PEMDAS+

# Overview

PEMDAS+ is a GUI application to challenge new computer science students to resolve expressions using correct operator precedence. It attempts to make learning operator precedence fun yet challenging. The name of this application comes from the memory device for the correct order: PEMDAS (**P**arentheses, **E**xponentiation, **M**ultiplication, **D**ivision, **A**ddition, **S**ubtraction). The **+** in the name refers to *future* enhancements planned for the application to include comparisons (==. !=, <. >, <=, >=).

# GitHub Link

Here is a link to the PEMDAS+ application in GitHub:

<https://github.com/midkids/IvyTech.git>

# Software Requirements

The PEMDAS+ application requires the following software to run:

* Python 3
* The breezypythongui.py module
* The PEMDAS.py module
* The lock2a.gif and lock2b.gif images

# Components

Graphical user interface

Description automatically generated

1 – Shows the current score of the user.

2 – Times how long the user takes (in seconds) to determine a correct answer to the given expression. This timer starts when the GET (expression) button is pressed and stops when either 1) the user submits the correct answer (evaluation) to the expression or 2) the user submits three incorrect answers (evaluations) to the expression. After either of these two conditions, the timer is reset to zero.

3 – Shows the current number of lives the user has left. This number starts at three and is reduced by one each time the user submits three incorrect answers for an expression.

4 – The GET button generates a new expression for the user to solve. It is disabled once an expression is presented to the user and remains so until one of the two conditions listed above for the timer is met.

5 – The expression box is where the randomly generated expression is shown to the user.

6 – The answer box is where the user types in their proposed answer (evaluation) of the shown expression. The answer can only be an integer.

7 - The SUBMIT button. This button is disabled until an expression is presented to the user. It is enabled as soon as the user is presented with the expression. The user should press this button once they have entered their proposed answer (evaluation) in the answer box.

8 - The RESET buttons resets the game, but without exiting the application. It zeroes out the score, the timer, and the answer. It sets the lives to three. It erases the expression in the expression box. It enables the GET button and disables the SUBMIT button.

9 – The high score box shows the highest score achieved for the entire time the user is playing the game. This duration could include one or more games where the user wins or loses.

10 – The EXIT button allows the user to exit the application at any time. It closes the GUI window. Although clicking the X in the windows menu will also close the application, using the EXIT button is preferred as it allows the application to properly close itself.

11 – The application shows a locked image of a lock while it is asking the user to solve the expression. The application shows an unlocked image of a lock when the user submits a correct answer (evaluation) to the expression.

# Objective

The objective of the PEMDAS+ application is for the user to correctly solve all expressions presented to them. The application is trying to challenge the user on the order of operations, not math. Therefore, the application includes the following provisions to keep the presented expressions manageable:

1. All integers in the expressions are from 1 to 5
2. The division operator is not used to ensure all answers (evaluations) are integers
3. The only exponentiation exponent used is 2
4. The expression will include zero or one exponentiation operators

# Play

1. The user presses the GET button
2. The application presents the user with an expression
3. The user evaluates the expression
4. The user enters their proposed answer (evaluation) in the answer box
5. The user presses the SUBMIT button
6. The application determines if the user submitted a correct answer (evaluation)
7. If the user enters a correct answer (evaluation)
   1. A popup window informs them of this fact
   2. Once the popup window is dismissed, the application is ready for the user to GET another expression
   3. The number of operators in the next expression will be one more than the one just solved
8. If the users enter an incorrect answer (evaluation)
   1. A popup window informs them of the number of tries they have left to correctly answer
   2. The users gets three chances to correctly answer each given expression
   3. On the third incorrect answer, a popup window shows the user the correct answer
   4. Once the correct answer popup window is dismissed, the application is ready for the user to GET another expression
   5. The number of operators in the next expression will be one less than the one just missed

# Scoring

1. If the user enters a correct answer (evaluation) on their first attempt at solving an expression, they are awarded points according to the following formula:
   1. Points = 50 **/** number of minutes to solve the expression **X** the number of operators in the expression
2. If the user enters a correct answer on their second attempt, they are awarded points per the same formula, except the 50 is replaced with a 30
3. If the user enters a correct answer on their third attempt, they are awarded points per the same formula, except the 50 is replaced with a 10

# Losing

The user loses the game when the number of lives becomes zero.

# Winning

The users wins the game when they correctly solve an expression with 11 operators.

# Good luck and have fun meeting the challenge of PEMDAS+!