results in Equals!
Equals Divided by Equals results in Equals!

Axioms of Algebra - 2

$W - 3 = 5$ Is a true statement if $W = 8$

Now, Add +3 to **both sides** (Fair?) and $W = 8$

$X + 4 = 9$ Is a true statement if $X = 5$

Subtract +4 to **both sides** (Fair?) and $X = 5$

$Y/3 = 6$ Is a true statement if $Y = 18$

Multiply **both sides** by +3 (Fair?) and $Y = 18$

$6Z = 24$ Is a true statement if $Z = 4$

Divide **both sides** by +6 (Fair?) and $Z = 4$

Conclusion
