2022 Academic Challenge Cup
Equations Tournament

Official Rules[*]

(revised August 2019)

The purpose of this competition is to engage students in high-level thinking in a friendly competitive spirit. Gifted Resource Council feels that it is more important for students to leave the competition with a feeling of success and having fun, than for them to leave with a trophy in hand. Everyone who does his/her best is a "winner."

Many teams will include players who are competing in Academic Challenge Cup for the first time. Encourage your students to welcome them and make everyone feel appreciated. Some of the newcomers will not know the rules as securely as others. Experienced players should answer questions that arise whenever the answer does not interfere with play.

Players should make every effort to resolve disputes that arise during play among themselves. Judges are available to resolve disputes only when the players at a table are unable to arrive at a cooperative resolution. In these situations, the decision of the judge(s) is final.

There have been no changes to the rules for 2022. The last change, made in 2018, was:

> Minor clarifications have been made to the definition of a valid goal on page 3. The clarifications are underlined.

[*] These rules are based on the game "Equations" by Layman E. Allen and published by Wff 'N Proof.

Equipment for Challenge Cup

- Each **TEAM** participating MUST bring a complete game to the competition, including gameboard, resource cubes, and timer.
- C/M cards, pencils, scratch paper, and scoresheets will be provided.
- Players may not bring calculators, tables, or other reference materials.

Division of Play

There will be five playing divisions:

- third grade
- fourth grade
- fifth grade
- sixth grade
- seventh and eighth grades

Any team may elect to "play up" (that is, compete at a more advanced level). For example, a fifth-grade team may elect to play in the sixth-grade competition. Individual players may also "play up." However, neither teams nor individuals may play at a level lower than their actual grade level.

Note: Rules regarding operations and expressions that can be used in play in the third grade division differ from those for other divisions. See *Special Rules for Playing Divisions*, below.

Use of Timer

Time limits, where used, are determined by the "egg timer" in your set (not by a watch or other timing device). Timers are used ONLY for these situations:

- Resources have been tossed and arranged (see *Procedure for Goal Setting,* below).
- When a Goal Setter has declared No Goal (see *Procedure for Goal Setting*).
- A challenge has been made (see *Challenges*).
- All but two Resources have been qualified (see *Force Out*).
- At the end of a round, if a challenge is not in progress (see *Cleanup*).

The timer should NOT be used at any other time, except upon the instruction of an official. If there is agreement among other players that one player is unnecessarily delaying play, a judge may be called.

Resources

Five Resource cubes of each color are used (total of 20 cubes). During play the number or operator on the upward-facing side of each cube is a Resource for that game.

Resources represent numbers and operators, and are used as in conventional written expressions, <u>except</u>:

- The "–" sign is only used to indicate the subtraction expression. You are not allowed to express negative numbers by just putting a "–" sign in front of the numeral: –5.
- Multiplication must always be explicitly indicated with an "x" symbol. You may not use parentheses to indicate multiplication.
- Square roots must include the number 2 before the radical: 2 √ 4.

Goal

The player to the left of the designated Scorekeeper is the first Goal Setter in each round. After the first game is completed, the player to the left of the original Goal Setter becomes the new Goal Setter, and this succession is repeated in each subsequent game.

The Goal is a number that represents one side of an equation. The Goal is set by moving cubes from the Resources section to the goal line and arranging them so that they express a number.

A valid goal:

- Must be an integer (for the third grade competition, it must be a positive integer or zero; see *Special Rules for Playing Divisions*). However, for fourth grade competitions and above, fractions or roots may be used to build an integer goal, for example, 1 ÷ 2 x 6 or 2 √ 4 + 3 are valid goals.
- May use operation signs and numerals: 1 + 1.
- May use up to 5 Resources to express a number: 4 ÷ 2 + 1.
- May be a single-digit number: 3.
- May include 2- or 3-digit numbers, by using two or three Resources: 33, 123, 42*25 are valid goals. Leading zeros may not be used (e.g., 003 is not permitted). Note: There is no limit on the value of the Goal.

When two operators are used, the Goal Setter must space the cubes as necessary to indicate parentheses, and declare their placement (e.g., "4 minus the quantity 2 plus 1" or "4 minus parentheses 2 plus 1"). If the cubes are not spaced or the verbal declaration is not made, the Order of Operations applies.

If the Goal fails to meet any of these requirements, other players should advise (not challenge) the Goal Setter and suggest appropriate correction. If necessary, the Goal Setter should be given more time to make a valid Goal.

Procedure for Goal Setting

1. Goal Setter tosses cubes. Any cubes rolling off the table should be rolled again. In the third grade competition, cubes showing radical or exponent operators should be rolled again until other Resources are shown.
2. Goal Setter (ONLY) arranges cubes, separating operators from numbers. No other player may handle cubes until it is his/her turn.
3. Someone at the table turns the timer.
4. Before the timer runs out, the Goal Setter either:
   - places Resources on the GOAL section of board and calls "goal," or
   - calls "no goal."
5. If the Goal Setter fails to call "goal" or "no goal" before the timer runs out, and any Resources have been placed in the GOAL section of the board, a declaration of "goal" is assumed. If no Resources have been placed in the GOAL section, a declaration of "no goal" is assumed.

Procedure continued on next page.

6. A No Goal declaration entails the claim that a valid Goal that does not produce an immediate flub (see *Flubs*, below) cannot be made using the available Resources. A No Goal declaration can be challenged (see *Challenges,* below).

- When a No Goal is declared, the timer should be allowed to run out, then turned again, if necessary, to allow all other players an opportunity to determine whether the claim is valid, or a challenge should be made.
- If a No Goal declaration is <u>not</u> challenged, a new game is begun, with the player to the Goal Setter's left becoming the new Goal Setter.
- If a No Goal declaration is challenged (see *Challenges*) a new game (with a new Goal Setter) is begun after the challenge has been resolved.

7. A declared Goal may be challenged because it does not meet the general requirements of any move (A Claim and P Claim; see *Flubs,* below). **Note:** As stated under *Goal,* if a Goal is invalid because it fails to meet special requirements (number of Resources, etc.), other players should assist the Goal Setter in making corrections: such errors cannot be challenged.
8. A goal challenge is resolved in the same manner as a challenge to any other move.
9. When the Goal Setter has declared a Goal (by calling "Goal"), the Goal cannot be changed. Play continues as described under *Move*, below. A Goal <u>can</u> be changed before the Goal Setter declares "Goal," and <u>cannot</u> be challenged until "Goal" has been declared or time has run out (see Step 5).

Solutions

A Solution is a mathematical expression that is equal to the Goal. The following are requirements for a valid Solution:

- Solution must equal the Goal.
- Only numbers and operators from the Resources may be used in a Solution.
- Each symbol represented by an individual Resource may only be used once (e.g., if the Resources remaining after the Goal has been set include two 3s, two 3s may be used to make the Solution, unless one or both is subsequently qualified otherwise; see *Move*, below).
- Only single-digit numbers are allowed in Solutions (numbers greater than 9 can be obtained by multiplication, addition, etc.).
- Parentheses may be used freely in written solutions. Where parentheses are not used, the Order of Operations applies.

Special Rules for Playing Divisions

<u>Third Grade Division</u>

- Use 5 of each color Resource. If a Resource as rolled is an exponent or a radical, roll the cube again until a number or permitted operation shows.
- The Goal must be a positive integer or zero.
- Fractions may <u>not</u> be used in either the Goal or the Solution. A fraction is defined here as a smaller number divided by a larger number (e.g., $4 \div 2$ is not a fraction; $2 \div 4$ is a fraction).
- Exponents and radicals are not used.

All Other Divisions

- Use 5 of each color Resource.
- The Goal may be a positive integer, a negative integer (obtained by subtraction), or zero.
- Exponents and radicals are used.
- Fractions are allowed, except that the Goal must simplify to an integer.

Move

To "move" means to take a single cube (except in *Bonus Play*, see below) from the Resources section and place it in one of the three areas on the gameboard, labeled Forbidden, Permitted, and Required. Moving a Resource into one of these areas qualifies how that Resource may be used in a Solution. Once a Resource is moved it may not be moved again. A Resource moved to:

REQUIRED *must* be used in a Solution.

PERMITTED *may* be used in a Solution.

FORBIDDEN *must not* be used in a Solution.

When the Goal has been set, the player to the left of the Goal Setter moves next; thereafter, turns to move pass to the left (clockwise).

The Goal Setter can be thought of as the first Mover, since Resources are qualified (those used to make the Goal cannot be used in a Solution), and since the Goal can be challenged like any subsequent move.

Bonus Play

Either the Goal Setter or the Mover may take advantage from a *bonus play*:

The Goal Setter may:
- Call "bonus"
- Place one Resource in the Forbidden area
- Set the Goal and call "Goal," as described above

On any move, the next Mover may:
- Call "bonus"
- Place one Resource in the Forbidden area
- Place one Resource in any area (including Forbidden)

Note: The Goal Setter or Mover must call "bonus" before playing, and must play one Resource in Forbidden before completing the Goal (Goal Setter) or playing the second Resource (Mover).

There is no score associated with a bonus play. The Mover or Goal Setter takes advantage from making what amounts to a double play.

Flubs

A flub is a violation of either of the two claims made implicitly by each Mover, including the Goal Setter:

1. A valid Solution can be made using qualified and unqualified Resources.
2. A valid Solution cannot be made by qualifying at most one more Resource.

Any player may challenge the Mover, declaring that a flub exists**. The last person to move a cube is the person challenged (Mover).** The Challenger must identify the Flub.

P-Flub: "Prevents all solutions." A P-Flub is a move that eliminates all Solutions: after a P-Flub, no more Solutions remain. The Mover, and all who side with the Mover, have the burden of proof, which is sustained by writing a valid equation (including a Goal, an equals sign, and a Solution). All who sustain the burden of proof (and have declared for the Mover) score (see *Scoring Games*). If no one sustains the burden of proof, the Challenger and all who declared for the Challenger score.

A-Flub: "Allows" a Solution to be completed with at most one more move when an alternative move is available (see *Force Out*). The Challenger, and all who side with the Challenger, have the burden of proof, which is sustained by writing a valid equation (Goal, equals sign, and Solution) using all Resources qualified as Required, any qualified as Permitted, plus, at most one Resource that has not yet been qualified. All who sustain the burden of proof (and have declared for the Challenger) score (see *Scoring Games*). If no one sustains the burden of proof, the Mover and all who declared for the Mover score.

No-Goal Flub: This flub can occur only when the Goal Setter has declared No Goal, and before the Resources are picked up for a new game. The Challenger, and all who side with the Challenger, have the burden of proof, which is sustained by writing a valid equation (Goal, equals sign, and Solution) using the available Resources. All who sustain the burden of proof (and have declared for the Challenger) score (see *Scoring Games*). If no one sustains the burden of proof, the Goal Setter and all who declared for the Goal Setter score.

Challenges

- There can be only ONE Challenger in a game (though other players choose to side with the Challenger or the Mover).
- **The player who speaks the words "A-flub" or "P-flub" first is the Challenger** (in the case of a No Goal challenge, the player who says "Challenge" first is the Challenger). Players should not touch the board when declaring a challenge. The Challenger may not change his/her declaration during the timer interval that follows (see below). If correct, the Challenger receives two points (see *Scoring Games*).
- In the event that two or more players apparently call a flub simultaneously, the other players should attempt to agree on who called first. If they cannot agree, or if they agree that there were simultaneous calls, the challenge will stand but there will be no Challenger for that game. During the timer interval the players who called the flub may change their declaration and side with the Mover. All who declare for the challenge will receive one point if correct (see *Scoring Games*).

Procedure to be used when a challenge is called:

1. Turn the timer.
2. While the timer is running, each player (except the Mover and Challenger) decides whether to side with the Mover or the Challenger. Those taking on the burden of proof as a result of this decision (see *Flubs,* above) also write an equation, as required.

   Be sure your students know that if they side with a Challenger who has the burden of proof, (A-Flub) or the Mover when s/he has the burden of proof (P-Flub), they must also write an equation that sustains the burden of proof to receive any points.
3. When the timer runs out, everyone must be prepared to declare C(hallenger) or M(over), and those having the burden of proof must stop writing. Players may not change written equations after the timer has run out.
4. Declaration proceeds in the direction of play (clockwise) beginning with the first player to the left of the Mover. Players indicate their declaration by using the C/M cards provided. A declaration may not be changed after the next player has made his/her declaration.

Force Out

A special situation arises when all but two Resources have been qualified: unless there is an existing flub, the next Mover cannot avoid committing a flub, since both remaining Resources are necessary to make a solution (playing either Resource in Permitted or Required produces an A-flub, playing either in Forbidden produces a P-flub). This situation is called a "Force Out." To avoid the unfair jeopardy:

- When a player qualifies the third-to-last Resource, leaving only two Resources unqualified, the timer is turned.
- During the timer interval, any player other than the current Mover (the player who qualified the last Resource) may call a flub. If a flub is called, it is resolved and scored in the usual way, except that when the flub is called, the timer is allowed to run out and is then turned again, permitting at least a full interval for the resolution of the flub.
- If no flub is called, any player, including the current Mover, who writes a valid equation (Goal, equals sign, and Solution) using the two remaining Resources before the first timer interval has expired receives 1 point (if a flub is not called, the timer is not turned a second time).

Cleanup

At the end of a round, a judge will call "Cleanup." No further moves may be made after this call.

- If a challenge is in progress, the players will resolve the challenge and score the game in the usual way.
- If a challenge is not in progress, the timer will be turned and every player will have the opportunity to write a valid equation (Goal, equals sign, and Solution) that includes in the Solution:
  - all Resources qualified as Required
  - no Resources qualified as Forbidden
  - any Resources qualified as Permitted
  - any Resources (and as many as needed) that are not yet qualified
- During the timed interval any player except the last Mover may call a flub. If a flub is called during Cleanup, let the timer run out and turn it over to start a new interval, during which the challenge is resolved in the usual way.

When the time has expired (or sooner, if all agree), players stop writing and show their equations.

- Any player showing a valid equation receives 1 point.
- Any player showing no equation, or an invalid equation, receives zero points.

Scoring Games

Points are tallied after each game, as follows:

Single Challenger correct	2 points
Player siding with Challenger correct	1 point
Mover correct	1 point
Player siding with Mover correct	1 point
Force Out/Cleanup - player with correct solution	1 point

Academic Challenge Cup Procedures and Team Scoring

The Equations competition at the Academic Challenge Cup consists of four rounds of play. In each round, participants are assigned to play at specific (numbered) tables. A computer program makes these assignments in advance, ensuring that the players at each table in each round are in the same playing division (e.g., 4-5 grade) but from different teams.

At each table, players complete as many games as they can in the time allotted for the round, usually about 20 minutes (see *Cleanup*, above, for the procedure at the end of the round). At the conclusion of each game points are awarded as described above and recorded (see *Scoresheets*).

Because the number of games completed during the round will vary from table to table, the scoring is performed as follows:

- Each player's total score for the round is tabulated by a designated scorekeeper and recorded (see *Scoresheets*).
- This total score is divided by the number of games played at that table for that round. The result, expressed as a decimal with two-place precision, is the player score.

For example, consider the results of a typical round:

Player	Game 1	Game 2	Game 3	Game 4	Game 5	Total
Tamika	2	1	1	1		5
Jared	0	2	1	0		3
Alex	0	1	1	2		4
Shaun	1	0	0	1		2
Kai	1	1	2	0		4

Four games were completed at this table during the round. Tamika had a total score of 5. Tamika's player score for the round will thus be $5 \div 4 = 1.25$. Jared's player score would be $3 \div 4 = 0.75$.

Player scores are calculated automatically by the computerized scoring system, based upon the round totals recorded on scoresheets. The system also accumulates player scores earned by all members of a team for the four rounds of play, to produce the team score. Teams and individuals with high accumulated scores are recognized at the conclusion of the competition.

Scoresheets and Initialing

Scoring rules are clearly written on the scoresheets at each table. Remember:

- When a player has the burden of proof (see *Flubs*), he/she must also write a correct equation that sustains that burden to receive points.
- It is essential that following each GAME, the Scorekeeper for that table initial each player's scoresheet to verify the correct number of points. Once a score has been initialed, it may not be changed. If there is a dispute between the Scorekeeper and a player, other players should attempt to resolve the dispute. When players cannot resolve the dispute, they should summon a judge.
- At the end of a ROUND, after the Scorekeeper has tabulated scores, each player must review and initial his/her line on the table scoresheet. Again, once the scoresheet has been initialed, nothing may be changed. Disputes that cannot be resolved among the players will be resolved by a judge.
- Following each round, the judges will pick up the scoresheets from each table before students are dismissed to the next round tables.

Note: Instructions for correctly completing scoresheets, with examples, are attached after page 10.

Additional Rules for Competition

- A cube is played as soon as it touches any part of one of the three designated areas on the mat — not when fingers are removed. Do not slide a cube across one area to reach another.
- When revealing equations, do not remove the cubes from the Permitted, Required, and Forbidden sections. Show equations written on your worksheets.
- Call for a judge only if you cannot resolve a problem. You should make every attempt to resolve issues without a judge. The decision of the judge is final.
- No scores will be changed after you have verified by initialing. If you have a problem, discuss your score BEFORE initialing.

Math Clarifications

- Equations must be complete: they must include a Goal and a Solution, and one (and only one) equals sign.
- The Goal may be written on paper EITHER as it appears on the gameboard, or the value of the Goal (only) may be simplified. For example, if the Goal is (3 + 1) x 2, either 2 * 3 = 8 or 2 * 3 = (3 + 1) x 2 would be valid written equations.
- Irrational numbers are not allowed. However, irrational numbers can be resolved to rational numbers. For example (2 √ 6) * 2 = 6 is acceptable. Note: the Third Grade Division of play does not permit exponents or radicals.
- Fractional roots are permitted. Example: (2 ÷ 3) √ 4 = 4 * (3 ÷ 2) = 8. Note: the Third Grade Division of play does not permit exponents or radicals.
- The positive root of a number is always, by definition, a positive number. For example, –2 is not the square root of 4, even though –2 squared equals 4. The expression –(n√a) is not permitted in Equations. Note: the Third Grade Division of play does not permit exponents or radicals.

Make sure all players know:

- the Order of Operations, and how to use parentheses to "override" the Order of Operations.
- that by using two subtraction Resources and parentheses correctly, the equivalent of addition can be achieved: $4 – (1 – 2) = 5$.
- division by zero is not permitted.

Players at the fourth grade level and above should also know:

- that by using two division Resources and parentheses correctly, the equivalent of multiplication can be achieved: $3 \div (1 \div 2) = 6$.
- $n * 1 = n$
- $n * 0 = 1$, except that $0 * 0$ is not defined.
- $n \sqrt{} 1 = 1$
- there is no zero root.
- the Laws of Exponentiation, and the expressions that can be derived thereby.
- $a^{-m} = 1 \div a^m$ Note that in Equations, the negative exponent must be obtained by subtraction, e.g., $2 * (4 – 7) \times 4 * 2 = 2$.
- $a^{m \div n} = \sqrt[n]{a^m}$ Example: $8 * (2 \div 3) = 3 \sqrt{} 8 * 2 = 4$.

Sportsmanship

Sportsmanlike behavior will be expected of all players. Penalties may be assessed by tournament judges for bad sportsmanship, ranging from warnings, to loss of points for the individual player or the player's team, to disqualification. The most serious penalties may be assessed for a first infraction if intimidation or abusive language is involved.

How to Fill Out Your Player Scoresheet

The Player Scoresheet is your personal record of your scores in each round. It also tells you the number of the table to which you are assigned for each round, and would be used if manual scoring became necessary. So, it is important to keep your Player Scoresheet with you throughout the competition. If your name is not pre-printed on the scoresheet, write it there, so if you and your scoresheet become separated you can be reunited.

After each game, enter 0, 1, or 2 points, depending on how you scored. This will also be done by the table scorekeeper after each game. Be sure you agree on the number of points you earned. The scorekeeper will initial your sheet after each game to indicate that agreement.

Total your points at the end of the round. The total will also be recorded by the table scorekeeper, who will initial the total on your scoresheet to indicate agreement. You should also record the total number of games played in the round in the box labeled "Games Played." This will allow you to compute your official score for the round just as the computerized scoring system will, as explained above (on page 8).

The following shows what a single round on a completed Player Scoresheet would look like.

Player: **Chris Helderson**

Table 001								
Round 1	**Game 1**	**Game 2**	**Game 3**	**Game 4**	**Game 5**	**Total**	**Games Played**	**Scorekeeper's Initials:**
Player Score:	2	1	1	1	—	5	4	SSC

How to Fill Out the Table Scoresheet

The Table Scoresheet is the official record of scores for each player at a table for one round of play. Table Scoresheets are collected after they are complete and used to enter scores into the computerized scoring system.

At the competition, the Table Scoresheet has names pre-printed in the name spaces, like the sample on the next page. If your name is the last one listed, you are the scorekeeper for the round. You are responsible for recording everyone's score accurately. If you are substituting for the player whose name is printed on the scoresheet or you are identified by a number instead of your name write your name in the name space.

The Table Scoresheet includes instructions for the table scorekeeper. Read those instructions on the sample scoresheet first, then review the completed scoresheet.

Remember that the Table Scoresheet is the official record. It should be initialed only when the player and the scorekeeper have agreed on the recorded total score. Once a player has initialed the Table Scoresheet, the results cannot be changed.

Gifted Resource Council

Table Scoresheet

Academic Challenge Cup

Sample

TABLE **03** ROUND **01**

Player Name	Game 1	Game 2	Game 3	Game 4	Game 5	Total	Player's Initials
GE013E45F) Chris Helderson	1	1	1	1	—	4	CH
NDO35E45F) Malika Broderson	2	1	1	2	—	6	M.B.
RR062E45F) Bob Chobanian	0	1	2	1	—	4	BC
EP041E45F) Chip Benjamin	1	0	1	1	—	3	CB
LF024E45F) Su-Shing Chen	1	2	0	0	—	3	SSC

Games Played	Scorekeeper
4	SSC

The last player listed on this scoresheet is designated the scorekeeper for this round. After each game the points of each player are verified with his/her Player Scoresheet and initialed by the scorekeeper and then entered onto this Scoresheet.

When the round is over, individual scores are totaled. The scorekeeper also writes the number of games played in the **Games Played** box.

Players should verify that the **Total** values from the Player Scoresheets agree with the Table Scoresheet, and then initial their rows. The scorekeeper also initials the **Games Played** box as correct.

When the scoresheet is complete and initialed by all players for this round, the scorekeeper raises his/her hand. An official will then pick up the scoresheet. All players remain seated until instructions are given to move to places for the next round.