The Big Ticket: How Not to Design a Game Show

KEYWORDS:
Teaching;
Probability.

David Burghes
University of Exeter, England.
e-mail: d.n.burghes@exeter.ac.uk

Summary
This article analyses a television game show and suggests improvements.

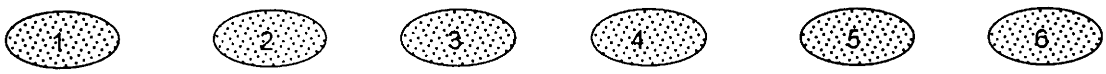
◆ INTRODUCTION ◆

You may have seen this game show, which was broadcast for 8–9 weeks on Saturdays on television in the United Kingdom in the spring/summer of 1998 as an extended National Lottery show. I only saw parts of some of the shows, while waiting for something else, or by mistake! I was amazed that such an unappealing programme was broadcast at all.

At the end of each show there was ridiculous over-promotion of a game in which the final contestants were certain to win substantial sums of money. Just in case you missed the shows, I summarize in figure 1 the way this game worked.

The game seemed incredibly predictable as it was impossible *not* to win a substantial amount, with a low ceiling on the maximum that could be won, compared with the guaranteed minimum winning amount.

Each contestant had to press *five* out of *six* buttons
and won the amounts behind all the buttons pressed:



Behind each button was a sum of money (to be won), the amounts being:

£50,000

£20,000

£15,000

£10,000

£5000

£0

Each one of these amounts occurred once, and only once.

Fig 1.

This contrasts with another popular television game show 'Who Wants to be a Millionaire', where the prizes won can vary between £0 and £1 million.

◆ COMMENTS ◆

I discussed the game with a class of average-ability age 15–16 pupils who were preparing for the UK GCSE Statistics examination (as well as for GCSE Mathematics). My starting points were:

(a) What is the *least* you could win?
(b) What is the *most* you could win?
(c) Design a better game.

Some of their suggestions are given here.

One pupil really impressed me by dividing each amount that could be won by £5000, so that he was dealing with the numbers 10, 4, 3, 2, 1 and 0.

Thus, in the game, you choose 5 of these 6 numbers.

(Clearly the maximum a contestant can win is $10 + 4 + 3 + 2 + 1 = 20$, or £100,000, and the minimum is $4 + 3 + 2 + 1 + 0 = 10$, or £50,000.)

Many of the pupils happily provided a table of winnings and probabilities. You can easily check the values as shown in table 1.

Winning	Probability
20	1/6
19	1/6
18	1/6
17	1/6
16	1/6
10	1/6

Table 1.

(You can now see why it was a predictable and incredibly boring game to watch!)

Some of the suggestions for a revised game were:

0	0	1	2	7	10	Total
✓	✓	✓	✓	X	X	3
✓	✓	✓	X	✓	X	8
✓	✓	✓	X	X	✓	11
✓	✓	X	✓	✓	X	9
✓	✓	X	✓	X	✓	12
✓	✓	X	X	✓	✓	17
✓	X	✓	✓	✓	X	10
✓	X	✓	✓	X	✓	13
✓	X	✓	X	✓	✓	18
✓	X	X	✓	✓	✓	19
X	✓	✓	✓	✓	X	10
X	✓	✓	✓	X	✓	13
X	✓	✓	X	✓	✓	18
X	✓	X	✓	✓	✓	19
X	X	✓	✓	✓	✓	20

Table 2. Possible choices

Total	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Probability	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{2}{15}$	$\frac{1}{15}$	0	0	0	$\frac{2}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	0	0	0	0	$\frac{1}{15}$	0	0

Table 3.

1. Change the amounts, e.g. to 0, 1, 1, 1, 1 and 16 or 0, 0, 1, 1, 4 and 14.
2. Contestants to choose only 3 or 4 of the 6 buttons.
3. Contestants to choose 4 out of 6 buttons and change the amounts,

   e.g. 0, 0, 1, 2, 7 and 10.

The analysis shown in table 2 is of the game changed in line with suggestion 3. This gives the distribution shown in table 3, with probabilities attached.

The advantages of a distribution of this type are that:

(a) there is substantial difference between the lowest sum (3, or £15,000) and the highest (20, or £100,000);

(b) there is a good chance of achieving a total near to 20 but no guarantee (in fact, the expected score is $\frac{200}{15}$, or about £67,000).

In other words, there is some possibility of real excitement, elation or disappointment, according to the numbers attained.

◆ REMARKS ◆

Analysing game shows provides a good opportunity for pupils to use elementary probability to show why some shows are poorly conceived and to use their creativity and ingenuity to design an improved game. It is also interesting to find some genuine motivation for combinatorial questions. It may be a sad reflection on the state of the nation's mathematical prowess that the production team thought that 'The Big Ticket' would be entertaining to the general public. In the end, I think that they may have underestimated the public's understanding of a rather trivial game.

In the very final edition of the show, the competitor obtained the *minimum* possible amount, but was still saluted with 'congratulations', 'well done' and lots of cheering and shouting. So the hype seemed to be more important than any appreciation or understanding of the game!