

Pentomino Buttons

The row of twelve buttons under the menu bar "contains" the pentominos that you will need to solve the puzzle. These buttons can be in one of three states...



A colored button which contains a Pentomino.



A button which is being pressed.



A gray button which does not contain a Pentomino.

How to Use the Buttons

Clicking a colored pentomino button with the **left** mouse button will change the pentomino button to gray and place the selected pentomino under the pressed button. If you prefer, you can also drag a pentomino from a button. When you do this the pentomino will appear under the button, and the cursor will change to the shape of a **hand**. The pentomino can be moved around the grid until the mouse button is released.

Clicking a gray pentomino button will remove the selected pentomino from the grid and color in the pentomino button. Clicking on the same button again will place the pentomino under the pressed button.

If you lose a pentomino outside the main window area, you can easily find it again by double clicking with the left mouse button on the grayed pentomino button.

Dragging the cursor from a pentomino button into the area surrounding the button will have no effect and the selected button will pop up again. If you move the mouse cursor back onto the same button without having released the left mouse button, the pentomino button will be pressed again. You can then continue to drag the pentomino onto the grid.

It is not possible to drag a pentomino back to its button from the grid.

Thanks for the Code...

The program code for the Pentomino buttons were based on routines written by [Stephen Chung](mailto:stephenc@cunixf.cc.columbia.edu) (stephenc@cunixf.cc.columbia.edu). Thanks Steve for a great idea and for allowing me to use the code in my program. I have included the modified version of the toolbar button program in the source code package available to registered users. The original toolbar program can be obtained from various windows ftp archives on Internet or possibly from Compuserve.

Control Close

The Control Close option of the Control Menu closes the active application window. If a dialog box is open and has a Control menu, choosing this command only closes the dialog box.



This is the Control Menu icon. Double-clicking this icon is the same as choosing Control Close.

If you are situated in Pentomino's main window then closing the application window is the same as choosing the Exit Game option under the Game menu.

Clicking Operation

The clicking operation is performed by moving the mouse cursor to the item to be clicked, pressing either the left or right mouse button briefly, and then releasing it without moving the cursor position.

Control Maximize

The Control Maximize option of the Control Menu enlarges the active window to fill the available screen space.



This is the Maximize icon which, if clicked, is the same as choosing Control Maximize.

You can restore a maximized window to its former size by using the Control Restore command.

Control Menu



This is the Control Menu icon which contains various standard controls for manipulating the size, position and status of the *Pentomino* window.

Control Restore

Control Move

Control Size

Control Minimize

Control Maximize

Control Close

Control Switch-To

Control Title

Control Minimize

The Control Minimize option of the Control Menu reduces the active window to a small icon at the bottom of the screen.



This is the Minimize icon which, if clicked, is the same as choosing Control Minimize.


Minimizing is useful when you are running another application at the same time as *Pentominos* and you wish to unclutter the screen.

This icon appears only on the Title bar of the main *Pentomino* window. It does not appear on any of the dialog box windows which, therefore cannot be minimized.

You can restore a minimized window to its former size by using the Control Restore command.

Control Move

The Control Move option of the Control Menu allows you to move a window around the screen.

When this control is selected, it displays a four-headed arrow  as the cursor which you can use to move the window. By using the keyboard arrow keys, you can manipulate the cursor and change the position of the window.

An easier method uses the mouse. Move the standard arrow cursor to within the Title bar of the window to be moved. Pressing the left mouse button while moving the cursor will cause the window to follow it.

If a dialog box is open and has a Control menu, you can also use this command to move the dialog box.

If the window is maximized, this command is unavailable.

Control Restore

The Control Restore option of the Control Menu restores the selected window to the size and location it had before you chose either the Control Maximize or the Control Minimize command.




This is the Restore icon which, if clicked, is the same as choosing Control Restore.

Control Restore does not affect changes made to a window with the Control Move or Control Size commands.

Control Size

The Control Size option of the Control Menu allows you to change the size of a window.

When this control is selected, it displays a four-headed arrow  as the cursor which you can use to change the size of any visible window. By using the keyboard arrow keys, you can manipulate the cursor and change the size of the screen.

An easier method uses the mouse. Move the standard arrow cursor to any edge or corner of the window to be resized. When you are in the correct position, the cursor will change to a double ended arrow. Pressing the left mouse button while moving the cursor will resize that edge or corner of the window.

If the window is maximized, this command is unavailable.

Control Switch-To

The Control Switch-To option of the Control Menu opens a dialog box which lists all of the open applications. The following pushbuttons are available within this dialog box.

Double clicking on the desktop area behind the displayed windows will have the same effect as choosing Control Switch-To.

Switch To

This option activates the selected application. An application can be selected by clicking on its name in the list box.

End Task

This option closes the selected application.

Cancel

This option closes the Task List window and cancels the *Switch-To* dialog box.

Cascade

This option sizes all open application windows so they overlap and each title bar is made visible.

Tile

This option maximizes all open application windows and sizes them so that the upper-left portion of each window is visible.

Arrange Icons

This option arranges the icons of all minimized applications across the bottom of the screen.

Control Title Bar

The title bar is the area at the very top of the Pentomino window. The default content of this area is the name of the program, *Pentomino*.

If the timer has been switched on, then the time taken to solve the puzzle will also be displayed and is updated every second. If the timer is switched off, the time display is removed.

If a puzzle has been solved, a message appears on the title bar after the program name which congratulates the user. If the solved puzzle is disturbed, this message is removed.

Dragging Operation

The dragging operation is performed by moving the mouse cursor to the item to be dragged, pressing (usually) the left mouse button, and while holding the button down, moving the cursor. The item under the cursor should be dragged along with the cursor. When the desired location is reached, the mouse button is released, dropping the dragged object at that position. The cursor should change shape as an indication of a drag operation.

Game Menu

The **Game Menu** allows you to start a new puzzle by clearing all the pentominos on the grid, save an incomplete puzzle, restore a previously saved complete or incomplete puzzle, or to leave the program.

New Game

Save Game

Restore Game

Exit Game

Exit Game

This Game menu option closes the *Pentomino* application window.



This is the Control Menu icon. Double-clicking this icon is the same as choosing the Exit menu option.

You can also use the Control Close menu option to close *Pentominos*.

Large Grid

This Grid menu option selects the largest available grid size for the *Pentomino* puzzle area. The height and width of each cell in the grid are set to 50 pixels.

A check mark is placed next to the Small option when it is selected.

You can use a large grid if you have trouble seeing the pentomino pieces clearly.

If you use a large grid on a lower resolution screen, such as 640x480 VGA, you may find that the highlighted puzzle area will not fit into the available window. The puzzle area will not be highlighted in this case and it is not possible to access the right side of the rectangle. A solution is to use the Variable Grid option and gradually reduce the size of the grid until the puzzle area becomes highlighted.

Medium Grid

This Grid menu option selects an intermediate grid size for the *Pentomino* puzzle area. This is the default grid size when the program is started. The height and width of each cell in the grid are set to 24 pixels.

A check mark is placed next to the Medium option when it is selected.

This size is ideal when viewed in relation to the Pentomino buttons. It is not too small nor too large.

New Game

This Game menu option allows the player to start a new puzzle. All of the pentominos are returned to their corresponding buttons, and these buttons are then shown as colored. This is an example of a colored pentomino button.



If the timer is active, it is reset back to zero.

Restore Game

This Game menu option provides the user with a means of restoring a saved copy of a *Pentomino* puzzle. Both completed and partially completed puzzles can be restored.

When this option is selected a dialog box appears which provide you with the means of selecting a puzzle to restore. If you wish, you can leave this dialog box open so that you can load previous puzzles and still be able to manipulate the pentomino pieces.

Grid Menu

The **Grid Menu** provides three standard grid sizes, and the ability to vary the grid size anywhere between **small** and **large**. You should select a size which is pleasing to the eye, yet still manages to fit the highlighted puzzle rectangle into the window. If the puzzle rectangle cannot fit into the window, no part of it will be shown.

Small Grid

Medium Grid

Large Grid

Variable Grid

Save Game

This Game menu option provides the user with a means of saving a copy of an incomplete *Pentomino* puzzle. This puzzle can be restored at a later time so that further efforts can be made to solve it.

The puzzles are stored in a file called **pent.ini** which is located in your main Windows directory. (the directory containing the win.ini file)

You can only save one incomplete puzzle for each puzzle format. So if become frustrated with trying to solve the 3x20 puzzle and wish to try a 6x10, then you can save the 3x20, partially solve a 6x10, and still be able to save the incomplete 6x10 puzzle. However, you cannot save two partially completed 6x10 puzzles.

When you manage to solve a puzzle, **pent.ini** is searched for the same pentomino layout. If it cannot be found, then the solved puzzle is allocated a sequence number and **automatically** saved. A dialog box will appear so that you can record your name with the solved puzzle.

If the puzzle is found in the **pent.ini** file but you have managed to solve the same puzzle in a shorter time than the one stored in the file, then your effort will supercede it. Switching the timer off causes your time to always be longer than the stored time.

Small Grid

This Grid menu option selects the smallest available grid size for the *Pentomino* puzzle area. The height and width of each cell in the grid are set to 15 pixels.

A check mark is placed next to the Small option when it is selected.

You can use a small grid when you are short of vertical space on your screen. You can reduce the size of the *Pentomino* window and still be able to see the complete highlighted puzzle area. A small grid may not help if you have a horizontal space problem because the size of the Pentomino buttons are not reduced or wrapped on the toolbar. If you reduce the horizontal size of the screen some of the buttons may not be visible.

Variable Grid

This Grid menu option provides the user with a means of varying the grid for the *Pentomino* puzzle area to sizes between the Small and Large options. The smallest size available is 15 pixels while the largest is 50 pixels. The grid can be changed in one pixels steps.

The check mark is removed from the fixed size options when the variable option is selected.

When this option is selected a dialog box appears which provide you with the means of varying the grid size. If you wish, you can leave this dialog box open so that you have control of the grid size while solving a puzzle.

About Pentomino

This Help menu option displays a dialog box containing some information about the version number and author of the *Pentomino* program.

After you have read the information contained in this window, you must close it before you can continue with solving a puzzle.

You can close the *About* box by clicking on the **OK** pushbutton, by pressing the **return** key on the keyboard, or by using the Control Close features provided by Windows.

Pentomino Help Index

Select one of sections below by clicking on it with the left mouse button or by using the Tab key to move the highlight and pressing Enter. For information on how to use Help, press **F1** or choose Using Help from the Help menu.

[Objectives of Puzzle](#)

[How to Play](#)

[Pentomino Command Menus](#)

[Pentomino Buttons](#)

[Manipulating Pentominos](#)

[Publishing Completed Puzzles](#)

[How to Register](#)

Index of Help Items

[3x20 Pentomino Puzzle](#)

[4x15 Pentomino Puzzle](#)

[5x12 Pentomino Puzzle](#)

[6x10 Pentomino Puzzle](#)

[About Pentomino](#)

[Clicking Operation](#)

[Control Close](#)

[Control Maximize](#)

[Control Menu](#)

[Control Minimize](#)

[Control Move](#)

[Control Restore](#)

[Control Size](#)

[Control Switch-To](#)

[Control Title Bar](#)

[Dragging Operation](#)

[Exit Game](#)

[Game Menu](#)

[Getting Started](#)

[Grid Menu](#)

[Help Menu](#)

[Help Using Help](#)

[How to Play](#)

[How to Register](#)

[Large Grid](#)

[Manipulating Pentominos](#)

[Medium Grid](#)

[New Game](#)

[Pentomino Buttons](#)

[Pentomino Command Menus](#)

[Pentomino Help Index](#)

[Pentomino Objectives](#)

[Publishing Completed Puzzles](#)

[Puzzle Menu](#)

[Restore Game](#)

[Restore Puzzle Dialog Box](#)

[Rotation Pentominos](#)

[Save Game](#)

Small Grid
Solution Numbers
Timer Control
Timer Menu
Translation Pentominos
Username Dialog Box
Variable Grid Dialog Box
Variable Grid

Help Menu

The **Help Menu** contains shortcuts into the help system for the program. It also includes an *About Box* which gives version and author details for the program. If this is the first time you have run this program **Getting Started** may be a good place to start.

[Pentomino Help Index](#)

[Getting Started](#)

[Registering](#)

[Using Help](#)

[About Pentomino](#)

How to Play

Starting a New Game

When Pentomino is first started it displays an empty puzzle grid with a highlighted rectangle located near the left border. This is the rectangle which must be filled with the 12 pentomino pieces to complete a puzzle. An empty grid can also be obtained by selecting the New item under the Game menu.

If you want to change the format of the highlighted rectangle, then you can choose one of the four available formats under the Puzzle menu. The format of the puzzle can be changed any time, even while pentominos are on the grid.

If the grid cells are either too small or too large for your display or if you just don't like the default size, you can change it to one of three preset sizes, or if you prefer, to any size between the smallest and largest available. Changing the size of the grid while solving a puzzle does not upset the pentomino pieces. These size options can be found under the Grid menu.

If you wish to have a timed game, you can turn on the timer with the Timer menu control. This is a toggle control which will alternatively switch the timer on or off.

You can obtain help at any time by pressing the **F1** key or by selecting the help items under the Help menu. If you wish to see what a particular control does, then a context help is available by pressing **Shift-F1** at which time the cursor will change to an arrow attached to a question mark. The next item that the user selects will be the one explained by the help system.

Selecting Pentominos



This is a typical button containing an available pentomino.

A pentomino piece can be selected by clicking on a Pentomino button at which moment the pentomino shown on the chosen button will appear on the grid just under the cursor. The second way to select a pentomino is to move the cursor over the appropriate pentomino button, press the left mouse button, and then move the cursor down from the button onto the grid while still pressing the left mouse button. The pentomino will appear under the cursor and move with it until the mouse button is released. This process is called dragging. You will notice that the cursor has changed from the standard arrowhead to a spread hand to indicates that a drag operation is in progress.

When the pentomino is in the required position, release the left mouse button to **drop** it.

Another thing you should notice is that the button showing the selected pentomino has changed from colored to grey. This indicates that the corresponding pentomino is somewhere on the grid. A greyed button is shown below.



If you press a grey pentomino button, it will revert to its colored state and the pentomino will be removed from the puzzle area. If you somehow lose a pentomino off the edge of the displayed grid, you can retrieve it by pressing its greyed button.

It is not possible to drag a pentomino back to its button.

Manipulating Pentominos

There are basically two manipulations that you can perform on pentomino pieces which are displayed on the grid.

By pressing, and holding, the left mouse button while the cursor is positioned over any of the cells of a pentomino, that pentomino can be dragged to wherever the cursor is moved. When the button is released, the pentomino is dropped at the location of the cursor. The orientation of the pentomino is not changed when it is moved.

By clicking the right mouse button while the cursor is positioned over a cell of a pentomino, that pentomino will be rotated 90 degrees clockwise. The cell that the cursor is positioned over is used as the pivotal point for the rotation. It is **not** possible to flip a pentomino so the its mirror image appears. This would be equivalent to turning a card from face down to face up. This action is not allowed when solving these puzzles.

Completing a Puzzle

Now all you have to do is move and rotate the 12 pentomino pieces until you have placed them within the highlighted rectangle. If you manage to get all the pieces to fit into the rectangle, you have solved a puzzle. There are many solutions to each puzzle format so don't give up in frustration too soon.

When you solve a puzzle, the program checks to see if that solution has been found previously, and if not, then you are invited to enter your name for the record. If a puzzle has been solved previously but you have managed it in a shorter time, then you will also be asked for your name. By turning the timer **Off** you effectively select the highest value of time so if any time is stored with the solved game, your effort will not be recorded.

Saving a Game

You can save a partially completed puzzle at any time by selecting the Save item under the Game menu.

If you solve a puzzle, it will be saved automatically as long as the conditions explained in the previous section are true.

Restoring a Game

You can restore either a partially complete puzzle, or any of the previously solved puzzles by selecting the Restore item under the Game menu. A dialog box will appear which will allow you to chose which puzzle you want to restore.

How to Register

Pentominos is distributed as shareware. It is **not** free. You may use it for 21 days before registering.

Registered Users may request the complete source code and all the resources used to develop this program.

Registration costs Aust\$20 (approximately US\$15) and if you wish to receive source code, then see below for additional postage and handling charges. Foreign customers please do **not** use personal cheques, but send a **Bank Draft** in **Australian Dollars** drawn on an **Australian Bank**. (If you wish to send **cash** in the mail you do so at your own risk, but cash **will** be accepted if received.)

Postage Rates

Internet email		No Charge
Australia	(inc. 3" or 5" disk)	AUD\$5.00
Overseas	(inc. 3" or 5" disk)	AUD\$7.00

You can print the registration form included with this distribution, or if you don't have a printer, you can just write a letter giving your name and address, and state that you are registering *Pentomino* Vsn 1.00. Don't forget to mention what type of disk you require if you want the source code. Send the form or letter, with your payment made out to **Stephen Balogh**, and to the following address:

Stephen Balogh
PO Box 414
Caulfield East
Melbourne
AUSTRALIA 3145

By registering, you support shareware development and affordable Windows Software. Your contribution will help promote future shareware development and the development of future versions of this program. Suggestions for improving *Pentominos* are very welcome.

Site licenses are available with the following discounts.

- 2 - 5 licenses receive a 20% discount.
- 6 - 20 licenses receive a 35% discount.
- 21 + licenses receive a 50% discount.

If you request the source code for the program you will still only receive **one** disk, so you should only include postage and handling for a single copy. However, you are entitled to give a copy of the source code to each of the license holders.

When you register, you will receive the complete source package used to develop this program. The package includes all C source code, resource files, bitmap files, cursor files, and help files (in RTF format). You can use this source code as an example of how to write a Windows application. The program was developed using Microsoft C 6.0, Microsoft Help Compiler 3.0 and Microsoft Software Development Kit 3.0.

Once you register, you are entitled to use and modify the source code and all associated files in any manner you desire. I do **not** require further royalties or credit.

If you have access to the Internet then any questions or discussion regarding the program, can be made via email. My Internet email address is steve@monu6.cc.monash.edu.au or steve@monash.edu.au.

Getting Started

Start a new game by pressing the [New](#) item under the [Game](#) menu.

Select the rectangle format you require by selecting one of the options under the [Puzzle](#) menu.

If you want a timed game then you can switch on the timer using the [Timer](#) menu option.

Select pentominos by [clicking](#) on the button showing the pentomino you require. The pentomino will appear on the screen under the button you just pressed, and the button will turn gray. You can remove the pentomino from the puzzle grid by pressing its grayed button.

You can [drag](#) a pentomino around the puzzle grid and then place it where you need it.

You can rotate a pentomino by clicking on the right mouse button while the cursor is located over one of the pentomino's cells. The pentomino will rotate by 90 degrees clockwise about this cell.

If you want to save your game before it is complete, select the [Save](#) option of the [Game](#) menu.

See also:

[Pentomino Objectives](#)

[How to Play](#)

Help Using Help

This Help menu option provides information on how to use the Windows help program.

This menu option is also available under the **H**elp menu in the title bar of the Windows Help program. If you use the second option, another copy of the help program will be started. When you are finished reading the **H**elp on **H**elp topics, you should close the second copy of the help program using the Control Close features provided by Windows.

Manipulating Pentominos

There are basically two manipulations that you can perform on pentomino pieces which have been displayed on the grid.

Moving Around the Grid

By pressing, and holding, the left mouse button while the cursor is positioned over any of the cells of a pentomino, that pentomino can be dragged to wherever the cursor is moved. When the button is released, the pentomino is dropped at the location of the cursor.

The orientation of the pentomino is not changed while being moved.

Rotation of Pentomino

By clicking the right mouse button while the cursor is positioned over a cell of a pentomino, that pentomino will be rotated 90 degrees clockwise. The cell that the cursor is positioned over is used as the pivotal point for the rotation. It is **not** possible to flip a pentomino so the its mirror image appears. This would be equivalent to turning a card from face down to face up. This action is not allowed when solving these puzzles.

Pentomino Command Menus

The following menus and menu items are available to the user. Press on the required menu item for more details of the selected menu.



This is the **Control Menu** icon which contains various standard controls for manipulating the size, position and status of the *Pentomino* window.

- [Control Restore](#)
- [Control Move](#)
- [Control Size](#)
- [Control Minimize](#)
- [Control Maximize](#)
- [Control Close](#)
- [Control Switch-To](#)
- [Control Title](#)

The **Game Menu** allows you to start a new puzzle by clearing all the pentominos on the grid, save an incomplete puzzle, restore a previously saved complete or incomplete puzzle, or to leave the program.

- [New Game](#)
- [Save Game](#)
- [Restore Game](#)
- [Exit Game](#)

The **Puzzle Menu** allows you to select the format of the rectangle into which the twelve pentominos must fit.

- [6x10 Pentomino Puzzle](#)
- [5x12 Pentomino Puzzle](#)
- [4x15 Pentomino Puzzle](#)
- [3x20 Pentomino Puzzle](#)

The **Grid Menu** provides three standard grid sizes, and the ability to vary the grid size anywhere between **small** and **large**. You should select a size which is pleasing to the eye, yet still manages to fit the highlighted puzzle rectangle into the window. If the puzzle rectangle cannot fit into the window, no part of it will be shown.

- [Small Grid](#)
- [Medium Grid](#)
- [Large Grid](#)
- [Variable Grid](#)

The **Timer Menu** only has one menu item which toggles the timer on or off.

- [Timer Control](#)

The **Help Menu** contains shortcuts into the help system for the program. It also includes an *About Box* which gives version and author details for the program. If this is the first time you have run this program **Getting Started** may be a good place to start.

- [Pentomino Help Index](#)
- [Getting Started](#)
- [Help Register Pentomino](#)
- [Help Using Help](#)
- [About Pentomino](#)

Pentomino Objectives

Polyominoes dwell amid the integer points of the Cartesian plane. They are composed of unit cells which have their vertices on integer points of the plane. An (n)-omino is a union of (n) cells whose interior is connected. The name given to (n)-ominoes depends on the number of cells that they contain. Some naming examples are:

2 cells dominos
4 cells tetrominos
5 cells pentominos
7 cells heptominos

This game uses the 12 rotation type pentomino shapes as the basis of the puzzle. The set of rotation type polyominoes is always less than the set of translation type polyominoes. For example, there are 18 translation type pentominoes and 12 rotation type pentominoes. These 12 shapes are shown on the row of buttons in the pentomino game.

Martin Gardner wrote an article in 1958 on the subject of polyominoes. In this article he pointed out that the twelve rotation type pentominoes (simply called pentominoes from now on) can be used to form variables rectangles with a total area of 60 units. The shapes of the rectangles are (3x20), (4x15), (5x12) and (6x10) units.

The number of solutions for each of these rectangle shapes are 2, 368, 1010 and 2339 respectively. The (3x20) shaped rectangle is the hardest to solve, while the (6x10) shaped rectangle is the easiest.

A 3D variation of the puzzle uses only N-pentacubes to form the rectangle shapes of (2x4x5), (2x5x5), (2x6x5) and (2x7x5). There are endless further possibilities, but the implementation of these extensions are left to you.

The objective of this game is to solve as many of the puzzles as you can in each of the four rectangle formats. As you solve each puzzle, it is saved in a file called pent.ini in the main Windows directory. These puzzles can be restored and used as the basis of other puzzles.

See also:

[How to Play](#)

[Getting Started](#)

5x12 Pentomino Puzzle

This Puzzle menu option selects the puzzle rectangle format which is 5 cells high and 12 cells wide. This rectangle is highlighted on the puzzle grid.

To solve a puzzle, you must place all 12 pentomino pieces within this rectangle. There must not be any overlapping pieces within the rectangle or any cell of a pentomino protruding outside of the rectangle.

There are 1010 solutions for this format.

4x15 Pentomino Puzzle

This Puzzle menu option selects the puzzle rectangle format which is 4 cells high and 15 cells wide. This rectangle is highlighted on the puzzle grid.

To solve a puzzle, you must place all 12 pentomino pieces within this rectangle. There must not be any overlapping pieces within the rectangle or any cell of a pentomino protruding outside of the rectangle.

There are 368 solutions for this format.

Puzzle Menu

The **Puzzle Menu** allows you to select the format of the rectangle into which the twelve pentominos must fit.

[6x10 Pentomino Puzzle](#)

[5x12 Pentomino Puzzle](#)

[4x15 Pentomino Puzzle](#)

[3x20 Pentomino Puzzle](#)

6x10 Pentomino Puzzle

This Puzzle menu option selects the puzzle rectangle format which is 6 cells high and 10 cells wide. This rectangle is highlighted on the puzzle grid.

To solve a puzzle, you must place all 12 pentomino pieces within this rectangle. There must not be any overlapping pieces within the rectangle or any cell of a pentomino protruding outside of the rectangle.

There are 2339 solutions for this format.

3x20 Pentomino Puzzle

This Puzzle menu option selects the puzzle rectangle format which is 3 cells high and 20 cells wide. This rectangle is highlighted on the puzzle grid.

To solve a puzzle, you must place all 12 pentomino pieces within this rectangle. There must not be any overlapping pieces within the rectangle or any cell of a pentomino protruding outside of the rectangle.

There are only 2 solutions for this format.

Publishing Completed Puzzles

I thought that it might be a good idea for people to exchange completed puzzles and perhaps eventually obtain a complete set for each of the four formats. I already have the two possible solutions for the 3 x 20 format, so after a few months, unless someone else beats me to it, I will publish these two solutions along with any others I might find.

A major difficulty might be the method of distribution of solutions. For people on the Internet or CompuServe, there is no problem. Others may have to resort to various BBS systems. It would be nice, however, if many of the solutions would end up on a common Windows archive site such as cica.cica.indiana.edu. An alternative method would be to mail the solutions that you find to me and I could collate them into a single *pent.ini* file which could then be stored on cica. (My mail address can be found in the *About* dialog box. Many of the files on cica are copied to and from CompuServe so the audience should be fairly large. People using various bulletin boards could copy the solutions to one of these sites every now and again if they have access.

If someone knows of a complete set of solutions, they may wish to keep it to themselves in case they spoil the fun for others. I believe that there may be published solutions in a mathematics book somewhere, but I could not find it.

I wonder how long before all solutions are found.... :-)

Restore Puzzle Dialog Box

This dialog box will appear when the Restore option from the Game menu is selected. It will remain visible until it is closed by the user. There is no need to close it, to continue solving a puzzle.

The purpose of the dialog box is to provide a means of restoring a previously saved puzzle.

Displays

There are four displays which show some information about the puzzle which been retrieved. The puzzle itself is displayed on the puzzle grid as soon as it is restored.

The **Puzzle ID** field contains the sequence number of the restored puzzle. It can be zero indicating that the restored puzzle has not been completely solved, or it can be a positive integer. Non-zero sequence numbers are assigned to puzzles which have been solved.

The **Date** field contains the date and time that the puzzle was saved.

The **Elapsed Time** field contains the elapsed time that it took to solve the retrieved puzzle. If the timer was switched off when the puzzle was saved, the message **NoTimer** will appear in this field.

The **Winners Name** field contains the name of the person who solved the currently retrieved puzzle. It will remain blank if an unsolved puzzle is retrieved.

Puzzle Not Found Message

If a puzzle of a specific format cannot be found a message box with **Puzzle not found** will be displayed. There are several reasons that this may occur.

The **pent.ini** file may be missing from the Windows directory.

There may be no unsolved puzzles saved on file when one is requested.

There may be no solved puzzles saved on file when one is requested.

There may be no puzzles of the specified format when one is requested.

The Puzzle Group

This group of two Radio Button controls determine if you wish to restore an incomplete puzzle which has been manually saved, or a solved puzzle which has been automatically saved.

Click on either of the two small circles to the left of the **Saved** or **Solved** captions. The one you click will be selected and highlighted.

If the type of puzzle you select does not exist on the file, you will see a message box to inform you.

The Format Group

This group of four Radio Button controls determines the format of the puzzle you wish to restore. The four options are 6x10, 5x12, 4x15 or 3x20 formats.

Click on any of the four small circles to the left of the format captions. The one you click will be selected and highlighted.

If the type of puzzle you select does not exist on the file, you will see a message box to inform you.

Previous Puzzle Pushbuttons

If you have retrieved a puzzle with a non-zero sequence number, you can retrieve previous puzzles by clicking on one of the four pushbuttons under the **Previous Puzzle** caption. Clicking the **-1** button will go back one puzzle, the **-10** button will go back ten puzzles, and so on. You cannot move before the first solved puzzle, and if you try, the program will keep showing you the first solved puzzle.

If you want to see a **saved** puzzle with a zero sequence number, you must select the **saved** Radio Control button in the **Puzzle** group.

Next Puzzle Pushbuttons

If you have retrieved a puzzle with a non-zero sequence number, you can retrieve following puzzles by clicking on one of the four pushbuttons under the **Next Puzzle** caption. Clicking the **+1** button will go forward one puzzle, the **+10** button will go forward ten puzzles, and so on. You cannot go past the last stored puzzle, and if you try, you will see a message box informing you of a **Puzzle not found**.

OK and Cancel Pushbuttons

When you have retrieved the puzzle you need you can click on the **OK** pushbutton to close the *Restore Pentomino Puzzle* dialog box. You can also perform the same action using the Control Close option of the system Control Menu.

Clicking on the **Cancel** pushbutton will restore the puzzle as it was before the *Restore Pentomino Puzzle* dialog box was opened and then close the dialog box.

Rotation Pentominos

Rotation type polyominoes can be defined by stating that two polyominoes are equivalent if there is a sequence of rotations of the plane which maps one polyomino onto another. Imagine that you have a shape cut out of a piece of cardboard. If you flip the shape over so that the surface which originally touched the table is now uppermost, and by rotation in the horizontal plane you can obtain the same original shape, then that polyomino is equivalent to the original, and is a rotation type.

Solution Numbers

The number of solutions available for each puzzle format is:

6 x 10	2339 solutions
5 x 12	1010 solutions
4 x 15	368 solutions
3 x 20	2 solutions

Timer Menu

The **Timer Menu** only has one menu item which toggles the timer on or off.
Timer Control

Translation Pentominos

Translation type Polyominos can be defined by stating that two polyominos are equivalent if some translation of the plane maps one onto the other.

Timer Control

This Timer menu option allows you to switch the timer on or off.

When the timer is switched **on**, the elapsed time is shown in the *Pentomino* title bar in the format of **hh:mm:ss**, indicating the hours, minutes and seconds which have elapsed.

When the timer is switched **off**, the *Pentomino* title bar only contains the name of the program.

When the timer option is toggled, the caption in the menu toggles between **Timer On** and **Timer Off**.

The timer can be reset to zero by selecting the New option under the Game menu. If the timer is switched off and then switched on again within the same game, it will be reset to zero.

When a game is saved the value of the timer is one of the parameters stored. If the timer is switched off when a puzzle is saved, a value of **zero** is stored.

When a game is restored the value of the timer parameter is loaded into the game timer. If the value is **zero** the game timer is switched off, otherwise it is switched on and the timer is set to the stored value. In the latter case, the timer is displayed on the *Pentomino* title bar, and continues counting.

Windows can only support 16 timers, so if there are already 16 timers being used by all the applications currently running, the timer cannot be started and a message box highlights the problem. You may be able to start the timer by closing another application which uses a timer, such as a clock program. You will need to close the message box before you can proceed.

Username Dialog Box

This dialog box will appear whenever a newly solved puzzle is automatically being saved.

A message will congratulate you for finding a new solution. You should enter your name in the space provided and when you are finished click the **OK** pushbutton, or just press the **return** key on the keyboard.

The dialog box will then be closed and the solved puzzle will be saved.

Variable Grid Dialog Box

This dialog box will appear when the Variable option from the Grid menu is selected. It will remain visible until it is closed by the user. However, there is no need to close it, to continue solving a puzzle.

The purpose of the dialog box is to provide a means of changing the puzzle grid cell size to any value between 15 and 50 pixels. The dialog box provides two methods of changing the size, and options of what to do once the user has varied the grid size.

Vary Grid Controls

The minimum value for these controls is 15 pixels, while the maximum value is 50 pixels. You cannot set any of the controls outside this range. If you exceed 50, the value will be set to 50. If you enter a value below 15, then the value will be set to 15.

Probably the most obvious control for varying the grid cell size is the horizontal scroll bar. There are three ways to alter values with the scroll bar.



When this button is clicked the grid cell size will be **reduced** by one pixel. If the area between this button and the thumb button is clicked the cell size will be reduced by five pixels.



When this button is clicked the grid cell size will be **increased** by one pixel. If the area between this button and the thumb button is clicked the cell size will be increased by five pixels.



When this button is dragged the grid cell size will be changed according to the position of the button. If it is located at the far left of the scroll bar, the grid cell size will be 15 pixels. If it is located at the far right of the scroll bar, the grid cell size will be 50 pixels.

You will notice that as you change the grid cell size using the scroll bar controls, the numeric value of the size appears in the box at the right end of the scroll bar. this value is constantly updated as you vary the controls.

This rectangle, known as an Edit Box, can also be used to control the size of the grid cells. You can directly enter values into this area. You will notice that when you place a new value in this box, the position of the thumb button on the scroll bar changes to match this value.

Pushbuttons

Once you have settled on a grid cell size, you can set the puzzle grid to this value. The grid is **not** changed until one of the following buttons are clicked.

Clicking on the **Set Grid** pushbutton will change the size of the grid cells without closing the *Pentomino Variable Grid* dialog box. You can leave the dialog box open all the time if you wish, there is no need to close it.

Clicking on the **OK** pushbutton will change the size of the grid cells and then will close the *Pentomino Variable Grid* dialog box.

Clicking on the **Cancel** pushbutton will change the size of the grid cells back to what they were before the dialog box was opened and will then close the *Pentomino Variable Grid* dialog box.

You can also close the dialog box using the Control Close option of the system Control Menu. The grid will remain as it appears when the dialog box is closed.

