

Odd and Even

Which set will I choose? Even = Win

* In these few pages
 0 = odd
 e = even

How I work out the probabilities:

Set A:

③ ②
 ④ ⑤ ⑥

And we know that:
 odd + even = odd
 odd + odd = even
 even + even = even
 so the numbers are
 not really important.

So in Set A
 There are
 2 odds
 +
 3 even

I then list it down on a table:

You can't pick
 the same number
 ball twice so
 I cross those
 out

	O	O	E	E	E
O		E	O	O	O
O	E		O	O	O
E	O	O		E	E
E	O	O	E		E
E	O	O	E	E	

So: $\frac{12}{20}$ odd

$\frac{8}{20}$ even

Less than half to win.

Faster way of doing it:

we can just
 draw the table
 like this

	$2o^{(a)}$	$3e^{(b)}$
$(a) 2o$	a^2 E -a	ab O
$(b) 3e$	ab O	b^2 -b E

I named them a and b
 so its easier for me to
 explain. a = number of O
 b = number of E

I subtract a and b
 because of the
 diagonal (can't pick
 the same number)

And it should give me the
 same answer:

	2o	3e
2o	2E	6O
3e	6O	6E

so 8 even
 12 odd.

so we have $\frac{8}{20}$ chance of winning in Set A.

Set B

③ ①
⑦ ⑤ ⑥

4 odds
1 even

using
the
same
method

	4o	1e
4o	12e	4o
1e	4o	X

* $o+o=e$
 $e+o=o$
 $e+e=e$

$\frac{12}{20} e$
 $\frac{8}{20} o$

So we have $\frac{12}{20}$ chance of winning in Set B.

Set C

②
③ ④
⑤ ⑥ ⑧

2 odds
4 evens

using
the
same
method

	2o	4e
2o	2e	8o
4e	8o	12e

remember to work out
what it is out of

$\frac{16}{30} o$
 $\frac{14}{30} e$

So we have $\frac{14}{30}$ chance of winning in Set C.

Set D

⑦
③ ⑨
④ ⑤ ①

5 odds
1 even

using
the
same
method

	5o	1e
5o	20e	5o
1e	5o	X
$\frac{20}{30} e$		$\frac{10}{30} o$

So we have $\frac{20}{30}$ chance of winning
in Set D.

∴	Set A	Set B	Set C	Set D
	$\frac{8}{20}$	$\frac{12}{20}$	$\frac{14}{30}$	$\frac{20}{30}$
	X	↓	X	↓
	less than half	$\frac{6}{10} = \frac{54}{90}$	less than half	$\frac{6}{9} = \frac{60}{90}$

I will pick set D because I will have the higher chance of winning.

Odd and Even

Fair game?

I list down all the possibilities of sets two balls to nine.

$$\frac{2}{10, 1e \times}$$

$$\frac{3}{10, 2e \times}$$

$$20, 1e \times$$

$$\frac{4}{10, 3e \checkmark}$$

$$20, 2e \times$$

$$30, 1e \checkmark$$

$$\frac{5}{10, 4e \times}$$

$$20, 3e \times$$

$$30, 2e \times$$

$$40, 1e \times$$

$$\frac{6}{10, 5e \times}$$

$$20, 4e \times$$

$$30, 3e \times$$

$$40, 2e \times$$

$$50, 1e \times$$

$$\frac{7}{10, 6e \times}$$

$$20, 5e \times$$

$$30, 4e \times$$

$$40, 3e \times$$

$$50, 2e \times$$

$$60, 1e \times$$

$$\frac{8}{10, 7e \times}$$

$$20, 6e \times$$

$$30, 5e \times$$

$$40, 4e \times$$

$$50, 3e \times$$

$$60, 2e \times$$

$$70, 1e \times$$

$$\frac{9}{10, 8e \times}$$

$$20, 7e \times$$

$$30, 6e \checkmark$$

$$40, 5e \times$$

$$50, 4e \times$$

$$60, 3e \checkmark$$

$$70, 2e \times$$

$$80, 1e \times$$

than I put
a \checkmark next to
it if it works.

Of course I notice a pattern before wasting all my time on this.

If a set '10, 3e' works, '30, 1e' will work as well

And if '10, 5e' fails, '50, 1e' will fail as well.

Example:

	10	3e
10	\times	30
3e	30	6e
	$\frac{1}{2}0$	$\frac{1}{2}e$

	3e	10
3e	6e	30
10	30	\times
	$\frac{1}{2}0$	$\frac{1}{2}e$

Looking at my results, I realised that 2 consecutive triangle number of odd and even number of balls will make a fair game. (Example '1, 3', '3, 1', '3, 6', '6, 3')

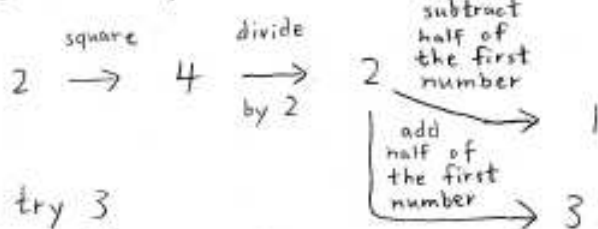
To convince myself, lets try 6 and 10.

6e	10o	120 240 120 240	10e	6o	(Prove one more time)
6e	30e		60o	10e	
10o	60o	90e	6o	60o	30e

And it works.

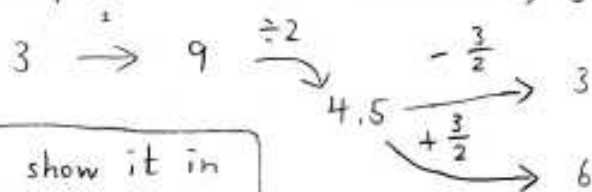
So far it worked for 4 balls, 9 balls and 16 balls, what have you noticed? Square numbers

But lets try to make a formula so it works for any number. (square number)



And there We Have It!

Lets try 3



And Again!

Lets show it in Algebra:

$$\frac{n^2}{2} + \frac{n}{2} \quad \text{And this will do the trick!}$$

Lets Try 6:

$$\frac{6^2}{2} + \frac{6}{2} = 18 + 3 = 21, 15$$

	21e	15o
21e	420e	315o
15o	315o	210e

$$315 + 315 = 630$$

$$420 + 210 = 630$$

$$\frac{630}{1260} \quad \frac{630}{1260} e$$

Thanks for Reading =]