

SMARTsig Confidential 7.01, Jan. 2000

In this month's issue . . .

2	Up Front – Mistaken Identities	SMARTsig
5	Decisions, Decisions, Decisions	Jaygee
8	Neural Networks with Soccer Scores	SMARTsig
10	Premier League Score!	
16	One Paced Final Furlong , won by a length	Davey Towey
19	SWAP SHOP	
20	Framing Your Own Market	Brian Blackwell
23	Mini-KISS Beaten Favourites System	Jim Perks
24	KISS#1 The Draw-Draw Bet	Steve P.
25	KISS#2 The Lucky Fifteen	Steve P.
27	Dynamic Modelling	Peter May
33	Complete Index to all 1999 SMARTsig Issues (Volume 6)	
46	How Important is that Last Form Figure?	Geoff Arnett
50	Millennium Competition	
51	The Punter's Revenge Serialisation XVII	Drapkin & Forsyth
62	Premium Staking	Bob, Edinburgh
68	National Hunt Ratings for January	SMARTsig
76	Subscription Rates / Back issues	

**NEXT
ISSUE** C₃

February 2000, issue 7.02, is scheduled for posting on February 3rd.

SMART ^{UP} FRONT

The intelligent choice

Mistaken identities

The toy retailer *Toys 'R' Us* have built a world-wide reputation and are very successful at what they do. They see their brand name as an integral part of this success story and will fiercely defend it should they feel their hard earned reputation is being exploited by others trying to cash in by using sound-alike names. They usually win their cases too!

Should a car retailer open up using the name of *Cars 'R' Us* for example, the more powerful originator of the *xxx 'R' Us* logo would quickly put a stop to it.

The defence of "one is Toys and the other is Cars" and therefore cannot be confused, is one that has been rejected by the courts. It is seen that the latter could be unfairly benefiting by the exploitation of a well known brand to enhance its own reputation. The original intention is irrelevant, it may after all have been in all innocence.

If I'd have attempted to launch SMARTsig under the name of *Race-Form Weekly* for example, the guys from Newbury would have jumped on me from a great height - and quite rightly too! Although their brand name is *Raceform*, without the hyphen, my proposed brand would serve only to confuse the buying public, giving a unfair advantage to the new venture with an instant 'establishment' feel.

Marketing specialists tell us just how important branding is, and its affect on the public's buying decisions. We all feel more comfortable with a brand we've heard of, and a name without connotations. No one in their right mind would ever again call a cruise ship Titanic - they'd be struggling for customers! But the same ship called almost anything else .. okay! Same ship, different public concept.

Interbet:

A recent message to our Email List highlighted a recent case of mistaken identity, it came from Tony Drapkin;

Wealth warning! It appears that there are two internet sites calling themselves Interbet.

Site number one is called Interbet and seems to be an offshore American outfit. The site is currently out of action, and has links directing would-be users to lottery-type operations. Their address is:

<http://www.interbet.com>

Site number two is also called Interbet (based in Lichtenstein), and is the site that some of us may be familiar with inasmuch as it offers a full betting service on UK racing, including early prices on all handicaps. The address is:

<http://www.inter-bet.com>

Note the hyphen, a subtle difference which has already led to a case of mistaken identity in which Switch card details have been sent to the wrong site (site number one). Since the site in question is 'temporarily unavailable' and offers no telephone help-line, the contact who brought this problem to my attention is unsure how to proceed in order to be reimbursed.

The lesson is clear. You must be careful when sending credit card or Switch details over the Internet. Double check the URL of the site to which you are making payment, and establish as far as possible the bona fides of the service. If you can, use a credit card facility in preference to Switch. With Switch, your account is debited directly, whereas with most credit cards, there is some degree of insurance in the event of your account being wrongly debited.

Still on internet, there have also been rumours of other sound-alike sites springing up, solely with the intention of taking your money. Banks are now on-line, so beware of the hyphen! Paying money into Nationwide or Nation-wide can be two very different things! - Ed

Talking of confusions, it might be the right time to quash another popular mistaken connection.

Smart-proof:

SMARTsig and Smart-proof have no connection other than my agreement with Dave Roberts that using the 'Smart' name to assist his then proposed proofing service get off the ground. There was certainly no plagiarism.

We both recognised, that especially in the aftermath of Sunday newspaper stories concerning R.I.D., the credibility of this new venture could be a major problem. The name of SMARTsig had by that time earned a respectable reputation, and it was thought that this could help.

Away from the possible plagiarism theme, but still concerned with misconceptions

The Solidus:

Earlier on this year, aspects of Davey Towey's Solidus were discussed, then in our May issue (605) Mick Johnson, the programmer who Davey worked with to convert his book's ideas to computer, informed us that the book was still available as a re-print directly from him. We in turn printed contact details for those wishing to take up the offer.

A few months later I had a call from Davey Towey. He informed me that his association with Mick Johnson had ended some considerable time before and he was shocked to find that his book was apparently being openly copied and sold without his permission.

As a consequence of this information, we will now refer all those interested in the Solidus approach to Davey's new operation, and the new Solidus computer software, both of which will be officially sanctioned by the original author. Work is still in progress on this project and we hope to bring you more news in the very near future.

- Stef



There are so many different elements to consider when analysing which horse is likely to win a given race that it can be a very confusing juggling act. Sort yourselves out with a decision table!

DECISIONS, DECISIONS, DECISIONS

JayGee

Rule-based systems typically consist of several individual rules leading, hopefully, to a single selection.

Having arrived at the selection can we be sure we've followed all the system's rules? And if we have, can we be certain that the system's rules are logically correct?

The answer to both questions is unequivocally yes - provided we translate the system rules into a Decision Table.

A Decision Table (DT) is a tool extensively used by Information Technology professionals to define the logical construction of a process prior to conversion into a set of detailed instructions such as a program, application macro, spreadsheet or database.

Unlike a Flow Chart a DT contains no graphic characters which means it may be compiled on and transferred between any computer platform as well as being easy to produce or modify in manuscript or by keyboard.

The major advantage of a DT however is that in its full entry format it may be checked for logical completeness with a simple arithmetical formula. So even if the system selection doesn't win at least you'll know that you chose the correct selection.

The construction and use of a full entry DT is probably best illustrated by looking at one covering an everyday situation; in this case a pedestrian controlled crossing as seen by a motorist.

To help understand the table here is the sequence in which the crossing's lights are displayed:

- Red
- Flashing Amber
- Green
- Amber

. . . . then repeat the cycle

Example Decision Table - Pedestrian Controlled Crossing

<i>Conditions</i>		<i>Rules</i>					
		1	2	3	4	5	6
1	Red?	Y	N	N	N	N	N
2	Flashing Amber?	-	Y	Y	N	N	N
3	Pedestrian on crossing?	-	Y	N	-	-	-
4	Green?	-	-	-	Y	N	N
5	Amber?	-	-	-	-	Y	N

Actions

		1	2	3	4	5	6
1	Stop	X	X	-	-	-	-
2	Wait until crossing clears	-	X	-	-	-	-
3	Prepare to stop	-	-	-	-	X	-
4	Proceed	-	X	X	X	-	-
5	Crossing lights broken	-	-	-	-	-	X
6	Proceed, but with caution	-	-	-	-	-	X

To use the table read each Condition in turn and depending upon whether the answer is Y or N refer to the appropriate Rule. If the answer to a particular Condition can be Y or N the notation "-" is used.

Because the example is a full entry DT note that the last rule covers

the contingency whereby the crossing's light display is broken.

The table may be checked for logical completeness as follows:

- a) Read Rule 1 and total the number of occurrences of "-" i.e. 4.
- b) Express the total derived at (a) above as a power of 2
i.e. 2 to the power of 4 which equals $2 \times 2 \times 2 \times 2 = 16$.
- c) Repeat (a) and (b) for each of the remaining Rules.
- d) Add the totals obtained at b. for each Rule
i.e. $16 + 4 + 4 + 4 + 2 + 2 = 32$.
- e) Next express the total number of Conditions to the power of 2
i.e. $2 \times 2 \times 2 \times 2 \times 2 = 32$.
- f) If the totals at d. and e. are equal the table is logically complete.

If this brief introduction has whetted your appetite why not try to produce a full entry DT for your favourite system?

Even if the system checks out OK the exercise should prove to be instructive and might even highlight an area for possible improvement.



SAVE ALMOST £50!

To help SMARTsig readers wishing to take the plunge in Neural Networks we have an exclusive 20% discounts with Ward Systems for their Predictor and Classifier AI programs.

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*Continuing our attempt to forecast soccer correct scores
by artificial intelligence methods, using Ward Systems
Predictor and Classifier.*

NEURAL NETWORKS WITH SOCCER CORRECT SCORES

SMARTsig

We began this report on our artificial intelligence experiments on football correct scores was in issue 6.11, November 1999. At that stage we merely discussed the proposed input and output configuration for the first attempt.

As a reminder we decided to begin with the following set-up;

Home team data

1. Average goals scored per home game (last 5)
 2. Average goals conceded per home game (last 5)
 3. Sum of all goals scored last 5 home AND last 5 away games
 4. Sum of all goals conceded last 5 home AND last 5 away games
 5. Points* total for last 5 home games
 6. Points* total for last 5 home AND last 5 away games
- (Neural network inputs 1 to 6)

Away team data

7. Average goals scored per away game (last 5)
 8. Average goals conceded per away game (last 5)
 9. Sum of all goals scored last 5 home AND last 5 away games
 10. Sum of all goals conceded last 5 home AND last 5 away
 11. Points* total for last 5 away games
 12. Points* total for last 5 home AND last 5 away games
- (NNet inputs 7 to 12)

* Points as per standard league games. i.e. $w = 3$, $d = 1$, $lose = 0$

In addition to the above 12, two further 'comparative' inputs were added to the whole (inputs 13 & 14); (there may be a case for arguing these are not strictly necessary because they are derived

directly from the other inputs. But it can be altered later)

13. Home team's *home points* minus away team's *away points*
[(item 5) – (item 11)]

14. Home team's *H&A games points* minus away team's *H&A points*
[(item 6) – (item 12)]

A network was trained using data derived from seasons 1995/6 and 1997/8. The newly trained nets were applied to fixtures from seasons 1996/7 and 1998/9. Both used matches concerning the four English divisions, league games only.

The network's 'goals scored' outputs were rarely in whole goals of course, they were 1.78, or 0.76, etc. In order to convert these to useable numbers the nearest whole equivalent was taken. The two examples here would be taken as '2' and '1'. All .5 decimals were rounded upwards. e.g. 1.5 = '2' but 1.49999 = '1'.

The disappointing outcome was that from the 1,559 games processed the network appeared to be playing safe and going for the easy option. Almost half were predicted to finish 2-1, slightly more than half predicted to be 1-1. There was only one alternative score given from the whole list, and that was 1-2. (the game in question actually finished 1-3)

The net was trained using Ward's Predictor program which is limited to a single output. This entailed building and running two separate nets, one for the home score, the other for the away.

Examining the two seasons used for training the average overall home score was 1.45 whereas the average away score was 1.09. The network was clearly training to a point where the errors were minimised, which equated to near enough the average scores.

As a consequence of these results I decided that the problem was either (a) the data used as inputs was less than satisfactory, or (b) the network had been 'overtrained'. 1-1 is the most common league score, and in the testing set it accounted for 196 of the 1559 samples. So it could be argued that if any of us wanted to 'best

(Continued on page 11)

FA Premier League SCORE!

The new FA Premier League correct score pool ('phone 0870 747 1966 or www.premscore.com) reports "expenses and commissions" in the mid thirties percentage. (34.5% on 27/11/99 for example) which is enough to make the prudent bettor squirm.

However, a single weekend attempt costs just £2.00 and you are asked to predict the correct score for six selected Premier League games. You win if 3 or more of your selections are correct.

Statistically, your best shot of improving your strike rate is to nominate each of the six games to finish 1-1. Armed with the fact that the statistics favour such a bet, and assuming very few others (less clued-up) would mark ALL games at 1-1 you could be on to a winning strategy. The significant detail is that this is a pool bet and for such a multiple 1-1 correct scores bet, it could well work out far better than a similar bet at fixed-odds.

Over the past couple of years the weekend Premier results have yielded 3 or more 1-1 scores on the following dates:

Fri 26/12/97	3 x 1-1 scores
Sun 28/12/97	3 x 1-1 scores
w/e 21/02/98	3 x 1-1 scores
** w/e 18/4/98	<u>4</u> x 1-1 scores **
w/e 10/05/98	3 x 1-1 scores
w/e 28/11/98	3 x 1-1 scores
w/e 27/02/99	3 x 1-1 scores
w/e 23/10/99	3 x 1-1 scores
w/e 06/11/99	3 x 1-1 scores

There's no way of telling if these would have matched with the 'Score' selected games or not. But does it occur often enough to warrant a throwaway £2 Saturday punt? Three correct should pay out a dividend of over £200!

(Remember, you heard it here first - so your 10% commission cheques gratefully received)

- Stef

(Continued from page 9)

guess' any league score, we'd be correct more often with our 1-1 predictions than any other. Indeed, selecting every game to finish 1-1 would give us a 12.57% strike rate.

Such a score is very rarely offered at any odds other than 11/2 by the fixed-odds companies, making it a 15.38% chance. This then is the strike rate we must aim for just to break even!

Despite our first model predicting over half the sample as 1-1 draws, did it show promise by at least being more successful than chance with its success rate amongst this group?

From the 812 predicted 1-1s, 107 were correct. A 13.18% strike

Superior to the 12.57% blanket coverage, but lower than the acceptable 1-1 betting proposition of 15.38%.

The 2-1 predictions, given for 746 of the games were correct on 66 occasions, a strike of 8.85%. The 1,559 test set contained 132 such scores, an actual percentage then of 8.47%. Not so easy to determine a 'base-level' percentage required to make a profit from 2-1 scores, the odds for such a score varies far more and is dependant upon relative strengths of the two sides engaged.

Our percentages were better than random in both cases, but not nearly good enough to begin the celebrations. Enough of an encouragement though to soldier on and experiment further.

By the way, re-processing the same set of results using Ward Classifier gave almost identical results to the ones obtained using Predictor. Classifier though was found easier to use for the task in hand because of its 'class' output, requiring just a single net to predict both home and away scores.

Both programs allow adjustments to be made with the trained net, with a setting called "generalisation", which defaults to 50%. This feature allows the user to determine how 'sharp' the net output will be, a fuzzyness adjustment if you like. Altering this between the two extremes of 0% and 100%, although affecting the predicted values, appeared to make little difference to the overall performance level.

Similarly, using alternative 'rounding' methods on the numeric outputs had little impact on the bottom line. And of course, such adjustments should be unnecessary if the NNet is performing as I would hope.

Time then for some 'tweaking' of the inputs and further testing. I often prefer taking a seemingly backward step to begin with in making the model less complicated. For this second attempt then I re-built a training model using simply the for & against scores from each teams previous 5 games. These were arranged as follows;

- 1 Home Team's home game 5 games ago, goals for
- 2 Home Team's home game 5 games ago, goals against
- 3 Home Team's home game 4 games ago, goals for
- 4 Home Team's home game 4 games ago, goals against
- ... etc ... for inputs 5 to 8
- 9 Home Team's most recent home game, goals for
- 10 Home Team's most recent home game, goals against

- 11 Away Team's away game 5 games ago, goals for
- 12 Away Team's away game 5 games ago, goals against
- ... etc ... for inputs 13 to 18
- 19 Away Team's most recent away game, goals for
- 20 Away Team's most recent away game, goals against

More inputs than before, (20 against 14) but a simpler format. Anyhow, we're still at the experimental stages and looking to see if the format improves the performance of a trained correct score net.

This configuration, although producing a more diverse range of predicted scores, also increased the number of games allocated as 1-1. Just over 100 more in fact than method 1, at 917. Of these 117 were correct predictions yielding a strike rate of 12.76%.

Just 60 games were suggested as 2-1 scores, a substantial reduction on the previous model. Of these 6 were correct, a 10% strike.

We lost out then on the accuracy of the 1-1, but made up for this with an increase in the 2-1 scores. However, taking all things into

consideration, no significant improvement was noted to suggest pursuing this particular configuration of inputs any further. Back to the drawing board.

My next few trials were all variations around the "last 5 games" theme, and all made little progress from our first trial. I needed to move away from the 'recent games' criteria. From my investigations over the past few years I am convinced that form over the *whole* season is better than anything gleaned from the recent past.

The other avenue I was trying to pursue was one of getting away from traditional soccer team ratings as the basis for predictions. Games won/lost, goals scored/conceded, etc., have all been 'done to death' by everyone treading this path before me.

An alternative approach is required then, a bit of lateral thinking if you like. Mind you, I'm not fool enough to believe any particular method I come up with be the first time anyone has explored such a route. Someone else will always have been there before you, but the fewer there have been, the better our chances of finding something in a corner somewhere that others may have overlooked.

A change of tactics doesn't guarantee a favourable result of course, however I am keen to compare predictions based upon factors other than games won and goals scored.

Looking at the current Premier League table for example (12/12/99) West Ham and Derby County have almost identical WDL away records - are we to gather from this that they are equals as away sides? The away game goals scored & conceded by Leicester City are virtually the same as Southampton's away record. Again, are such comparisons valid?

For my first 'lateral' attempt I've decided to record team performances by actual scores. Not goals for and against - but match 'scores'.

In order to illustrate this point I'll add flesh to the bones of the Leicester City and Southampton away records.

Leicester City away goals:	8 games,	For 10	Against 13
Southampton away goals:	8 games,	For 10	Against 14

Goal records tell us so little about the actual game scores from which they are derived. For example;

Leicester City away games	(all home team goals quoted first)
	lost 3-1, 2-0 (twice), 2-1 (twice)
	drawn - none -
won 0-3, 2-3, 0-1	

Southampton away games	lost 4-1, 3-2, 2-1, 1-0
	drawn 1-1, 3-3
	won 0-1 (twice)

Viewing merely the overall for & against record would suggest that both teams would usually score a single goal away from home and the most common score may be in the 1-1 to 2-1 range. Seeing the actual game scores paints perhaps a different picture, only 25% of the actual scores fall into the suggested 1-1 to 2-1 range.

If such statistics were presented in a suitable manner, could the Neural Net make any more sense of it I wonder?

In the meantime I'd be looking on the Ward Systems internet site where there is an area dedicated to the users of the Ward products. Here you can discover the recommendations from the programmers behind the software and read through questions posed by other users. And if you're looking for sound advice on how to get the best from a product, who better to get it from than the people behind it all?

One piece of advice I found significant was that it was better not to use too many inputs for a Ward NNet. Rather like the human equivalent of the system which is over burdened with far too many rules I suppose. Such methods often fall over by the sheer weight of their own complexities.

With this advice in mind, it would not be prudent I decided to attempt to record *every* past match score when building the model. Covering every result combination, even with a conservative range of 0 to 3

goals for each of the home and away sides would necessitate 16 variations (4 x 4). Add the home team's record to the away teams and we're up to 32 inputs!

We'll select just the most common scores then to use for our initial attempt in this area. Working from the most frequently seen result it was decided to use just the top 5 scores. These were 1-1, 1-0, 2-1, 0-0 and 2-0.

In order to express the figures in a meaningful way it was of little use simply recording the number of occasions a particular result was achieved, the frequency was therefore converted into a percentage.

Taking our example from our earlier two examples, the two teams *numeric* records of away games in our designated area were as follows;

Team	1-1	1-0	2-1	0-0	2-0
Leicester	0	0	2	0	2
Southampton	1	1	1	0	0

Whereas we'll be presenting them in percentage terms, based upon the frequency set against the number of games played, which is;

Team	1-1	1-0	2-1	0-0	2-0
Leicester	0.00%	0.00%	25.00%	0.00%	25.00%
Southampton	12.50%	12.50%	12.50%	0.00%	0.00%

Such a model follows the advised "not too many inputs" rule and is easily updated as each week passes, constantly reflecting the fortunes, at least in terms of our specified 'match scores' for each team.

Space has defeated us again this month, so the investigation will continue in a future issue.

If you're a NNet user yourself of course you can try the above strategy for yourself (SMARTsig discount offer on page 7)

*Continuing the theme of accurate post-race analysis
Davey examines the well-worn running comments of 'ran
on well' & 'faded final furlong'.*

ONE-PACED FINAL FURLONG (won by a length!)

Davey Towey

I have been exploring the theme of post-race analysis and drawing attention to the real point which is to quantify races run by watching them yourself.

If instead, you prefer to rely on the formbook you will see phrases such as "ran on well" and "faded final furlong" which must be among the commonest phrases in the formbook. Because of the frequency of their use they condition the readership into acceptance of their validity and ultimately their accuracy.

The above phrases are used to describe horses overtaking or being overtaken by each other - but this always happens in a race anyway! If they are accompanied by little else they do not portray the real nature of the race.

In addition to the above, the phrases are usually reserved for what is happening at the very end of a race, the normal siting of the winning post.

It is easy to confuse <ran on well> with <faded final furlong>. Many times I have seen a winning horse that I would describe at the very best as <staying on at one pace> overtake a fading horse that had overcooked it in the early stages. The loser would be described as <faded>, <no extra> or <outstayed>. The winner of course would have <ran on well>.

As the terms are relative we gain the impression that one horse is better than the other. However the race may have been lost by one individual rather than won by the other - even that may have happened in the early or middle stages of the race.

The individual may have been the jockey and not the horse, however it is the horses who are handicapped and not the jockey.

So, we have to introduce yet another variable when assessing a horse race on paper - how true is the formbook?

The surest way of telling is watching the race yourself.

"Don't believe all you read" - that's another pearl of wisdom that we have grown to accept, not by becoming cynical but as an act of self-preservation. It is commonly applied to newspapers (and all journalists would hold their hands up) but I would also apply it to anything linked with horse-racing.

This suggests a considerable margin of error if you rely on the racing press for your information!

Not only do we need the ability to relate one horse to another but also to relate one race to another. We need to be proficient at comparing horse A's <ran on well> in one race with horse B's <faded final furlong> in another.

Although by no means the definitive answer, speed ratings do serve this need much of the time but there's another story.

It is also pointless to profess post-race analysis unless it is done for real, like here and now:

11th Dec, 3.05 Cheltenham 2m1f H

Two 4 year olds dominated the market - Katarino and Far Cry. Before the race I took the view that both would find this tough and my post-race analysis didn't change that view.

"We need to be able to compare horse A's <ran on well> in one race with horse B's <faded final furlong> in another."

Both of these fine young prospects were only getting 4 lbs. from last years winner, the seasoned top-class Relkeel. I also took a pre-race view that now being 10 years old and on his debut, Relkeel would be beaten.

Sir Talbot on his previous run had tried to give 24 lbs. to Rodock and didn't quite manage it but achieved a very good speed rating. Sir Talbot was suited to course, going and distance, consequently I had a large bet on him.

Coming down the hill, when going best of all and looking a certain winner, Sir Talbot somehow managed to fall. As it turned out Relkeel edged in front of Far Cry in a close finish, but to be honest I wasn't excited by the form of a 10 year old beating a 4 year old.

Nevertheless, there was a large drain on the pacemaker battery.

When the same conditions occur I will do the same again as Sir Talbot, despite gaining an "F" next to his name looked very good to me.

11th Dec, 3.40 Cheltenham 3m 1/2f NHF

Bindaree was a very confident selection in this so I went home happy. This horse will be hard to beat in the best staying hurdles.

No Tale To Tell receiving 7 lbs. was a good second.

11th Dec, 3.25 Lingfield 2m 1/2f NHF

Hannigan's Lodger was a worthy favourite but odds of 8/11 in these sort of races seems to invite defeat.

Unluckily for her it was the debutante Cresswell Native who turned in an excellent effort to win fairly easily.

Both opened up a large gap back to the third and both will be winning again but Cresswell Native in particular looks pretty smart.

SMART

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SMARTsig thanks you, the reader, for your support with contributions for publication.

Your articles, stories, ideas, theories and research are always welcomed. Everything from the simplest KISS system of a few lines to the complex mathematical argument which knocks your socks off!

A very profitable Year 2000 to you all!

Keep 'em coming!

A while back now the topic of framing your own betting market was raised on our e-mail group. Brian Blackwell, an Oz SMARTie mentioned a book covering the subject by an Australian bookmaker. Other interested members asked him for a summary.

FRAMING YOUR OWN MARKET

Brian Blackwell

Earlier I mentioned the approach to framing a betting market that has been used, and still is used, by some bookmakers here in Australia. It's an approach that I have used successfully myself. It appeals to me because there is a strong 'instinctive' component.

The bookmaker AJ Conroy put the approach into his little book back some 17 years ago. He says there are two stages in race assessment, the first a 'flexible evaluation' marked in cipher or just plain written comment.

Now, over the years, I have spoken myself to a number of bookmakers who have used the following approach, and they told me that even with the advent of computerised ratings they still use the method because it enables them to have a direct hands-on link with the pricing.

What is done is that the bookies use 'markings' to indicate how they assess each runner: In Conroy's book, they go as follows:

XXX	Odds-on, or a very short quote
XX	First class show
X	Second class show
OX	Chance (middle pin)
OOX	Possibility
O	Very little chance
OOO	Hopeless

The written equivalent to the above says Conroy, would be:

Bird:	Odds-on or very short quote
Yes:	First class show
Risk:	Unreliable, or must have everything its own way
Care:	Could shorten, big betting stable
Lay:	Has ability but plenty of weaknesses
Chance:	Has ability
Keep:	Could shorten, wait until betting starts
No:	Very little chance on form.

Conroy then goes into an explanation of how he arrives at each assessment, first eliminating those runners whose recent or past performances in similar or weaker class over the same distance suggest they have little or no chance of success. This is done, he says, because they will have no bearing, financial or percentage-wise, on the makeup of the market.

The next step, based on 'common sense and a lot of mental spadework' is to try to sort the remainder into groups influenced mainly by form, rider or driver, barrier position and the expected condition of the track.

Conroy suggests reading and re-reading the form-lines, noting margins (lengths won or lost by), SP, time (as compared with the fastest of the day, standard times) etc.

As a bookmaker, Conroy had to frame a market that gave him an edge, and punters might well follow the bookies in this respect. In framing a market, there is a good case for saying that the punter should act just as a bookmaker would.

Conroy had a 112% market, pointing out that with a readymade, short priced favourite the assessor's task is made that much easier because he is likely to work inwards from the long-shots till he finds out what percentage it's feasible to extract from the rest of the field and then price it accordingly, keeping in mind that he needs 112% or more as a margin of error. Thus, says Conroy, if he estimates he can muster 62% from the rest of the field he will mark the favourite at Evens (50%) giving him the 112%.

If the race looks open, he will work from outside in until he has

condensed the remainder into a nucleus of first class chances, the number of which has a definite bearing on the opening prices of the favourites.

Conroy talks of a small advantage if the X and O cipher is used, if it's allied to a formula that he has worked out. It serves the dual purpose of giving the assessor an idea of the structure of the market while providing a reasonable set of prices.

Conroy says the formula is not foolproof (what is??). Basically his approach is built around a valuation of X which in turn translates the flexible summary into percentages and then into prices, as illustrated in the following example.

- 1 The number of X's in the summary are counted and the total is divided into 112 plus any small number that will give an even answer to the nearest 0.5 (half point). To the answer add 1.5 and this will give the value of X percentage wise.
- 2 For each O in front of an X, subtract one-third (33%) of the value of X.
- 3 Any O's not tied to an X are discounted.

Thus (race example):

	PERCENTAGE	PRICE
XX	26	11/4
XX	26	11/4
X	13	13/2
X	13	13/2
OX	9	10/1
OX	9	10/1
OX	9	10/1
OOX	5	20/1
OO	2	50/1
OOO	1	100/1+

Total: 10 'X' markings divided into 115 equals 11.5 plus 1.5 equals 13%. Thus, X equals 13%.

A common error, says Conroy, is to over-estimate the chances of the outsiders, thus distorting the percentages of the other competitors in the market. He says the prices arrived at from the flexible summary are a rough outline but if the formula has been used correctly the percentage will always be right even if your price distribution is astray.

Here then is how Aussie bookies for 50 years and more have together sorted their betting markets. No doubt there would be some fine tuning done later, but basically the approach was a neat and easy way to turn their thoughts on each runner into a value price.

Bettors can use the idea themselves. Go through the form, allot your X and O markings, find the value of X, price each runner and there you are.

No Neural Networks here, mate!



During a recent stay in hospital this member was advised by a fellow patient to follow the fortunes of beaten favourites.

Mini-KISS

BEATEN FAVOURITES SYSTEM

Jim Perks

Any chance of getting the following system idea checked out? The rules were given to me by one of the other patients when I was in hospital.

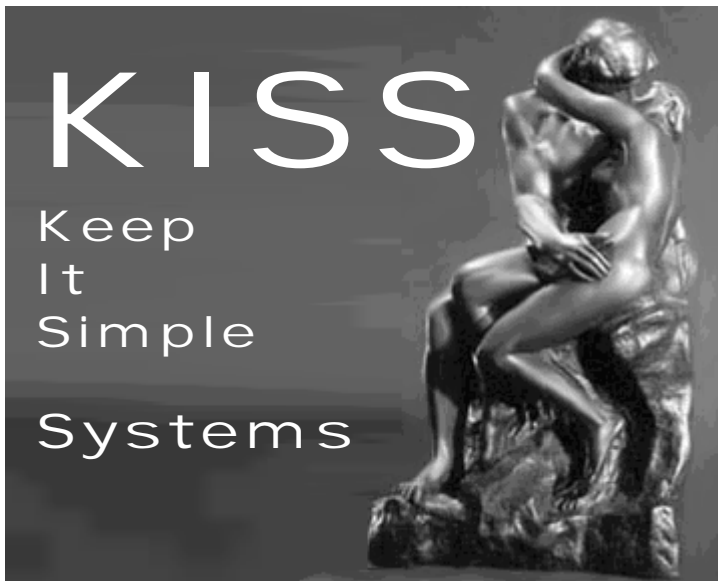
Very simply the method suggests looking at beaten favourites. The horse's last run (where it was the beaten favourite) must be a better finishing position than the run before.

For example:

Last 2 form figures of 02, 32, 43, etc. are okay and a bet.

Last 2 form figures of 22, 23, 40, etc. are rejected, and no bet.





It is a while since we featured any simple soccer ideas, but fear not, along comes a new member with a couple of ideas for you to try.

FIXED-ODDS FOOTBALL SYSTEMS

Steve P.

I've just received my first two issues of SMARTsig and thought I would plunge straight in with a couple of items for the KISS feature of my own. They are both for football betting and come from my brother Matt who is particularly successful in this area.

KISS#1 The Draw-Draw bet.

This is available at fixed odds on all televised matches. The bet is for the teams to be drawing at both half time and full time and is usually priced up at about 9/2.

Statistically this bet comes up every 6 games so a staking plan is required for this to be profitable.

The simplest method is to bet to win a set amount say £100 and if a loser, next time you stake to win £100 plus what was lost on the first bet, etc.. When the bet comes up you go back to staking to win £100 again. You obviously also need a good betting bank at the outset to counter a long initial losing run but the bet does tend to come up with monotonous regularity. If nothing else, it certainly makes those televised goal-less draws much more enjoyable viewing!

KISS#2 The Lucky Fifteen

This one is still very much at the experimental stage but should produce the occasional big pay-out. Take four games and back them all to finish 0-0 in a Lucky Fifteen. I'm sure most SMARTsig readers wouldn't dream of placing a Lucky Fifteen bet so here's the logic:

A Lucky Fifteen is basically a Yankee plus a single on each of your selections but the point that makes this bet worthwhile is that if only one of your selections comes in the pay-out is twice the odds of your winner.

The average price of a game to finish 0-0 is about 9/1 so if only one match finishes 0-0, you receive £19 to a £1 stake (including the return of the stake on the winning selection). This more than covers the other 14 losing bets and tax. If two games finish 0-0 you're laughing as you have two winning singles and (assuming the price of both games is 9/1) a 99/1 double. (I've never been able to work out doubles so apologies if that is wrong!)

Picking which games you think will finish 0-0 is obviously the difficult part!

For this latter method I should make it clear that when I said back four matches to finish 0-0 you should, of course, always back 'no goal-scorer' as you are still paid out if any goals that are scored are designated as own goals.



Couldn't let the two football KISS ideas pass without further comment. - Ed . . . over the page æ

If the draw-draw result occurs one time in six, yet the odds available are around 9/2. These figures lead to the level-stakers poor-house, so a staking plan is suggested.

Two points. Firstly the 'recovery' plan advocated can get the user into deep trouble when extended losing sequences are encountered (and with a hit rate of 1 in 6 they will be encountered). Secondly, I checked out the double results for all English clubs from the 1998/99 season*. D-D occurred on 357 occasions from 2,036 games. A strike of 17.53% or once every 5.7 times. Looking at just the Premier League the strike was better at 74 from 380, or 19.4%

Not too far from level-stakes profitability with the improved strike rate from last season. ALSO . . . I'm given to understand that live televised games throw up more drawn games than would otherwise be the case (although I've seen no hard evidence to support this). Taking these facts into consideration, and perhaps a little judicious selecting on your part and there may well be a little to be made from this idea.

* Figures from Bill Hunter's WEOSS service (see page 75).

Half time-Full time results 1998/99 season.

	H-H	H-D	H-A	D-H	D-D	D-A	A-H	A-D	A-A
Allgames	27.55%	5.30%	1.47%	14.93%	17.53%	10.31%	2.46%	5.21%	15.23%
Premier	28.95%	5.00%	0.79%	14.21%	19.47%	9.47%	1.32%	5.79%	15.00%
D1	29.53%	5.07%	1.81%	13.77%	18.48%	8.70%	1.99%	5.98%	14.67%
D2	25.18%	5.43%	1.45%	15.94%	16.49%	11.41%	2.90%	4.53%	16.67%
D3	26.99%	5.62%	1.63%	15.58%	16.30%	11.41%	3.26%	4.71%	14.49%

Also asked about was . . . **Calculating multiples**

To work out doubles (or any other multiple bets. Simply add 1 point to each of the odds, multiply them out, then deduct 1 from the answer. e.g. 6/4 & 11/2 (equivalent of 1.5 to 1 and 5.5 to 1)

. . . add 1 point to each and multiply them together.

$$2.5 \times 6.5 = 16.25$$

. . . deduct 1

$$\text{answer} = 15.25 \text{ to } 1 \text{ double.}$$

- Stef

Most of us would consider several criteria in assessing a horserace. But attaching an individual 'importance' multiplier to each of these factors is also of crucial importance to the overall effectiveness.

DYNAMIC MODELLING

Peter May

When assessing a race, what factors do you consider? Ability ratings, *TopSpeed* and *Postmark* maybe, going preferences, race distance preferences, recent form etc.?

You may consider all of these and some more besides, but the crucial factor in the analysis is the importance of each component. For instance, is it more important for the horse to be suited by the going than the distance? And where does recent form rank in the list? These questions are not easy to answer, and to make matters worse they may vary in importance from horse to horse.

When computerising the task it is usual to design a model which takes each of the factors and applies a weight (or scaling value) to it. The sum of these values becomes the output of the model and may take the form of a rating or probability of success. The model outputs for each horse can then be compared in order to deduce the selection. For instance a simple model may take the following form:

output = x x Ability Rating + y x Going Suitability + z x Recent Form

But how do you generate the weights (x , y & z)?

A common approach is to use a multiple linear regression model. However this is not a very reliable method unless the factors you are considering are independent. And in racing this is not usually the case: the best jockeys ride the best horses etc.

Other methods that can be used include a neural network (dependence not a problem), a multinomial logit model, or your own assessments.

For many years I thought this was the best approach, but now I am beginning to wonder whether this use of global constants (as in the weights) is the most effective method.

I am not concerned with generating a value method which makes a profit here, but rather a method for solving the problem of which horse is going to win. (This statement will discourage many of you from reading any further because, surely, the only reason to analyse a race is to increase your chance of making a profit? Well it is for some, but not all, I quite like the challenge of deciding which horse is going to win as opposed to which horse is offering a value bet. In fact models such as these will always struggle to make a profit because they are considering the same inputs as the bookmakers' in the same way as the bookmakers' so, in theory, there should be agreement between the two and hence no value in terms of betting.)

This type of model requires the raw data (historical race results) to be pre-processed. For instance, routines need to be set up to determine the suitability of today's race distance etc.

Often these can be expressed as: suitable, not suitable and unknown. And this is the first major problem with this approach. What about the boundary cases?

These discrete classes will include horses which possess very similar historical profiles but are put into different categories. This is most obvious in considering fitness and the days since last run. Given a threshold of, say, 84 days, a horse un-raced for 85 days would be considered unfit whilst a horse un-raced for 83 days maybe put in the unknown group. Would two days make that much difference?

As another example consider the following records of three hypothetical horses (A-C) and a two-input model.

All three are rated 100, and in terms of going suitability have the following success rates on the prevailing ground:

A 0-21;
B 1-6,
and C 0-3.

Consequently, horse A has encountered the going 21 times and has failed to win. In the classification scheme all three may be classified as being unsuited by the ground, consequently all three ratings will be reduced by the same amount with the output from the model indicating a three-way dead-heat.

But it can be seen that horse A has no chance on the ground, whereas horse B has at least won on the going and from only three races it is difficult to assess horse C.

As an alternative the success ratio can be used, resulting in the figures 0%, 16% and 0% input into the model.

But again this indicates the same degree of confidence in the going assessment for horse A as horse C. And what about a horse that has run once on the ground and won a two-runner race where the only opponent pulled up? Would 100% be an acceptable model input in this case?

Furthermore, even if the horses are both correctly classified as not being suited by the going, the first runner may not be able to act on the surface at all reducing its chance of success to nil, whereas the second may at least be able to run to a reasonable level of form even though unsuited by the ground.

However, both of these will be treated the same by the model with similar reductions to their ratings.

Is there an alternative solution? Well possibly.

One method would be to increase the number of categories from three to nine, say. But there are still boundary problems.

Another solution would be to include the wins and runs data into the model without pre-processing. This does increase the complexity of the model and does not really address the final criticism.

Alternatively a more dynamic modelling approach can be employed.

By dynamic model I mean a model that changes for each horse and

does not involve global constants. This model can take several forms but is horse specific as opposed to a general model which can be applied to any runner. In other words it is created, or trained, on data for a particular horse as opposed to data collected from all runners.

A multiple regression model is a possible architecture or, preferably, a neural network. The main drawback with this approach is the lack of data.

Horses do not run that often so the training data will not be that extensive. Normally with a NN approach one would divide the data set into three partitions and use them separately for training, testing and validation. However this is a luxury we cannot afford for this problem.

Instead a hold-one-out method can be used. For instance for a horse which has run ten times, ten neural networks are trained on each combination of nine training records. When implemented, ten outputs will be derived (one for each network) which can then be either averaged or combined in some other way.

However we are still dealing with very small numbers and as such the network should have very few hidden nodes, maybe two or three only, depending on the number on inputs considered. As an example consider the handicap hurdler Tilty.

<i>Race Distance</i>	<i>Going</i>	<i>Days since last run</i>	<i>Course Direction</i>	<i>Rating Achieved</i>
24.5	good	29	l	104
26	good to soft	54	r	104
26.5	soft	35	r	68
25.5	good	13	l	99
26	good to soft	7	r	99
26	good	11	r	99
26	soft	25	r	96
24.5	soft	19	r	51
26.5	good to soft	27	r	97
25.5	good	33	l	97

These data can be used to train a neural network to predict the rating the horse is likely to achieve in today's race based on these four components.

For instance given the inputs: 20f race, good going, 41 days since last run and left-handed course, then network predicted that Tilty would record a rating of 90.

This process of training the network than applying it to today's race conditions would be followed for each runner in the race to generate a set of ratings that could be used to rank the runners. Naturally more complex models can be generated. A further advantage with this method is that ver little data pre-processing is required.

However analysing the structure of the network can also be informative. In this case if we keep the race distance, days since last run, and course direction fixed at 25f, 20 and *right* but allow the going to vary we get the following results:

<i>Prevailing going</i>	<i>Predicted Rating</i>
good to firm	109
good	98
good to soft	85
soft	71
heavy	58

Clearly from this analysis Tilty is better suited by fast going than soft.

Interestingly changing the course direction to left-handed reduced the output by about 3lbs, in this case, but changing the days since last run input made no significance difference to the outputs.

Although this method appears to work well, the small training sets are a worry. Consequently, I am currently investigating alternative network structures which may help.

For instance using a knowledge-based neural network which

incorporates a fixed architecture that represents an amount of existing knowledge. In other words the network has some initial knowledge, as opposed to starting from a random position.

Also I am testing pre-trained networks as my initial structure. These have been trained on all cases then are allowed a short period of time to adjust for a specific horse.

The human equivalent would be to have a good knowledge of horseracing derived from many years of race analysis then applying this knowledge to certain horses but also allowing a degree of flexibility to accommodate the factors specific to a particular horse.

Consequently this is an ongoing research task so if you have any thoughts please contact me at peter@pjmr.freeseve.co.uk.



Peter May also puts his skills to good use by producing ratings available to SMARTsig members



N.H. SPEED RATINGS

By Peter May

National Hunt ratings supplied daily throughout the season by Email and available to SMARTsig members at a very competitive price.

The computer generated figures are from Raceform Update regular columnist Peter May, who is also the author responsible for the Raceform series Flat Racing for Profit, Jump Racing for Profit and Forecasting Methods for Horseracing. His academic qualifications are based around computer forecasting modelling and his current PhD research is with artificial intelligence techniques at Oxford Brookes University.

The ratings are available by e-mail only and are sent out the day before racing.
Email for more information or requests to;

peter@pjmr.freeseve.co.uk

SMARTsig member Ray Hopper has been using the ratings since the beginning of last year. Check out his in-depth analysis of the ratings, see last issue (612) p. 46

SMARTsig Confidential Complete 1999 magazine index.

January 1999 (Vol 6 no. 01).

Upfront - Punters, Tipsters & Newspapers - All three parties appear to be trapped in a vicious circle where nobody wins. But the newspapers, who allow the advertising in its current form, who hold the key to improving the situation. Has any UK title got the bottle to call a halt to the current downward spiral?

Top Ten Books on Gambling and Speculation - Jacques Black - Following our recent debates on the best gambling books past and present, Jacques reveals his own list. He sets very stringent criteria for them to qualify too, they must promote ideas which have been proven to work and Jacques must have been able to apply these same principles to make money for himself.

All Weather All-Age Handicap Ratings - SMARTsig Report – The artificial intelligence ratings covering the AW period from January 1st to March 31st. Used in conjunction with James Crawford's strategy these have proved extremely profitable last AW winter period, the summer turf season, and is already well in profit this AW season.

The Punter's Revenge - Tony Drapkin & Richard Forsyth - Continuing our serialisation of the popular book. This month we're looking at the professional gambler.

Full Index to SMARTsig Confidential Volume 5 (1998) - Every article, author and subject covered through 1998

End of Year League Positions - Stefan Perry - Last soccer season we showed how mid-term league positions are extremely accurate indicators of where teams will be placed by the season's end. Using a similar principle we show how to select certain conditions, where the qualifying away wins bring a success rate in excess of 50%!

Misleading Advertising? ... We can all do that! - Bryan Shreeve - A professional tipster with plenty to say on the subject of the way many of his counterparts advertise their wares, and of newspapers who profess to 'police' the situation in order to safeguard the interests of their readers.

Simple Systems, Newspaper Tipsters & Ernie - Jim Streek - Jim reveals a very quick and simple selection method that he was told about the day after it had given a 50/1 winner. Since that time, a random daily check highlighted a 100/1 winner! (Update – readers following the method since the publication of this issue found to their delight that the 3rd such selection won a National Hunt bumper race at a very nice 20/1)

K.I.S.S. - SMARTsig Report - 'Keep It Simple Stupid' is a well-worn slogan that has been used in our pages many times. We're now redefining these

same initials to mean 'Keep It Simple – Systems'. From this month forward we will be featuring at least one very simple system each and every month that has shown to be capable of providing winners.

Month, Age & Gender - SMARTsig Report - Likelihood ratios/ratings for National Hunt all-age handicap races covering the January/February period. Cover More With Less - John Norris - More worked examples of reduced guarantee tables, allowing the cost multiple cover bets to be greatly reduced whilst maintaining a the best chance of a return.

Top Jockey Plan Follow-Up - Ted Hanbury - One readers preferred method of selecting the jockeys most likely to be the ones to follow.

February 1999 (Vol 6 no. 02). Sorry SOLD OUT

Putting the Record Straight – Edward Walker – Well, well. Look what reader EW spotted that had been missed by 10,000 others before him. (at least, anyone who did spot it has kept quiet)

Commercial Horse-to-Follow Lists - Terry Collins - The performance of three widely available HTF lists for this season's NH racing are checked out head-to-head.

SWAPSHOP - SMART member's trading area, books for sale and wanted.

KISS - Simple but effective systems. - This month an all-weather horseracing strategy from Peter Howes utilising a simple formula from each runners previous race. And a plan using information available in Racing & Football Outlook that increases the success rate for highlighting fixed-odds draws.

How Do Pros. Make It Pay? - PJ – This reader is trying to get to grips with the realities of strike rates, losing runs and average prices. How can a successful pro handle the inevitable long losing runs? Reply from Tony Drapkin.

Mathematical Progress? - Anon - Are we as a nation producing a mathematically challenged generation? Hilarious, tongue-in-cheek look how political correctness has influenced maths teaching.

Readers Queries - SMARTsig – A few misconceptions corrected. We provide the statistics on favourites, comparing those who won last time out and those that did not. Also, percentage successes for 1st, 2nd & 3rd favourites for Flat and National Hunt racing in the UK.

Optimal Multiple Bets - Andrew Falkingbridge – Given 8 selections, is it better to bet as singles, trebles, four-folds, or a full cover of everything from singles upwards? Presented here is Andrew's formula allowing you to establish for certain the optimum value multiple bet from any list of selections.

A Model for Successful Soccer Predictions - Alun Parry - One readers step-by-step investigations into how the different factors affect the bottom line when building a soccer selection strategy.

Beating the Wheel - Rex Towers – Ever since the roulette wheel was first spun systemites have been pursuing the illusive dream of "The man who

broke the bank at Monte Carlo". Can a systematic strategy really help to win at the roulette table?

The Punter's Revenge (serialisation) - Drapkin & Forsyth - This month looking at the much promoted (at least by the tipsters) "inside information". Many reading the advertising think it is the only way to go. Hyped it certainly is, but is it a fact of life, or fiction promoted to hook the unwary?

The Sportsbook Performance - Ray Hopper - The all-singing, all-dancing, computer Sportsbook promises a horseracing and sports form book with a ratings service. Our man checks out the performance of the horserace ratings.

Outback - Probably? - Stefan Perry - A basic tutorial for those still struggling with probabilities and chance.

March 1999 (Vol 6 no. 03). Sorry SOLD OUT

Up Front – SMARTsig – Things can go wrong when using a system based upon form figures, as our recent example shows. Plus; Are moves afoot to curb the excesses of tipster advertising? Plus; Officer & Gentleman, after one of our readers cast doubt upon the thoughts of some so called 'professional punters', he's invited out for a days racing by a well known pro. Feedback (Probably?) – Bernard Rasmussen - Discussing the mathematical credentials of last months 'Optimal Multiple bets' article. Further thoughts along the same lines from Seymour and Torsten Lundgren.

Commercial Horse-to-Follow Lists - Terry Collins - Updating the results from three HTF lists for this season's NH racing. Two of the lists are showing comfortable profits and are vying neck and neck for the top spot. The third list are unfortunately some way behind, but history has shown this one fares well at the Cheltenham Festival.

All Weather Review – Jim Crawford – The latest update on the all-age handicap methods we've been following for more than a year now. Jim's convinced that there's just about everything here to make a substantial second income from betting!

Cheltenham Festival (I) – Timefan – Race-by-race statistics from the last eleven years allowing an insight into just where each winner is likely to come from.

Cheltenham festival (II) – Vic Lee – In-depth study of the records of unbeaten horses coming into the Festival week. Not the clear-cut success story you'd perhaps expect.

The Tipster Game – Alan Potts – A behind-the-scenes glimpse of the tipster/customer relationship. Concluding with Alan's rules to follow for those thinking of choosing a tipster, what to look for and what to avoid.

How Good Are Tipsters And Systems? – Alistair Watson – A clever method of evaluating the results of a tipster or system over a short term. Are the recorded profits/losses from the few results to date likely to continue or not?

Beating the Casino – Jo Bloggs – Two proven methods of beating the

casino at blackjack. "If you can't make money using this method, don't ever bother trying to make money gambling again, because you'll lose" says the author.

KISS – Flat Racing Systems – William Hutton – Five proposed simple flat racing systems AND six for National Hunt and/or flat racing.

KISS – Better Than Forecast – Roger Harmer – Almost 5,500 newspaper tipster selections checked in four categories flat(turf), flat(AW), hurdles and chases, as expected a loss was recorded in every category. However, by applying a simple filter the losses were transformed into substantial wins in each and every category.

Queries Answered – SMARTsig – Readers queries answered by interrogating our horseracing computer databases. This month we lay bare at what weights handicap winners come from for flat(AW), flat(turf) and National Hunt racing.

You Can't Back All the Winners – Henk Eilerts – One readers step-by-step ideas to winner finding.

The Sun (Templegate) NAPS – Rod Leeming – Simple selection system based on Templegate's Naps, coupled with a staking plan reaps rich rewards.

April 1999 (Vol 6 no. 04).

Up Front – SMARTsig – Two SMARTsig members from opposite ends of the 'success with betting' scale met up for a day at the races. The self-confessed 'mug punter' recounts ". . . the luckiest day of my life

The Turf Season – Jim Crawford – A definitive set of rules and a worked example for the All-age handicap system that has proved so successful over the past 18 months or so. Also a full bet-by-bet breakdown of the AW selections October – March.

Commercial Horses-To-Follow Lists – Terry Collins – You've seen the pre-season advertisers hype. Now we're nearing the end of the 98/99 NH campaign see how the HTF lists given by Jumping Prospects, One Jump Ahead & Racing Channel fared head-to-head over the season.

Speed Figures, Weight & Class – Tom Whitley – A readers alternative to the traditional speed figure calculations and comparisons. A variation on the excellent work and ideas advocated in The Solidus.

The Solidus Approach – © Davey Towey – Applying common sense and the laws of physics to performances against the clock.

Flat, All-Age Handicap (Turf) Ratings – SMARTsig – Artificial intelligence enhanced ratings based upon a horses age, sex, last three form figures and the time of year. Ratings tables here for April.

KISS – Unexposed Gold – Paul Montgomery – System for flat and/or NH

KISS – Mistakes Maybe, Deception Never – Nov 98 to Feb 99 results from yet another simple system. From 51 bets the method produced 16 winners, including one at 100/1 and two at 20/1

KISS – Low Weighted Jockeys – Jim Streek – Light weight combined with ability gives winners and placers up to 20/1

KISS – Derby System – Allan Speedie – Since 1950 this plan has provided the winner in 30 of the 49 races.

Improving Returns – Mark Adams – Take one of our systems that is already showing a profit, add the filter of only using the top courses and hey presto! a tax-paid profit of over 50%

The Punter's Revenge (serialisation) - Drapkin & Forsyth – From Chapter 5 of this punters classic, the basics of horseracing.

Using 2-y-o figures to Spot 3-y-o Winners – Timefan – Recapping from this time last year when Timefan first advocated this idea. It did indeed prove profitable, so we publish this years list of system qualifiers.

Templegate and Nick Fox – Various members – Points arising from last month's Templegate system results and the ensuing discussion.

Reference Classes – Peter May – Further explanation for using 'reference classes' for system research and development.

May 1999 (Vol 6 no. 05).

Up Front - SMARTsig - The good old days, before computers?

Neural Networks & Artificial Intelligence - SMARTsig - Beginning a new series and monthly workshop on the use of computer artificial intelligence software. This month homing in on soccer draws and seeing how data presentation can help improve a neural net.

Member's Saver! - Save the best part of £50 on state-of-the-art NNet software from Ward Systems.

The Solidus Update - Mick Johnson - The famous book is now available once more AND the PC software package that used the Solidus principles is available for free.

Tipsters, Some Personal Experiences - Robin Logan - From premium rate lines through to the big boys Robin has sampled many of them. He tells it how it is.

Commercial Horses-To-Follow Lists - Terry Collins - Final results from the National Hunt season from these three well known lists. The best (and worst) revealed.

Flat (turf) All-Age Handicap Ratings - SMARTsig - Our artificial intelligence generated ratings for the month of May.

A Modern Parable - Mike Gittos - Making money from betting takes a fair bit more than just backing good winners. Two punters here have the very same bets but with wildly different results.

Strategic Punting - Timefan - Making use of multiple systems, or a portfolio of methods, simultaneously for best effect.

Draw Bias Ratings - SMARTsig - The effects of the draw expressed as numeric multipliers at various going declaration, over all distances. This month figures for Ascot and Bath.

KISS - Top Weight System - Bob Holman - Simple to use system aimed at all-aged handicaps.

KISS - Following Top Jockeys - Tony Symonds - The second of this month's two easy to operate systems based around the top jockeys.

The Punter's Revenge - Drapkin & Forsyth - Serialisation part 9 of the punter's classic covering handicaps, non-handicaps and trainer statistics.

Natural Selectivity - John Gregory - There's no such thing as a system to ensure success with the ladies or the horses argues John. But there are golden rules to follow to maximise your chances!

Book Review, The Inside Track (Alan Potts) - Brian Harfoot - An independent review of the pro gambler's latest book.

Interpreting Ratings - Peter May - Peter discusses the options for making the best use of ratings and assesses analysis methods to back up the theories.

June 1999 (Vol 6 no. 06).

Up Front - SMARTsig – Staking plans or false promises? What they are capable of doing, and what many expect them to do can often be worlds apart.

Towards a Better Form Source - Jaygee - Laying the foundations for the ultimate in racecards, past form and statistics.

Implied Win Probabilities - Steve Tilley - Ratings on their own show nothing more than a best or an average performance, and a horse will rarely run exactly to its rating. A technique here to help assess variations likely from the 'norm' then to make comparisons, arriving at a horse's implied win chance.

Draw Bias Ratings - SMARTsig - The effects of the draw expressed as numeric multipliers at various going declaration, over all distances. This month figures for Ayr and Beverley.

The Draw, A Tale of Two Halves - Alan Potts – There's really no substitute for first-hand knowledge of a racecourse. Alan describes how the Newmarket July course displays a draw bias apparently missed by the main sports papers.

Wheel of Fortune? - John Purcell - A roulette method suggested a few issues back is put under the microscope using real roulette spin records from Baden-Baden casino. Does the method still stand up?

KISS(1) Group 1 Quickie - Mike Dove - Simple rule to decide whether to bet or not, then selection pinpointed in less than 30 seconds for all English, Irish and French Group 1 races.

KISS(2) Shorter Opening Shows - John Purcell - Profits from comparing opening shows with the betting forecast?

Flat (turf) All-Age Handicap Ratings - SMARTsig - Our artificial intelligence generated ratings for the month of June.

Course Conformation & Standard Times - Timefan - 'Standardising' standard times to MPH and applying this information to consider course

characteristics.

All-Age Handicap Bootstrapping - Alistair Watson - Alistair's method of assessing just how robust is a sequence of bets, applied to the all-age handicap results.

Neural Networks & Artificial Intelligence - SMARTsig – Second of our new series on the use of computer artificial intelligence software. Comparing the merits of Ward System's 'Classifier' and 'Predictor' as applied to soccer spread betting superiorities.

Member's Saver! - Still on! Save the best part of £50 on state-of-the-art NNet software from Ward Systems.

The Punter's Revenge - Drapkin & Forsyth - Serialisation part 10 of the punter's classic. Measuring ability and private handicap ratings..

Neural Network Tips & Techniques - Peter May - Proven modelling techniques from someone who builds them.

KISS Feedback - Harry Bevan - A critical look at one of the ideas put forward last issue.

KISS(3) Two Year Olds Summer System - Glyn Amos - Following juveniles over the summer months, strike rates of up to 64% have been seen in recent years.

KISS(4) Back to the Right Class - Ian Rutherford - Very simple method of spotting potential winners when changing class.

July 1999 (Vol 6 no. 07).

Up Front - SMARTsig - Winning Line Haute Couture & Bootstrapping.

The Ultimate Bookmaker Directory - Collaboration of members – Punter friendly listing of low-tax, no-tax and concession bookmakers. On-shore, off-shore, telephone & internet.

AI All-Age Handicap Ratings for July - SMARTsig - Artificial intelligence smoothed ratings for July.

Towards a Better Form Source (II) - Jaygee - Second instalment of building the ultimate in racecards, past form and statistics.

Each-Way Misconceptions - Erasmus - Win & place betting is not quite as clear-cut as many would think. Erasmus illustrates occasions where each-way betting is prudent.

The Punter's Revenge - Drapkin & Forsyth - Serialisation part 11 of the punter's classic. Recent form and factors affecting a racehorse's performance.

KISS #1 So Simple Soccer System - Allan Speedie - Here's an extremely simple system for the fixed-odds coupon that has gleaned after-tax profits for the past four seasons.

KISS #2 Simplified Horse Race Match Betting - Ted Hanbury - Using published ratings from Raceform to gain a substantial edge in horserace spread betting.

Staking Strategies - Bob, Edinburgh - Level stakes punters are lazy punters

argues Bob. Varying stakes is the only intelligent way to make profits from betting.

Looking Back at Cheltenham - Vic Lee - Further conclusions now the dust has settled at the National Hunt festival.

Level the Devil? - Tom Lee - Warning from another quarter on the inherent dangers facing level stake punters.

Draw Bias Ratings - SMARTsig - The effects of the draw expressed as numeric multipliers at various going declaration, over all distances. This month figures for Brighton and Carlisle.

Tony Symond's Top Jockey KISS - Brian Conlon - Further research on the winning system published in our May issue, then criticised in the June magazine.

Henk's Top Jockey Plan Update - Ted Hanbury - This plan we first published in issue 2.07 (July 1995) and it still creates an interest (and profits). To quote the author "Most readers, using no more than a little common sense, will easily be able to make good use of the formula"

Musing From the SMARTsig E-mail Group - Various members - The e-mail group discuss the merits/problems of backing more than one horse in a race or 'saver' bets.

August 1999 (Vol 6 no. 08).

Win Your Target, Then Stop? - Email group - Is target betting, or stop-at-a-winner tactics over a season the way to improve your bottom line?

Draw Bias Ratings - SMARTsig - The effects of the draw expressed as numeric multipliers at various going declaration, over all distances. This month figures for Catterick and Chepstow.

Bucking The Trend - Tony Hazzard - Increasing the stakes on your higher priced selections rather than decreasing them seems to go against what naturally 'feels' right. Tony checks the theory out on some real-life results and is pleasantly surprised.

Football Info Overload - Doug Bryson - A look at what Bill Hunter's weekly Emailed soccer service has to offer the fixed-odds player. He proves the worth of a Derek McGovern system and shows how a system we published in our July issue can be dramatically improved by better use of information.

How Thirteen Spin Doctors Beat The Wheel - John Lucas - John's appetite is whetted by an old but profitable casino system during this book review.

Neural Networks - SMARTsig - Constructing and using NNets for horserace prediction. How well can they perform when targeting specific track and distance combinations. We get a 20% profit from Wolv. 6f races.

Further Symonds' Speculation - Harry Bevan - Our on-going saga of the Symonds Top Jockey system where Harry cast more doubts.

Top Jocks Kiss - Tony Symonds - This flat season, to mid July, he's reporting 29 winners from 50 selections at average odds of 7/4 and news of a full end-of-season update.

No Magic Staking Plans! - Steve Tilley - Steve sets out to prove mathematically, once and for all, that no automated staking plan can turn a level stake losing system into a winner over the long term.

KISS #1 NoConSequence Selection System - John Norris - Never mind sequences, this method opts to follow 'non-sequences' for fixed-odds football.

KISS #2 Error Correction Six - John Norris - An alternative way to cover the results of six football games.

KISS #3 Goal Grader - John Norris - Rate soccer games for yourself using the published league tables.

AI All-Age Handicap Ratings for August - SMARTsig - Artificial intelligence smoothed ratings for August.

Ready To Scoop? - Email Group - The Tote's new 'win-big' bet is the Scopp 6. What does our Email discussion group make of it?

Towards a Better Form Source (III) - Jaygee - Third and final instalment of building the ultimate in racecards, past form and statistics.

The Punter's Revenge XII - Drapkin & Forsyth - Part 12 of the punter's classic. More factors affecting a racehorse's performance and a summary of all the points to look for when winner finding.

September 1999 (Vol 6 no. 09).

Upfront - SMARTsig - Member confidentiality and mailing lists.

Maximising Returns - Email Group - 'Kelly' staking may well be the optimal method of enhancing betting profits, but is it perhaps far better suited to casino card games? Our Email group concludes it is a technique totally unsuited to horserace and sports betting, exposing the player to far too much risk.

Handicaps and Ability Peter Brown Queries answered concerning handicap classifications and defining a horse's ability to race.

The Punter's Revenge XIII - Drapkin & Forsyth - Part 13 of the punter's classic examines the role the computer has to play in predicting results and improving profits.

All Weather Débutantes - Email Group - A question regarding just how well AW first-timers fared prompted some very informative statistics.

Teletext KISS - Roger Goodman - Easy to operate armchair bettor's system with a claimed strike rate of 70% plus!

Theta Resampling v1.3 (Software Review) - Rod Leeming - A computer programs that uses complex modern statistical techniques to test the longer term validity of a sample of results. Tipsters, systems, horserace software result sequences can all be analysed to see if they are long term winners or simply a 'flash-in-the-pan'.

More Top Jockey KISS - Harry Bevan - The saga of Tony Symonds' simple system continues . . .

Neural Networks in Practice - SMARTsig - Continuing the look at

Wolverhampton's 6 furlong races from last month. Simplifying the network architecture has a beneficial effect on the bottom line. 89 level stake bets producing over 59 points profit.

Trusty Trainers? - Terry Collins - Just how revealing are trainer interviews we see so regularly in the sporting press? This analysis sets out to mathematically measure how useful they are to the punter

Predicting and Beating Starting Prices - Alan Potts - Even money shots win around 50% of the time, so if you can get better odds than SP you're well on the way to a profit. Here's how one pro punter sets about the task.

Raceline (Software Review) - Timefan - From the stable of tipster Russell Clarke comes a computer package giving race-by-race analysis on a daily basis. Our man takes a closer look.

Staking Strategies II - Bob, Edinburgh - Why obtaining value is the punter's ultimate weapon in his struggle for a profit.

Value Of a Kind - Micawber - Look not to individual results, but to the overall picture. The successful gambler has to learn to accept losers as part of the game, but to keep his eye on value and a simplistic approach.

October 1999 (Vol 6 no. 10).

AW 10th Birthday Special

Upfront - SMARTsig – Sympathy for the bookmaker.

AW#1 All Weather Racing Tactics - Jim Crawford - We've reported on Jim's progress over the past couple of years and seeing how he makes good profits following a strict regime over the winter AW racing season.

SWAP SHOP - Racing books for sale & wanted.

Simple Simon and Complicated Kevin - Davey Towey - The author of the groundbreaking Solidus book discusses mixing the elements of complex and simple approaches to best effect in this first part of a new series.

AW#2 All Weather Standard Times - Alan Potts - Pro punter Alan has been seriously betting the AW for 5 years. Here he reveals his latest standard times for the AW circuit on which he bases his speed figures.

KISS#1 Simply Profitable - Jim Streek - One of our 'simple is best' stalwarts gives us another couple of easy to operate systems that appear to do the business.

KISS#2 Racing Post Ratings - Alan Rogers - An analysis of several hundred Postmark, Topspeed and Postdata ratings give rise to a simple strategy to keep an eye on.

More Top Jockey KISS - Brian Conlon - Have our detectives uncovered the secrets behind the system revealed earlier this year?

AW#3 AW All-Age Handicap Method - SMARTsig - Step-by-step guide of how to make the very best use of the SMARTsig artificial intelligence AW ratings.

AW#4 AW AI All-Age Handicap Ratings - SMARTsig - Reprint of the full AW ratings for use from now until the end of December.

AW#5 AI Draw Bias Ratings for All 3 AW Tracks - SMARTsig - Every draw position, for every distance, for all 3 AW courses.

The Punter's Revenge Serialisation XIV - Drapkin & Forsyth - Moving onto chapter 8 and football forecasting.

Low Tax, No Tax & Concession Bookmaker Directory - SMARTsig - All the contact numbers and web addresses brought bang up-to-date.

Bookmaker Customer Feedback - SMARTsig E-Mail Group - Establishing a tax-free bookie account is all too simple now, but will they accept the level of betting as do their onshore tax charging counterparts? Real life stories from our members.

Soft to Firm (ish) - SMARTsig E-mail Group - Methods and madness over the officially declared course "going".

AW#6 In Defence of All-Weather Racing - Richard Davenport - A supporter of flat racing's poor relation spells out the attractions of the sport.

National Hunt AI Ratings - SMARTsig - Month by month, artificial intelligence ratings based upon last 3 runs, age & gender for Chase and hurdle all-age handicap races over October.

Back With A Vengeance - Vic Lee - We're always wary of the selection who has been a long time away from competitive racing. Vic spots some big priced winners though who come back following an extended absence.

November 1999 (Vol 6 no. 11).

Upfront - SMARTsig – When Confusion Reigns – Begin with a simple method, add a few filters here and there along the way and then look back and try to establish the definitive rules. Suddenly everyone is coming up with a different selection!

Jim Crawford AW System, definitive - SMARTsig – So much confusion over how to operate the system, not helped by our less than full explanation last month. So, triple-checked for this final translation of the ultimate how-to-do-it guide.

TV Program Makers Request for Help – A request from the producers of two forthcoming TV documentaries (BBC2 & Grampian/ITN) for help/ideas/stories from anyone involved in the world of betting.

Just One of Those Days? – Davey Towey – Were we watching the same race! Ever checked out the shorthand race report of a race you've watched and been puzzled as to how we can differ so much in individual interpretations of the same event?

Milking the Market – Bob, Edinburgh – Bob suggests, with the aid of charts and race statistics, that in order to improve your profits you do not necessarily need to alter your selection strategy.

Neural Networks with Soccer Correct Scores – SMARTsig – First part of a series where we attempt to gain an edge in predicting football correct scores using the latest in artificial machine intelligence.

SWAP-SHOP – SMARTsig members only sales, wants & swaps.

KISS#1 Merrie Maidens – Geoff Arnett – Quick & easy selection process from maiden races.

KISS#2 Good Run Last Time, Running Again Quickly – Martin Kilgariff – The bare bones of a method that has been around as long as anyone can remember. It keeps cropping up though, so it must have some merit, mustn't it? Martin blasts the idea and variations of the same theme through his database of the last nine years and displays the real truth of the matter.

Bookmaker Update – Various – Further issues covered as a result of last months bookmaker stories.

A Phoenix From the Flames? – Tony Symonds – From the ashes of one system a new one is born. Will it be a worthwhile following next season?

The Punter's Revenge Serialisation XV - Drapkin & Forsyth - Chapter 8 continues the football forecasting theme. Detailing a soccer team rating method adapted from a technique for the rating of chess players.

FRANTastic – SMARTsig – Drapkin & Forsyth's FRAN rating method from our book serialisation has not been forgotten. A close adaptation of it continues to flourish and is updated weekly by Bill Hunter's Football Yearbook software and his WEOSS service.

Feedback from Last Issue – Various – Following on from Vic Lee's observations reported last month of NH winners after very long lay-offs, we get pointers as to what type of trainers can achieve this feat – and those who can't!

Staking Plans are Not Magical Cure-Alls – Erasmus – The title here says it all! A quick look at Kelly staking and some recommended reading.

National Hunt AI Ratings - SMARTsig - Month by month, artificial intelligence ratings based upon last 3 runs, age & gender for Chase and hurdle all-age handicap races for November.

December 1999 (Vol 6 no. 12).

Upfront - SMARTsig – On-form, off-form, or merely statistics? – Would the fact that a stable was bang in form influence your betting? That's fine, so long as you're sure of your interpretation of 'on-form' is sound.

Top Weights and Top Jockeys - Brian Conlon – It all began with a simple letter in our KISS section earlier this year, then in true SMARTsig tradition others started to dig a little deeper.

The Punter's Revenge Serialisation XVI - Drapkin & Forsyth – More from chapter 8, with further investigations into a variety of ideas for football team ratings and testing their effectiveness.

You'll Lose Out if You Don't Go Nap on Value – John Lucas – The Consumers Association have built a long-standing reputation for helping

customers to make better informed choices. John reviews a book from the "Which?" stable on how to make the best of your betting.

The Weighting Game, A weighty question – Bob, Edinburgh – There are some racing 'experts' who would have us believe that the weight carried by a horse has little significant effect. Not proven says Bob, who pinpoints the shortcomings in the arguments for such theories.

Comparing Four Punters – Steve Tilley – Can a single strategy be found to improve the profitability of some SMARTsig members who had volunteered a recent list of real-life bets?

Dies, Lamb Dies, and Sheep Dips – Davey Towey – Further thoughts on the effectiveness of post-race analysis from the author of The Solidus.

Rugby Handicaps – Email Group – It would appear that either rugby is too difficult a medium to predict accurately, or the bookmakers are so poor at the task that they can comfortably offer 14/1 against their handicap being correct.

An Exercise in Results Analysis – Ray Hopper – No matter whether you produce ratings for yourself or use those produced by a third party, analysing the results they produce is an essential part of making them 'work' better for you.

Horserace Computer Programs – John Williams – A mini-overview of some of the software packages now available and how they've progressed over recent years.

KISS – Handicap Bottom Weight System – Chris Alty – This simple little idea flies in the face of traditional wisdom and statistics. Higher weights in handicaps win proportionally more races than the lower weights, yet this idea successfully bucks the trend!

Eight Winning Seasons From Eight! – Martin Kilgariff – Martin prepares to demolish the above KISS system by checking over the past eight seasons and is forced to review his initial reaction.

National Hunt AI Ratings - SMARTsig - Month by month, artificial intelligence ratings based upon last 3 runs, age & gender for Chase and hurdle all-age handicap races for December.



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Before computers, investigative work on past performances needed a great deal of patience and stamina, but was often well worth the effort. In the technological world of today such research is equally as valuable, but is performed in a fraction of the time.

HOW IMPORTANT IS THAT LAST FORM FIGURE?

Geoff Arnett

The search for a betting system that can be operated profitably is best started with a look back at past events. The following example below shows how a systematic and logical review of the 1998 Flat season's data has thrown up some interesting factors that may have potential as the basis for a profitable system.

The thought processes that led me to the results were :

1. I was looking for a system with a high strike rate (30% plus) to minimise losing runs and the consequent loss of confidence that can result. The obvious place to start was with SP clear favourites.
2. I decided to analyse only favourites that started at better than even money as I have no desire to back 1/5 shots and the like.
3. I think it is a well-established fact that non-handicaps are more profitable for favourite backers, so I limited my analysis to this subset of races. The results at this stage showed a 7.9% level stake pre-tax loss.
4. I then decided to analyse the runners/races further, breaking them down by three key factors : last form, distance of race and going of race. I kept the categories broad to try to ensure that sample sizes remained large enough to be statistically meaningful. The results can be seen below :

1998 Flat Season – Turf Only – Non Handicaps Only

Clear Favourites > Evens						
	Wins	runners	Strike Rate	Ave SP	Return	Profit
All	363	1124	32.3%	1.852	1035.29	-7.9%
Last Run of Season						
None	59	192	30.7%	1.788	164.48	-14.3%
1	56	177	31.6%	1.726	152.63	-13.8%
2	73	252	29.0%	1.767	201.98	-19.8%
3	51	155	32.9%	1.840	144.86	-6.5%
4	34	105	32.4%	2.019	102.63	-2.3%
Other	90	243	37.0%	1.987	268.81	10.6%
All	363	1124	32.3%	1.852	1035.39	-7.9%
Going						
G/S or Softer	115	423	27.2%	1.859	328.79	-22.3%
Good or Better	248	701	35.4%	1.849	706.60	0.8%
All	363	1124	32.3%	1.852	1035.39	-7.9%
Distance						
6.5f or less	139	452	30.8%	1.839	394.58	-12.7%
more than 6.5f	224	672	33.3%	1.860	640.71	-4.7%
All	363	1124	32.3%	1.852	1035.29	-7.9%

This set of results was very interesting – and more than a little surprising!

While I had expected that the longer distance races may prove a better betting medium than sprints (due to less trouble in running, draw effect, etc) and that better ground would give more profitable returns for favourites, I was not prepared for the “Last Run of Season” figures.

These results seemed to run completely contrary to the thought that the better the last form figure, the better the horse’s chance.

Having considered this last factor more carefully, I would make the following comments :

- a) The sample of 1,124 races seems high enough, given the significant difference in returns, to make the chance of a pure statistical freak very unlikely. (Maybe one of the statisticians amongst us could verify this?)
- b) So, maybe the significance of the last form figure is vastly overestimated by the market as a whole.
- c) And, maybe a horse which did not reach the first four places last

Clear Favourites > Evens	Wins	Runners	Strike Rate	Ave SP	Return	Profit
Last Time Out - 3rd or worse Good Going or Better More than 6.5f	83	198	41.9%	1.889	239.80	21.1%

time out does have to have an outstanding chance on overall form to be made favourite – often leading to a price that represents excellent value.

So the next logical step was as follows :

5. To combine the favourable factors identified above, in the hope of significantly increasing profitability. The results were very promising :

I am all too well aware that this type of analysis is nothing more than “back-fitting” and that other seasons’ results (none of which I have analysed as yet) may well show that 1998 was nothing more than a freak year.

Clear Favourites > Evens						
Last Time Out - 3rd or worse						
Good Going or Better						
More than 6.5f						
	Wins	Runners	Strike Rate	Ave SP	Return	Profit
All	83	198	41.9%	1.889	239.80	21.1%
Month						
Apr/May	16	45	35.6%	1.792	44.68	-0.7%
June	15	27	55.6%	1.882	43.23	60.1%
July	20	46	43.5%	1.974	59.48	29.3%
August	14	38	36.8%	1.934	41.08	8.1%
Sept/Oct	18	42	42.9%	1.853	51.35	22.3%
All	83	198	41.9%	1.889	239.80	21.1%
Age Maximum						
None	39	82	47.6%	1.972	115.90	41.3%
2	19	48	39.6%	1.825	53.68	11.8%
3	22	61	36.1%	1.823	62.10	1.8%
4 or 5	3	7	42.9%	1.708	8.13	16.1%
All	83	198	41.9%	1.889	239.80	21.1%
Type of Race						
Auction	10	25	40.0%	1.833	28.33	13.3%
Claimer	13	28	46.4%	1.971	38.63	37.9%
Seller	9	24	37.5%	2.167	28.50	18.8%
Other	51	121	42.1%	1.830	144.35	19.3%
All	83	198	41.9%	1.889	239.80	21.1%
Type of Runner						
Maiden	38	84	45.2%	1.799	106.35	26.6%
Non-Maiden	45	114	39.5%	1.966	133.45	17.1%
All	83	198	41.9%	1.889	239.80	21.1%

The logo for SMARTsig, featuring the word 'SMARTsig' in a bold, sans-serif font. The 'S' and 'M' are larger and more prominent, with 'A', 'R', 'T', 's', and 'i' following in a smaller size. The 'g' is a simple lowercase letter.

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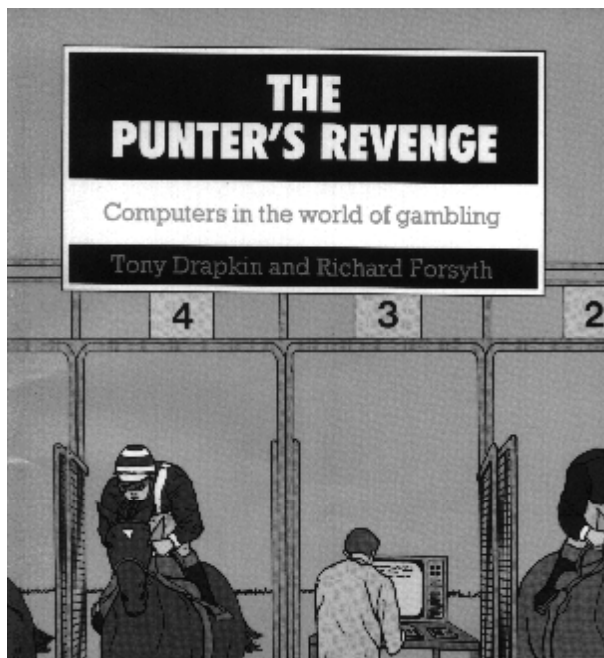
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THE

PUNTER'S REVENGE

(Serialisation part XVII – Chapter 8 & 9)

Tony Drapkin & Richard Forsyth

8.5.4 Joint frequency tables

Since we have distinguished six types of prior result for either side there are $6 \times 6 = 36$ possible combinations. Counting how often each leads to a home, draw and away would be immensely tedious by hand, and error-prone into the bargain. This is exactly the sort of job where the computer comes into its own.

Table 8.10 gives the results of such an analysis on a total of 1,124 games from the 1985-86 season.

There are 36 rows in the full table, but we omit more than half of them - only presenting here the ones that exhibit non-trivial departures from chance expectation.

Table 8.10 joint predecessor frequency table

We have appended H, D or A to each row according to whether the

Last-H	Last-A	Home	Draw	Away	Total	Home %	
HL	HL	12	2	1	15	80.00	H
HL	AL	14	3	5	22	63.64	H
HL	HD	4	4	8	16	25.00	A
HL	AD	1	3	2	6	16.67	D?
HL	HW	9	8	9	26	34.62	A
HL	AW	4	4	2	10	40.00	D?
AL	AW	5	8	14	27	18.52	A
HD	HW	13	5	4	22	59.09	H
AD	HW	24	18	17	59	40.68	D
AD	AW	11	0	3	14	78.57	H
HW	HL	15	4	5	24	62.50	H
HW	AD	7	12	1	20	35.00	D
HW	HW	39	9	15	63	61.90	H
AW	HL	10	15	3	28	35.71	D
AW	HD	21	6	7	34	61.76	H
AW	AD	9	3	2	14	64.29	H
AW	AW	9	5	1	15	60.00	H

excess occurs in the home, draw or away column, with a query mark after the two smallest groups.

We can recast this information in simplified form as follows;

Table 8.11

Last game of H	Last game of A	Increased chance of
HL	HL or AL	= > Home
HD	HW	= > Home
AD	AW	= > Home
HW	HL	= > Home
HW	HW	= > Home
AW	HD	= > Home
AW	AD	= > Home
AW	AW	= > Home
[HL	AD or AW	= > Draw]
AD	HW	= > Draw

HW	AD	= > Draw
AW	HL	= > Draw
HL	HD	= > Away
HL	HW	= > Away
AL	HW	= > Away
AL	AW	= > Away

We have put brackets around the rule based on the two smallest groups.

In case you are doubtful about this format, let us pick an example from the middle section

AW vs HL = > Draw

and interpret it. What it says is that if the latest game of the home side was an away win (AW) and the latest game of the away team was a loss at home (HL) than a draw is indicated.

This particular rule is quite surprising, and since only 28 examples (from 1,124 games) exhibited such a pattern it is best not to place too much faith in it - though it is definitely worth keeping an eye on.

Looking at the immediately previous result of both sides gives us therefore some suggestive, but not conclusive, evidence. However, it is usually considered more informative to examine the last or last few home games of the home team, and the last or last few away games of the away team, to establish recent home and away form, which so far we have not done (Tables 8.12 and 8.13).

Table 8.12 Last home of home team

Table 8.13 Last away of away side

Last home	Home	Draw	Away	Total	(Home %)
Lost by 2 or more	45	25	32	102	44.12
Lost by 1 goal	66	40	45	151	43.71
Drew	119	55	61	235	50.64
Won by 1 or 2	190	83	93	366	51.91
Won by 3 or more	81	34	22	137	59.12

Even with a computer, you would be hard put to find a sample big enough to analyse meaningfully - although joint two-game outcome sequences (with 81 cells in the table) would be just about feasible.

You must also beware of a hidden problem. Our analyses of short sequences were based on all games available in our database. But if you rely on newspaper information, you may be ignoring midweek matches. The last game for the newspaper compiler will probably have taken place six or seven days before the Saturday of the match to be forecast.

In the meantime, however, one or both teams may have been engaged in mid-week games perhaps with quite different results. For example, in the game quoted in Section 8.5.3, West Ham's latest result was listed as an away win but in the interval between publication of the form and the match itself, they suffered an away defeat.

So if you choose to use sequences, your data must be kept bang up to date. Otherwise predictions based on sequences will be practically worthless. In fact, the volatility of such information virtually forces you to keep computerised records.

Nevertheless, before we leave the area of very recent form, we will consider one more way of using the last two games played by each side.

If we adopt the points scoring scheme

AW	= 6
HW	= 5
AD	= 4
HD	= 3
AL	= 2
HL	= 1

we can add up the last two values obtained by the home team (e.g. $HD + AL = 3 + 2 = 5$) and do the same for the away team (e.g. $AW + HD = 6 + 3 = 9$).

We call these totals HLASTTWO and ALASTTWO.

By subtracting one from the other (HLASTTWO - ALASTTWO) you get a useful predictor of home wins, as shown by Table 8.14.

Table 8.14 Subtracting ALASTTWO from HLASTTWO

The row with the highest proportion of draws is row 2, with 28.24%, but this is not statistically significant.

Difference	Home	Draw	Away	Total	(Home%)
-4 or less	77	53	71	201	38.31
-3 to -2	93	61	62	216	43.06
-1 to 0	156	61	70	287	54.36
+1 to +2	132	60	62	254	51.97
+2 or more	158	69	56	283	55.83

Chapter 9 Putting the BOOT in

This section of the book deals primarily with the compilation of a computer program (BOOT), implementing all the main points discussed in the preceding chapter. The BASIC listing, for a BBC micro, unfortunately has little relevance in a computer world which has taken giant technological leaps over recent years. Many of the points raised though are still valid and extracts are printed here to help to complete the soccer prediction picture. - Ed.

We are now in a position to gather some of the fruits of our research. We have found a number of isolated clues to team performance, but we must now attempt to tie them together into a coherent forecasting strategy.

None of the form pointers we have identified is adequate on its own, but several weak effects together may well be enough to tilt the balance of probabilities in our favour.

9.1 No place like home

We have concentrated so far on the problem of predicting home wins. Although home forecasts generally yield short odds, you can still sometimes find value-for-money bets on the fixed-odds coupon if you look carefully. Also predicting away wins and draws is a more ambitious task than picking home winners.

However, the realities of fixed-odds betting force us to shift our attention, mainly due to the fact that bets on home wins are only accepted five at a time. Except for cup games, you can only bet on fivefold accumulators and upwards. This drastically reduces the attractiveness of home-win bets, necessitating a change of tactics.

What we want is a collection of rules that will enable us to pick out value-for-money bets on football games: this is not quite the same thing as a general-purpose football forecasting program, as will become clear later.

9.2 A football program

We present here the BOOT program whose name stands either for Bets Often On Target (if you are an optimist) or Beware Of Obvious Traps (if you are pessimistically inclined). It is not an all-singing, all-dancing football forecasting system. On the contrary, it attempts to locate its own narrow but comfortable niche in the betting market. Its aim is to find matches where the bookmakers may have slipped up. They are pretty shrewd when it comes to setting the odds, but nobody is perfect, and they have to get their coupons printed on Monday for the following Saturday; whereas the punter can wait to take into account the midweek results right up to Thursday night.

BOOT's method was prompted by the observation that draws are not only elusive but also, in a sense, rather obstinate creatures. If you look at the forecasts of any tipster or system, you will very probably notice what we call a 'seesaw' effect in operation.

9.2.1 Riding the seesaw

The 'seesaw effect' refers to the fact that, in any forecasting system for soccer games, you can push down the expected probability of a home win and thereby raise the probability of an away.

Or you can do the opposite.

But, try as you will, the proportion of draws remains stubbornly fixed between 20% and 30% - like a fulcrum on which the other two categories are balanced. So-called 'banker' homes are almost as likely to result in draws as 'banker' aways, and, if anything, somewhat more likely than 'banker' draws.

"It is a fallacy to suppose that draws are especially frequent between evenly matched teams - or even between teams where the side playing away is slightly, but not too much, stronger."

Actually the whole football-pool industry is founded on the premiss that there really is no such thing as a banker draw; and nothing we have found so far leads us to dispute this proposition. It is a fallacy to suppose that draws are especially frequent between evenly matched teams - or even between teams where the side playing away is slightly, but not too much, stronger.

The difference is not enough to rely on. This is the bane of all attempts at scientific football-pool betting, but to the fixed-odds punter it can be a godsend. For the majority of punters tend to assume that 'certain' home wins are more likely than they really are. The bookies respond to this assumption by shortening the odds against home wins and therefore lengthening them somewhat on aways and draws.

In fact an analysis over a ten-week period of games where Mecca bookmakers were offering odds of 14/5 or better (i.e. at least 2.8 to 1) against the draw threw up 62 games, mainly banker homes with a couple of banker away wins.

Of these 36 (58%) resulted in home wins; 8 (13%) were away wins, and no less than 18 (29%) were draws.

That means that simply backing the games on the Mecca coupon with 14-5 odds or more against the draw would have been a viable betting plan over this period, though we suspect that this will prove a temporary aberration. (Readers are invited to check the stability of this phenomenon with their own favourite bookmaking company over a longer period.)

The central notion of BOOT is to make use of this finding and look for signs and symptoms which will enable us to tell genuine home bankers from not-so-genuine ones by examining very recent form.

Only games with odds against the draw of 11/4 or better are considered by the program. These matches, obviously, are deficient in draws; but not so deficient as perhaps the bookmakers might wish - due to the seesaw effect.

In fact the proportion in a sample of over 175 such games was only a shade under 25%. Our objective is to raise it above 30% at which point the bet becomes a fair one, even after tax.

We are thus trying to find an objective basis for extracting a subgroup of games in which draws, while still not numerous, are relatively frequent. These are cases where a powerful home team (or occasionally a very strong away team) slips up against unfancied opposition and has to settle for a draw.

How often have you read the sports-page banner headline,

where Zobo Town are the team currently languishing near the foot of



**LEAGUE LEADERS STUMBLE
AGAINST LOWLY ZOBO TOWN**

the table? It happens practically every other week.

Never mind that they hit the woodwork six times in the last fifteen minutes, were 'robbed' of a penalty just before half-time by a referee

who needs contact lenses if not a complete brain transplant, and let in a 'soft' own-goal to produce a shock 1-1 scoreline.

Forget the excuses!

“Like poker . . . anyone can win with a flashy hand of four aces or a straight flush; but the good players can make money with dull ordinary hands like three sevens or a pair”.

Once the final whistle has blown, the result is decided. This is one of the glories of football.

It also provides a potential source of income for the stout-hearted backer.

But betting in this fashion can be disconcerting. You will usually be betting on results that you know full well are unlikely to happen.

The danger is that you will ignore value-for-money bets because you fancy the more obvious outcome, If

you do not like this situation you are better off sticking to horserace betting; there is plenty of information on that subject in Chapters 6 and 7.

It is rather like poker (see Chapter 11). Anyone can win with a flashy hand of four aces or a straight flush; but the good players can make money with the dull and ordinary hands like three sevens or a pair of queens.

In footballing terms, anybody can predict the result of Liverpool versus the Slagthorpe Colliery Brass Band reserves. The trick is to get run-of-the-mill games right a little more often than the bookies would expect.

But it will not make you rich. In fact, if you trouble to work out your hourly rate of pay over the season as whole, you will probably find you are earning below the statutory minimum wage!

(Incidentally, if Liverpool are playing the Slagthorpe Colliery Brass

Band B-team, it must be a charity match, and such games have a habit of ending up with charitable scorelines like 6-6. So if anyone is offering odds against the draw ...)

9.2.3 Betting decisions

In theory it should be possible to make a modest level-stake profit by following all a computer's or a system's recommended bets.

But in practice you cannot do this, because the betting shop will insist that you bet on trebles (three matches at a time) and upwards.

Also covering a large number of trebles, as many as 15 games in one week, is prohibitively expensive; so you may be forced to look for a way of whittling down the computer's suggestions to a smaller number - i.e. getting rid of the chaff without, if possible, discarding the wheat. We make no bones about leaving this job up to the user, It is here that you can take account of knowledge unavailable to the computer.

On other weeks it may make too few forecasts, as few as 5 for example. There is not much hope of getting 3 from 5, so you may choose to skip such weeks, even though you lose one or two 'winning' bets. Alternatively you may include additional games for other reasons; but this will probably reduce your expected long-term gains.

Incidentally, when the bookmakers offer really good odds, of 2/1 or greater against a home win, the match really is an away banker. You can use this fact in your favour if you ever try the 4-aways pool on Littlewoods. In this way you are employing one gambling firm against another, which is always gratifying.



More from the Punter's Revenge when we continue next issue with more from Chapter 9

Investigating the various staking options used in last month's articles, and their effect upon the bottom line. Our value champion digs that little bit deeper to find his conclusions.

PREMIUM STAKING

Bob, Edinburgh

Martin Kilgariff's analysis of the 4-day plan in Issue 6.11 was thought provoking, particularly as it concerned the use of stakes. Also Steve Tilley's article in issue 6.12 seemed to fit in nicely with these thoughts.

Hitherto I had always thought that the 4-day plan had lots of winners at short prices but Martin's data showed that I was well off the mark.

Despite my misconceptions about the plan I have had a closer look at Martin's findings and it seems that they can be used to flesh out theoretical points that I have been making about the use of premium staking for value.

These are my interpretations of Martin's figures.

Four-day plan 1991-99

First, the bad years

- Altogether there were 3 losing years out of the 9, viz 1991, 1993 and 1995 and all 3 years were within the group with the 4 lowest strike rates. In 1991 the win rate was only 14.86% and short run backers went bust. These were particularly hard years for fingernail-biting punters.
- 1994 was an odd year with a low strike rate of 17.92% and yet a profit of £2212 to a £100 level stake. Evidently a year with at least a couple of higher than average priced winners. The kind of bets that backers reject simply because they look high priced no-hopers.

“The key feature of the good years is the superior strike rates obtained. The better the strike rate, the greater the profit.”

- In the first 5 years of the plan the total level stakes bet were £95,600 with total returns of £90,224 for a 5 year total loss of £5,376.

The key question arising from the bad years is why anyone would persist with the plan not knowing of the good years to come.

This surely would require a degree of confidence verging on the super-human.

Next, the good years

- Altogether there were 6 winning years out of the 9. In the later years from 1996 to 1999 strike rates were much higher than the earlier years and the profit for the 4 years was £25,271.
- 1999 was a peak with 25.46% winners and a handsome 63.55% profit was obtained. Martin described it as a vintage year with a huge profit of £13,626. Since the profit of the whole 9 years amounted to £19,895, 1991 alone accounted for some 68% of the total.

The key feature of the good years is the superior strike rates obtained. The better the strike rate, the greater the profit.

Overall look at the results

- The strike rate fluctuated wildly between 14.86% in 1991 and 25.46 in 1999. This raises the spectre of bank-busting losing runs. The plan is most certainly a high risk plan.
- Even at its best, the low strike rate falls below the 27% achievable by simply picking a press tipster, almost any tipster, and following him. Therefore with strategies with superior strike rates available it is difficult to see why this plan would be preferred.

- The plan is profitable overall and this must mean that prices obtained must have been sufficient to compensate for the low strike rate of 1 winner in 5.
Yet recent fitness is a well known and popular selection trait and one would suppose that the average (mean) price of selections would have been fairly low.
If so, then the profitability of the plan must have depended to a great extent on the availability of high priced winners.
- A plan with high priced winners carries with it the absolute necessity of adhering to the system.
Systems with high strike rates and low prices are considerably more flexible and open to adaptation than are plans with poor strike rates and high prices.
Therefore it seems likely that this system does not offer the best possibilities for value seekers.

Proportional staking of the 4-day plan

Martin also provided the figures for the 4-day plan with 1999 staked with varying stakes, i.e. to win a given sum which I presumed must be £100.

The Pret% amounted to 135.27 compared with a Lret% of 163.55 and the results seem to confirm my view of the prime policy for bettors, i.e. the policy of seeking value.

Always bet your mostest when the value is the mostest.

- recap of the basics. Value comes from two sources. Either from higher prices with strike rate unchanged. Or from improved strike rates with a stable minimum price in mind. Most punters seek to do both.

With the 4-day plan, value seekers are faced with a system with an unreliable selection method and a highly variable strike rate.

Martin shows that when stakes are increased on the lower priced horses and reduced on the higher priced animals (as required by

proportional staking) then the plan's level stake profitability is severely dented. Thus it appears to depend heavily on its higher priced winners for its profitability.

The contribution made by the lower priced winners is of lesser value, if indeed they are of any value at all.

This is hardly surprising. What is surprising is the resistance to the idea that stakes ought to be increased on the higher priced horses and cut back severely (or indeed, eliminated entirely) on the lower priced.

It would be interesting if Martin was kind enough to re-run the plan through his machine and staked the system according to value. Obviously there is nothing he can do about the strike rate as that is fixed. However, let's say that all bets between 5/1 and 20/1 are value bets and carry a premium of one additional point per bet.

This plan offers a fair example of the kind of system I had in mind when I argued that a system of raising stakes on the best value bets could turn a losing system into a winning one. Therefore please note that if Martin is able to carry out this additional work and it does not produce a marked improvement in results, I am prepared to eat my hat.

Steve Tilley's four punters

In issue 6.12 Steve Tilley provides a further example which might be modified to show the benefit of staking for value. I was intrigued by his comparison of the betting patterns of four punters (issue 6.12) and amused that he was depressed to find that Punter A operated successful in the area which I had suggested might be the optimum.

However after evaluating each of the four punters, Steve felt unable to discern a rule which would benefit them all and would allow them to increase their percentage profit.

Without information on strike rates it is difficult to be certain but I believe that Steve may be mistaken. On the basis of the figures he provides all four punters appear well able to improve their total

profitability by placing an additional premium stake on the bets they make at prices longer than 9/2.

The key to this of course is to look at the total profits obtained rather than simply consider rates of profitability by each category. If you calculate the profit or loss for each category it is possible to obtain the total profit for each of the four punters when the prices obtained are 9/2 or longer.

For example, for prices of 9/2 and longer punter B won 0.24 times 21 plus 1.20 times 5 minus 1 times 1.00. In total this amounted to a profit of 10.04 for the 27 bets. Now if all such bets contained a premium of 1 point per bet we have an additional 10.04 to be added to the overall profit of 55% for punter B.

The figures for each of the four punters are as follows.

	A	B	C	D
Number of bets 9/2 or longer	36	27	228	151
Total number of bets	154	92	281	152
Proportion of bets in the higher price ranges	23%	29%	81%	99%
Additional points available	21.5	10.04	84.81	89.35
Original rate of return on total bets	13%	55%	42%	58%
Therefore original total profits in points	20.02	50.6	118.02	88.16
Total profits after available additions	41.52	60.64	202.83	177.51
Total stakes to include premium stakes	190	119	509	303
Revised rates of return	22%	51%	40%	59%

There are lessons here for us all and Steve's groundwork has been most illuminating.

C and D have evidently nothing to learn from this exercise. They already know more than I'll ever know and clearly understand the significance of betting at value price levels.

Furthermore, given the volume of their betting in the higher price ranges it is also clear that the additional points discussed are not available to them since their selection/staking strategy is already at an optimal level.

Punter B is evidently another shrewdie. Steve thought that he ought not to bet at longer than 11/2. I doubt that this is true.

With the distribution of his bets at the various price levels, he gives the appearance of a bettor with strong selection skills. Let the market price his horses as it will, his strike rate will assure him of future winners at all price levels and additional points are certainly available from a premium staking policy.

Personally, I thought that he ought not to be betting on the real shorties. I would say that he's on a hiding to nothing down there.

Punter A has most to gain from my approach.

He appears to be totally oblivious of value and yet if he were to adopt the 9/2 minimum price level for his betting he would have profits of 21.50 for 36 bets, i.e. his strike rate would alter dramatically from its present 13% to some 60%.

This of course would place him right there with the big boys, C and D! - Which of course, is where we all want to be!

Staking for value

To sum it all up then, Martin's results for the four day plan and Steve's records of the actual bets of four punters are yet further evidence that staking for value must be a part of every successful punter's betting strategy.

Punters who seriously want to win money ought to eliminate or at the very least discount those bets where value is least and they ought, conversely, to consider placing premium stakes on those bets where value is greatest.



A series of newly developed ratings for this jumps season will be continuing through to March. Aimed specifically at National Hunt all-age handicaps and split into hurdle and chase categories.

N. HUNT AI RATINGS - JANUARY

SMARTsig Report

The SMARTsig ratings tables allow quick comparison to be made between runners in *NH all age handicaps* using the information relating to each runner's last 3 form figures, its age and gender. A neural network was trained with outputs of 1 for a win, zero for a loser. The generated outputs were consequently also within the range zero to one but for ease of use the tables display the NNet output values multiplied by 1,000.

Care should be taken with your interpretation of 'last three form figures' when consulting the tables. Finishing positions 1, 2, 3 & 4 are represented 'as is', and '0' is any finish of 5th or worse.

e.g. newspaper form figures 878352. For our purposes the last 3 figures would be read as '302'

Non-finishers, 'F', 'B', 'P', 'U', etc. are also regarded as '0'

e.g. newspaper form figures of 88F1UF would be interpreted as '100'

Disqualifications noted in the form figures are ignored, simply drop the 'd' e.g. Newspaper form figures of 121212d1, last 3 = '121'

Season break identifiers of '-' and '/' are all converted to '-' and must be included as form figures.

e.g. Newspaper form figures 00/0-. The last 3 would be read as '-0-'

Occasionally a runner will have fewer than three form figures, these groups will be found in the final table on page 74. Finally, please remember to distinguish between chases and hurdles, the two sets of ratings are NOT interchangeable.

January ratings here, February ratings will be published next month.

Tables begin on the next page . . .

JANUARY CHASES							formfigures	JANUARY HURDLES																		
5yo		6yo		7yo		8yo		9yo		10yo+			4yo		5yo		6yo		7yo		8yo		9yo		10yo+	
M	F	M	F	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F
563 402	543 423	519 432	491 431	459 418	421 393	1	1	1	458 346	432 332	409 321	388 314	368 309	351 306	334 305											
523 343	501 362	475 372	445 370	412 358	374 333	1	1	2	402 302	379 291	359 282	341 277	325 273	309 272	295 272											
480 288	456 308	430 318	400 318	367 307	330 284	1	1	3	351 262	332 253	315 246	299 243	285 241	272 241	259 242											
435 240	411 262	386 275	358 277	326 268	292 249	1	1	4	305 225	289 218	275 214	262 211	249 211	238 211	226 213											
370 188	350 215	328 233	304 241	278 239	249 227	1	1	0	246 177	233 173	222 170	212 169	203 170	193 171	183 173											
412 220	390 243	365 257	338 261	308 255	275 237	1	1	-	284 209	269 202	256 199	244 197	233 196	222 197	211 199											
578 433	548 443	516 442	480 431	440 410	397 377	1	2	1	428 325	404 313	383 303	364 296	346 291	329 289	313 287											
528 363	497 373	463 373	427 363	388 342	345 311	1	2	2	375 284	355 274	337 266	320 261	304 257	289 255	275 255											
475 299	445 310	412 312	377 305	339 287	298 259	1	2	3	328 247	311 238	295 232	280 228	267 226	253 224	240 224											
424 244	394 258	364 264	331 260	296 246	259 222	1	2	4	286 213	271 206	257 201	245 198	233 196	221 196	208 195											
353 185	328 206	303 218	277 222	249 217	219 201	1	2	0	232 168	220 163	209 160	199 158	188 156	178 156	166 155											
399 221	371 237	342 245	311 243	278 232	243 210	1	2	-	267 197	253 191	240 186	228 184	217 182	205 182	194 182											
578 446	540 446	501 437	458 418	413 389	365 350	1	3	1	401 307	379 296	360 287	342 280	325 276	308 272	292 270											
519 367	481 368	442 361	401 344	357 317	311 281	1	3	2	352 269	333 259	316 252	300 246	285 242	270 240	256 238											
460 296	424 300	386 295	347 282	306 259	263 227	1	3	3	308 234	292 225	277 219	263 215	249 211	236 209	222 207											
404 236	370 244	336 244	301 235	264 218	225 190	1	3	4	270 202	255 195	242 190	230 186	217 183	205 181	191 179											
330 173	303 189	276 198	249 199	220 191	191 175	1	3	0	220 160	208 155	197 150	186 147	175 144	164 141	151 138											
378 211	346 222	314 224	281 218	246 204	210 180	1	3	-	252 187	239 181	226 176	214 172	202 169	190 167	177 165											
566 444	522 436	476 419	429 394	380 359	329 314	1	4	1	377 292	357 281	339 273	322 266	305 261	289 257	273 254											
500 357	457 352	413 338	368 316	322 285	274 244	1	4	2	332 256	314 246	298 239	283 233	268 229	253 225	238 222											
437 281	396 279	355 270	314 252	272 226	228 191	1	4	3	291 223	276 215	262 208	248 203	234 198	220 195	205 191											
378 218	342 221	305 218	269 206	231 186	193 157	1	4	4	256 193	242 186	229 180	216 175	203 170	190 166	175 162											
304 154	276 168	249 174	222 174	195 165	168 149	1	4	0	211 155	199 148	188 142	176 137	163 132	150 127	135 121											
351 192	317 199	284 198	250 190	216 173	181 148	1	4	-	240 180	227 173	214 167	202 162	189 157	176 153	161 148											
528 415	477 398	426 373	375 341	323 300	270 251	1	0	1	347 274	329 264	312 255	296 248	280 242	263 236	247 231											
457 321	409 308	361 289	314 261	267 226	218 182	1	0	2	307 241	290 232	275 224	260 217	245 210	229 205	213 199											
391 241	347 234	304 220	262 199	220 170	178 134	1	0	3	271 212	256 203	242 195	228 188	213 181	198 175	181 168											
332 178	294 177	258 171	222 157	187 136	153 108	1	0	4	240 185	227 176	213 168	199 161	185 154	169 146	152 138											
264 119	238 131	213 137	190 137	167 131	146 118	1	0	0	202 151	189 142	176 133	163 125	148 116	132 106	114 96											
307 153	272 156	239 154	207 144	176 128	146 105	1	0	-	226 173	213 164	200 156	186 148	172 141	156 132	139 124											
555 437	509 426	461 406	412 378	362 341	310 295	1	-	1	366 286	347 275	329 266	312 260	296 254	280 250	264 246											
487 348	442 339	397 323	351 299	304 266	255 224	1	-	2	323 250	306 241	290 233	275 227	260 222	245 218	229 214											
423 270	381 266	339 254	297 235	254 208	210 172	1	-	3	284 219	269 210	255 203	241 197	226 192	212 188	197 183											
363 206	326 208	289 203	253 190	216 169	178 140	1	-	4	250 190	236 182	223 176	210 170	197 164	183 159	167 154											
291 143	263 156	236 162	210 161	184 153	158 138	1	-	0	207 153	195 146	183 139	171 133	158 126	144 120	128 112											

JANUARY CHASES										formfigures		JANUARY HURDLES																	
5yo		6yo		7yo		8yo		9yo		10yo+				4yo		5yo		6yo		7yo		8yo		9yo		10yo+			
M	F	M	F	M	F	M	F	M	F	M	F			M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
505	344	492	370	476	385	454	389	428	380	397	359	2	1	1	447	335	421	321	398	311	378	304	359	300	342	298	326	298	
475	297	460	322	440	336	417	339	389	330	356	308	2	1	2	391	290	369	279	349	271	331	266	315	263	300	263	286	264	
440	253	423	278	402	293	378	296	350	287	318	267	2	1	3	340	249	321	240	304	234	289	231	275	229	262	230	250	232	
402	216	385	242	365	258	341	262	314	256	283	238	2	1	4	293	211	277	204	263	200	250	198	238	198	227	199	216	201	
346	176	331	206	313	226	293	236	270	234	243	222	2	1	0	233	161	221	157	209	154	199	154	190	155	180	156	171	159	
383	200	366	227	347	244	324	250	298	245	268	229	2	1	-	272	194	257	188	244	184	232	183	221	183	211	184	200	187	
519	371	497	387	472	392	443	386	410	369	372	339	2	2	1	417	314	394	302	373	293	354	286	336	283	320	281	305	280	
479	314	455	329	429	334	399	329	365	312	327	283	2	2	2	365	272	344	262	326	255	310	250	294	247	280	246	266	247	
436	262	412	278	385	284	355	280	323	265	286	239	2	2	3	317	234	300	225	284	219	269	216	256	214	243	214	231	214	
392	217	369	236	343	244	316	243	285	231	251	209	2	2	4	274	198	259	191	246	187	233	184	221	183	210	183	198	184	
330	171	311	195	290	210	267	215	242	210	215	195	2	2	0	218	151	207	146	196	143	185	141	175	141	165	141	154	141	
370	199	348	219	324	229	298	230	269	220	236	200	2	2	-	254	182	241	176	228	172	216	169	205	168	194	169	183	169	
519	382	490	388	458	385	422	371	384	347	342	311	2	3	1	390	296	369	285	349	277	332	271	315	267	300	264	285	263	
471	316	441	323	409	321	374	308	336	285	295	251	2	3	2	341	257	323	247	306	240	290	235	275	232	261	230	247	230	
422	257	392	266	361	266	328	256	292	236	253	206	2	3	3	297	220	281	212	266	206	252	202	239	200	226	198	213	197	
374	208	346	220	317	224	287	218	255	202	220	177	2	3	4	257	187	243	180	230	175	218	172	206	169	193	168	181	167	
309	158	288	177	265	189	241	191	216	184	190	168	2	3	0	206	143	195	138	184	133	173	130	162	128	150	125	138	123	
351	188	325	202	298	208	270	204	239	192	207	169	2	3	-	239	172	226	165	214	161	202	157	190	155	178	153	166	152	
508	378	472	377	435	366	395	346	353	316	308	275	2	4	1	366	281	347	271	329	263	312	257	296	252	281	249	266	247	
454	305	419	305	382	297	344	279	303	252	260	214	2	4	2	321	244	303	235	287	228	272	222	258	218	244	216	229	213	
400	241	367	245	333	240	297	226	260	203	221	170	2	4	3	280	210	265	202	250	195	236	190	223	187	210	184	196	181	
350	190	320	198	290	197	258	188	225	171	191	144	2	4	4	243	179	230	171	217	165	204	161	191	157	178	153	164	150	
287	139	264	156	241	165	218	167	195	159	170	144	2	4	0	197	138	185	131	173	125	162	120	150	115	137	111	122	106	
327	169	299	179	271	182	242	176	212	162	181	138	2	4	-	227	164	214	157	201	151	189	147	177	143	164	139	150	135	
475	349	433	339	390	321	347	294	302	258	255	213	2	0	1	336	263	319	253	302	245	286	239	271	233	255	229	239	224	
415	270	376	263	336	249	295	226	254	195	211	155	2	0	2	296	229	280	220	264	212	250	206	235	200	220	195	204	190	
360	203	324	201	288	192	252	175	215	149	178	116	2	0	3	260	198	245	189	231	182	217	175	202	169	187	163	172	157	
310	151	279	155	249	152	219	142	188	124	158	98	2	0	4	228	170	214	161	200	154	187	147	173	140	158	133	141	126	
254	106	232	122	212	131	193	133	175	129	157	117	2	0	0	187	133	175	124	162	115	148	107	134	99	118	90	100	80	
289	132	261	139	233	140	207	133	180	120	153	98	2	0	-	213	157	200	148	187	140	173	133	159	126	144	118	127	110	
499	371	461	366	421	353	380	330	336	298	290	255	2	-	1	355	275	337	264	319	256	303	250	287	246	272	242	257	239	
443	296	405	293	367	282	328	263	287	234	243	195	2	-	2	312	238	295	229	279	222	264	216	250	212	235	209	221	205	
388	230	353	232	318	225	282	210	244	185	205	152	2	-	3	272	205	257	197	243	190	229	185	216	181	202	177	187	173	
337	178	307	184	276	183	244	173	212	155	178	128	2	-	4	237	175	224	167	211	161	198	156	185	151	171	146	157	142	
275	129	253	145	230	153	208	155	186	148	163	134	2	-	0	193	135	181	128	169	121	157	115	144	109	130	103	115	97	

JANUARY CHASES								formfigures	JANUARY HURDLES																			
5yo		6yo		7yo		8yo		9yo		10yo+			4yo		5yo		6yo		7yo		8yo		9yo		10yo+			
M	F	M	F	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F		
461	310	455	342	445	362	429	369	408	363	381	344	3	1	1	436	324	411	311	388	302	368	295	350	292	334	291	319	293
438	273	429	303	415	321	397	326	373	319	344	299	3	1	2	380	279	358	268	339	261	322	257	306	255	292	255	279	257
409	238	397	267	382	284	362	289	337	282	308	263	3	1	3	329	237	310	229	293	223	279	220	265	220	253	221	242	224
375	208	363	237	347	254	327	260	303	255	274	236	3	1	4	282	199	266	192	252	188	240	186	228	187	217	189	207	192
323	175	312	207	297	228	279	238	258	236	232	223	3	1	0	221	146	208	142	197	140	188	140	178	141	169	143	160	147
358	195	345	224	330	243	310	250	286	245	258	228	3	1	-	261	180	246	175	233	171	221	170	211	171	201	173	191	177
474	334	459	355	440	365	417	363	389	349	356	322	3	2	1	406	304	383	292	363	284	345	278	328	275	313	274	298	275
441	287	424	307	403	316	378	313	349	299	316	272	3	2	2	354	261	334	251	316	245	300	241	286	239	272	239	259	240
404	243	386	263	364	273	339	271	310	258	277	232	3	2	3	306	222	289	214	273	208	260	205	247	204	235	205	223	206
365	206	347	228	326	239	302	239	274	228	243	205	3	2	4	263	185	248	179	235	175	222	172	211	172	200	173	189	174
308	168	292	194	275	209	254	215	232	210	205	194	3	2	0	206	136	194	131	183	128	173	127	163	127	154	127	144	128
345	191	328	213	308	226	285	227	258	218	228	197	3	2	-	243	168	229	162	217	159	205	157	194	156	184	157	173	159
474	342	452	354	426	355	397	345	364	324	327	291	3	3	1	380	286	359	276	340	268	323	263	307	260	293	258	278	258
434	287	410	298	384	300	354	291	321	270	284	238	3	3	2	331	246	312	237	296	230	281	226	267	224	253	223	240	223
391	237	367	250	342	253	313	245	281	227	246	198	3	3	3	286	209	270	201	256	195	242	192	229	190	217	189	205	190
348	195	326	211	302	216	275	212	246	198	213	172	3	3	4	246	174	232	167	219	163	207	160	195	158	184	157	172	157
289	154	271	175	252	187	231	190	208	184	183	167	3	3	0	194	128	182	122	171	118	160	115	150	113	139	112	127	110
327	178	306	195	283	203	258	201	231	189	201	166	3	3	-	228	158	214	152	202	147	191	145	179	143	168	142	156	141
464	337	436	341	405	335	372	319	335	292	295	254	3	4	1	356	271	337	261	320	254	303	249	288	245	274	243	260	242
418	275	390	280	359	275	327	261	291	236	252	201	3	4	2	311	233	293	224	278	218	263	213	250	210	236	208	222	207
372	220	345	228	316	226	285	215	252	193	216	162	3	4	3	269	198	254	190	240	184	227	180	214	177	201	175	188	173
327	177	302	188	276	190	249	183	220	166	188	140	3	4	4	232	165	218	158	206	153	193	149	181	145	169	143	155	140
269	135	250	154	231	164	211	166	190	159	168	144	3	4	0	184	122	172	115	161	110	149	105	137	101	125	97	111	93
306	159	283	172	259	177	234	173	207	159	178	136	3	4	-	215	150	202	143	190	138	178	134	166	130	153	127	140	124
435	308	401	303	365	290	328	267	289	235	248	193	3	0	1	327	254	309	244	293	237	278	231	263	227	249	223	234	220
385	240	352	238	318	228	284	209	247	180	209	142	3	0	2	286	219	270	210	255	203	241	197	227	192	213	188	198	184
336	183	306	185	276	179	245	165	213	142	179	109	3	0	3	249	186	234	178	221	171	207	165	193	159	179	155	164	150
293	139	267	147	242	146	216	138	189	122	162	97	3	0	4	216	157	202	148	189	141	176	134	162	128	148	122	132	116
242	104	225	122	209	132	193	136	178	132	162	121	3	0	0	174	117	161	108	149	100	135	92	121	84	106	76	89	67
274	123	251	134	228	137	205	132	182	119	158	99	3	0	-	201	143	188	134	175	127	162	120	148	113	133	106	117	99
456	330	426	330	393	322	358	303	320	274	279	234	3	-	1	346	265	327	255	310	248	294	242	280	239	265	236	251	235
408	265	378	267	346	261	312	244	276	218	237	181	3	-	2	302	228	285	219	270	212	255	207	242	204	228	201	214	199
361	209	332	215	302	211	271	198	238	176	202	144	3	-	3	262	193	247	185	233	179	220	174	207	171	193	168	180	165
316	165	290	175	264	175	237	168	208	151	177	124	3	-	4	226	162	212	154	200	148	187	143	174	139	161	136	148	132
259	125	241	143	222	153	203	155	184	149	163	134	3	-	0	180	120	168	112	156	106	144	100	132	95	118	90	104	84

JANUARY CHASES							formfigures		JANUARY HURDLES																			
5yo		6yo		7yo		8yo		9yo		10yo+			4yo		5yo		6yo		7yo		8yo		9yo		10yo+			
M	F	M	F	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
426 297	426 333	421 356	410 366	393 362	369 344	4	1	1	426 315	401 302	379 294	360 288	343 286	327 286	314 289													
407 267	403 300	394 320	380 328	360 322	333 302	4	1	2	370 269	348 259	329 252	313 249	298 248	285 249	273 253													
381 237	374 268	362 287	345 293	323 287	296 266	4	1	3	319 226	300 218	284 213	270 211	257 212	246 214	235 218													
349 211	340 241	327 260	310 266	287 260	259 240	4	1	4	272 187	256 181	242 177	230 176	219 177	209 180	200 185													
296 181	287 213	274 233	258 242	237 239	212 223	4	1	0	209 133	197 129	186 127	177 127	168 129	160 133	152 137													
331 199	322 230	309 249	292 255	269 250	242 231	4	1	-	250 168	235 163	223 160	211 160	201 161	192 164	183 168													
438 317	429 342	416 355	397 356	374 344	344 318	4	2	1	396 295	374 284	354 276	336 271	321 269	306 270	293 272													
410 277	398 300	382 312	361 311	335 298	304 271	4	2	2	344 251	324 242	307 236	292 233	278 232	265 233	253 236													
376 239	362 262	344 273	323 272	296 259	265 233	4	2	3	296 211	279 204	264 199	251 197	239 196	227 198	216 201													
338 206	324 229	306 241	285 242	259 230	229 207	4	2	4	252 174	238 167	225 164	213 162	202 163	192 164	182 167													
281 171	268 197	252 212	234 217	212 211	186 193	4	2	0	195 123	183 118	172 115	162 115	153 115	144 116	135 118													
319 192	305 216	288 229	267 230	242 220	213 198	4	2	-	232 156	218 150	206 147	195 146	185 146	175 148	166 151													
438 322	422 338	402 343	378 336	349 317	315 285	4	3	1	370 278	350 268	331 261	315 256	300 254	287 254	274 255													
403 274	385 289	363 293	338 286	308 267	274 236	4	3	2	321 236	303 228	287 222	273 219	259 217	247 218	235 219													
363 230	344 246	323 251	297 244	268 227	235 197	4	3	3	276 198	261 191	246 186	233 183	221 182	210 183	199 184													
322 193	304 210	283 217	259 213	232 198	202 172	4	3	4	236 163	222 156	209 152	198 150	187 149	176 149	165 150													
263 155	248 177	231 189	212 192	191 184	167 166	4	3	0	182 114	170 109	160 105	149 103	139 102	129 101	118 100													
302 178	285 196	265 204	242 202	217 190	188 166	4	3	-	217 146	204 140	192 136	181 134	170 133	160 133	149 133													
429 315	407 323	382 321	354 308	322 283	285 247	4	4	1	347 263	328 254	311 247	296 243	282 240	268 239	255 240													
388 261	366 269	340 268	312 255	280 232	244 197	4	4	2	301 224	284 216	269 210	255 206	242 204	230 203	217 203													
346 213	323 223	299 223	272 213	242 192	208 161	4	4	3	259 188	244 180	231 175	218 171	206 169	194 168	182 168													
304 173	283 186	260 190	236 183	209 167	179 140	4	4	4	222 154	208 147	196 142	184 139	172 136	161 134	148 133													
246 136	230 155	214 166	196 168	176 160	155 144	4	4	0	172 108	160 101	149 96	138 92	127 89	115 86	102 82													
283 158	264 173	243 178	220 174	195 160	168 136	4	4	-	204 138	191 131	179 126	168 123	157 120	145 118	132 116													
404 285	376 285	346 276	315 256	280 226	243 186	4	0	1	318 246	301 237	286 231	271 226	258 222	244 220	230 218													
359 226	332 227	304 220	274 203	241 177	206 140	4	0	2	277 210	261 202	247 195	234 190	220 186	207 183	193 181													
315 175	290 180	265 177	237 164	209 142	178 110	4	0	3	239 176	225 168	212 162	199 157	186 152	172 148	158 144													
275 137	253 146	231 148	209 140	185 124	159 99	4	0	4	206 145	192 137	180 130	167 124	154 119	140 114	125 109													
225 106	212 125	198 136	185 140	171 136	157 125	4	0	0	162 103	150 94	137 86	124 79	111 72	96 64	80 56													
256 123	237 135	218 139	198 135	177 123	155 102	4	0	-	190 130	177 122	165 115	152 109	139 103	125 97	110 91													
422 307	398 312	371 307	341 292	308 265	271 227	4	-	1	337 257	319 248	302 241	287 237	273 234	260 233	247 232													
379 251	355 257	328 253	299 239	266 214	231 178	4	-	2	292 219	276 210	261 204	248 200	235 198	222 196	209 196													
336 201	312 209	287 208	259 197	229 175	196 143	4	-	3	252 183	237 176	224 170	211 166	199 163	186 161	174 160													
294 162	272 173	250 175	225 168	199 152	170 125	4	-	4	216 150	202 143	190 138	178 133	166 130	154 127	141 125													
238 126	223 145	207 155	190 157	172 150	153 135	4	-	0	168 106	156 98	145 93	133 88	121 83	108 78	95 74													

JANUARY CHASES								formfigures	JANUARY HURDLES																			
5yo		6yo		7yo		8yo		9yo		10yo+			4yo		5yo		6yo		7yo		8yo		9yo		10yo+			
M	F	M	F	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F		
380	304	387	344	388	370	382	381	369	378	348	359	0	1	1	411	303	387	291	366	284	348	280	333	280	319	282	307	287
362	279	364	314	360	336	349	344	332	337	307	316	0	1	2	355	256	335	247	317	242	301	240	288	241	277	244	266	249
334	251	332	284	324	303	310	308	289	299	262	276	0	1	3	304	213	286	205	271	202	258	201	247	203	237	207	228	213
298	224	293	255	283	272	267	276	245	267	217	244	0	1	4	257	172	242	166	229	164	218	164	208	167	199	172	192	178
235	190	228	219	217	237	200	242	179	235	153	215	0	1	0	194	115	182	112	172	111	163	112	155	116	148	120	141	126
278	212	272	242	261	259	245	263	222	254	195	231	0	1	-	235	152	221	148	209	146	199	147	190	150	182	154	174	160
390	318	388	347	381	363	368	365	348	354	322	328	0	2	1	382	283	361	274	342	267	326	264	312	264	299	266	288	271
363	283	357	309	346	322	329	321	307	308	278	280	0	2	2	330	239	311	231	295	226	281	225	269	225	258	228	248	233
328	247	319	271	305	283	286	281	262	267	232	239	0	2	3	282	198	266	191	252	188	239	187	229	188	219	191	210	196
287	214	277	238	262	249	242	247	217	233	188	207	0	2	4	238	159	224	153	212	151	201	151	191	152	183	156	174	160
220	175	210	199	195	212	177	214	155	204	129	182	0	2	0	179	105	168	101	158	99	149	100	140	101	132	104	124	108
265	200	254	223	239	234	220	234	196	220	167	195	0	2	-	217	140	204	135	193	133	183	133	174	135	165	138	157	143
389	318	381	338	367	346	348	341	324	322	294	290	0	3	1	357	267	337	258	320	252	305	250	292	249	280	251	269	255
356	275	344	293	328	299	306	293	280	273	248	241	0	3	2	308	225	291	217	276	213	263	211	251	211	240	213	230	217
316	234	302	251	284	257	262	250	235	231	204	200	0	3	3	263	185	248	179	235	175	223	174	212	174	202	177	192	180
272	198	258	215	240	221	218	216	193	199	163	171	0	3	4	222	148	208	143	197	140	186	138	176	139	167	141	157	143
205	156	192	176	177	187	159	186	137	176	113	154	0	3	0	167	97	155	92	145	89	136	88	127	88	118	89	108	90
250	182	236	200	218	207	197	203	173	188	144	161	0	3	-	202	130	190	125	179	122	169	121	159	122	150	123	140	125
382	308	367	320	349	321	326	310	299	286	266	250	0	4	1	335	253	317	245	301	240	287	237	275	236	263	238	252	240
343	259	327	271	307	271	283	259	255	236	222	201	0	4	2	289	213	273	206	259	201	246	199	235	199	224	200	213	202
300	214	283	226	263	227	239	217	212	195	180	162	0	4	3	247	175	232	169	220	165	208	163	197	162	187	163	176	164
256	176	239	189	220	192	198	185	173	167	144	138	0	4	4	208	140	195	134	184	130	173	128	162	127	152	127	141	127
191	136	178	154	163	163	147	163	128	153	107	134	0	4	0	157	90	146	85	135	81	125	78	114	76	104	74	92	72
234	160	218	175	200	179	179	174	156	158	129	132	0	4	-	190	123	178	117	167	113	156	111	146	109	135	109	125	109
361	276	341	280	319	274	293	257	263	229	230	189	0	0	1	307	238	291	230	277	225	264	221	252	220	240	219	228	220
319	223	299	228	276	223	251	207	223	181	191	144	0	0	2	266	200	251	193	238	188	225	184	214	182	202	181	190	180
276	176	257	183	236	181	213	169	187	146	158	114	0	0	3	227	165	214	158	201	152	190	148	178	146	166	144	154	142
234	140	217	150	199	151	179	144	158	127	134	101	0	0	4	193	131	180	124	168	119	156	114	145	110	132	107	119	103
178	107	168	126	157	136	146	139	134	134	121	121	0	0	0	147	85	135	77	123	71	111	64	99	59	85	53	70	46
214	125	199	138	183	142	166	137	147	124	126	102	0	0	-	177	116	164	108	152	102	141	97	129	93	116	89	102	84
376	299	359	308	339	306	315	293	286	267	253	229	0	-	1	325	247	308	239	293	234	279	231	266	231	255	231	244	233
336	248	318	257	296	255	272	242	243	217	210	181	0	-	2	280	208	265	201	251	196	239	194	227	193	216	193	205	194
292	202	274	212	253	212	229	200	202	178	171	145	0	-	3	239	171	226	164	213	160	201	157	190	156	180	156	168	156
248	164	231	176	212	178	190	170	166	152	138	124	0	-	4	202	136	190	130	178	126	167	123	156	121	145	120	134	119
185	125	173	144	159	153	144	153	127	144	108	127	0	-	0	153	88	141	82	130	77	120	73	109	70	97	67	85	63

JANUARY CHASES										formfigures	JANUARY HURDLES									
5yo		6yo		7yo		8yo		9yo		10yo+		4yo	5yo	6yo	7yo	8yo	9yo	10yo+		
M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
410 297	413 334	410 358	401 369	386 365	363 347	-	1	1	421 311	396 298	375 290	356 285	339 284	324 284	311 288					
393 269	391 303	384 324	371 332	352 326	326 306	-	1	2	365 264	344 255	325 248	309 245	295 245	282 247	270 251					
366 241	361 272	351 292	336 298	314 291	287 270	-	1	3	314 221	295 214	279 209	266 208	253 208	242 211	232 216					
334 215	327 245	315 264	298 270	276 263	248 242	-	1	4	267 181	251 175	237 172	226 172	215 174	206 177	197 182					
279 185	271 216	259 236	243 244	222 239	197 222	-	1	0	204 127	192 123	181 121	172 122	163 124	156 128	148 133					
316 203	308 234	296 252	279 259	257 252	230 233	-	1	-	245 163	230 157	218 155	207 155	197 157	188 160	180 165					
421 314	415 341	404 356	388 357	366 345	338 320	-	2	1	392 291	369 280	350 273	333 269	317 267	304 268	291 271					
395 277	385 301	371 313	352 313	327 300	297 273	-	2	2	339 247	320 238	303 243	288 230	275 229	262 231	251 234					
361 241	349 264	333 275	313 275	287 261	257 235	-	2	3	291 206	274 199	260 195	247 193	235 193	224 195	214 199					
323 208	311 232	294 244	273 244	248 232	219 208	-	2	4	247 168	233 162	220 159	209 158	198 159	188 161	179 164					
264 173	252 199	237 214	219 218	197 210	172 192	-	2	0	189 116	177 112	167 110	157 109	149 110	140 112	131 114					
304 195	291 219	275 231	254 232	230 221	201 198	-	2	-	227 150	213 145	201 142	191 141	181 142	172 144	162 147					
422 318	408 336	391 342	369 336	342 317	309 285	-	3	1	366 274	345 264	328 257	312 254	297 252	284 253	272 255					
388 272	372 289	352 294	329 287	301 268	267 237	-	3	2	317 232	299 224	283 219	269 216	256 215	244 216	233 218					
349 230	332 247	312 252	288 246	260 228	227 198	-	3	3	272 193	256 186	242 182	230 180	218 179	207 180	196 182					
308 194	291 212	272 219	249 215	222 199	192 173	-	3	4	231 157	217 151	205 147	193 146	183 145	172 146	162 147					
247 156	233 178	217 190	199 191	177 183	153 164	-	3	0	177 108	165 103	155 99	145 97	135 96	125 96	114 96					
287 179	271 198	252 206	231 203	205 190	177 166	-	3	-	212 140	199 134	187 131	176 129	166 129	156 129	145 130					
413 310	394 320	372 319	346 307	315 283	280 247	-	4	1	343 259	324 250	308 244	293 240	279 238	266 238	254 239					
374 258	354 268	330 267	304 256	273 233	239 198	-	4	2	297 220	280 212	266 207	252 203	239 202	227 201	215 202					
332 212	312 223	289 224	263 214	234 193	202 162	-	4	3	255 183	240 176	227 171	214 168	203 166	191 166	179 166					
290 174	271 187	250 191	226 184	200 167	171 140	-	4	4	217 149	204 142	191 137	180 134	169 132	157 131	146 130					
231 137	217 156	201 166	183 168	164 159	143 142	-	4	0	167 102	155 95	144 91	133 87	122 84	111 81	98 78					
269 159	252 174	232 179	210 175	186 160	159 136	-	4	-	199 132	187 126	175 121	164 118	153 116	141 114	129 113					
390 280	365 281	338 273	308 255	276 226	240 186	-	0	1	314 243	298 234	283 228	269 224	255 221	242 219	229 218					
346 223	322 226	296 220	268 204	237 177	203 141	-	0	2	273 206	258 198	244 192	230 188	218 184	205 182	192 180					
304 175	281 181	257 178	232 165	204 143	174 112	-	0	3	235 172	221 164	208 158	195 153	183 149	170 146	156 143					
263 138	244 148	224 149	202 142	179 126	154 101	-	0	4	201 140	188 132	175 126	163 120	150 116	137 111	123 106					
213 108	201 126	189 138	176 141	163 137	149 125	-	0	0	157 96	144 88	132 80	119 73	106 67	92 60	76 52					
245 124	228 137	210 141	191 137	170 124	149 103	-	0	-	185 125	173 117	160 110	148 104	135 99	121 94	107 88					
384 289	363 294	340 289	313 273	282 246	247 207			1	319 245	302 237	287 231	273 227	261 225	248 225	236 225					
342 235	321 241	298 237	271 223	241 197	208 161			2	276 207	261 199	247 194	234 190	222 188	210 187	198 187					
300 189	279 197	257 195	232 183	204 161	174 128			3	237 171	223 164	210 159	198 155	186 152	174 151	162 149					
258 151	239 162	220 164	198 156	174 139	148 113			4	201 138	188 131	176 125	165 121	153 118	141 115	128 112					
201 117	189 136	176 146	162 148	147 141	131 126			0	154 92	142 84	131 78	119 73	107 68	94 63	80 57					
395 299	400 338	400 363	392 374	378 371	356 353			1	416 306	391 295	370 287	352 283	336 281	322 283	309 287					
378 273	378 308	372 329	361 337	343 331	318 310			2	360 260	339 251	321 245	305 242	291 242	279 245	268 250					
351 245	347 278	339 297	324 303	303 295	276 273			1	309 217	291 209	275 205	262 204	250 205	239 209	230 214					
317 219	311 250	300 268	284 273	262 265	235 244			1	262 176	246 171	233 168	221 168	211 170	202 174	194 179					
259 188	252 218	240 237	224 244	203 238	177 220			1	0	199 121	187 117	176 116	167 117	159 120	152 124	144 129				
299 208	292 238	280 256	264 261	242 254	214 233			1	-	240 157	225 152	213 150	203 150	193 153	185 157	177 162				
406 315	402 343	393 358	379 361	358 349	331 323			2	1	387 287	365 277	346 270	329 266	314 265	301 267	289 270				
379 279	372 304	359 317	341 317	318 304	289 276			2	2	335 243	316 234	299 229	284 227	271 227	260 229	249 233				
345 243	335 267	320 279	301 278	276 264	246 237			2	3	287 202	270 195	256 191	243 190	232 190	221 193	212 197				
306 211	295 235	279 247	259 246	235 233	205 208			2	4	243 163	228 158	216 155	205 154	195 155	185 158	176 162				
406 315	395 336	379 343	359 338	334 319	302 287			3	1	381 270	341 261	324 255	308 251	294 255	282 252	270 255				
398 307	381 319	361 319	336 308	308 284	274 248			4	1	339 256	320 248	304 242	290 238	277 237	264 238	252 240				
375 277	353 280	329 273	301 255	270 227	236 187			0	1	311 240	294 232	280 226	266 222	253 220	241 219	228 219				
198 108	186 127	175 138	163 141	151 136	137 124			0	0	152 91	139 82	127 75	115 69	102 62	88 56	73 49				
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