CRIBBAGE KING

USERS MANUAL

Cribbage King

Users Manual

For the Apple IIGS Computer

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Introducing Cribbage King

Overview

Cribbage is one of the best two player card games ever invented. It is very easy to learn and yet its intricacies have fascinated scholars for centuries. Its fast pace and the opportunities it provides for outsmarting the opponent have made it very popular in the U.S.A., particularly in New England and the Northern states.

Cribbage King's unique blend of features provides both beginners and experts with a challenging and entertaining Cribbage playing partner. Seven different computer personalities are available to challenge and teach you. Beginning and intermediate players will find that the computer players' insights and advice will improve their game. Even expert players should learn a thing or two.

Before *Cribbage King* may be run, the program must be installed. Follow the instructions on the *How to Install Cribbage King / Gin King* sheet.

About This Manual

This manual describes how to use the *Cribbage King* program. In addition, the manual contains a "Rules of Cribbage" chapter (page 4), a glossary of Cribbage terms (page 67), and a chapter describing the playing styles of the seven computer players (page 28). For your convenience, a subject index (page 70) is also included.

Features

Cribbage King contains many exciting features not found in other computer Cribbage games:

- ◆ *Cribbage King* includes all aspects of real Cribbage, including discarding, the play (pegging), scoring, and muggins.

- ◆ You may play two-handed, four-handed, or five-card Cribbage (see page 18).

- ◆ You may play against seven distinct computer personalities: Shark, Mrs. Bass, Reggie, Lord Ainsley, Lady Ames, Chesley, and Alfie. Each computer player has its own strengths and weaknesses (see page 28).

- ◆ The computer players can be made to play against each other (see page 22).

- ◆ You may ask for advice from any of the seven computer personalities (see page 24). Detailed advice and probability analysis is given in clear English.

- ◆ A "duplicate" Cribbage mode is available (see page 20). After playing a game, another human or a computer player can replay the game with the same cards being dealt.

- ◆ You may set up scenarios for analysis by indicating what cards you want dealt, what the starter card is, and what the score is (see page 21).

- ◆ The program will keep a permanent record of your win and loss records against the computer players (see page 24).

- ◆ The top computer player, Shark, employs modern Cribbage playing techniques and sophisticated probability analysis that make it the toughest computerized cribbage opponent available.

The Rules of Cribbage

History

The card game of Cribbage was invented and named by the English poet Sir John Suckling. John Suckling was born into a wealthy English family in 1609. At the age of 18 he inherited his fortune and was knighted by King Charles I at age 21.

Sir John's skill at gambling games was legendary, and he was particularly adept at card games and bowling. Two popular games during this time were called "Noddy" and "One-and-Thirty." The complete rules for these games have been lost, but some details are known. Both games involved scoring by counting to specific numbers: 15 or 21 in Noddy and 31 in One-and-Thirty. Noddy players often used a score-keeping device called a Noddy board. Sir John used aspects of both of these games as a basis for a new card game he called "Cribbidge." The use of 15 as a scoring combination in Cribbage comes from Noddy. The target of 31 during pegging in Cribbage comes from One-and-Thirty. The modern Cribbage board is based in part on the Noddy board.

Cribbage was brought to the New World by early colonists. Today, it is one of the most popular two-player card games in the world. Clubs dedicated to Cribbage can be found in several New England states. In states like Wisconsin and Minnesota, Cribbage is taught to fifth-graders as a substitute for recess during inclement weather. Cribbage is said to be the most popular card game in the U.S. Navy.

The largest Cribbage organization in the United States is the American Cribbage Congress.

Overview

Players. Cribbage is best played with two players, but it can be played with three or four.

Cards. A regular pack of 52 cards is used. The King is high and Ace is low. Each face card has a value of 10, Aces have a value of 1, and the values for the other cards are equal to their rank.

Draw for Deal. Each player draws one card. Low card deals first. The deal alternates from hand to hand.

Deal. Each player is dealt six cards.

Discard. Each player discards two cards from his hand into the crib (also called the kitty). The crib is an extra hand that belongs to the dealer and is not revealed at this time.

The Starter. After the players have discarded, the non-dealer cuts the deck and the dealer turns up the top card. This card is called the starter and is used later in scoring the hands and crib. If the starter is a Jack, the dealer scores two points (called "his heels").

The Object. The object of Cribbage is to be the first player to reach 121 points.

The Cribbage Board
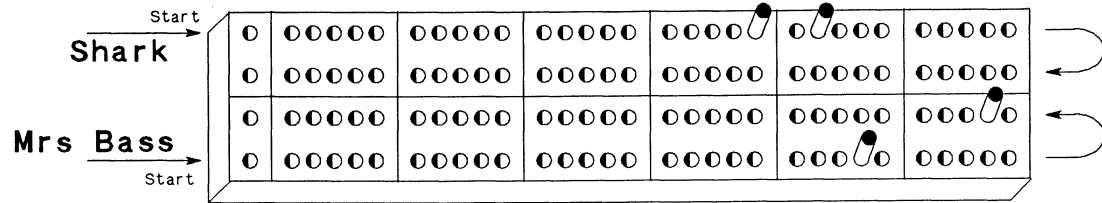
Scores accrue so rapidly in Cribbage that a scoring device called a Cribbage board is used to keep score. The board has four rows of thirty holes each, plus two start holes per player. Each hole represents one point and each player uses two pegs. Every time a player scores, the score is recorded by leapfrogging the back peg over the front peg by an appropriate number of holes. In this way, it is easy for your opponent to check that you have tallied the correct number of points.

The players' pegs start at the left side of the board and travel along the outside rows to the right side of the board. The pegs then turn around and travel along the inside rows back to the left. A game to 121 points consists of travelling up and back two times.

In the illustration above, Mrs. Bass leads Shark by a score of 32 to 22 (assuming the game has just started), and has just scored eight points. Shark's last score was two points.

As soon as one player reaches 121 or more points, the game is over immediately.

In *Cribbage King*, the Cribbage board is always displayed at the top of the screen.

The Play

After the starter is cut, each player exposes one of his cards at a time in a pile in front of him. This phase of the game is called "the play" (also called "pegging"). The non-dealer begins by playing a card and announcing the value of the card. The dealer then plays a card and the total of the two cards is announced. Play continues alternately with the new total being announced each time until a player cannot play without carrying the total over 31. This is called a go. After a go is called, the other player must play additional cards if he can do so under or equal to 31. In this way, the same player may play two or three times in succession. Playing the last card under 31 is worth one point. Hitting 31 exactly scores 2 points.

After the go is scored, the player who called the go begins a new series of plays. The count restarts at zero and the total again cannot go over 31. Playing the last (eighth) card during play is considered a go and is worth one point, (or two points if you hit 31).

SCORING DURING PLAY

In addition to scoring for go, there are other ways to score during the play:

♦ *Jack starter* - For turning over a Jack as the starter card, the dealer scores two points. This is called His Heels.

♦ *Fifteen* - For making the count 15, score two points.

♦ *Pairs* - For playing a card that is the same rank as the card just played, score 2 points. For playing the third card of a rank score six, and for playing the fourth card score 12.

♦ *Runs* - For playing a card that is in sequence of rank with two or more cards played just previously, score the number of cards in the run (sequence). The cards do not have to be played in sequential order to score a run as long as no foreign cards intervene. Examples: 7-9-8 is a run of three, 4-2-A-3 is a run of four, and 6-7-7-8 is not a run.

♦ *Thirty-One* - For making the count exactly thirty-one, score two points. The one point for go is not scored in this case.

When a go is called and the count starts over, the cards already played are turned over and can no longer be used to score with.

Let's run through a sample play sequence. Mrs. Bass is the dealer, so Shark makes the first play:

Shark:

"Eight"   "24 for 3"
               (run of 3)   "go"

Bass:

"Fifteen for 2"   "30 for 4"   "31 for 2"
                   (run of 4)
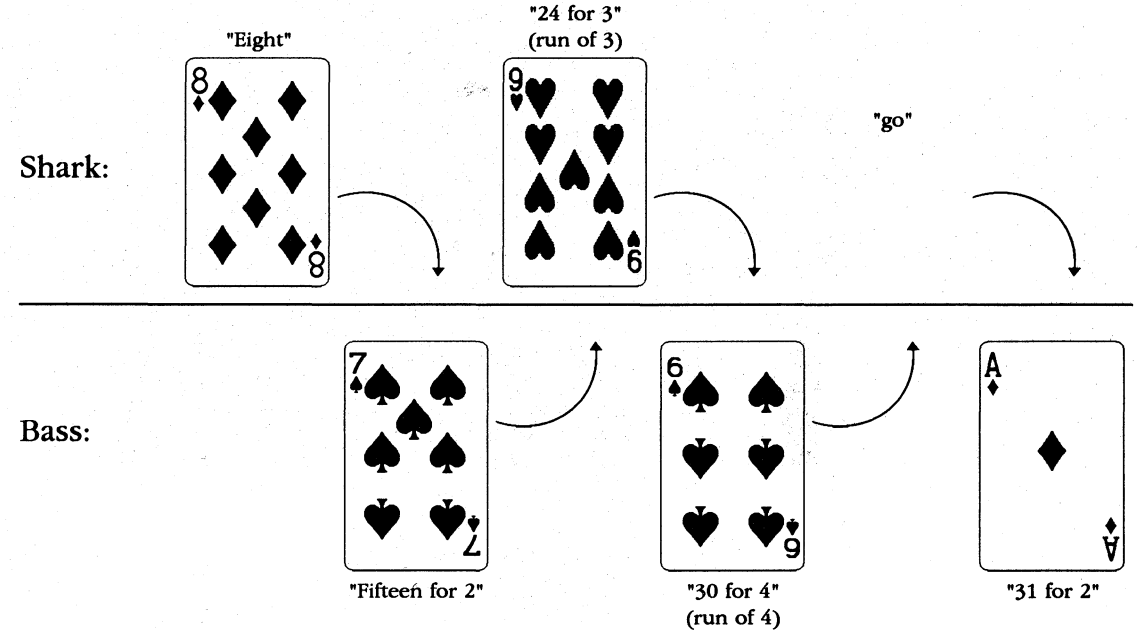
Since Shark called the go, he makes the new lead:

"Ten"

Shark:

"20 for 2" (pair)
"and a go is 3"

Bass:

"Fifteen for 2"
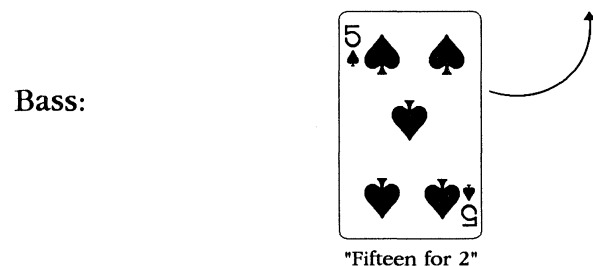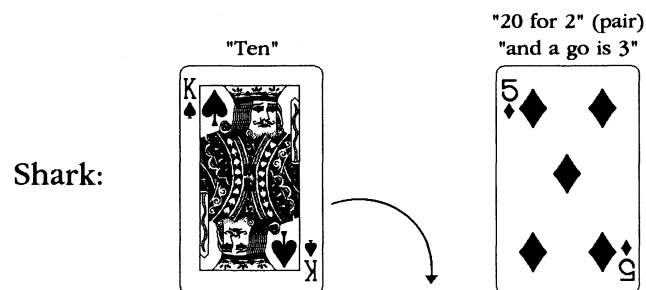
Showing

During the *showing* phase, the hands are counted and scored. The hands are scored in the following order: non-dealer's hand, dealer's hand, and crib. The starter card is treated as a fifth card belonging to each of these three hands. The combinations that score are as follows:

- ◆ *Fifteens* - Each combination of two, three, four, or five cards that add up to 15 scores two points. K-5, 10-4-A, 4-5-6, A-2-3-4-5 are all combinations that score two points for fifteen.

- ◆ *Pairs* - For each pair, score 2 points. Three of a kind (also called pair royale), actually contains three pairs and so is worth 6 points. Four of a kind is similarly worth 12 points.

- ◆ *Runs* - For each combination of cards that forms a run of three or more, score the number of cards in the run. Examples:

  - ▸ J-Q-K is worth three points

  - ▸ 10-J-Q♦-Q♣-K is worth 8 points (not including the pair) for two runs of four: 10-J-Q♦-K and 10-J-Q♣-K

  - ▸ J-Q♦-Q♣-K♣-K♠ is worth 12 points (not including the two pairs) for four runs of three: J-Q♦-K♣ and J-Q♣-K♣ and J-Q♦-K♠ and J-Q♣-K♠.

- ◆ *Flush* - When the four cards in the hand or crib and the starter card are all of the same suit, this scores five points for a flush. When the four cards in the hand are the same suit and the starter card is a different suit, this scores four points for a flush in the hand only. In the crib, you can score a flush of five only.

- ◆ *Nobs* - One point is scored if your hand contains a Jack of the same suit as the starter card. This is called his nobs.

Let's count a sample hand:

Starter
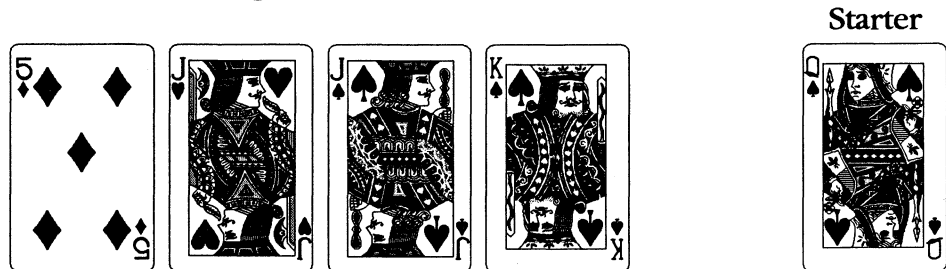
In Cribbage, the hands are counted out loud. Fifteens are counted first, followed by runs, pairs and nobs. As the hand is counted, the cumulative score is declared along with each scoring combination. For example, the above hand is counted "Fifteen 2, fifteen 4, fifteen 6, fifteen 8, double run of 3 is 14, pair is 16, nobs is 17." The fifteens are formed by combining the five with each of the four face cards. A run of three can be formed with each of the two Jacks, scoring a total of six points for runs. The pair of Jacks is worth two points and having a Jack of the same suit as the starter card (spades) is worth 1 point for nobs.

Let's try one more example:

Starter
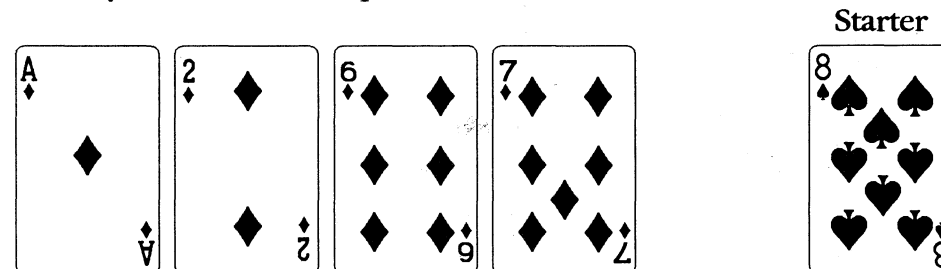
This hand is counted "Fifteen 2, fifteen 4, fifteen 6, run of 3 is 9, flush is 13." The combinations that add up to fifteen are 8-7, 8-6-A, and 7-6-2. The 6-7-8 run is worth three points. The four cards in the hand are all diamonds, so it scores four for a flush. If this had been the crib, no points would be scored for a flush since the starter is not the same suit (diamond).

Playing Cribbage King

Menus

Pull-down menus are used in *Cribbage King* to access the many features the program has to offer. The menu bar is always displayed at the top of the screen:

⌂	File	Edit	Settings	Options
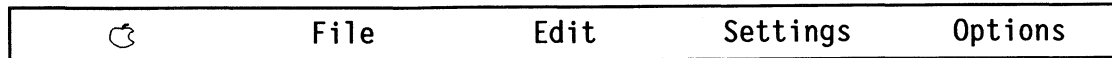
To pull down one of the menus, move the mouse cursor up to the menu bar and click the mouse button. To activate a menu selection, use the mouse to position the highlight bar to the desired selection, then release the mouse.

Many menu selections have a key label to the right of the selection. These key combinations can be used to access the selection directly, without pulling down the menu. For example, you may ask for advice by pressing ⌘A (the ⌘ key and the A key simultaneously).

If it is not possible to change a menu selection, that selection will be ghosted.

Entering Information

At various times during the program, you will be asked to enter information by typing it in. You may use the following keys when entering information:

→	Right Arrow Key	Moves the cursor one character to the right.
←	Left Arrow Key	Moves the cursor one character to the left.
clear		Clears all text in the window.
delete		Deletes the character to the left of the cursor and moves the cursor one character to the left.
return		Press the return key when you have completed entering the information.
enter		Same as return key.

If you have made an illegal entry, the program will re-prompt you.

Apple Menu

```
 ┌─────────────────────────┐
 │ ⌂                       │
 ├─────────────────────────┤
 │ About Cribbage King     │
 │ Help                    │
 │ Control Panel           │
 └─────────────────────────┘
```
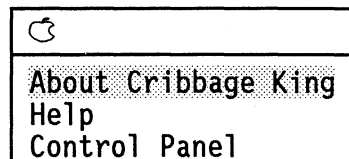
ABOUT CRIBBAGE KING

This selection displays the copyright and version information.

HELP

This selection accesses the on-line help sub-menu. Select one of the five help topics. You will be presented with a window containing information on the desired topic. Most of the help topics consist of multiple pages; use the mouse to press the Next and Prev buttons. Press the Exit button to return to the game.

CONTROL PANEL

This selection accesses the Apple IIGS control panel.

File Menu

```
 ┌─────────────────────────┐
 │ File                    │
 ├─────────────────────────┤
 │ New Game            ⌘N  │
 │ Save Settings           │
 │ End Game                │
 ├─────────────────────────┤
 │ Quit               ⌘Q  │
 └─────────────────────────┘
```
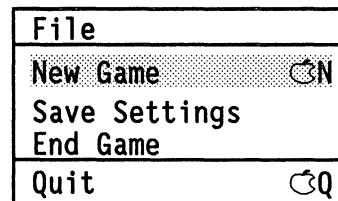
NEW GAME

This selection starts a new game. If you are in the middle of a game, you must select End Game before selecting New Game.

SAVE SETTINGS

This selection saves the current program settings to disk. The next time the program is run, these saved settings will be loaded automatically.

END GAME

This selection ends the current game in progress. At this point, you may make any game settings changes you desire before selecting New Game.

QUIT

This selection ends the current game in process and quits the program.

Settings Menu

```
┌─────────────────────────┐
│ Settings                │
├─────────────────────────┤
│ Game Settings...        │
│ Enter Name...           │
│ Players...              │
│ Dealer...               │
│ Enter Score...          │
└─────────────────────────┘
```
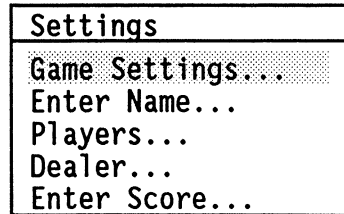
GAME SETTINGS

This selection allows you to specify the Cribbage variant, the number of points per game, and the shuffle mode. You will be presented with a dialog box containing the game settings. After you have made your choices, click the OK button. If you change your mind about your choices, click the Cancel button to restore the settings to their previous state.

Cribbage Variant. The three possible settings for this parameter are: Two-handed Cribbage, Four-handed Cribbage, and Five-card Cribbage.

This parameter cannot be changed in the middle of a game. If you are in the middle of a game and would like to play a different type of Cribbage, select New Game from the Game Menu. You may then select a different type of Cribbage.

Two-handed Cribbage is what most people mean when they say "Cribbage." It is the most popular modern version of Cribbage. The rules for two-handed cribbage are shown in the **Rules of Cribbage** chapter on page 4.

Four-handed Cribbage is played in two partnerships. In *Cribbage King*, players 1 and 3 are partners playing against players 2 and 4. (See the Players Menu

section of the manual.) Four-handed Cribbage differs from two-handed Cribbage in the following respects:

♦   Partners sit opposite, and the deal progresses clockwise. Only one score is kept for each team.

♦   Five cards are dealt to each player instead of six.

♦   Each player discards one card into the dealer's crib instead of two.

♦   The player to the left of the dealer makes the first play, and the play progresses clockwise. At a call of go, the other players continue to play if able, with the last player to play scoring for go. The first player that called go makes the new lead.

Five-card cribbage (called "Cribbidge") is Sir John Suckling's original game. It differs from modern Cribbage in the following respects:

♦   In the draw for deal, high card deals. The non-dealer immediately pegs 3 points to compensate for the dealer's advantage.

♦   Five cards are dealt to each player, instead of six.

♦   Two cards are discarded to the crib, leaving three in the hand.

♦   The play stops after the first go; the unplayed cards are not used.

♦   The game is usually played to 61 points instead of 121.

Edmund Hoyle preferred five-card Cribbage. He felt that six-card Cribbage did "not tax the mind much." Well, Hoyle wasn't right about everything. Six-card

Cribbage is now "The Game" and the older version has disappeared almost completely from the scene.

Of course, with *Cribbage King*, you may judge for yourself.

Game To 61/121 Points. Usually, modern cribbage is played to 121 points, but if you are in the mood for a shorter game, you may play to 61 points. Five-card Cribbage is usually played to 61 points.

This parameter may not be changed in the middle of a game.

Shuffle Mode. This parameter determines how new cards are dealt. There are three possible settings: Shuffle Cards, Replay Cards, and User Supplied Cards. The parameter can be changed anytime during the game except when you are being asked to discard or to make a play.

When Shuffle Cards is set, cards are dealt normally (randomly) and the deck is shuffled as appropriate.

When Replay Cards is set, the cards that were dealt in the previous game are dealt again in exactly the same order. Both players will receive the same hands as in the last game and the starter cards will be the same. This setting is useful when you want to play "duplicate" Cribbage. You can have someone else (or a computer player) replay a game you just played and compare Cribbage skills with the luck removed.

The shuffle mode should be set to Replay Cards _before_ Start New Game is selected for the second game. If the second game goes longer and requires more deals (and more cards), the additional cards will be dealt normally (randomly).

If you select Save Settings after completing the first game, the cards dealt during the game are saved along with the other settings (see the **Save Settings** section on page 17). In this way, you or someone else can replay the game at some later date.

The User Supplied Cards mode is used to set up different scenarios for analysis. Every time the program needs to deal a hand or supply a card, it will ask you to enter the card(s) instead.

To enter cards manually, indicate the rank of each card using A,2,3,4,5,6,7,8, 9,10,J,Q,K. Indicating the suit of each card is optional. Suits are entered by using C,D,H,S. Cards may be separated by spaces, commas or not at all. The program will beep and re-prompt you if it can't understand what you're trying to say.

You are not required to enter all the cards asked for or any at all. If you don't enter enough cards for a hand, the program will deal the remaining cards randomly. This means that if you just press the Enter key when asked to supply cards, the hand will be dealt normally (randomly). If you enter a card that has already been taken, the program will choose the closest available card.

Here are some examples of entering hands:

Example 1:   AS,2H,5C,5D,10S,QH
Example 2:   A 5 6 4D 3D
Example 3:   4H56

When entering cards, you may use the editing keys discussed in the **Entering Information** section on page 15.

Numerical Score. When this setting is on, numerical scores are displayed alongside the Cribbage board.

ENTER NAME

Use this selection to change the name that the program uses to identify you. When editing your name, you may use the editing keys discussed in the **Entering Information** section on page 15.

PLAYERS

This selection is used to choose your opponent or select your tutor. You will be presented with a dialog box containing the names of the seven computer personalities and radio buttons for players 1 through 4 and the tutor. Click on the OK button when you are finished.

You may change the players in the game at any time. If a human player is participating, he or she may only be player 1.

DEALER

This selection is used to change who has the deal and is used to set up scenarios for analysis. The dealer may only be changed immediately after the draw for deal has taken place, or immediately after the dealer's crib has been counted.

CHANGE SCORES

This selection is used to set up a particular scenario (like an end-game situation) for analysis. After selecting Change Scores, you will be presented with a dialog box containing an editing window for each team. Enter the new scores. When entering scores, you may use the editing keys covered in the **Entering Information** section on page 15.

You may change scores at any time during a non-tournament game.

Options Menu

```
┌─────────────────────────┐
│ Options                 │
├─────────────────────────┤
│ Sound                   │
│ F/X                     │
│ Sort Hands              │
│ Muggins                 │
│ Tournament              │
│ Advice              ⌘A  │
│ Show History            │
│ Show Statistics         │
└─────────────────────────┘
```
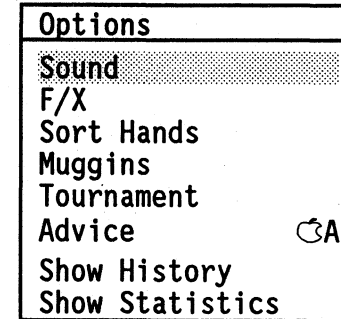
SOUND

This selection turns the sound effects on and off.

F/X

This selection turns the special visual effects on and off.

SORT HANDS

If you would like your dealt cards to be sorted automatically, turn this setting on. Otherwise the cards will be displayed as dealt.

MUGGINS

When playing Muggins in Cribbage, you are entitled to take any points for yourself that your opponent overlooks. When you are playing Muggins in *Cribbage King*, the program will ask you to count your own hands and cribs.

Enter this information in the window provided. (See the **Entering Information** section on page 15.) The program will then count the hand and your opponent will score points when you are wrong. The computer opponents are never wrong when they are counting.

When the Muggins setting is off, all hands and cribs are counted automatically. Pegging points are always counted automatically, regardless of the Muggins setting.

This option may be changed at any time during the game (except when you are being asked to enter the score of your hand). If there are no humans playing in the game, Muggins is automatically off.

TOURNAMENT MODE

Tournament mode is used when you want to play a "for the record" game of Cribbage against the computer. Tournament mode may only be set to ON at the very beginning of a game. While in tournament mode, you may not ask for advice, change the score, or change the opponent(s). Cards are shuffled and dealt normally. When you complete a tournament game, your personal playing history is updated on disk. See the discussion of Show History on page 25 for more information.

ADVICE

When it is time for you to discard or to make a play, you may ask one of the computer players for advice. The computer player giving advice is called the tutor and may be changed by accessing the Players selection under the Settings Menu (see page 22). The computer personalities and an explanation of the advice they give can be found in the **Computer Personalities** chapter on page 28.

SHOW HISTORY

When you select Show History, the program will display your win and loss records and statistics against the various computer opponents in tournament mode.

Each user of your program may have his or her own personal playing history stored and updated on disk. Make sure that each user of the program uses a different name. (See the **Enter Name** section on page 22 for information on changing the human player's name.)

The win and loss records and statistics shown are applicable to the currently selected Cribbage variant (two-handed, four-handed, or five-card). See the **Settings Menu** section (page 18) for information on changing the type of Cribbage game selected.

SHOW STATISTICS

When you select Show Statistics, the program will display statistics of the game in progress. The statistics are described on page 26.

Discarding

The cards that are dealt to you at the beginning of each hand are shown at the lower left of the screen. When discarding, you will be told how many cards to discard and who owns the crib. Use the mouse to indicate your discard(s). You may ask for discarding advice by pressing ⌘A. Discarding advice is described in the **Computer Personalities** chapter on page 28. If you would like to change who you are getting advice from, change the tutor by accessing the Players selection under the Settings Menu (see page 22).

Playing

After you have discarded, your four (or three) remaining cards will be displayed in the lower left of the screen. Each card that you play will be displayed in the row directly above the cards in your hand.

Your opponent's (or opponents') plays will be displayed in the next row up. The name of the computer player making the play will be shown above the card.

Use the mouse to choose a card to play. If you attempt to play an illegal card, the program will reject your choice.

You may ask for playing advice by pressing ⌃A. Playing advice is described in the **Computer Personalities** chapter on page 28.

During play, the current count and any scoring is displayed in a window at the right of the screen. The Muggins option (see the **Options Menu** section, page 23) has no effect during play. The program will automatically check for go's.

Wrap-up

At the end of the game, the program will display some statistics it has been keeping during the game. For a description of skunks and streets, see the Glossary, page 67.

For hands (dealing and not dealing) and cribs, the number in parenthesis is the average number of points scored (per hand) in the appropriate category. The number not in parenthesis is the total scored in the category.

For pegging (dealing and not dealing), the number in parenthesis is the average number of points scored in the category per deal. The other number is the total points pegged (dealing and not dealing).

Computer Personalities

Overview

Much of the success of good Cribbage players comes from their ability to analyze and anticipate the play of their opponent. This is especially important during pegging. This is why *Cribbage King* gives you seven different computer personalities to play against or get advice from.

This chapter contains descriptions of the computer personalities and an explanation of their advice. When giving advice, the computer players are telling you how they themselves would play the hand. The computer players are presented in order from the simplest to the most complex.

The advice examples in the following sections are from two-handed (normal) Cribbage. The advice given in five-card and four-handed Cribbage is similar, except that in four-handed Cribbage, all computer players except Alfie use the same pegging strategy.

Alfie

The best thing that can be said about Alfie is that he knows the rules of Cribbage and how to count his hands. Beyond that, he knows nothing about Cribbage strategy and his play is completely random. He is a good opponent to choose if you need to beat up on somebody. Asking him for advice is not productive.

Alfie can be used to illustrate the relationship between skill and luck in Cribbage. It is said that a good player can beat a mediocre player about 70%

of the time. What about a very good player (like Mrs. Bass) against a player with no skill, like Alfie? Mrs. Bass will win 99.5% of the time.

Chesley

Chesley makes quick decisions without in-depth analysis. The advice he gives is appropriate for beginning Cribbage players.

Typical discarding advice from Chesley would look like:

(Hand: 2♣ 3♠ 4♠ 7♠ 8♦ 9♥)

```
Advice from Chesley:  Discard the 7♠ 8♦.
This keeps 6 points in the hand, with good
run possibilities.  The crib will score at
least 2.
```

Chesley looks for the discard that keeps the most points in the hand, while taking into account the possibilities of making a run. He also considers the cards being thrown into his own or his opponent's crib.

When giving playing advice, Chesley uses rule-of-thumb guidelines that should be easy for a beginner to follow. Besides scoring plays, he tries to make plays that are covered (see Glossary, page 67) and tries to avoid making the count 5 or 21.

Although Chesley's strategy is simple compared to the other players, it is very effective: he's no pushover. He will beat Mrs. Bass about 45% of the time.

Lady Ames

Lady Ames is only interested in the pegging aspect of the game. (See Glossary.) She makes her discards based on the pegging potential of the cards kept.

Typical discarding advice from her would look like:

(Hand: 2♣ 3♠ 4♠ 7♠ 8♦ 9♥)

```
Advice from Lady Ames:  Discard the 4♠ 7♠.
You can expect to gain about 1.8 points on
Chesley during the play.
```

If you want to know what hand is best to keep for pegging, Lady Ames is the one to ask. Lady Ames's advice for the best pegging discard depends, of course, on who has the deal.

When you ask Lady Ames for advice during the play, Lady Ames considers each of your cards and looks at all of the opponent's possible responses and your counter-responses. She keeps track of all cards that have been played and what was thrown in the crib. In this way, she can tell you how many scoring responses the opponent has and how many of them are covered.

To illustrate what is meant by scoring responses and covered plays, consider the following play sequence:

Your hand: 7 8 K K (Starter is 7.)

You	Chesley
K	
	6
K	
	A (Go)

At this point, you hold a 7 and an 8 and ask Lady Ames for advice:

```
Advice from Lady Ames: Play the Seven.
Chesley has 5 scoring responses, and three of
them are covered.  You can score on 7 other
Chesley plays.  Chesley doesn't have an A,2,3
or 4.  The expected net gain on the exchange
is 0.04.
```

The cards that Chesley could use to score on the 7 are three 8's and two 7's. (Remember that the starter is a 7.) Three of his plays are covered (the 8's) because you can pair an 8. In addition, there are seven other plays he could make (three 6's and four 9's) that you could score on.

When Lady Ames reports that the opponent does not have particular cards, it is either because the opponent has called a go at less than 31, or because all four cards of a particular rank have been accounted for.

To calculate the expected net gain (or loss) on the exchange, Lady Ames looks at all the possible cards that the opponent can be holding. She assumes that the opponent has a preference as to which cards to play. This creates an

ordered probability distribution that yields the expected net points on the exchange.

Expert Cribbage players do not calculate this number each time they make a play, but they do have an intuitive feel for what the approximate number is. By keeping track of the cards played and what you threw in the crib, you should always know the number of scoring responses by your opponent for a particular play. You can use Lady Ames to check yourself.

Because Lady Ames only pays attention to pegging when discarding, she is not difficult to beat. You will, however, have a hard time out-pegging her.

Lord Ainsley

Lord Ainsley plays conservatively and always tries to minimize his risk. Typical discarding advice from Lord Ainsley would look like:

(Hand: 2♦ 6♣ 6♥ 6♦ 9♠ K♠)

```
Advice from Lord Ainsley: Discard the 2♦ K♠.
This will score at least 12 points. You can
expect Mrs. Bass to peg about 3.5 points
during the play. The crib will score no more
than 14.
```

Lord Ainsley expects the worst, so he looks for the hand that will guarantee him the most number of points if he doesn't get a good starter card. He also likes to balk your crib whenever possible. (See **Glossary**, page 67.)

Typical play advice from Lord Ainsley would look like the following:

```
Advice from Lord Ainsley: Play the Nine.
Mrs. Bass has 5 scoring responses, and all of
them are covered. You can score on 7 other
Mrs. Bass plays. Mrs. Bass should score 0.60
on the exchange.
```

Lord Ainsley uses the same algorithms as Lady Ames for pegging (see page 30) except that he is primarily concerned with minimizing the opponent's score. His own points are of secondary importance. That is why the last line ("Mrs. Bass should score 0.60 on the exchange") is different.

Lord Ainsley's playing style is appropriate when you need to slow down the game and "play off." (See **Glossary**, page 67.) When playing an entire game, Lord Ainsley will succeed in keeping the opponent's crib and the pegging points low. However, because he is so conservative, he and Chesley play about even.

Reggie

Reggie plays aggressively and always shoots for maximum score. Typical discarding advice from Reggie would look like:

(Hand: 2♣ 3♠ 4♠ 7♠ 8♦ 9♥)

```
Advice from Reggie: Discard the 7♠ 8♦.
This will score the maximum 12 points with a
4♥ starter. You can expect to peg about 4.0
points during the play. The crib could score
24.
```

Reggie always chooses the hand that will yield the maximum number of points (with the right starter card). He is not overly concerned with balking the opponent's crib. When you want to discard for maximum score, Reggie is the one to ask.

Typical play advice from Reggie would look like the following:

```
Advice from Reggie: Play the Nine.
Mrs. Bass has 5 scoring responses, and all of
them are covered.  You can score on 7 other
Mrs. Bass plays.  You should score 1.33 on
the exchange.
```

Reggie uses the same algorithms as Lady Ames and Lord Ainsley, but he is only concerned with his own scoring opportunities.

Reggie's playing style is appropriate when desperation offense is called for. When playing an entire game, Reggie gives up too many points in the opponent's crib. He will lose to Chesley about 65% of the time.

Mrs. Bass

Mrs. Bass always makes the best percentage play, and is the second toughest computer opponent. Typical discarding advice from Mrs. Bass would look like:

(Hand: 2♣ 3♠ 4♠ 7♠ 8♦ 9♥)

```
Advice from Mrs. Bass:  Discard the 7♠ 8♦.
The expected score for your hand is 8.2.  A
4♥ starter will score the maximum 12.  You
can expect to gain about 1.7 points on Ches-
ley during the play.  The expected score for
your crib is 6.5.
```

To calculate the expected score for each hand to keep, Mrs. Bass looks at all of the possible starter cards and counts the hands that would result. Since the starter card is a random event, this method will yield a statistically accurate expected score.

To calculate the expected value for the crib, Mrs. Bass assumes that the opponent knows what he or she is doing and makes sensible discards. Mrs. Bass uses an analysis of all possible Cribbage hands (all 20,358,520 of them) to calculate the expected crib score for a particular discard. The same discard will be worth more in the opponent's crib than in your own crib.

Typical play advice from Mrs. Bass would look like the following:

```
Advice from Mrs. Bass: Play the Seven.
Chesley has 5 scoring responses, and three of
them are covered.  You can score on 7 other
Chesley plays.  Chesley doesn't have an A,2,3
or 4.  The expected net gain on the exchange
is 0.04.
```

Mrs. Bass uses the same play advice as Lady Ames. (See page 30.)

Shark

Shark is the toughest computer player. Typical discarding advice from Shark would look like:

(Hand: 2♣ 3♠ 4♠ 7♠ 8♦ 9♥)

```
Advice from Shark:  Discard the 7♠ 8♦.
The expected score for your hand is 8.2.  A
4♥ starter will score the maximum 12.  You
can expect to gain about 1.7 points on Ches-
ley during the play.  The expected score for
your crib is 6.5.  Your hand has a 56% chance
of being counted.
```

Shark uses basically the same discarding algorithm as Mrs. Bass, with some differences. Shark is the only computer player who is aware of the score, so his discarding advice at the end-game will be different. He calculates the probability that his hand will be counted, and will adjust the importance of pegging accordingly. If Shark is counting first and has enough to go out, he will select the best pegging hand among those that have enough points to win.

Shark also knows when the game is out of reach and when it is appropriate to try to beat the skunk.

If Shark falls behind early in the game, he will use desperation offense to try to catch up.

Typical play advice from Shark would look like the following:

```
Advice from Shark: Play the Nine.
Mrs. Bass has 5 scoring responses and all of
them are covered.  You can score on 7 other
Mrs. Bass plays.  Mrs. Bass doesn't have an
A,2,3 or 4, and probably doesn't have a 10.
The expected net gain on the exchange is
0.77.
```

Shark uses the same play algorithm as Mrs. Bass with some important differences. Shark makes some assumptions about what the opponent may hold in his or her hand. First, from an analysis of all possible Cribbage hands, Shark knows the approximate probability of each card that the opponent may have, depending on who has the deal. Second, when the opponent makes a play, Shark tries to deduce what the remaining cards are in the hand. Third, if the opponent passes up a score during play, Shark assumes that the opponent probably doesn't have that scoring card.

Although Shark uses these additional algorithms during play, the expected net gain on the exchange that he reports is the same as what Mrs. Bass would report.

Shark's playing style is the closest to expert human players. He will beat Mrs. Bass 52% of the time and an expert Cribbage player 50% of the time.

Improving Your Game

Computerized Cribbage would not be as interesting if it did not simulate a real life activity. The whole point of playing Cribbage against a computer is to improve your Cribbage talents for use against your human opponents.

Beginners should play against Chesley and ask Chesley for advice. Chesley's advice is the most straightforward and easy to follow. As you gain Cribbage experience, you can move up to Mrs. Bass and Shark as opponents and tutors. Lady Ames, Lord Ainsley, and Reggie have specialized playing styles which are usually not appropriate for an entire game.

One of the purposes of having different computer opponents is so that you can practice analyzing your opponent's play and adjusting your play to take advantage of it. This is a skill that will be useful when playing your human adversaries.

Human players often tip off their cards by how they act and how long it takes for them to make a play. Since a computer player has an excellent "poker face", it is harder to tell what he is thinking. However, if you're sharp-eyed, you may notice that he sometimes takes no time at all to make a play, even though he has more than one card left. This may mean that he has a pair.

Freed of the burden of shuffling, dealing, and even counting hands, it can be easy to go into "auto-pilot" and stop thinking about the game. If you turn the Muggins option on (see page 23), this will help to keep you thinking about the flow of the game.

Have fun!

Cribbage By The Numbers

Introduction

Cribbage is a true game of numbers. While the outcomes of all card games are influenced by the laws of probabilities, the scoring system of Cribbage makes it unique. The winner of a game of Cribbage reaches his goal by making a series of scoring plays that accumulate over the course of the contest. For this reason, the predicted points associated with each individual decision have a direct and tangible bearing on the outcome of the game.

Certain Cribbage probabilities are subject to completely random events and are therefore not difficult to calculate by hand. Other Cribbage plays involve predicting the actions of one's opponent. Calculating the expected gain in such cases involves the analysis of tens of millions of Cribbage hands and hundreds of hours of computer time. A knowledge of these tendencies and probabilities will help fine-tune an expert player's Cribbage prowess.

This appendix presents the results of such a computer study. A strong grasp of Cribbage fundamentals is assumed. Failing that, a healthy appetite for graphs and numbers will suffice.

Scoring In Cribbage

Points are scored in Cribbage in three different categories: in the hands, during pegging (the "play"), and in the crib. The hands and pegging can be further broken down into dealer and non-dealer. The average points scored per deal and per game in each of these categories are shown in Table I (page 40).

The average number of points scored by a player in two deals (dealing and not dealing) has been the subject of debate since the game's invention. The conventional wisdom of the mid-17th century held that this average was 25 points. In the late 1600's, the number was thought to be 29 points. Edmund Hoyle proclaimed in the 18th century that the true two-deal average was 28 points. In 1980, Cribbage expert Delynn Colvert presented the results of his research which found the average to be 26.4.

The two-deal average becomes very important towards the end of the game when players begin jockeying for board position. Board position is discussed on page 65.

As shown in Table I, the points scored in hands during the game account for 61% of the points scored. Cribs and pegging account for the other 39%. After you make your discard, the score for your hand is determined by the starter card, which is a random event. Scoring in cribs and during pegging, on the other hand, depends on the actions of your opponent. This means that a knowledge of probability theory is not enough to win in Cribbage. To score effectively in the 39% of the game that involves pegging and cribs, you must be able to outfox and anticipate your opponent. The information contained in the following sections will help you to do just that.

Table I: Average Points Scored By Category

	Per Deal	Per Game	% Total
Non-dealer pegging:	2.4	10.4	8.8%
Non-dealer's hand:	8.2	36.3	30.8%
Total for non-dealer:	10.6	46.7	39.6%
Dealer Pegging:	3.6	16.1	13.6%
Dealer's Hand:	8.1	35.6	30.2%
Dealer's Crib:	4.4	19.5	16.6%
Total for Dealer:	16.1	71.2	60.4%
Total for Pegging:	6.0	26.5	22.5%
Total for Hands:	16.3	71.9	61.0%
Total for Cribs:	4.4	19.5	16.6%
Total:	26.7	117.9	100.0%

Notes: First column shows average points scored per deal. Second column shows points per game. Last column shows percentage of total points.

Discarding For Hand Points

When deciding which two cards to discard from your hand, you need to consider the scoring possibilities in three categories: hand points, crib points, and pegging points.

There are 15 different ways to discard two cards from the original six cards dealt. The starter card can be any one of 46 cards. For a given set of four cards, the average value of the hand is calculated by adding up the points scored by the four cards with each of the 46 possible starter cards. The sum is then divided by 46.

Let's illustrate this calculation with an example. It is the opponent's crib and you are dealt: 2♣ 3♣ 4♦ 5♥ 9♠ Q♠. Suppose we wanted to examine two alternative discards: keeping the 2-3-4-5, and keeping the 3-4-5-Q. The starter card can be any one of the 46 other cards. Since suits are not relevant for this hand, you only need concern yourself with the rank of the starter. The calculations are shown in Table II (page 43).

We see from the calculations that even though the 3-4-5-Q keeps more points in the hand (5 points to 4 points), the 2-3-4-5 will yield more points on average (8.6 points to 8.0 points). Note that every starter card helps the 2-3-4-5 hand, while the same can not be said of the 3-4-5-Q hand.

Even though the calculations only take a couple of minutes, taking out your paper and calculator in the middle of a game would irritate most Cribbage partners. A quick comparative estimate can be made by looking at how many starter cards would improve a given hand.

Table II: Calculating Average Score For Hand: Two Proposed Discards

	Keep 2♣ 3♣ 4♥ 5♦				Keep 3♣ 4♥ 5♦ Q♥		
Starter	# in deck	Points	Total	Starter	# in deck	Points	Total
A	4	7	28	A	4	7	28
2	3	10	30	2	3	8	24
3	3	12	36	3	3	12	36
4	3	12	39	4	3	10	30
5	3	12	36	5	3	12	36
6	4	9	36	6	4	8	32
7	4	6	24	7	4	7	28
8	4	8	32	8	4	7	28
9	3	6	18	9	3	5	15
10	4	8	32	10	4	7	28
J	4	8	32	J	4	7	28
Q	3	8	24	Q	3	9	27
K	4	8	32	K	4	7	28
Total=396 Avg. Score = 396/46 = 8.6				Total=368 Avg. Score = 368/46 = 8.0			

Notes: The first column is the rank of the starter. The second column is the number of cards of the given rank that could be the starter. The third column is the score of the hand with a given starter. The last column is the total points. The sum of the total points is divided by 46.

Discarding For Crib Points

The second discard criterion involves the crib. The crib is comprised of five cards: two supplied by you, two supplied by your opponent, and the starter card. This means that your two known cards are combined with one of 46,575 possible three-card combinations. Further complicating the calculation is the fact that your opponent is (presumably) not making random discards.

Before we can calculate the predicted crib score for a given discard, we need to gain some understanding about the combinations of cards the opponent is most and least likely to discard. If we were to examine the 20,358,520 possible Cribbage hands and the correct discard for each hand, would we see a pattern in the discards that we could put to use? The answer is yes, and the results are shown in Table III, Table IV, Table V, and Table VI.

Table III shows the most common combinations discarded by a player into his own crib. As we will see later, these are not the discards that will yield the most points in the crib. It rarely makes sense for a player to break up his own hand to score more points in the crib. A player controls 4 out of the 5 cards that make up a scoring hand as opposed to 2 out of 5 in the crib. On average, the hand will score 84% more points than the crib.

Table IV: The 15 Least Common Combinations Discarded into Own Crib

Cards		Pct.	1 in
5	5	0.36%	278.8
6	J	0.40%	252.5
4	9	0.42%	237.6
8	J	0.42%	236.5
9	Q	0.43%	235.0
4	10	0.44%	228.6
6	10	0.44%	228.2
3	10	0.46%	218.5
6	Q	0.47%	213.0
7	J	0.48%	208.0
2	10	0.48%	207.0
4	J	0.48%	206.5
8	Q	0.48%	206.4
9	K	0.49%	205.8
3	J	0.50%	198.8

Notes: The first column is the two card combination. The second column is the percentage of the time that the given combination will be discarded. The third column is the inverse of the percentage.

Table III: The 15 Most Common Combinations Discarded into Own Crib

Cards		Pct.	1 in
Q	K	3.11%	32.1
7	8	3.10%	32.2
A	2	2.88%	34.7
A	4	2.88%	34.7
2	3	2.85%	35.1
6	9	2.77%	36.2
A	3	2.61%	38.3
J	Q	2.03%	49.3
5	K	2.02%	49.4
K	K	1.93%	51.8
J	K	1.92%	52.0
3	4	1.88%	53.1
5	Q	1.86%	53.8
8	9	1.84%	54.2
7	9	1.81%	55.3

Notes: The first column is the two card combination. The second column is the percentage of the time that the given combination will be discarded. The third column is the inverse of the percentage.

Table IV shows the least common combinations discarded by a player into his own crib. The fact that the 5 5 combination tops this list seems unusual until you consider how valuable a pair of fives are in combination with face cards in the hand.

Table V shows the most common combinations discarded into the opponent's crib. All of these combinations do a good job of limiting the points in the crib.

Table VI shows the least common combinations discarded into the opponent's crib, and there are no surprises on the list. Note that even though a pair of fives is the worst thing to throw into the opponent's crib, one out of every 1,689 hands on average will dictate such a discard. Also note that a five appears in 12 of the 15 combinations. Player's discard tendencies are presented graphically in Figure 1 (page 47).

Table VI: The 15 Least Common Combinations Discarded into Opponent's Crib

Cards		Pct.	1 in
5	5	0.06%	1688.9
J	J	0.07%	1453.3
5	10	0.10%	974.8
5	J	0.11%	942.9
5	7	0.11%	940.1
4	5	0.11%	914.7
5	6	0.11%	910.5
5	Q	0.12%	854.5
5	K	0.12%	847.7
3	5	0.12%	835.5
10	10	0.13%	780.8
5	8	0.15%	670.4
6	6	0.17%	599.2
A	5	0.17%	575.9
5	9	0.18%	550.3

Notes: The first column is the two card combination. The second column is the percentage of the time that the given combination will be discarded. The third column is the inverse of the percentage.

Table V: The 15 Most Common Combinations Discarded into Opponent's Crib

Cards		Pct.	1 in
A	K	2.63%	38.0
10	K	2.60%	38.5
2	8	2.57%	38.9
2	K	2.53%	39.5
A	8	2.46%	40.6
3	K	2.44%	41.0
2	7	2.34%	42.7
4	K	2.30%	43.5
A	7	2.13%	47.0
A	Q	2.09%	47.8
A	3	2.08%	48.2
8	K	2.01%	49.7
2	9	1.99%	50.2
A	9	1.99%	50.4
2	Q	1.97%	50.6

Notes: The first column is the two card combination. The second column is the percentage of the time that the given combination will be discarded. The third column is the inverse of the percentage.

Notes: The solid line represents the probability of discarding a given rank into one's own crib. The dotted line represents the probability of discarding a rank into the opponent's crib.
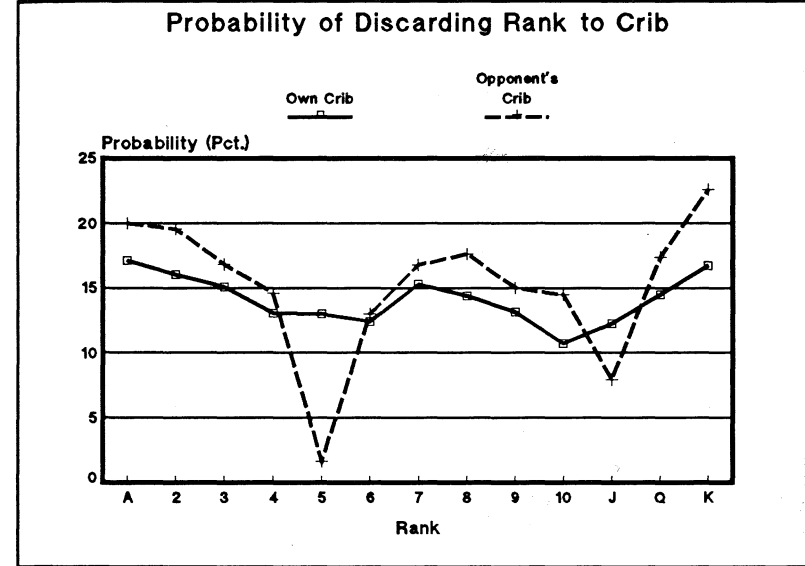
Figure 1: Probability of Discarding Rank to Crib

Figure 1 shows that both players have a tendency to discard high and low cards to the crib. For the non-dealer, there is a big dip at 5 and a smaller dip at the Jack. Because of "his nobs", every Jack is worth 0.25 points on average.

As fascinating as this information is, it is only of secondary importance. We are only interested in the discard data to the extent that they help tell us the average points scored in the crib for a given discard. The results of this analysis are presented in Table VII, Table VIII, Table IX, and Table X.

The fact that a pair of fives tops the list in Table VII makes sense. The presence of the 2-3 and 5-6 combinations at the top of the list is worth noting. Because these combinations aren't worth any points by themselves, we wouldn't expect them to have a greater crib scoring potential than a Jack-5, for example, but they do.

Any combination that is a pair or adds up to fifteen guarantees 2 points in the crib. Any combination that contains a five also guarantees 2 points in the crib, since it is impossible to have a non-scoring hand containing a five. The same is true for the 2-3 and A-4 combinations.

Table VII: The 15 Best Discards Into Own Crib

Ranks		Suits	Min	Max	Avg. Crib
5	5	Diff	2	29	8.31
2	3	Same	2	18	6.98
2	3	Diff	2	18	6.95
5	6	Same	2	24	6.57
7	8	Same	2	24	6.56
5	6	Diff	2	24	6.53
7	8	Diff	2	24	6.52
5	J	Same	2	28	6.52
5	J	Diff	2	29	6.50
4	5	Same	2	24	6.44
4	5	Diff	2	24	6.41
5	10	Same	2	28	6.32
5	10	Diff	2	28	6.28
5	Q	Same	2	28	6.26
5	K	Same	2	28	6.25

Notes: The first column contains the ranks of the discards. The second column indicates whether the suits are the same or different. The third column is the minimum crib score given the discards. The fourth column is the maximum crib score. The last column is the average crib score.

The worst discards into your own crib are almost but not exactly the same as the best discards into your opponent's crib. In general, a "crib buster" involves a face card and a second card from 6 to 10, with the two cards at least 3 ranks apart. Note that while a 10-King combination is worth an average of 2.59 points in your own crib, it is worth 3.79 points in your opponent's crib (see Table IX, page 50). This is because your opponent is providing two other cards in the crib, and he, of course, has his own agenda.

Table VIII: The 15 Worst Discards Into Own Crib

Ranks		Suits	Min	Max	Avg. Crib
10	K	Diff	0	20	2.59
10	K	Same	0	20	2.62
9	Q	Diff	0	14	2.86
9	Q	Same	0	16	2.89
9	K	Diff	0	14	2.91
9	K	Same	0	15	2.94
6	Q	Diff	0	16	2.99
10	Q	Diff	0	20	2.99
6	K	Diff	0	16	3.00
Q	K	Diff	0	20	3.01
6	Q	Same	0	16	3.02
10	Q	Same	0	20	3.02
6	K	Same	0	16	3.03
Q	K	Same	0	20	3.04
6	10	Diff	0	16	3.04

Notes: The first column contains the ranks of the discards. The second column indicates whether the suits are the same or different. The third column is the minimum crib score given the discards. The fourth column is the maximum crib score. The last column is the average crib score.

Table IX: The 15 Best Discards Into Opponent's Crib

Ranks		Suits	Min	Max	Avg. Crib
10	K	Diff	0	20	3.79
10	K	Same	0	20	3.83
9	K	Diff	0	14	3.92
9	Q	Diff	0	14	3.92
9	K	Same	0	15	3.96
9	Q	Same	0	16	3.96
6	K	Diff	0	16	4.00
7	K	Diff	0	14	4.01
8	K	Diff	0	14	4.01
7	10	Diff	0	14	4.01
6	K	Same	0	16	4.05
7	K	Same	0	15	4.05
8	K	Same	0	15	4.05
7	10	Same	0	15	4.06
6	Q	Diff	0	16	4.06

Notes: The first column contains the ranks of the discards. The second column indicates whether the suits are the same or different. The third column is the minimum crib score given the discards. The fourth column is the maximum crib score. The last column is the average crib score.

Table X shows the worst discards you can make into your opponent's crib. The ordering is somewhat different than that of Table VII (page 48). Table X validates an age-old Cribbage rule-of-thumb: throwing a five into the opponent's crib is a bad idea. The 2-3 combination is also dangerous.

Note that two cards of the same suit discarded to the crib are worth slightly more than the same two cards of different suits. This is because of the long-shot possibility that the crib will end up in a five-card flush. In your own crib, this difference is worth 0.028 points on average, while in your opponent's crib, the average difference is 0.039 points.
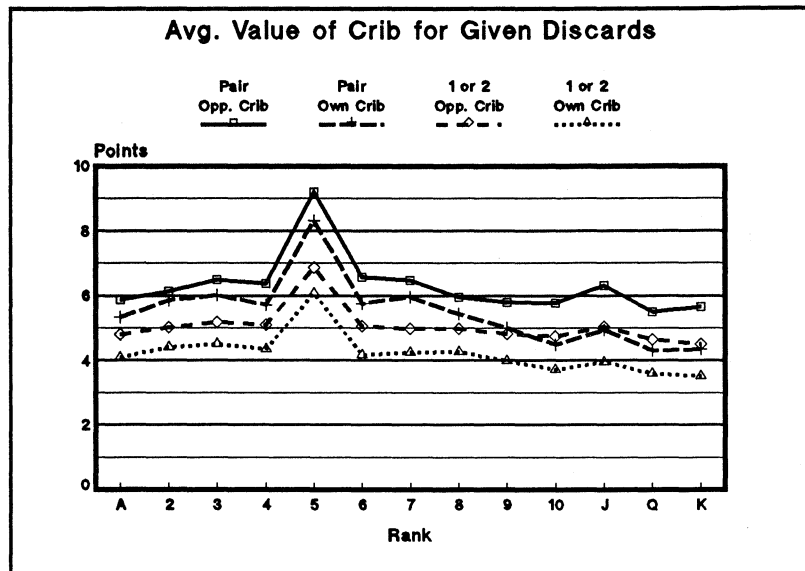
Table X: The 15 Worst Discards Into Opponent's Crib

Ranks		Suits	Min	Max	Avg. Crib
5	5	Diff	2	29	9.20
5	J	Same	2	28	7.54
5	J	Diff	2	29	7.51
5	6	Same	2	24	7.33
5	6	Diff	2	24	7.29
5	10	Same	2	28	7.27
5	10	Diff	2	28	7.23
2	3	Same	2	18	7.22
5	Q	Same	2	28	7.22
2	3	Diff	2	18	7.18
5	Q	Diff	2	28	7.18
4	5	Same	2	24	7.16
5	K	Same	2	28	7.15
4	4	Diff	2	24	7.12
5	K	Diff	2	28	7.11

Notes: The first column contains the ranks of the discards. The second column indicates whether the suits are the same or different. The third column is the minimum crib score given the discards. The fourth column is the maximum crib score. The last column is the average crib score.

Let's illustrate how to use the above information with an example. It is your crib and you are dealt: A♣ 2♣ 3♣ 9♥ 10♦ K♠. The discard that yields the highest potential hand points is the 10-K. The average score for the A-2-3-9 is 7.98 points. The average value for the crib for the 10-K discard is 2.59 points (from Table VIII, page 49). The average score for the A-2-3-K is 7.80 points. The average value for the crib for the 9-10 discard is 3.99 points. This means that the A-2-3-K (7.80+3.99=11.79) is a better hand to hold than the A-2-3-9 (7.98+2.59=10.57) because of the difference in crib potential.

Avg. Value of Crib for Given Discards

Figure 2: Average Value of Crib for Given Discards

Notes: The top line represents the average value for a crib when a pair of a given rank is discarded to the opponent's crib. The next line is for a pair discarded to one's own crib. The next line represents the average crib when one OR two cards of a given rank is discarded to the opponent's crib. The last line is for one or two cards discarded to one's own crib.

The average crib values for discards are presented graphically in Figure 2. Note the dramatic increase at 5, and the slight increase for Jacks.

Discarding For Pegging

As the dealer, you can expect to peg an average of 3.6 points per deal. As the non-dealer, this figure is 2.4 points. The actual number of points that you will peg depends more on the abilities of yourself and your opponent than on which cards you keep. Table XI, Table XII, and Table XIII (page 54) present the average pegging points scored for selected four card hands. The numbers assume that both players are equal in pegging ability and that this ability is high.

Table XII: The 10 Best Pegging Hands for Non-dealer

Hand				Points
A	A	A	A	3.54
A	A	A	2	3.48
A	A	A	3	3.45
A	A	A	4	3.42
A	A	2	2	3.42
A	A	2	3	3.39
A	A	3	3	3.36
A	2	2	2	3.36
A	A	A	5	3.36
A	A	2	4	3.36

Notes: The first column is the hand. The second column is the average number of points scored during pegging by the non-dealer with the given hand.

Table XI: The 10 Best Pegging Hands For Dealer

Hand				Points
A	A	A	9	4.80
A	A	5	9	4.77
A	A	2	9	4.74
A	A	3	9	4.71
A	A	4	9	4.67
A	2	2	7	4.64
A	A	5	6	4.64
2	2	5	7	4.61
A	A	2	8	4.57
A	A	4	7	4.57

Notes: The first column is the hand. The second column is the average number of points scored during pegging by the dealer with the given hand.

Table XIII: The 10 Worst Pegging Hands

Hand				Dealer Points	ND Points
K	K	K	K	2.25	1.19
Q	K	K	K	2.32	1.22
Q	Q	K	K	2.38	1.25
10	K	K	K	2.38	1.28
9	K	K	K	2.42	1.31
Q	Q	Q	K	2.45	1.28
8	K	K	K	2.45	1.33
10	Q	K	K	2.45	1.31
J	K	K	K	2.48	1.25
7	K	K	K	2.48	1.39

Notes: The first column is the hand. The second column is the average number of points scored during pegging by the dealer with the given hand. The last column is the average points scored by the non-dealer with the given hand.

Typically, the difference between the pegging potential of the best four-card pegging hand and the worst four-card pegging hand from a given six-card deal is around 1 point. When deciding on a discard during the game (not the end-game), pegging potential is usually used as a tie-breaker.

The Play

Pegging is the most exciting phase in Cribbage. Opponents square off, each trying to anticipate, out-think, and out-bluff the other. To become proficient in pegging requires more than knowing the probabilities. You must learn your opponent's preferences and tendencies, and take advantage of them. That being said, probability CAN give an approximation of which cards the opponent is likely to be holding. The same computer analysis that determined the frequency of discards can be used to generate an approximate profile of the opponent's hand. The results are presented in Figure 3 and Figure 4 (page 56).


Notes: The solid line represents the probability that the dealer will hold at least one card of a particular rank. The dashed line represents the probability that the non-dealer will hold a rank.
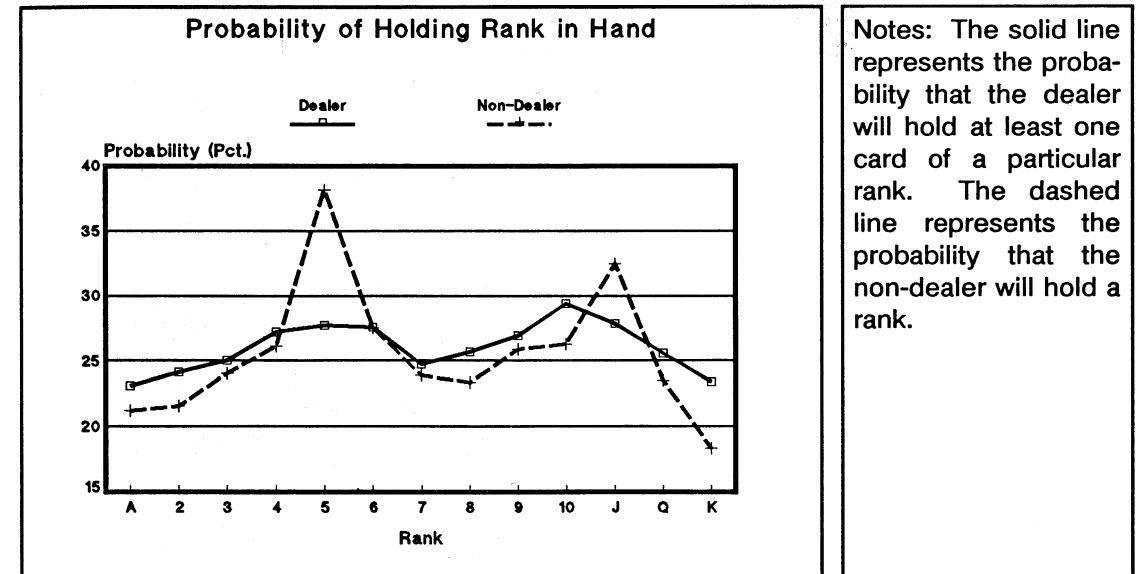
Figure 3: Probability of Holding Rank in Hand

Because the non-dealer tries to avoid discarding a five into the opponent's crib, he will have at least one five in his hand 38% of the time. The non-dealer will have a Jack 32% of the time. The dealer's cards are more evenly distributed.

Let's illustrate how these data can be used with an example. You are the dealer and you hold a 9-10-J-Q hand. The starter is a King, and you discarded a pair of Aces to the Crib. Your opponent leads a 7. You can't cover any of your plays, and the 9 is out of the question. His seven lead doesn't tell you that much about his likelihood of holding a 10, Jack or Queen. Figure 3 tells you that he is less likely to have a Queen than a 10 or Jack. Because you want to minimize his chances of pairing your next play, the Queen is the best response.

Scoring Distributions

Figure 5 through Figure 10 (page 62) show the scoring distribution for the different scoring categories.

The non-dealer is held scoreless during pegging 20% of the time. He is most likely to peg one point during pegging.
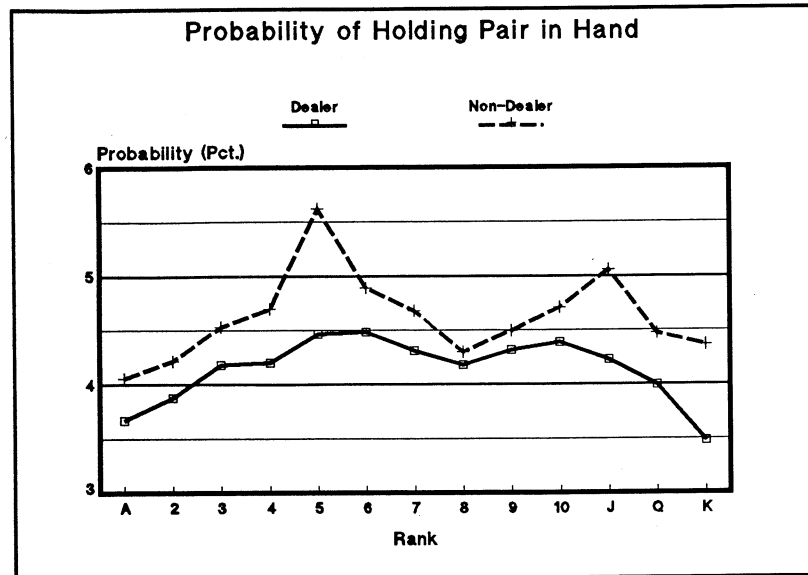
Notes: The solid line represents the probability that the dealer will hold a pair of a particular rank. The dashed line represents the probability that the non-dealer will hold a pair.

Figure 4: Probability of Holding Pair in Hand
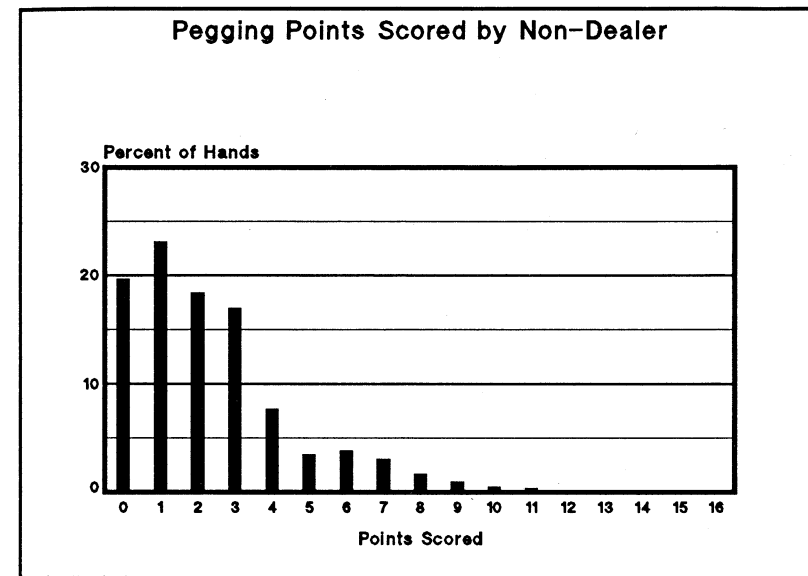
Notes: Each bar represents the percentage of hands that the non-dealer will peg a specific number of points.

Figure 5: Pegging Points Scored by Non-dealer
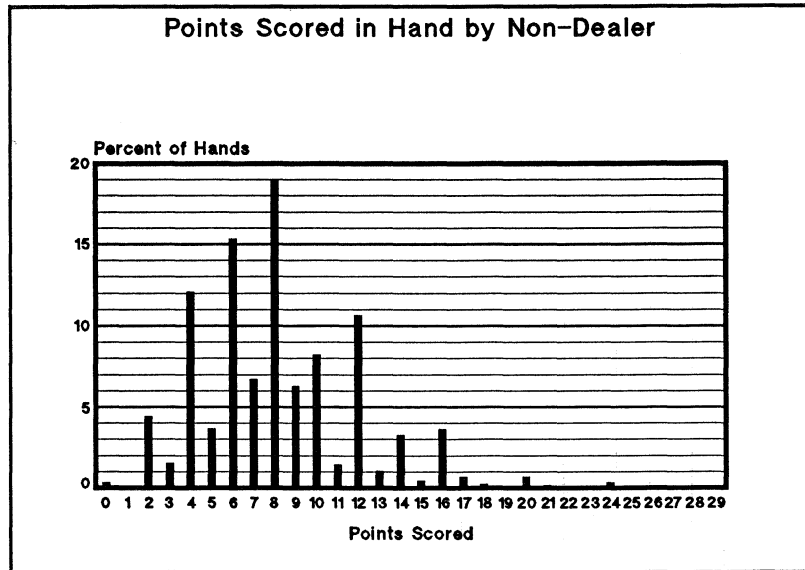
Points Scored in Hand by Non-Dealer

Percent of Hands

Points Scored

Notes: Each bar represents the percentage of hands that the non-dealer will score a specific number of points.

**Figure 6:** Points Scored in Hand by Non-Dealer

Total Points Scored by Non-Dealer
Pegging and Hand Points in One Deal

Percent of Deals

Points Scored

Notes: Each bar represents the percentage of deals that the non-dealer will score a specific number of total (pegging plus hand) points.

Figure 7: Total Points Scored by Non-dealer

The hand cannot score 19, 25, 26, or 27. A 28 hand is possible, but rare, and a 29 hand is extremely rare. The non-dealer will be held scoreless 1 out of 318 hands and will score a single point 1 out of 1430 hands.

The dealer is guaranteed at least one point during pegging.

Pegging Points Scored by Dealer

Percent of Hands

Points Scored

Figure 8: Pegging Points Scored by Dealer
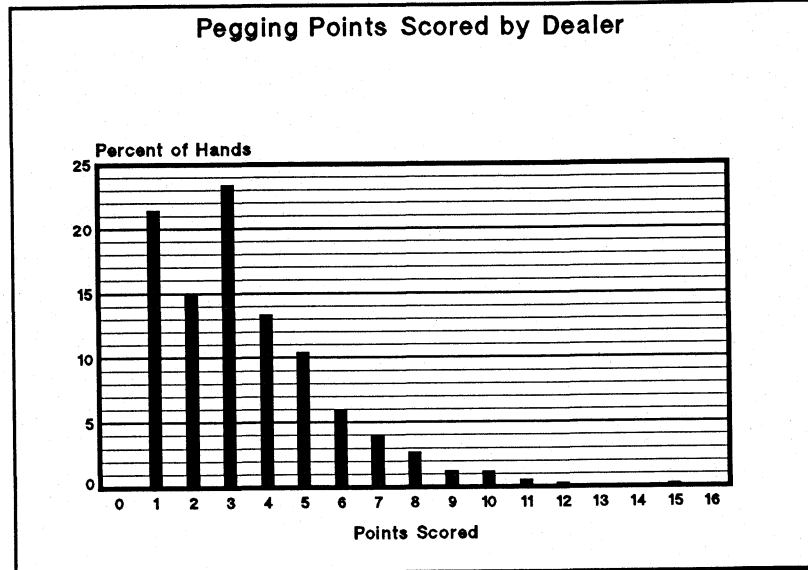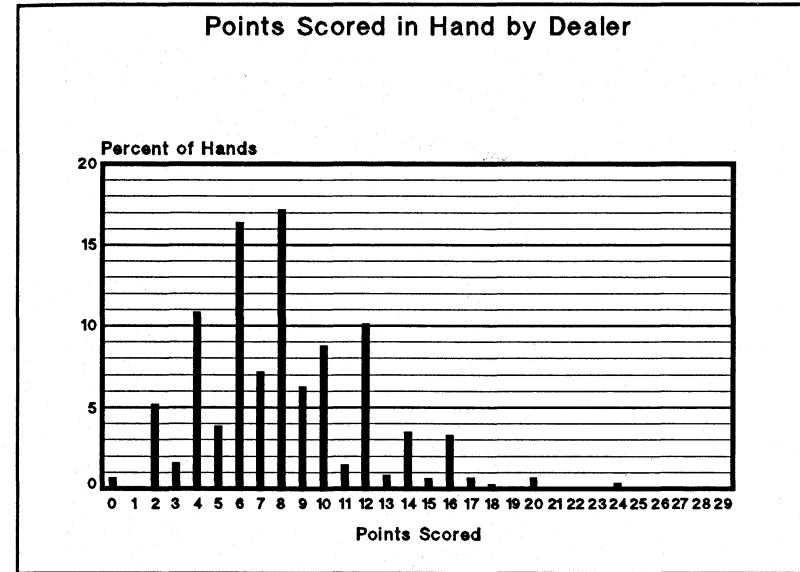
Notes: Each bar represents the percentage of hands that the dealer will peg a specific number of points.

Points Scored in Hand by Dealer

Percent of Hands

Points Scored

Figure 9: Points Scored in Hand by Dealer

Notes: Each bar represents the percentage of hands that the non-dealer will score a specific number of points.

The distribution of points for the dealer's hand is very similar to that of the non-dealer.

Total Points Scored by Dealer
Pegging, Hand, Crib Points — One Deal

Percent of Deals

Points Scored

Notes: Each bar represents the percentage of deals that the dealer will score a specific number of total (pegging plus hand plus crib) points.
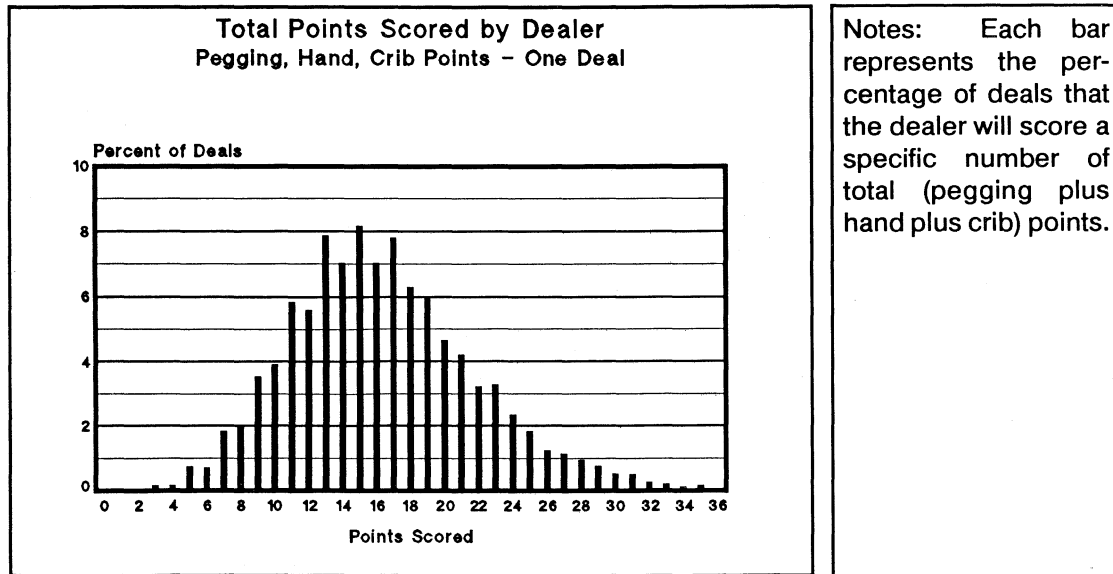
Figure 10: Total Points Scored by Dealer

The End Game

The information contained in Figure 5 (page 57) through Figure 10 (page 62) can be very useful in the end-game. If we know the distribution of points scored by the dealer and non-dealer in the different categories, we can estimate the probability that a player will be able to peg or count out from a given number of points away. This information is presented graphically in Figure 11.

Probability of Counting Out
Independent of Opponent's Score

Non-Dealer Pegs Out	Non-Dealer Wins	Dealer Pegs Out	Dealer Wins
—□—	—+—	—◇—	····△····

Figure 11: Probability of Counting Out
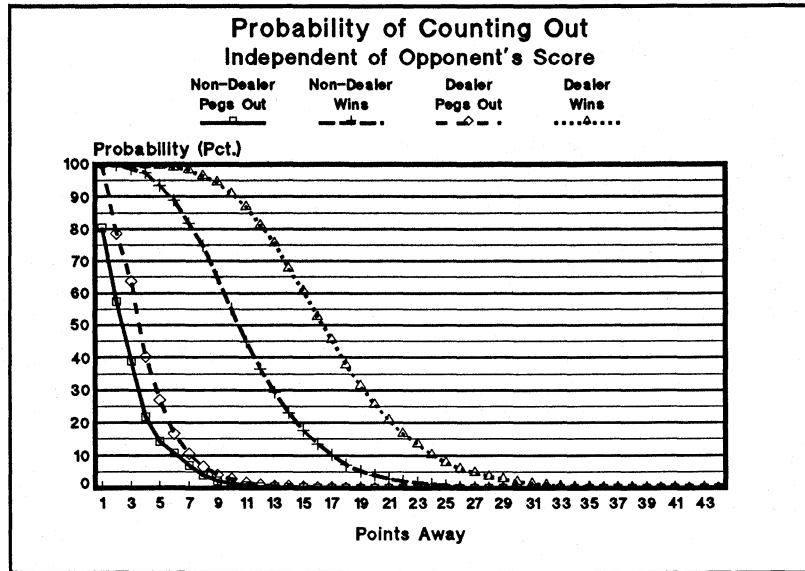
Notes: The solid line represents the probability that the non–dealer will peg out given a certain number of points from game. The line marked with plus signs represents the probability that the non-dealer will either peg out or count out. The line marked with diamonds represents the probability that the dealer will peg out. The line marked with triangles represents the probability that the dealer will either peg out or count out. These probabilities do not take the opponent's score into account.

As an example, suppose you are trailing 112 to 105 and it is your deal. The probability that your opponent will peg or count out from 9 points away is around 65%. This probability assumes that both players are playing normally. You can bring that 65% down by discarding for defensive pegging. You then need to "play off" and prevent him from pegging any points at all costs. If you are still alive after he counts his hand, your chances of counting out are nominally around 50% This percentage will be reduced somewhat if you needed to weaken your hand for defensive pegging.

Board Position

Because a Cribbage game ends instantly when someone scores the 121st point, board position becomes very important in the second half of the game. Naturally, the player who scores more points will win more games. However, when the players' abilities are equal, the player who can most effectively influence the pace of the game is at an advantage.

Figure 12: Probability of Winning Game - Tie Score
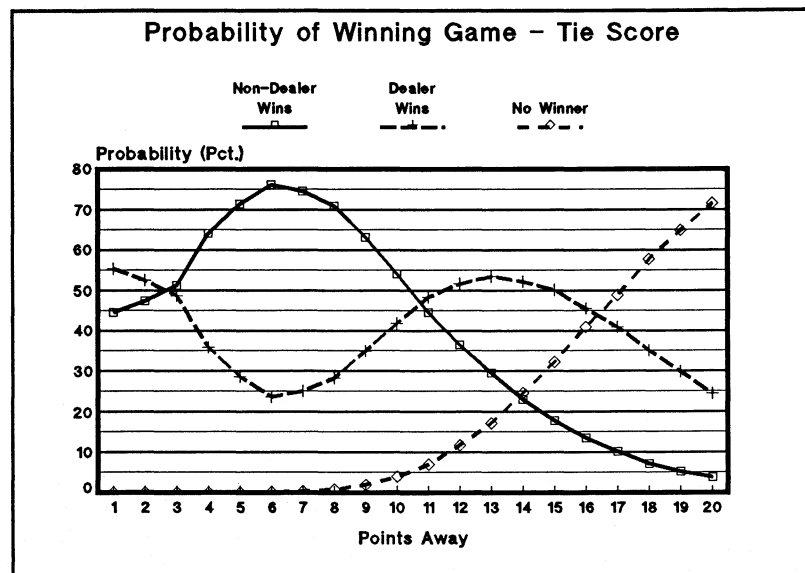
Notes: The solid line represents the probability that the non-dealer will win the game on the current deal if both players are tied and a certain number of points away. The line marked with plus signs represents the probability that the dealer will win the game under the same conditions. The line marked with diamonds represents the probability that neither player will win the game on the current deal.

The data presented in Figure 12 help us determine the most advantageous board position in the end-game. To maximize our chances of winning a tie game, we would like to be the non-dealer with both players six points away. Since the average points scored by the dealer is 16.1, our best board position for the previous hand is 22 points away. So, if we can influence the scoring so that we have the deal 22 points away from game, we will be in great shape. We can even let the opponent get up to 5 points ahead of us to achieve this board position.

Have fun, and keep on pegging!

Appendix B - Glossary

Balk. To balk the crib means to discard cards that have a low scoring potential.

Cover. When you make a play that your opponent can't score on without a responding score by you, the play is covered.

Crib. The crib is a hand belonging to the dealer that is formed by two discards from each player.

Cut. The Cut is another term for the starter card.

Dead Hole. Dead hole is another term for stink hole.

Double Pair Royale. Double Pair Royale is a phrase meaning four-of-a-kind.

Fours. Fours is a term for four-of-a-kind.

Holes. Holes is another word for points.

Kitty. Another word for crib.

Lurch. In a game to 121 points, a lurch is the same as a double-skunk. (See Skunk.) In a game to 61 points, a lurch is the same as a skunk.

Muggins. If a player miscounts his hand or misses a score during the play, his opponent may call "Muggins" and claim the missed points as his own. See the Muggins Option section on page 23.

Nineteen. It is impossible to score exactly 19 points in a cribbage hand or crib. So when a player says "I have nineteen", he means that his hand is worth zero points.

Once around. A game played to 61 points is up and back on the Cribbage board once, or once around. (See page 20.)

Pair royale. Pair royale is a phrase meaning three-of-a-kind.

Pegging. To peg is to score points during the Play (see below).

Pitch. To pitch cards is to discard them into the crib.

Play, The. This is the phase of the game after discarding where the players alternately play cards and score points for making certain combinations. See the **Rules of Cribbage** section on page 4.

Play off. When a player is playing off, it means that he is primarily concerned with minimizing his opponent's scoring opportunities, even to the extent of passing up opportunities himself.

Play on. When a player is playing on, it means that he is primarily concerned with scoring as many points as possible even at the expense of providing his opponent with scoring opportunities.

Proil. Proil is short for pair royale (three-of-a-kind).

Salt. To salt the crib means to discard cards that have a high scoring potential.

Skunk. In a game to 121 points, a player is skunked if he fails to score 91 points before his opponent wins the game. On the Cribbage board, the skunked player would still be on third street when the game ended. When a

player fails to score 61 points in a game to 121, he has been double-skunked. Skunks usually count as two games won for the victor.

In a game to 61 points, a player is skunked if he fails to score 31 points.

Starter Card. The card that is turned over by the dealer after the players have discarded.

Stink Hole. The stink hole is the last hole on the cribbage board before winning.

Street. Each row of thirty holes on the Cribbage board is called a street. The players start on first street, turn the corner onto second street, followed by third and fourth streets. In some wagering circles, winning a street (turning the corner first) is worth something.

Tripling. Tripling means to play the third card of a three-of-a-kind during the play.

Twice around. A game to 121 points is up and back on the Cribbage board twice, or twice around.

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