

GUIDE TO BASIC EQUATIONS

MATERIALS

Playing mat (see below), one-minute timer, 24 cubes (6 of each color)

Red 0, 1, 2, 3, +, -

Blue 0, 1, 2, 3, x, ÷

Green 4, 5, 6, *, x, -

Black 7, 8, 9, √, +, ÷

RESOURCES		
FORBIDDEN	PERMITTED	REQUIRED

GOAL

EXPONENTS AND ROOTS

In the game of Equations, the * is used to represent the exponent operation. 5^2 is represented as $5 * 2$ and has a value of 25. The √ symbol is used for the root operation, $\sqrt{81}$ is the square root of 81 and has a value of 9 ($9 \times 9 = 81$). The expression $4 \sqrt{81}$ is the fourth root of 81 and has a value of 3 ($3 \times 3 \times 3 \times 3 = 81$).

NOTE: In the Minor and Elementary divisions (grade 6 and below) Basic Equations, the following rules apply:

If * is used for raising to a power, both base and power must be whole numbers (0, 1, 2, 3, 4, ...). If √ is used for the root operation, the index must be a counting number (1, 2, 3, 4 ...) and the base and total value must be whole numbers.

ROLLING FOR FIRST

Two or three player games will be played. All players roll the same colored cube (all red, all blue, all green or all black) to determine who goes first. The person with the highest number is the goal setter. If there is a tie for first place only, those players will roll again. After first is determined, the play continues clockwise. The person to the left of the goal setter is next.

BEGINNING A SHAKE

A shake consists of rolling the cubes, setting the Goal, and moving cubes until a Challenge is made and settled or a Force Out is declared and resolved. A shake begins as soon as the stall for rolling the cubes (turning the timer over and announcing "stall") or a player has picked up the cubes to roll them. Once the cubes are rolled to form the Resources, no player may alter the face of the cubes nor obstruct the other players' view of any cubes remaining in Resources.

SETTING THE GOAL

The goal setter will roll all 24 cubes and set the goal.

The goal may be:

- a single digit number- example 8
- a two digit number - example 23
- a three digit number - example 345
- an expression example 3×4 example $(4 \times 5) + 2$
- to show the use of parentheses, leave a space between the groupings- example $4 \times 5 + 2 = (4 \times 5) + 2$
- The goal may not contain more than 5 cubes.
- The goal setter has 2 minutes to set the Goal. Once a cube touches the goal line, it cannot be moved back to Resources. The goal setter may rearrange the cubes. When finished, the goal setter will say "Goal set".

ORDER OF OPERATIONS

In Basic Equations (Minor, Elementary, and Middle divisions), Order of Operations is used to interpret a Goal or Solution. The order is parentheses first, roots and exponents (moving left to right), multiplication and division (moving left to right), and addition and subtraction (moving left to right). It is the responsibility of the Goal Setter and the Solution Writer to ensure parentheses are added as needed.

MAKING A MOVE

The person to the left of the goal setter is the first mover. That person has 2 minutes to make a move or challenge. This will give the mover time to study the resources and write possible solutions for the Goal. The mover will move a cube to one of the three areas of the playing mat.

FORBIDDEN	PERMITTED	REQUIRED

Forbidden - Cubes in this area may not be used in any solution.

Permitted - Cubes in this area may be used in a solution.

Required - Cubes in this area must be used in any solution.

BONUS MOVE

A player may choose to make a bonus move and move 2 cubes on his turn. The player should say "Bonus" before moving. The first cube moved must go to Forbidden. The second cube can be moved anywhere on the board (Forbidden, Permitted, Required, or the Goal).

All players after the first mover have a one minute time limit.

ILLEGAL PROCEDURE

A move that violates a procedure or custom is labeled illegal procedure. Examples are moving out of turn or moving two cubes without calling Bonus before the first cube is placed in Forbidden. The person who charges Illegal Procedure must specify what caused the Illegal Procedure within 15 seconds. The Mover must return the cube(s) to Resources and , if necessary, make another move within 10 seconds. There is no penalty assessed.

If another legal move has been made before the Illegal Procedure is noticed, that move insulates the Illegal Procedure and play continues.

CALLING A CHALLENGE

The game stops when a challenge is made.

- You do not have to wait for your turn to challenge.
- The only player who can not challenge is the player who made the last move. A player who has challenged himself, loses one point, the "challenge" is set aside and the shake continues.
- The last player to move is the Mover. The player who calls the flub is the Challenger. The third person must declare which player he agrees with. This player, the Joiner, has one minute to make his decision and state it out loud.
- The Challenger must pick up the "challenge block" or "flub ball" and state his challenge. If both players challenge at the same time, the player with the "flub ball" in his hand is the Challenger.
- A player must not pick up the "flub ball" unless he intends to challenge. If the player who picks up the "flub ball" does not specify a legitimate challenge within 15 seconds, a one point penalty is enforced. The player has a minute to specify a challenge. If no valid challenge is stated within that minute, the player loses another point and the shake continues.

CHALLENGES

P FLUB - Call this challenge when you believe a solution can not be made.

- The Mover has the burden of proof and must write a solution.
- If the Joiner agreed with the Mover, he also has to write a solution.
- The Joiner has one minute to state who he sides with. Solution writers have two minutes after the Joiner has decided to write a solution.

A FLUB - Call this challenge when you believe a solution can be made with the cubes available on the board and at most, one other cube from Resources.

- The Challenger has the burden of proof and must write a solution.
- The Joiner who agrees with the Challenger must also write a solution.
- The Joiner has one minute to state who he sides with. Solution writers have two minutes after the Joiner has decided to write a solution.
- The Challenger (and the Joiner who agreed with him) must include with their solution an alternate or safe move. The alternate move is something else that the Mover could have done instead of the move he made that would not create any flub or challenge situations. A good safe move is to take something you don't need and put it into Forbidden.
Example: * to F.

CA FLUB - Call this challenge when someone makes an A flub move earlier in the game but no one catches it. A player at a later time realizes there was an A flub made earlier in the game and calls CA flub. The CA flub can even be called by the person who made the earlier A flub, providing that he was not the last person to move.

- The challenge has the burden of proof and must write a solution. He has two minutes in which to complete his solution.
- The joiner who agrees with the challenger must also write a solution. The joiner has one minute to agree with either the challenger or the mover and then two minutes to write a solution if he joins the challenger.
- The challenger (and the joiner who agreed with him) must include with their solution an alternate move or safe move. The alternate move for a CA flub does not go back to the last move, but goes back to where the flub was made originally.

CHECKING A SOLUTION

- Each player should wait until everyone has finished writing and has presented their solution before checking any solution. Please remember each player has 2 minutes to write their solution.
- There is a 2 minute time limit also to check solutions.
- You should check : does
- The solution equals the goal,?
- Were all the cubes in Required used?
- Did the solution writer use any cubes in Forbidden?
- Are all the cubes in the solution available in Required, Permitted, or Resources?
- Each of the solution writer's opponents may accept or reject the solution. It doesn't matter if the joiner agreed with you. If you can find something wrong with their solution, it is wrong.

FORCE OUT MOVE

The force out is a move and not a challenge. A force out usually happens when most of the cubes have been moved to the playing mat and no challenges were made. A force out states that a player can make a solution with at most one cube from Resources and there are no safe moves available. All players have two minutes to write a solution after a force out is called.

Do not call force out if

- There are two cubes left in Resources and you need both of them in your solution. Move one of the cubes to Permitted or Required. If someone calls an A flub on you, they will be wrong because there is no alternate move.
- The last mover moved a cube to Forbidden that you needed to write any solution. Call a P flub

CHALLENGING A FORCE OUT MOVE

Sometimes a player will call a force out when it is not really a force out. When that happens, you may challenge the force out move. You should pick up the challenge cube and say "Challenge Force Out because....."

- a solution cannot be written with at most one more cube from Resources (It is either impossible (P flub) or you need more than one cube to complete your solution, or
- a solution AND an alternate move can be written (it's really an A flub)

The mover is the person who called Force out.

The joiner has one minute to decide with whom he agrees.

If the challenger thinks a solution cannot be written, the mover (and anyone who agrees with him) has 2 minutes to write and present a solution.

If the challenger thinks a solution AND an alternate move can be written, he (and anyone who agrees with him) has 2 minutes to write a solution,

SCORING

Challenger right	10 pts		Mover right	10 pts
Challenger wrong	6 pts		Mover wrong	6 pts
Joiner right (with Challenger)	8 pts	Joiner wrong 6 pts	Joiner right (with Mover)	10 pts
Force out - solution right	8 pts		Force out - solution wrong	6 pts

TIME LIMITS

Setting the Goal	2 minutes
First move (after the Goal is set)	2 minutes
All other moves	1 minute
Joining the Challenger or Mover	1 minute
Writing a Solution	2 minutes
Checking a Solution	2 minutes

TOURNAMENT SCORING

At the end of a 30 minute round, the teacher or tournament official will call a 5 minute warning. At that time, finish the shake you are playing but do not start another shake. A shake is considered to be started if the cubes are rolled.

After 5 minutes, the teacher or tournament director will announce that the round is now over. At that time, if a game has not ended in a challenge, each player has two minutes to write a solution for the Goal using all Required cubes and any other available cubes. A correct solution will score 8 points, and incorrect solution will score 6 points.

When the last challenge or force out has been completed, the players will total their scores. The player with the highest score receives 6 team points, the second place will receive 4 points, and the low score receives 2 points. (This method will equalize the scores at different tables. The raw score varies depending on the number of shakes played.)

The three players are splitting a total of 12 points. A two player game will split 10 points.

SCORING CHART

	high raw score	middle raw score	low raw score
All different scores	6	4	2
Tie for first place	5	5	2
Tie for second place	6	3	3
Three way tie	4	4	4
2 player game	6	4	
2 player tie	5	5	