

## Glossary of Terms for Equations<sup>®</sup>

Additional minute	The extra 60 seconds a player receives to complete what he must do after the first time limit has expired; by the end of this extra minute, the player must complete the action or receive a second -1 and forfeit what he is doing
Adventurous Equations	The form of Equations in which players choose variations at the beginning of each shake; all four divisions play this form of the game
Adventurous variation	One of a list of special rules for each shake; each player must select one or two rules from the list for the appropriate division
Ambiguous Goal	A Goal that has more than one legal interpretation
Ambiguous Solution	A Solution that has more than one legal interpretation
Average	One half the sum of two numbers
Base	<b>(a)</b> A number that is raised to a power; <b>(b)</b> an integer greater than one whose powers provide the place values for a numeration system
Basic Equations	The form of Equations in which adventurous variations are not used
“Bonus”	The word a Mover must say before making a bonus move
Bonus move	A move to Forbidden which a player makes after saying the word “Bonus” and before making another move to any one of the three sections of the mat
Challenge	A claim by an opponent that a Solution is possible Now or that it is Never possible or that the Goal-setter’s No Goal declaration is incorrect
Challenge block	An object that a Challenger must pick up in order to challenge
Challenger	The player who makes a legal challenge
Clockwise	To the left
Correct Solution	A Solution that satisfies all the requirements listed in Section <b>VII-B</b> of the Equations Tournament Rules
Counting number	A member of the sequence 1, 2, 3, 4, ...; same as the Positive integers
Cube	A block containing a symbol on each of its six faces
Digit	In base $m$ , a symbol representing a whole number from 0 through $m - 1$ ; in base eight, the digits are 0, 1, 2, 3, 4, 5, 6, and 7; in base nine, include 8; in base ten, include 9; in base eleven, include * (for ten); in base twelve, include $\surd$ (for eleven).

Digit cube	A cube with a digit on its top face
Division	One of the four levels of competition: Elementary (grade 6 and below), Middle (grade 8 and below), Junior (grade 10 and below), and Senior (grade 12 and below)
Elementary Division	The division of play for students in grade 6 and below
Equation	A mathematical equation in this form. $\text{Solution} = \text{Goal}$ The Solution must unambiguously equal the interpretation of the Goal.
Equation-writer	A player who must write a Solution after a challenge or after the last Resource cube is moved to the playing mat
Even-year variation	A variation that may be chosen during a school year ending in an even-numbered calendar year, such as 2009-10
Exponent	A number representing the power to which a base is raised; in mathematics texts, the exponent is written as a superscript behind the base; in Equations, an exponent follows the * operator except when the Exponent variation is in effect, in which case the * is not required
Exponentiation	The operation of raising a number to a power
Factor	A positive integer which is an even divisor of a whole number; that is, positive integer $A$ is a factor of whole number $B$ if $A \times X = B$ for some integer $X$ ; for example, 2 is a factor of 8 because $2 \times 4 = 8$
Factorial	The mathematical operation represented by !; for $n$ a whole number greater than or equal to 0, $0! = 1$ and $n! = n \times (n-1)!$
Fractional exponent	An exponent that equals an expression of the form $N \div D$ , where $N$ and $D$ are integers ( $D$ not 0) and $D$ is not a factor of $N$
Forbidden	The section of the playing mat labeled FORBIDDEN; cubes in this section may not be used in any Solution
Forceout	The term used for the situation in which the last cube from Resources is played to Required or Permitted
Goal	The physical configuration of one or more cubes placed on the GOAL section of the playing mat; also any number represented by a legal interpretation of those cubes
“Goal”	The word the Goal-setter says when finished setting the Goal
Goal section	The section of the playing mat where the Goal is placed
Goal-setter	The player who rolls the cubes and sets the Goal
Grouping symbols	Symbols used in pairs (such as parentheses, brackets, and braces) to indicate the order of operations in an Equation

Illegal challenge	After a player picks up the challenge block, <b>(a)</b> a claim other than Now or Never or a No Goal challenge, <b>(b)</b> a Now or Never claim by the last Mover (who is therefore challenging himself), <b>(c)</b> a Now or Never claim before the Goal has been completed, <b>(d)</b> a Now claim with no cubes in Required or Permitted, <b>(e)</b> a Now claim with fewer than two cubes left in Resources, or <b>(f)</b> a Never claim after the first minute following the move of the last cube in Resources to Required or Permitted
Illegal procedure	A move or other action that violates a procedural rule; examples: moving out of turn, attempting to make a bonus move without first saying “Bonus”
Incorrect Solution	A Solution that violates one or more stipulations of section <b>VII-B</b> of the Equations Tournament Rules
Index	The non-zero number placed in front of a radical sign ( $\sqrt{\quad}$ ) to indicate which root is being taken; if the index is 2 (for square root), it may be omitted
Insulation	The process whereby an illegal procedure is protected from correction by a subsequent legal action by another player
Integer	One of the numbers in the infinite sequence 0, 1, 2, 3, 4, ... or the negative of a number in the sequence
Invalid challenge	Same as Illegal challenge
Junior Division	The division of play for students in grade 10 and below
Legal interpretation	An evaluation of the Solution or the Goal that does not violate the rules of mathematics or the game of Equations
Legal move	<b>(a)</b> A bonus move by the Goal-setter (who is not leading in the match), <b>(b)</b> setting a legal Goal by the Goal-setter, or <b>(c)</b> , after the Goal has been set, the transfer of a cube from Resources to Required, Permitted, or Forbidden by the player whose turn it is with the exception that the last cube in Resources may not be legally played to Forbidden
Mathematical expression	A group of numerals and operation signs that evaluates to a unique number; examples: 17, $9+5$ , $(8 \times 6) - 3$ , $45 \div 9$ , $\sqrt{64}$
Match	A sequence of shakes played continuously by two or three players until a specified time limit has been reached
Middle Division	The division of play involving students in grade 8 and below
Minute	The length of time it takes all the sand to pass from the top half of the timer to the bottom half
Move	The setting of the Goal or the transfer of a cube from the Resources to Required, Permitted, or Forbidden

Mover	The player who made the most recent move
Multiple of $k$	An integer that equals the product of the integer $k$ and another integer; example: 30 is a multiple of 6 because $30 = 6 \times 5$
Natural number	Same as Counting number
“Never”	The word a player says when making a Never Challenge
Never Challenge	A challenge that no correct Solution can be written using all the cubes in Required, none, some, or all the cubes in Permitted, and none, some, or all the cubes in Resources
“No Goal”	The words the Goal-setter must use to make a no Goal declaration
No Goal challenge	The claim by an opponent that the no Goal declaration of the Goal-setter is incorrect; section <b>IV-D</b> of the Equations Tournament Rules explains how to work out this challenge
No Goal declaration	The claim by the Goal-setter that no Goal can be set which has a possible Solution from the remaining Resources
Non-negative	Not smaller than zero; that is, zero or positive
Non-positive	Not larger than zero; that is, zero or negative
Non-zero	Not equal to zero
“Now”	The word a player says when making a Now Challenge
Now Challenge	A challenge that a Solution can be written using all the cubes in Required, none, some, or all the cubes in Permitted, and, if needed, one cube in Resources
Numeral	A mathematical expression that names a number; examples: 13, $7+8$ , $3\sqrt{8}$ , $5!$ , and (in Senior Division with $\sqrt{=}i$ variation) $4\sqrt{\quad}$
Numeral cube	A cube whose top face contains a symbol that names a number
Odd-year variation	A variation that may be chosen during a school year ending in an odd-numbered calendar year, such as 2010-11
Operation cube	A cube whose top face contains an operation symbol
Operation symbol	One of the symbols $+$ , $-$ , $\times$ , $\div$ , $*$ , or $\sqrt{\quad}$ ; this definition applies whether these symbols have their usual mathematical meanings or special meanings defined by variations
Order of operations	The sequence in which operations are to be performed in the Goal or a Solution
Penalty	The punishment a player receives for an illegal action; examples: loss of one point, returning an illegally played cube to Resources

Percent	$P$ percent of $X$ is $(P \div 100) \times X$ ; for example, 20 percent of 75 = $(20 \div 100) \times 75 = (1 \div 5) \times 75 = 15$
Percent sign	The symbol %
Permitted	The section of the playing mat labeled PERMITTED; cubes in this section may be used in any Solution
Playing mat	The rectangular piece of cardboard (or, in older games, two rectangular cardboards) that contains the REQUIRED, PERMITTED, FORBIDDEN, and GOAL sections; even if the physical mat contains a RESOURCES section, this is not considered part of the playing mat
Power of $x$	A number obtained by applying an exponent to the number $x$
Prime	Same as Prime number
Prime number	A whole number with exactly two factors, itself and 1; examples: 2, 3, 5, 7, 11, 13, 17, 19, ...
Radical	The symbol $\sqrt{\quad}$ which represents the operation of taking the root of a number
Radical sign	Same as Radical
Rational number	A number that can be expressed as the ratio $A/B$ where $A$ and $B$ are integers and $B$ is not 0; examples: $\frac{3}{4}$ , $-\frac{17}{5}$ , $\frac{7}{1}$ , $\frac{5}{(-10)}$ . Note: <b>(a)</b> every integer is a rational number; <b>(b)</b> a decimal number like .75 is a rational number since it equals $\frac{3}{4}$ ; a repeating decimal like .454545... is a rational number because it equals $\frac{45}{99}$
Regular move	A move that is not a bonus move; that is, play of a cube from Resources to the mat without calling "Bonus" or the second move on a turn after a bonus move
Required	The section of the playing mat labeled REQUIRED; cubes in this section must be used in any Solution
Resource cube	A cube that has been rolled for the shake but has not yet been played to the Goal, Required, Permitted, or Forbidden sections
Resources	The symbols that appear on the top faces of the cubes after they have been rolled for the shake
Root	$x$ is the $n$ th root of $y$ if $x^n = y$ , where $x^n$ means $x$ to the $n$ power, ( $n$ is not 0)
Root sign	Same as Radical
Round	Same as Match
Scoresheet	A piece of paper on which players' scores for the shakes of a match are recorded and totaled and which the players sign or initial and which the winner of the match (or one of the winners

	if there is a tie) turns in to a designated person or place when the match ends
Senior Division	The division of play for students in grade 12 and below
Shake	A play of the game starting with the roll of the cubes and ending with at least one player writing a Solution
Solution	An expression which names a number and which forms the left side of the Equation that is presented after a challenge or forceout
Symbols of grouping	Same as grouping symbols
Table	A group of two or three players competing against each other in a match
Ten-second warning	The countdown from 10 to 1 that an opponent must make out loud when the sand runs out on a player's time limit
Third Party	In a three-player match in which a challenge has been made, the player who is neither the Challenger nor the Mover
Timed player	A player who is being timed to complete a task (roll the cubes, set a Goal, make a move, write or check a Solution, etc.)
Time limit	The amount of time allotted by the rules for a player to complete an action
Timer	An hour-glass-shaped piece of plastic (or glass) containing sand that is used to determine one- and two-minute time limits during a match; the sand in a timer usually takes about 60 seconds to pass through
Turn	The time when a player is obligated to move (which includes setting the Goal), challenge, or complete a required action (e.g., selecting a variation) within some specified time limit
Undefined expression	A mathematical expression that has no value; examples are $8 \div 0$ , $0\sqrt{3}$ , $0^{-3}$
Valid challenge	A challenge that is not illegal
Variation	Same as Adventurous variation
Variation selection	A player's choice of one or two variations from the appropriate list (Elementary, Middle, Junior, or Senior); the player indicates the selection by circling the name of the variation(s) on the variation selection chart and, if necessary, filling in the blank to indicate which cube is wild, which base is chosen, etc.
Variation selection chart	A chart printed either on the back of the scoresheet or on a separate page on which each player must record his/her variation selection for each shake on this chart

Warning	The announcement that the time limit for the match (round) has been reached and that no new shakes are to be started
Whole number	A non-negative integer; that is, a member of the sequence 0, 1, 2, 3, 4, ...
Wild cube	A cube containing a symbol on its top face which may represent another symbol because of a variation chosen for the shake

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