Hoosier Backgammon Club

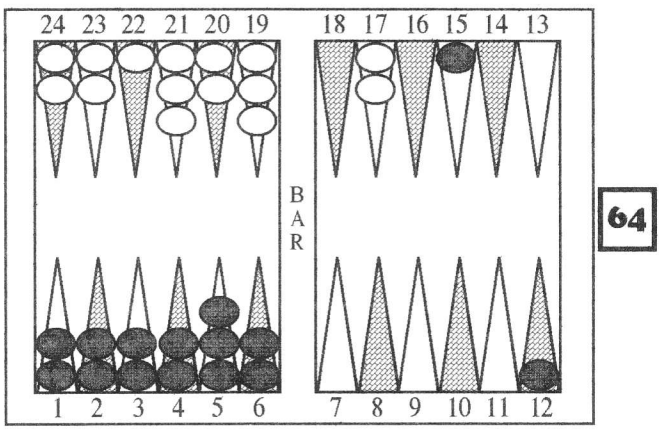
Spring is just around the Corner!

Mar-Apr 1993
Volume X, No. 2

The Statistical Significance of Rollouts

by Chuck Bower

Position 1



You're playing a one-on-one money game with a friend and reach Position 1. Your opponent (White) doubles you to 2 and you take. After some good rolling, you reach a strong position and double your opponent out. While writing down the score, your friend takes exception to your earlier decision to take, and the two of you decide to play out Position 1 to completion (that is, without the doubling cube) 20 times under the condition that if you win 5 or more of these games, he pays you $20, three or less wins and you pay him $20, and exactly 4 wins by you is a push. At the end of the 20 games, you have won six, and he grudgingly pays up. The question I pose is: "Was the take actually correct?" A more general question is: "How many times should Position 1 be played out in order that you are confident that it is a take or a drop?"

The field of mathematical statistics can be applied to rollouts to determine the number of times a position should be played out in order to be confident that the results do not suffer from statistical uncertainty. Before answering the above question, it is helpful to introduce a statistical term, *confidence level*. You can never be 100% confident of any result which depends upon random trials. The dice may have conspired to come up double 6's for White ten times per game during every game, for example. No matter how unlikely a certain dice sequence is, there still exists the possibility that it happened. A *confidence level* is simply the

...continues on Page 3...

1992 Awards Tournament

Each **1992 TOP TEN Player of the Year** was awarded a personalized doubling cube and shared $250 in cash and SPATS gift certificates.

HBC 1992 TOP TEN

1st.. Don Woods
2nd.. Jim Curtis
3rd.. Chuck Stimming
4th.. Ken Bruck
5th.. Gabe Stiasny
6th.. Butch Meese
7th.. Holly Stowe
8th.. Larry Strommen
9th.. Kevin McLeaster
10th.. Mary Ann Meese

Open Division
1st John O'Hagan
2nd Jeff Baker

Advanced Division
1st Cyrus Mobed
2nd Kevin McLeaster

Intermediate Division
1st Dennis Schulte
2nd Jan Gurvitz

HBC introduces a new event:

Free-Time Knock-outs

This event will provide longer matches, gammon points, flexible scheduling and entry fees tailored to the wants of the players. Opponents choose when and where to play. Both single-elimination and main-consolation formats available with 10 days to play each round. Grid sizes of 4, 8 and 16. Gammon points awarded and 90% return of entry fees. Three divisions offered-Open, Advanced, and Intermediate. More than one entry fee offered for each division. Details and entry forms will be available by the end of March.

Hoosier Pips...HBC welcomes new players Gerry Herzfeld, Jim Caristi, Frank Smietana, Matthias Kehder and Martin Boppmeier...Congratulations to Stan Gurvitz for winning the special new player event held on February 21st...Condolences to Don Woods on the death of his father February 18th.

Hoosier Backgammon Club's Newsletter for HBC members and subscribers.
Subscription rate: $10/year (Canada $12 and oversea $14). Let us know if your address changes.
Butch & Mary Ann Meese: (317) 845-8435. 7620 Kilmer Lane, Indianapolis, IN 46256-1634

1993 **HOOSIER BACKGAMMON CLUB** Gammon Point Standings.

HBC **Player of the Month** for **February** is **Don Woods** with 198 gammon points.

1)	Don Woods..... 292	Larry Strommen..... 100	Tom Hendryx..... 20
2)	Kevin McLeaster..... 254	Woody Woodworth..... 90	Mick Dobratz..... 20
3)	Ken Bruck..... 222	Steve Perlman..... 84	Stan Gurvitz..... 10
4)	Cyrus Mobed..... 212	Jeff Baker..... 78	Eric George..... 10
5)	Ellis Bray..... 182	Bill Julian..... 74	Sharon Baker..... 10
6)	Butch Meese..... 160	Gino Agresti..... 60	Tom Helt..... 10
7)	Mary Ann Meese..... 142	Jan Gurvitz..... 55	Holly Stowe..... 10
8)	Gabe Stiasny..... 130	Mike Marr..... 50	Stu Whitcomb..... 10
9)	John O'Hagan..... 120	Dennis Schulte..... 40	Scott Kaplan..... 5
10)	Wendy Kaplan..... 104	Jim Curtis..... 30	
	Chuck Stimming..... 102	Bill Gheen..... 20	

Review: How Gammon Points are Awarded.

During weekly play, 10 gammon points are awarded for each match won. If there is a second lower division, 5 gammon points are awarded for each match won. The player finishing 1st will receive bonus points by multipling the gammon points won by 2.0. The player(s) finishing second also receive bonus points by multipling the gammon points won by 1.6. If there is an additional level of finishing, i.e. placing 3rd/4th, bonus points are determined by multipling the gammon points won by 1.3. This system has been in place since the start of 1992. We believe it is the fairest method since there is no bonus for getting a bye. For example, if a player win 1st place by only winning 3 matches, he receives 60 gammon points. This compares to another player who wins 4 matches to finish 1st and is awarded 80 gammon points.

	February 4th	February 11th	February 18th	February 25th
1st	*Gino Agresti*	*Ellis Bray*	*Don Woods*	*Cancelled*
2nd	*Kevin McLeaster*	*Cyrus Mobed*	*Ellis Bray*	*Snow*
2nd	*Ken Bruck*	*Ken Bruck*	*Wendy Kaplan*	*Storm*

41st INDIANA OPEN Backgammon Tournament

April 16-18, 1993

Omni North Hotel

ABT AMERICAN BACKGAMMON TOUR ★ 1993

National Labor Day Backgammon Tournament

Indianapolis

Sept 3-7,1993

Radisson Hotel

ABT AMERICAN BACKGAMMON TOUR ★ 1993

BACKGAMMON Schedule

Mar 19-21...	Midwest Backgammon Championship, Marriott Oak Brook Hotel, Oak Brook, IL.....	(312) 338-6380
Apr 16-18...	**41st INDIANA Open, Omni North Hotel, Indianapolis.....**	**HBC Hotline**
Ap30-Ma2...	14th Granite State Open, Woodbound Inn, Jeffery, NH.....	(603) 863-4711
May 28-31..	14th Annual Chicago Open, Sheraton Suite Hotel, Elk Grove, IL.....	(708) 674-0120
Jun 16-20...	1993 Las Vegas Open, Maxim Hotel & Casino, Las Vegas, NV.....	(708) 470-9491
July 02-04...	Michigan Summer Championships, Novi Hilton, Novi, MI.....	(313) 232-9731
Sep 03-07..	**National Labor Day Backgammon Tournament, Radisson Hotel, Indpls.....**	**HBC Hotline**

Thursdays..... 7:00 PM at **SPATS**-Castleton Square between J.C.Penneys & L.S.Ayres..... 842-3465

probability that a true or false result can be trusted, based on random uncertainty. With sufficient repetition, you can be confident at any given percentage level, as long as that level is less than 100%. Two common confidence levels used by statisticians (because of the relative ease of calculating the number of trials required to achieve them) are the 84% confidence level (more precisely 84.1%) and the 98% confidence level (97.7% being more precise). If a rollout is statistically significant at the 84% confidence level, that means that the probability that a condition is true is 84% (for example, that the position is a *take*). The probability that the condition is false is therefore 16%. This can be stated as "the odds are 5.3 to 1 against the condition being false." Likewise, a condition being true at the 98% confidence level means that the odds are 43 to 1 against it being false (97.7 ÷ 2.3 = 43).

Table 1 (Page 4) is a compilation of the number of rollouts required to be confident that a long, non-contact race is a take or a drop. (Note: for long, non-contact races [pip count of 70 or more] with a live cube, the drop/take point is about 20%, not the simple 25% that some elementary books indicate. This is because the cube will be used to end some games that would have been turned around. But more on this in a later article...) The first column is the percentage of games that the trailer (person accepting the cube) wins, based on the rollout. The second and third columns are the minimum number of rollouts required to give 84% confidence and 98% confidence in the result. In our example, based on 20 rollouts, we got Black winning 30% of the games. The table says that the game should be rolled out at least 22 times to be 84% sure that a 30% position is a take and 85 times to be 98% sure that a 30% position is a take, so we are close to being 84% confident, but certainly not 98% confident that Position 1 is a take. (For the mathematically inclined, the relationships used to derive columns 2 and 3 are given in the Formulas, see second column this page and Page 4.)

Another way of approaching the problem is to ask: "Given that I have rolled out a position a certain number of times, how confident am I that it is a take/drop?" Columns 4 and 5 of Table 1 show the confidence levels that the result in column 1 is valid based on 100 and 1000 rollouts, respectively.

By now some of you may be wondering why someone would roll a position out more than 20 or 30 times, since a typical end position should take several minutes to roll out just once. I agree that hand rollouts are probably not a good way to spend one's time. Fortunately, the explosion in affordable computer power in combination with commercially available backgammon software which approach the expert level can make long rollouts a simple proposition. For example, *Expert Backgammon for the PC* can play itself an entire game (that is, from the standard opening setup) on a 486/50MHz home computer in 3 seconds. These advances have made rollouts a valuable learning tool, even for the experts. If one allows a computer to play out the position, you must realize that the results are affected by the software's decision making ability, and that one bonehead play, made repeatedly, can bias the outcome. These *systematic errors* cannot be beaten down by increasing the number of rollouts. As a consequence, there is often a lingering doubt in the outcome, particularly in rollouts of complicated positions. However, given the sophistication of today's software, the systematic uncertainty for most positions, particularly non-contact positions, is probably small.

In closing, I point out that Table 1 does not directly address games where gammons and backgammons are possible. These situations are not as simple to calculate, and this topic deserves an entire article unto itself. However, the number required can be estimated by the following rule of thumb: calculate the unit cube equity (value of the game to the trailing player divided by the cube level, see Formulas, below) and compare it to the unit cube equity of Table 1, column 6. When you find the number in column 6 which is closest to the particular equity you calculated, then multiply the number of games required (columns 2 or 3) by 1.5. The result is the number of rollouts required to be confident at the 84% level (98% level if you used column 3) that random fluctuations will not change the take/drop result. Oh, by the way, Expert Backgammon says that position 1 is a drop at the 99.999% confidence level; that is, the chance that this position is a take is about 100,000 to 1 against. In 12,000 rollouts, Black won only 18.5%, which is less than the 20% required to take. You were sure lucky that day!

Formulas

The mathematical equations used to calculate the numbers in Table 1 are:

$$S = \sqrt{\frac{p(1-p)}{n-1}}$$

$S < |R-p| \Rightarrow$ better than 84% confidence;
$2S < |R-p| \Rightarrow$ better than 98% confidence;

where:

S = standard deviation,

p = probability that trailer wins game or

$$\frac{\text{\# of wins by trailer}}{\text{total \# of games played}},$$

n = total # of games (rollouts),

R = comparison condition (for example, take point = 0.2 as used in Table 1).

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Unit cube equity is calculated from the equation:

$$E_U = W_S + 2W_G + 3W_B - L_S - 2L_G - 3L_B$$

where:

E_U = unit cube equity,
W_S = fraction of games which end in simple wins (that is, not gammons or backgammons),
W_G = fraction of games which end in gammon wins,
W_B = fraction of games which end in backgammon wins,
L_S = fraction of games which end in simple losses,
L_G = fraction of games which end in gammon losses,
L_B = fraction of games which end in backgammon losses.

Table 1

Number of rolls requires to obtain a given confidence level that a position is a take or drop, based on the rollout result of Column 1. (Note: Table assumes that the drop/take point is 20%).

Percentage of Games that Trailer Wins (Rollout Result)		Number of Games 84% C.L.	Number of Games 98% C.L.	% Confidence Level for 100 Games	% Confidence Level for 1000 Games	Unit Cube Equity
50%	Take	4	12	>99.95	>99.95	0.0
40%		7	25	>99.95	>99.95	-0.2
35%		11	41	99.9	>99.95	-0.3
30%		22	85	98.5	>99.95	-0.4
25%		76	301	87.0	>99.95	-0.5
24%		115	457	82.0	99.8	-0.52
23%		198	789	76.0	98.8	-0.54
22%		430	1715	68.0	94.0	-0.56
21%	Take	1660	6627	60.0	78.0	-0.58
20%	Take/Drop	"large"	"large"	50.0	50.0	-0.6
19%	Drop	1540	6157	60.0	79.0	-0.62
18%		370	1477	70.0	95.0	-0.64
17%		158	628	79.0	99.4	-0.66
16%		85	337	86.0	>99.95	-0.68
15%		52	205	92.0	>99.95	-0.7
10%	Drop	10	37	99.95	>99.95	-0.8

Chuck Bower is from Bloomington, IN and has been playing backgammon since 1975 in between his education. He has a PhD in Astrophysics from Indiana University.

Match Winning Percentage Determined by Rating Difference versus Match Length

The table below shows the winning percentage between two players based on the difference in their ratings and match length. The formula comes from an article by Larry Kaufman that appeared in INSIDE BACKGAMMON, Volume 1, Number 5, Page 21.
The formula: Ratio = 10 raised to the power of D x Square Root(ML)/2000
where D = difference in the rating between the two players and ML = Match Length.
Winning Percentage (of player with higher rating) = Ratio/(Ratio + 1.0).

	Match Length										
Diff.	5	7	9	11	13	15	17	19	21	23	25
0	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
50	53.2%	53.8%	54.3%	54.8%	55.2%	55.6%	55.9%	56.2%	56.6%	56.9%	57.1%
100	56.4%	57.6%	58.5%	59.4%	60.2%	61.0%	61.6%	62.3%	62.9%	63.5%	64.0%
150	59.5%	61.2%	62.7%	63.9%	65.1%	66.1%	67.1%	68.0%	68.8%	69.6%	70.3%
200	62.6%	64.8%	66.6%	68.2%	69.6%	70.9%	72.1%	73.2%	74.2%	75.1%	76.0%
250	65.6%	68.2%	70.3%	72.2%	73.8%	75.3%	76.6%	77.8%	78.9%	79.9%	80.8%
300	68.4%	71.4%	73.8%	75.9%	77.6%	79.2%	80.6%	81.8%	83.0%	84.0%	84.9%
350	71.1%	74.4%	77.0%	79.2%	81.0%	82.6%	84.0%	85.3%	86.4%	87.4%	88.2%
400	73.7%	77.2%	79.9%	82.2%	84.0%	85.6%	87.0%	88.2%	89.2%	90.1%	90.9%

SANDS Super Jackpot
Wilcox Snellings vs Joe Russell
17 Point Match

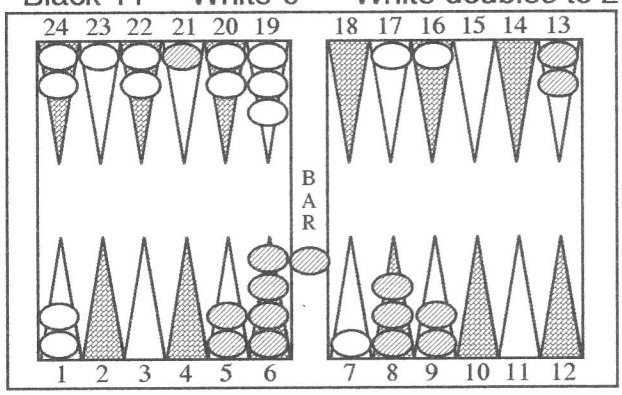
The **HBC Newsletter** presents a 17-point match between **Wilcox Snellings** and **Joe Russell** from the **SANDS Super Jackpot, Las Vegas Open, June 1992**.

Instructions: You will need a backgammon board to follow along. The board is numbered 1 to 24 based on the view of the player on roll. Each player will always be moving from a higher to lower point with only the point(s) moved to used. The home portion of the board is numbered 1 thru 6. Bearing off is noted as moving to the zero (0) point. To make it easier to follow, the larger number rolled is noted first. In some situations where the smaller number rolled is forced, it will be presented first. An example: being on the BAR with a roll of 5-2 with the 5-point made and the 2-point open.

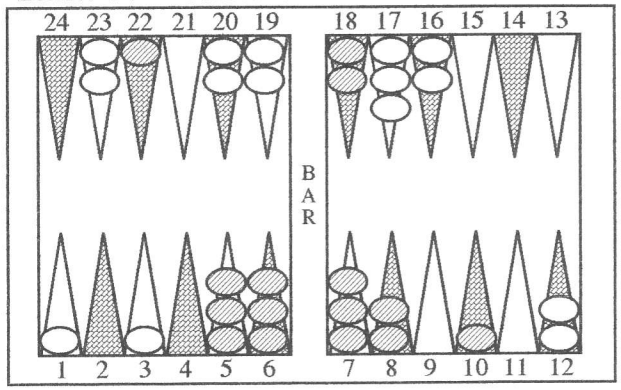
Abbreviations used: Closed Board**(CB)**, Entry Failure**(EF)**, Misplay**(MP)**, No Play Possible**(NP)**, opponent's piece was hit **(x)**, superscript**(5^2)** denotes 2 or more pieces moving to a point; this example has 2 pieces moving to the 5 point.

In the doubling positions, **Wilcox** is the dark checkers and **Joe** the light. The positions are shown from Wilcox's side of the board; study them first before going through the games.

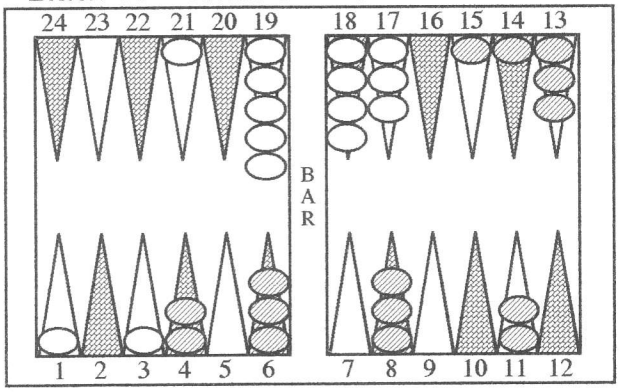
Black-11 White-9 White doubles to 2?



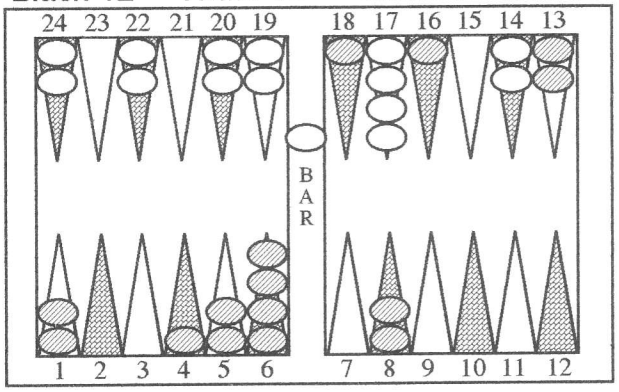
Black-11 White-10 Black doubles to 2?



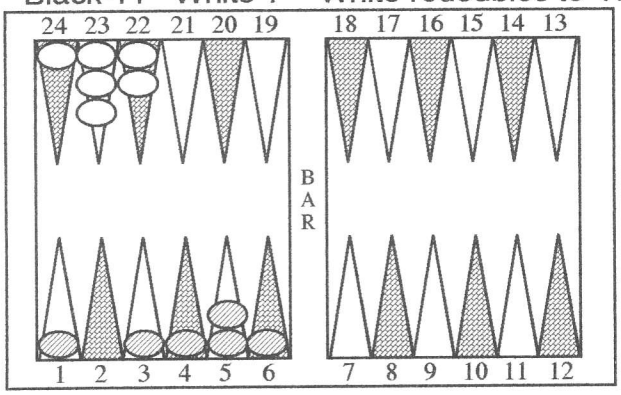
Black-11 White-7 Black doubles to 2?



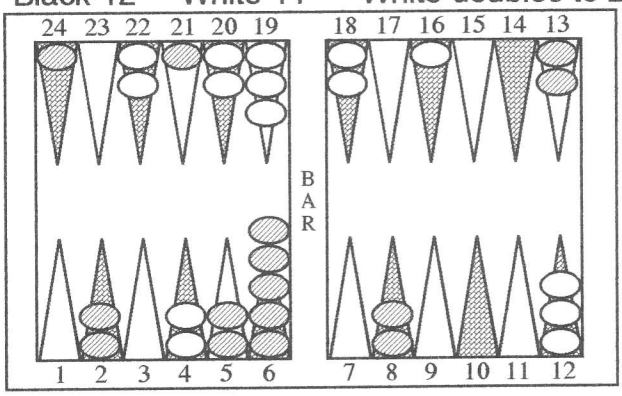
Black-12 White-10 White doubles to 2?



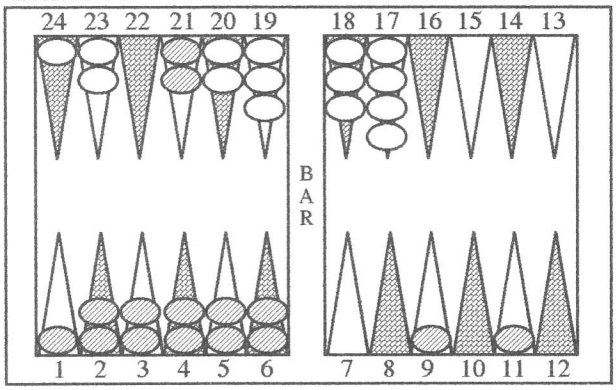
Black-11 White-7 White redoubles to 4?



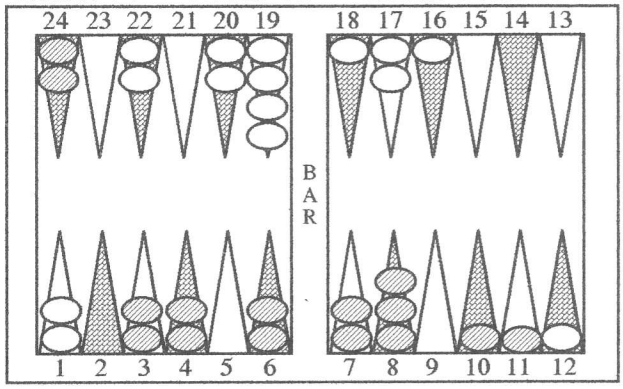
Black-12 White-11 White doubles to 2?



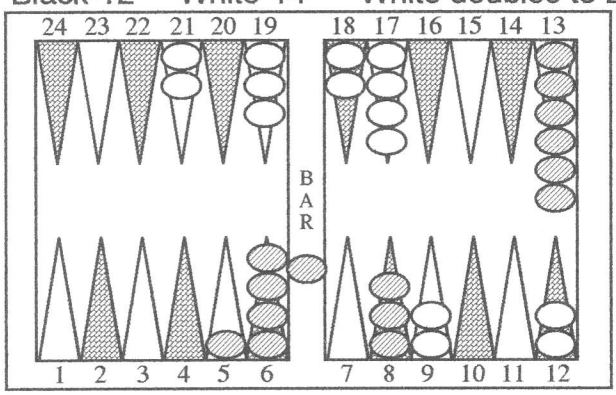
Black-12 White-13 White doubles to 2?



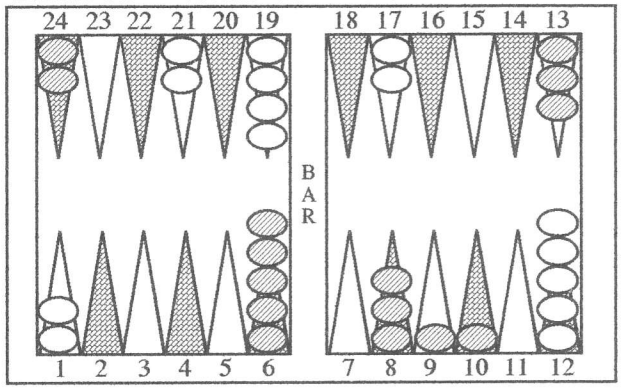
Black-14 White-15 Black doubles to 2?



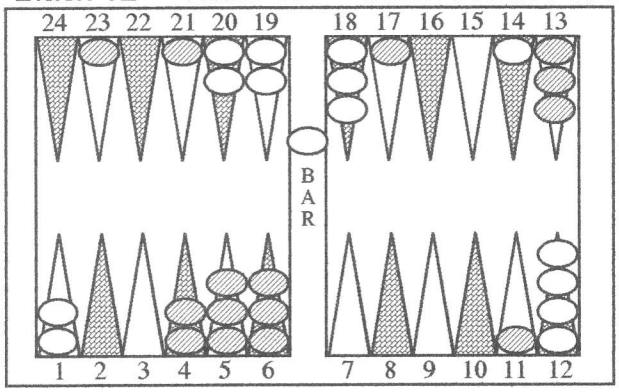
Black-12 White-14 White doubles to 2?



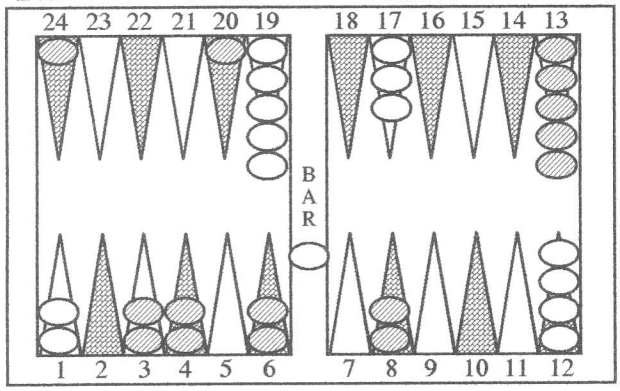
Black-15 White-15 White doubles to 2?

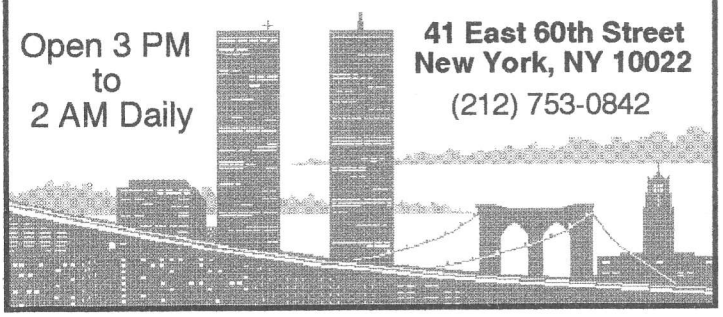


Black-12 White-15 Black doubles to 2?



Black-13 White-15 Black doubles to 2?





SANDS Super Jackpot

Wilcox Snellings vs Joe Russell

17 Point Match

Game 17

Wilcox Snellings - 11 Joe Russell - 7

	roll	played	roll	played
1)	..	...	54	8 20
2)	64	14	64	10
3)	22	4^2 11^2	66	7^4
4)	63	15x	43	22 4
5)		double to 2?		take
6)	42	9^2	43	4^{F8} 3
7)	43	9^{F13} 11	22	20^2 5
8)	42	11^{F15} 4	64	2^2
9)	63	4	21	5^2
10)	55	1^{F11} 6^2	63	2^{F8} 3
11)	11	1 3	65	14 15
12)	54	3 5	61	9 6
13)	63	2 5	51	4 6
14)	11	5^{F9}	43	7
15)	33	6 $0^{2\ F6,3}$	44	3 0^3
16)	61	0^2	42	1 0
17)	22	$0^{2\ F6,2}$	54	0 2
18)	54	0^2	66	0^4
19)	42	0^{F6}		redouble to 4?
20)		pass		

Game 18

Wilcox Snellings - 11 Joe Russell - 9

	roll	played	roll	played
1)	31	5^2	31	5^2
2)	54	8 9	43	9 10
3)	31	9	55	$3^{2\ F13,8}$ 5
4)	53	16x	41	24 9x
5)	53	EF	44	$1x^{2\ F13,5}$
6)	62	23 EF	64	18 2x
7)	43	21 EF		double to 2?
8)		pass		

Game 19

Wilcox Snellings - 11 Joe Russell - 10

	roll	played	roll	played
1)	51	8 5	21	11 5
2)	66	18^2 7^2	11	20x
3)	33	22 $5x^2$ 10	63	22 5
4)	61	7 5	44	9^2 2^2
5)		double to 2?		pass

Game 20

Wilcox Snellings - 12 Joe Russell - 10

	roll	played	roll	played
1)	..	...	64	18 9
2)	66	$7x^2$ 18^2	63	22 3
3)	21	11 7	33	5^2 3 21
4)	64	1^{F11}	55	16 8 1^2
5)	11	$5^{3\ F6(2),7}$	64	16 9
6)	61	1 4	55	11^2 8^2
7)	21	16x 6		double to 2?
8)		pass		

Game 21

Wilcox Snellings - 12 Joe Russell - 11

	roll	played	roll	played
1)	..	...	64	18 9
2)	61	$7x^2$	43	21^2
3)	31	5^2	61	7^2
4)	55	8^2 2^2	33	5^2 3^2
5)	32	21 6		double to 2?
6)		take	63	$4x^{F13}$
7)	11	23^2 5	31	4 5
8)	63	2 5	42	7^{F13}
9)	54	1^2	51	8^2
10)	41	1^{F6}	63	15 18
11)	55	3^2	53	10^{F18}
12)	61	4 NP	61	8
13)	43	2 3	64	4^2
14)	21	3 4	42	4 6
15)	21	1^2	64	1 3
16)	51	17	22	$2x^3$ 1
17)	..	CB	31	3 4
18)	..	CB	21	0^{F3}
19)	..	CB	32	1 0
20)	..	CB	62	0 4
21)	61	18	33	0^2 2^2
22)	55	12 3	21	0^2
23)	42	6	51	0^2
24)	54	game		

Game 22

Wilcox Snellings - 12 Joe Russell - 13

	roll	played	roll	played
1)	..	...	41	9 5
2)	33	21^2 5^2	32	5 22
3)	64	3x	21	$22x^{F\ Bar}$
4)	22	23 $4^{2\ F6,4}$	66	7^2 10
5)	62	$15x^{F23}$	21	23^2
6)	41	11 5	62	1^{F9}
7)	42	9^2	64	13
8)	62	3^2	64	13
9)	33	7 3^{F9}	54	8 2
10)	61	1 2	65	2^{F13}
11)	11	2^{F6}	65	7 8
12)	42	9 11		double to 2?
13)		pass		

Game 23

Wilcox Snellings - 12			Joe Russell - 14	
	roll	played	roll	played
1)	65	13	66	7^2 18^2
2)	54	15	32	10x-8
3)	41	21 5	22	$4x^2$ 16^2
4)	66	EF		double to 2?
5)		pass		

Game 24

Wilcox Snellings - 12			Joe Russell - 15	
	roll	played	roll	played
1)	51	8 5	11	5^2 7^2
2)	33	5 21^2 10	63	15x
3)	41	24 17x	42	21 13
4)	64	11 4x	42	21x 4x
5)	62	23 EF	62	7 11
6)	62	17	64	11
7)	11	21x 5 23	31	24 8x
8)	44	$17x^{F\ Bar}$ 4^2	64	EF
9)		double to 2?		pass

Game 25

Wilcox Snellings - 13			Joe Russell - 15	
	roll	played	roll	played
1)	53	3^2	62	5
2)	22	20x 4^2	63	EF
3)		double to 2?		pass

Game 26

Wilcox Snellings - 14			Joe Russell - 15	
	roll	played	roll	played
1)	..	...	52	8 11
2)	42	4^2	51	5^{F11}
3)	32	10 11	51	3 5
4)	43	7^2	41	3
5)	32	10 4	64	14
6)	52	8 11x	43	22 9
7)	31	$3x^2$	61	24 7
8)		double to 2?		pass

Open Forum

Do you find any doubling positions or plays presented in the match interesting? Your comments are welcomed. Prefer write-ups on DOS disk.

HBC Offers Reprints of Matches

HBC has been presenting quality matches of top players for over 3 years. Each match is complete with all doubling positions. Write to HBC for a list of available matches.

Game 27

Wilcox Snellings - 15			Joe Russell - 15	
	roll	played	roll	played
1)	..	...	42	4^2
2)	43	9 10		double to 2?
3)		take	41	9 23
4)	61	7^2	21	7^2
5)	41	5^2	32	21^2
6)	32	10 22	32	8
7)	52	8 22	55	11^2
8)	54	3^2	65	7 8
9)	53	5 7	43	6
10)	65	2^2	21	5^2
11)	52	1 4	21	4 7
12)	32	4 3	21	4^{F7}
13)	51	1 7	63	5 8
14)	54	1^2	42	2^{F8}
15)	66	10^2	52	3 5
16)	42	6 5	31	5 6
17)	43	6 0	52	0^2
18)	54	0^2	11	0^{F4}
19)	52	0^2	43	0^2
20)	21	0^2	65	0^2
21)	54	1 0	21	2 5
22)	61	0^2	43	0 3
23)	21	0^{F3}	66	0^4
24)	63	0^2	42	game

WS-17 JR-15
Match

HBC's Next Match

HBC's next match comes from
WORLD CUP III
between two excellent players.