

Chances Are...The Mathematics Of Probability



Chances Are.....The Mathematics of Probability

As we began brainstorming in class, someone mentioned the boardwalk and the many games you can find there. Some of those games, such as the Wheel of Chance, incorporate probability. We decided to create our own, and that is where the math began!

Our group felt that a 2 ft. wheel would be big enough. So we started out with a piece of wood 2 ft. x 2 ft. To find the center of it we divided the 2 ft. by 2 and got 1 ft. as half of each side. We drew two perpendicular lines on the piece of wood running right through the center. When we'd found our center we used a compass spread 1 ft. apart (because 1 ft. is half the diameter of the circle) and drew a circle on our piece of wood. After we had that drawn we cut it out and painted it yellow (we planned to use our school colors in the design of our project).

Since a circle has 360° in it, we needed to find a number that was a multiple, that number was 40. If you divide 360° by 40 it gives you 9° for each section of the wheel. We then took a protractor and found 9° all around and divided the circle up into 40 segments. The problem now was finding a pattern for the numbers. We came up with the following pattern by means of trial and error:

$$\begin{array}{l} \underline{1}+5= \underline{6}+5= \underline{11}+5= \underline{16}+5= \underline{21}+5= \underline{26}+5= \underline{31}+5= \underline{36}-34= \underline{2} \\ \underline{2}+5= \underline{7}+5= \underline{12}+5= \underline{17}+5= \underline{22}+5= \underline{27}+5= \underline{32}+5= \underline{37}-34= \underline{3} \\ \underline{3}+5= \underline{8}+5= \underline{13}+5= \underline{18}+5= \underline{23}+5= \underline{28}+5= \underline{33}+5= \underline{38}-34= \underline{4} \\ \underline{4}+5= \underline{9}+5= \underline{14}+5= \underline{19}+5= \underline{24}+5= \underline{29}+5= \underline{34}+5= \underline{39}-34= \underline{5} \\ \underline{5}+5= \underline{10}+5= \underline{15}+5= \underline{20}+5= \underline{25}+5= \underline{30}+5= \underline{35}+5= \underline{40} \end{array}$$

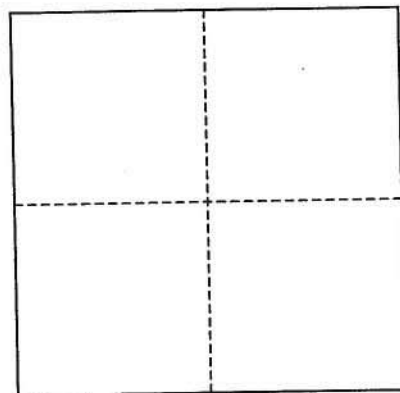
All numbers used on the wheel are in bold and underlined!

We chose to alternate colors on the board, by making every other number either red or black. To add more probability, we added two green numbers.

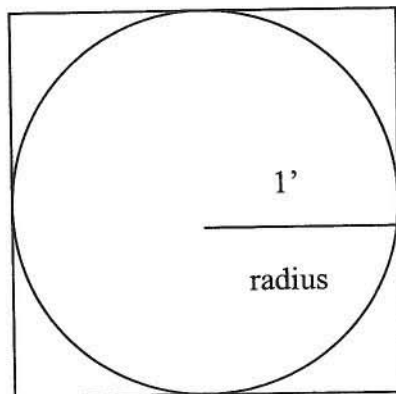
We calculated the odds of landing on certain numbers, certain colors, and combinations of colors and numbers. We collected actual data vs. probable, as you will see on our board.

During the making of our project we incorporated many different parts of mathematics, not just probability. We used area, volume, radius, circumference, rotational symmetry, conversion factors, fractions, and percentages. We also learned about number patterns and how to figure out the probability of landing on certain numbers. With this project we aimed for the Mathematics of Probability but we learned so much more.

What We Learned



2'



Fractions

-divide whole into parts to find center

Area of square = $s \times s$

in feet -

$$2' \times 2' = 4 \text{ ft.}^2$$

Volume of rectangular prism = $l \times w \times h$

in. ³ to ft. ³

in inches -

$$24'' \times 24'' \times 0.5'' = 288 \text{ in.}^3$$

Conversion Factors

Area from ft. ² to in. ²

$$4 \cancel{\text{ft.}^2} \times \frac{144 \text{ in.}^2}{1 \cancel{\text{ft.}^2}} = 576 \text{ in.}^2$$

Volume from

$$288 \cancel{\text{in.}^3} \times \frac{1 \cancel{\text{ft.}^3}}{1.728 \text{ in.}^3} = .16 \text{ ft.}^3$$

Radius

. use radius to make a complete circle

Area of circle = πr^2

in feet -

$$= 3.14(1 \text{ ft.})^2$$

$$= 3.14 \text{ ft.}^2$$

Volume of cylinder = $\pi r^2 \times h$

in feet -

$$= 3.14(1 \text{ ft.})^2 \times 0.04 \text{ ft.}$$

$$= 3.14 \text{ ft.}^2 \times 0.04 \text{ ft.}$$

$$= 0.1256 \text{ ft.}^3$$

Area of circle = πr^2

in inches -

$$= 3.14(12 \text{ in.})^2$$

$$= 3.14(144 \text{ in.}^2)$$

$$= 452.16 \text{ in.}^2$$

Volume of cylinder = $\pi r^2 \times h$

in inches -

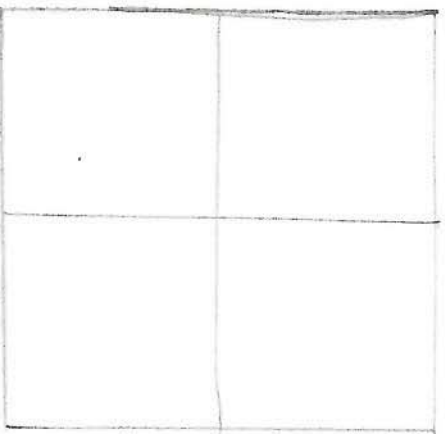
$$= 3.14(12 \text{ in.})^2 \times 0.5 \text{ in.}$$

$$= 3.14(144 \text{ in.}^2) \times 0.5 \text{ in.}$$

$$= 452.16 \text{ in.}^2 \times 0.5 \text{ in.}$$

$$= 226.09 \text{ in.}^3$$

Area of Square



a feet

Area
 $A = L \times W$
 $a \times a = a^2$

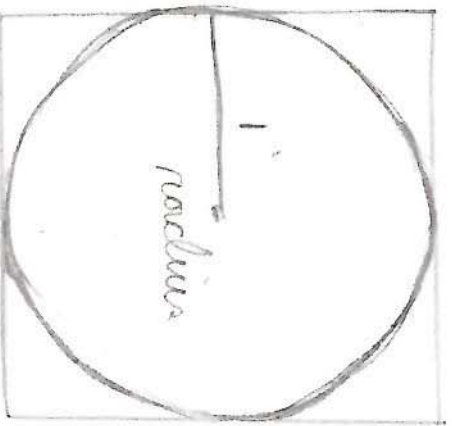
Volume

in inches - $V = L \times W \times H$

$24 \text{ in} \times 24 \text{ in} \times 5 \text{ in} =$
 $\boxed{2880 \text{ in}^3}$

in feet - $12 \text{ in} \times 12 \text{ in} \times 12 \text{ in} = 1728 \text{ in}^3$
 $288 \text{ in} \times 1728 \text{ in} = \boxed{16 \text{ feet}^3}$

Volume of Circle

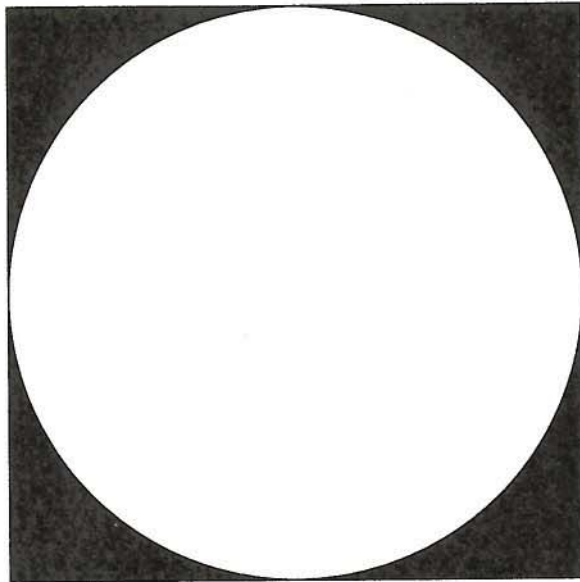


Volume in inches

$V = \pi r^2 \times h$
 $V = 3.14 \times 12 \text{ in}^2 \times .5 \text{ in}$
 $V = 3.14 \times 144 \text{ in}^2 \times .5 \text{ in}$
 $V = \frac{452.16 \text{ in}^3 \times .5 \text{ in}}{}$
 $V = \boxed{226.09 \text{ in}^3}$

Volume in feet

$V = \pi r^2 \times h$
 $V = 3.14 \times 1 \text{ ft}^2 \times .04 \text{ ft}$
 $V = 3.14 \times 1 \text{ ft}^2 \times .04 \text{ ft}$
 $V = \boxed{0.1256 \text{ ft}^3}$



**. Shaded Area Removed
Area & Volume**

$$\text{Area Square} = 576 \text{ in.}^2$$

$$\underline{\text{Area Circle} = 452.16 \text{ in.}^2}$$

$$\text{Shaded Area Removed} = 123.84 \text{ in.}^2$$

. Volume Removed

$$\text{Volume of Rectangular Prism} = 288 \text{ in.}^3$$

$$\underline{\text{Volume of Cylinder} = 226.08 \text{ in.}^3}$$

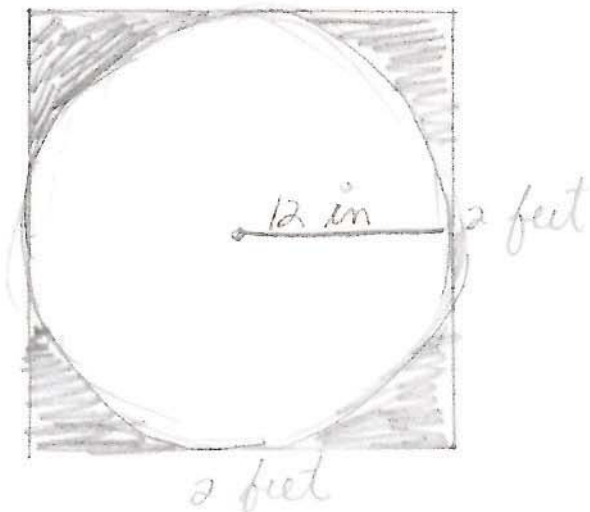
$$\text{Volume of Shaded Area Removed} = 61.92 \text{ in.}^3$$



Check Work

Area of shaded portion removed	123.84 in. ²
<u>X height of wood</u>	<u>.5 in.</u>
	= 61.92 in. ³

Shaded Area Removed
Area + Volume



Area of Circle

$$\pi \cdot r^2 = \text{area}$$

$$\pi \cdot 12\text{ in}^2 = \boxed{452.16\text{ in}^2}$$

Area of Square

$$L \times W = \text{area}$$

$$2\text{ ft} \times 2\text{ ft} = 4\text{ feet}^2$$

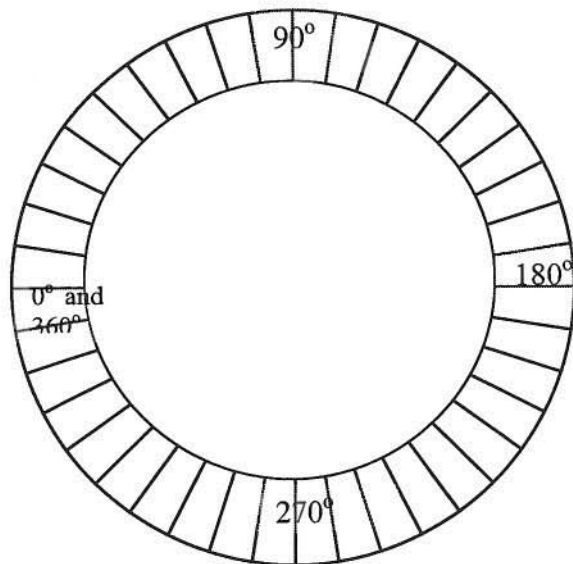
$$24\text{ in} \times 24\text{ in} = \boxed{576\text{ inches}^2}$$

Shaded Area Removed

$$576\text{ in}^2 - 452.16\text{ in}^2 = \boxed{123.84\text{ in}^2}$$

Shaded Volume Removed

$$288\text{ in}^3 - 226.08\text{ in}^3 = 61.92\text{ in}^3$$



Using a protractor:

Circle :

$$360^{\circ} \div 40 = 9^{\circ}$$

Using a compass to create an inner circle:

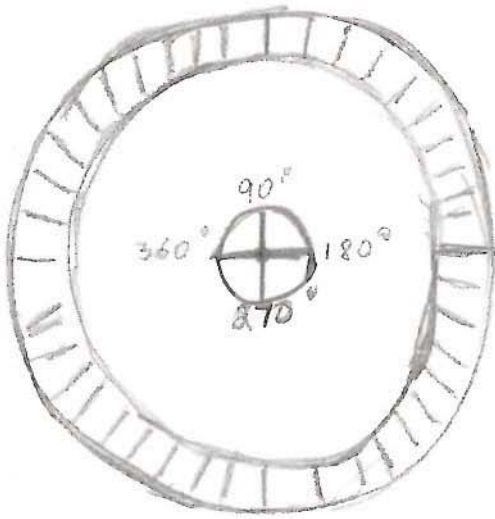
Area = inner circle

$$\text{Area} = \pi r^2$$

$$\text{Area} = 3.14 (9.5\text{in})^2$$

$$\text{Area} = 3.14 \times 90.25 \text{ in.}^2 \approx 283.39 \text{ in.}^2$$

The Angles

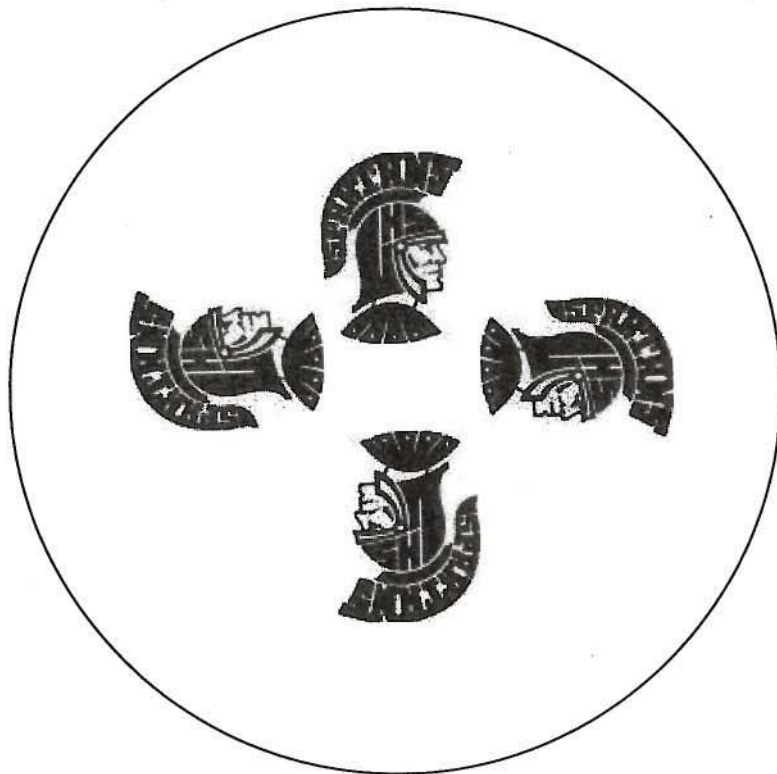


$$360^\circ \div 40 \text{ squares} = 9^\circ$$

Area of Small Circle



$$\begin{aligned} A &= \pi \times r^2 \\ A &= \pi \times 9.5 \text{ in}^2 \\ A &= \pi \times 90.25 \text{ in}^2 \\ A &= \boxed{283.39 \text{ in}^2} \end{aligned}$$



Rotational Symmetry

Rotational symmetry is when there is a center point around where the object is turned a certain number of degrees and the object still looks the same.

We decided to include something more than probability, and applied some rotational symmetry to our project. We used our school logo, the Spartan, to portray the idea of rotational symmetry around the center point of the project base. Rotate the Spartan any number of times, and the Spartan will still look the same.

Number Pattern

Our project has a series of numbers that you yourself can figure out. There is a certain pattern to the project. This pattern, however, will only work starting from the first to last number, 1 to 40. You must take 1, and add 5 each time to get the next 7 numbers. Then, subtract 34 from the sum of those numbers, and you will get the next number. Repeat the pattern to get the rest of the numbers. When you get to 40, you will see that you will not have to subtract 34.

$$\begin{aligned}\underline{1} + 5 + 5 + 5 + 5 + 5 + 5 + 5 - 34 &= \\ \underline{2} + 5 + 5 + 5 + 5 + 5 + 5 + 5 - 34 &= \\ \underline{3} + 5 + 5 + 5 + 5 + 5 + 5 + 5 - 34 &= \\ \underline{4} + 5 + 5 + 5 + 5 + 5 + 5 + 5 - 34 &= \\ \underline{5} + 5 + 5 + 5 + 5 + 5 + 5 + 5 &= 40\end{aligned}$$

Equation

Let n equal each number on the board, starting from 1 and ending on 40. (Note: Every time the equation is used, the variable n will change into the next number on the board.) $n + 5$ is used for seven numbers, and then the equation $n - 34$ is used once, and so on. When you get to 35, you will add five to get the seventh number, which will be 40. Since it is the last number on the board, you will not have to subtract 34.

1(first number)	$36 - 34 = 2$	$37 - 34 = 3$	$38 - 34 = 4$	$39 - 34 = 5$
$1 + 5 = 6$	$2 + 5 = 7$	$3 + 5 = 8$	$4 + 5 = 9$	$5 + 5 = 10$
$6 + 5 = 11$	$7 + 5 = 12$	$8 + 5 = 13$	$9 + 5 = 14$	$10 + 5 = 15$
$11 + 5 = 16$	$12 + 5 = 17$	$13 + 5 = 18$	$14 + 5 = 19$	$15 + 5 = 20$
$16 + 5 = 21$	$17 + 5 = 22$	$18 + 5 = 23$	$19 + 5 = 24$	$20 + 5 = 25$
$21 + 5 = 26$	$22 + 5 = 27$	$23 + 5 = 28$	$24 + 5 = 29$	$25 + 5 = 30$
$26 + 5 = 31$	$27 + 5 = 32$	$28 + 5 = 33$	$29 + 5 = 34$	$30 + 5 = 35$
$31 + 5 = 36$	$32 + 5 = 37$	$33 + 5 = 38$	$34 + 5 = 39$	$35 + 5 = 40$

In each group of 8 numbers lies another pattern, 1, 6, 11, 16, 21, 26, 31, and 36 have 6 and 1 in the digits. 2, 7, 12, 17, 22, 27, 32, 37 have 7 and 2 in the digits. 3, 8, 13, 18, 23, 28, 33, and 38 have 3 and 8 in the digits. 4, 9, 14, 19, 24, 29, 34, and 39 have 4 and 9 in the digits. 5, 10, 15, 20, 25, 30, 35, and 40 have 0 and 5 in the digits.

Red Numbers:

2, 3, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 29, 30, 31,
32, 33, 39, 40

Chances of the number being red:

2, 3, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 29, 30, 31,
32, 33, 39, 40

$$\frac{19}{40} = 0.475 = 47.5 \%$$

Chances of the number being red and odd:

3, 9, 11, 13, 19, 21, 23, 29, 31, 33, 39

$$\frac{11}{40} = 0.275 = 27.5\%$$

Chances of the number being red and even:

2, 10, 12, 20, 22, 30, 32, 40

$$\frac{8}{40} = \frac{1}{5} = 0.2 = 20\%$$

Green Numbers : 1 and 4

Chances of the number being green: 1, 4

$$\frac{2}{40} = \frac{1}{20} = 0.05 = 5\%$$

Chances of the number being green and odd: 1

$$\frac{1}{40} = 0.025 = 2.5 \%$$

Chances of the number being green and even: 4

$$\frac{1}{40} = 0.025 = 2.5 \%$$

Black Numbers:

**5, 6, 7, 8, 14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 34,
35, 36, 37, 38**

Chances of the number being black:

**5, 6, 7, 8, 14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 34,
35, 36, 37, 38**

$$\frac{19}{40} = 0.475 = 47.5\%$$

Chances of the number being black and odd:

5, 7, 15, 17, 25, 27, 35, 37

$$\frac{8}{40} = 0.2 = 20\%$$

Chances of the number being black and even:

6, 8, 14, 16, 18, 24, 26, 28, 34, 36, 38

$$\frac{11}{40} = 0.275 = 27.5\%$$

Multiples of 10: 10, 20, 30, 40

Chances of the number being a multiple of 10:

10, 20, 30, 40

$$\frac{4}{40} = \frac{1}{10} = 0.1 = 10\%$$

Single Digit Numbers:

1, 2, 3, 4, 5, 6, 7, 8, 9

Chances of the number being a single digit:

1, 2, 3, 4, 5, 6, 7, 8, 9

$$\frac{9}{40} = 0.225 = 22.5\%$$

Chances of the number being a single digit and

green: 1, 4

$$\frac{2}{40} = \frac{1}{20} = 0.05 = 5\%$$

Chances of the number being a single digit and

black: 5, 6, 7, 8

$$\frac{4}{40} = \frac{1}{10} = 0.1 = 10\%$$

Chances of the number being a single digit and

red: 2, 3, 9

$$\frac{3}{40} = 0.075 = 7.5\%$$

Double Digit Numbers:

**10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23,
24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37,
38, 39, 40**

Chances of the number being a double digit:

**10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23,
24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37,
38, 39, 40**

$$\frac{31}{40} = 0.775 = 77.5\%$$

Chances of the number being a double digit and green:

$$\frac{0}{40} = 0 = 0\%$$

Chances of the number being a double digit and black:

**14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 34, 35, 36, 37,
38**

$$\frac{15}{40} = 0.375 = 37.5\%$$

Chances of the number being a double digit and red:

**10, 11, 12, 13, 19, 20, 21, 22, 23, 29, 30, 31, 32, 33,
39, 40**

$$\frac{16}{40} = \frac{2}{5} = 0.4 = 40\%$$

1st Trial

Green	1		15
Red	2	III	3
Red	3		8
Green	4		8
Black	5		12
Black	6		10
Black	7		5
Black	8		7
Red	9		8
Red	10	III	4
Red	11		8
Red	12		6
Red	13		5
Black	14		7
Black	15		8
Black	16		5
Black	17		6
Black	18		9
Red	19		9
Red	20		17

Actual Data Recorded

Red	21		9
Red	22	III	3
Red	23		9
Black	24		7
Black	25		10
Black	26		12
Black	27	II	2
Black	28		8
Red	29		15
Red	30		9
Red	31		10
Red	32	I	1
Red	33		13
Black	34		8
Black	35		8
Black	36	III	4
Black	37	III	3
Black	38		10
Red	39		12
Red	40		11

Total: 324 spins

We had to spin the wheel 324 times for every number to come out at least once.

1st Trial

Actual Percentage Recorded

Green	1	15/324=.0463=4.6%
Red	2	3/324=.0093=1%
Red	3	8/324=.0247=2.5%
Green	4	8/324=.0247=2.5%
Black	5	12/324=.037=3.7%
Black	6	10/324=.0309=3.1%
Black	7	5/324=.01543=1.5%
Black	8	7/324=.02160=2%
Red	9	8/324=.0247=2.5%
Red	10	4/324=.01235=1%
Red	11	8/324=.0247=2.5%
Red	12	6/324=.0247=2.5%
Red	13	5/324=.01543=1.5%
Black	14	7/324=.02160=2%
Black	15	8/324=.0247=2.5%
Black	16	5/324=.01543=1.5%
Black	17	6/324=.0247=2.5%
Black	18	9/324=.0278=2.8%
Red	19	9/324=.0278=2.8%
Red	20	17/324=.05247=5.2%
Red	21	9/324=.0278=2.8%
Red	22	3/324=.0093=1%
Red	23	9/324=.0278=2.8%
Black	24	7/324=.02160=2%
Black	25	10/324=.0309=3.1%
Black	26	12/324=.037=3.7%
Black	27	2/324=.00617=1%
Black	28	8/324=.0247=2.5%
Red	29	15/324=.0463=4.6%
Red	30	9/324=.0278=2.8%
Red	31	10/324=.0309=3.1%
Red	32	1/324=.00308=0.3%
Red	33	13/324=.0401=4%
Black	34	8/324=.0247=2.5%
Black	35	8/324=.0247=2.5%
Black	36	4/324=.01235=1%
Black	37	3/324=.0093=1%
Black	38	10/324=.0309=3.1%
Red	39	12/324=.037=3.7%
Red	40	11/324=.0339=3.4%

1st Trial

	Probable	Vs.	Actual
Single Digit Number	22.5%	<	23.3%
Green, Single Digit Number	5%	<	7.1%
Black, Single Digit Number	10%	<	10.3%
Red, Single Digit Number	7.5%	>	5.9%
Double Digit Number	77.5%	>	76.7%
Green, Double Digit Number	0%	=	0%
Black, Double Digit	37.5%	>	33.2%
Red, Double Digit	40%	<	43.5%
Black Numbers	47.5%	>	43.5%
Black, Odd Numbers	20%	<	21%
Black, Even Numbers	27.5%	>	26.2%
Red Numbers	47.5%	<	49.4%
Red, Odd Numbers	27.5%	<	32.7%
Red, Even Numbers	20%	>	16.7%
Green Numbers	5%	<	7.1%
Green, Odd Numbers	2.5%	<	4.6%
Green, Even Numbers	2.5%	=	2.5%
Multiples of Ten	10%	<	12.4%

1st 2nd 3rd 4th 5th 6th 7th 8th 9th 10th 11th 12th 13th 14th 15th 16th 17th 18th 19th 20th 21st 22nd 23rd 24th 25th 26th 27th 28th 29th 30th 31st 32nd

queen - 1 - IIII IIII IIII - 15
 red - 2 - III - 3
 red - 3 - IIII III - 8
 queen - 4 - IIII III - 8
 black - 5 - IIII IIII II - 12
 black - 6 - IIII IIII - 10
 black - 7 - IIII - 5
 black - 8 - IIII II - 7
 red - 9 - IIII III - 8
 red - 10 - IIII - 4
 red - 11 - IIII III - 8
 red - 12 - IIII I - 6
 red - 13 - IIII - 5
 black - 14 - IIII II - 7
 black - 15 - IIII III - 8
 black - 16 - IIII - 5
 black - 17 - IIII - 6
 black - 18 - IIII IIII - 9
 red - 19 - IIII IIII - 9
 red - 20 - IIII IIII IIII II - 17
 red - 21 - IIII IIII - 9
 red - 22 - IIII - 3
 red - 23 - IIII IIII - 9
 black - 24 - IIII II - 7
 black - 25 - IIII IIII - 10
 black - 26 - IIII II - 7
 black - 27 - IIII - 2
 black - 28 - IIII II - 8
 red - 29 - IIII IIII IIII - 15
 red - 30 - IIII IIII - 9
 red - 31 - IIII IIII - 10
 red - 32 - I - 1
 red - 33 - IIII IIII III - 13
 black - 34 - IIII III - 8
 black - 35 - IIII III - 8
 black - 36 - IIII - 4
 black - 37 - IIII - 3
 black - 38 - IIII IIII - 10
 red - 39 - IIII IIII II - 12
 red - 40 - IIII IIII I - 11

total - 324 times

Qot 2 Percentages calculated

1st Trial

green #1 $\frac{15}{324} = .0463 \approx 4.6\%$

red #2 $\frac{3}{324} = 0.0093 \approx 1\%$

red #3 $\frac{8}{324} = 0.0247 \approx 2.5\%$

green #4 $\frac{8}{324} = 0.0247 \approx 2.5\%$

black #5 $\frac{12}{324} = 0.037 \approx 3.7\%$

black #6 $\frac{10}{324} = 0.0309 \approx 3.1\%$

black #7 $\frac{5}{324} = 0.01543 \approx 1.5\%$

black #8 $\frac{7}{324} = 0.02160 \approx 2\%$

red #9 $\frac{8}{324} = 0.0247 \approx 2.4\%$

red #10 $\frac{4}{324} = 0.01235 \approx 1\%$

red *11 $\frac{8}{324} = 0.0247 \approx 2.5\%$

red *12 $\frac{6}{324} = 0.01852 \approx 2\%$

red *13 $\frac{5}{324} = 0.01543 \approx 1.5\%$

black *14 $\frac{7}{324} = 0.02160 \approx 2\%$

black *15 $\frac{8}{324} = 0.0247 \approx 2.5\%$

black *16 $\frac{5}{324} = 0.01543 \approx 1.5\%$

black *17 $\frac{6}{324} = 0.01852 \approx 2\%$

black *18 $\frac{9}{324} = 0.0278 \approx 2.8\%$

red *19 $\frac{9}{324} = 0.0278 \approx 2.8\%$

red *20 $\frac{17}{324} = 0.05247 \approx 5.2\%$

1st Trial

Actual % merge recorded
calculated

$$\text{red} \# 21 \quad \frac{9}{324} = 0.0278 \approx 2.8\%$$

$$\text{red} \# 22 \quad \frac{3}{324} = 0.0093 \approx 1\%$$

$$\text{red} \# 23 \quad \frac{9}{324} = 0.0278 \approx 2.8\%$$

$$\text{black} \# 24 \quad \frac{7}{324} = 0.02160 \approx 2\%$$

$$\text{black} \# 25 \quad \frac{10}{324} = 0.0309 \approx 3.1\%$$

$$\text{black} \# 26 \quad \frac{12}{324} = 0.037 \approx 3.7\%$$

$$\text{black} \# 27 \quad \frac{2}{324} = 0.00617 \approx 1\%$$

$$\text{black} \# 28 \quad \frac{8}{324} = 0.0247 \approx 2.5\%$$

$$\text{red} \# 29 \quad \frac{15}{324} = 0.0463 \approx 4.6\%$$

$$\text{red} \# 30 \quad \frac{9}{324} = 0.0278 \approx 2.8\%$$

$$\text{red } \# 31 \quad \frac{10}{324} = 0.0309 \approx 3.1\%$$

$$\text{red } \# 32 \quad \frac{1}{324} = 0.00308 \approx 0.3\%$$

$$\text{red } \# 33 \quad \frac{13}{324} = 0.0401 \approx 4\%$$

$$\text{black } \# 34 \quad \frac{8}{324} = 0.0247 \approx 2.5\%$$

$$\text{black } \# 35 \quad \frac{8}{324} = 0.0247 \approx 2.5\%$$

$$\text{black } \# 36 \quad \frac{4}{324} = 0.0123 \approx 1\%$$

$$\text{black } \# 37 \quad \frac{3}{324} = 0.0093 \approx 1\%$$

$$\text{black } \# 38 \quad \frac{10}{324} = 0.0309 \approx 3.1\%$$

$$\text{red } \# 39 \quad \frac{12}{324} = 0.037 \approx 3.7\%$$

$$\text{red } \# 40 \quad \frac{11}{324} = 0.0339 \approx 3.4\%$$

Probable Vs. Actual

Single Digits

$$4.6\% + 1\% + 2.5\% + 2.5\% + 3.7\% + 3.1\% + 1.5\% + 2\% + 2.4\% = 23.3\%$$

Green Single Digit

$$4.6\% + 2.5\% = 7.1\%$$

Black Single Digit

$$3.7\% + 3.1\% + 1.5\% + 2\% = 10.3\%$$

Red Single Digit

$$1\% + 2.5\% + 2.4\% = 5.9\%$$

Double Digit

$$1\% + 2.5\% + 2\% + 1.5\% + 2\% + 2.5\% + 1.5\% + 2\% + 2.8\% + 2.8\% + 5.2\% + 2.8\% + 1\% + 2.8\% + 2\% + 3.1\% + 3.7\% + 1\% + 2.5\% + 4.6\% + 2.8\% + 3.1\% + 0.3\% + 4\% + 2.5\% + 2.5\% + 1\% + 1\% + 3.1\% + 3.7\% + 3.4\% = 76.7\%$$

Green Double Digit

$$0\%$$

Black Double Digit

$$2\% + 2.5\% + 1.5\% + 2\% + 2.8\% + 2\% + 3.1\% + 3.7\% + 1\% + 2.5\% + 2.5\% + 2.5\% + 1\% + 1\% + 3.1\% = 33.2\%$$

Red Double Digit

$$1\% + 2.5\% + 2\% + 1.5\% + 2.8\% + 5.2\% + 2.8\% + 1\% + 2.8\% + 4.6\% + 2.8\% + 3.1\% + 0.3\% + 4\% + 3.7\% + 3.4\% = 43.5\%$$

Black Numbers

$$3.7\% + 3.1\% + 1.5\% + 2\% + 2\% + 2.5\% + 1.5\% + 2\% + 2.8\% + 2\% + 3.1\% + 3.7\% + 1\% + 2.5\% + 2.5\% + 2.5\% + 1\% + 1\% + 3.1\% = 43.5\%$$

Black Odd

$$3.7\% + 1.5\% + 2.5\% + 2\% + 3.1\% + 1\% + 2.5\% + 1\% + 3.7\% = 21\%$$

Black Even

$$3.1\% + 2\% + 2\% + 1.5\% + 2.8\% + 2\% + 3.7\% + 2.5\% + 2.5\% + 1\% + 3.1\% = 26.2\%$$

Red Numbers

$$1\% + 2.5\% + 2.4\% + 1\% + 2.5\% + 2\% + 1.5\% + 2.8\% + 2.2\% + 2.8\% + 1\% + 2.8\% + 4.6\% + 2.8\% + 3.1\% + 0.3\% + 4\% + 3.7\% + 3.4\% = 49.4\%$$

Red Odd

$$2.5\% + 2.4\% + 2.5\% + 1.5\% + 2.8\% + 2.8\% + 2.3\% + 4.6\% + 3.1\% + 4\% + 3.7\% = 32.7\%$$

Red Even

$$1\% + 1\% + 2\% + 5.2\% + 1\% + 2.8\% + 4.3\% + 3.4\% = 16.7\%$$

Green Number

$$4.6\% + 2.5\% = 7.1\%$$

Green Odd

$$4.6\%$$

Green Even

$$2.5\%$$

Multiples of Ten

$$1\% + 5.2\% + 2.8\% + 3.4\% = 12.4\%$$

2nd Trial

Green	1	III	3
Red	2	III	4
Red	3	II	2
Green	4	III	3
Black	5	IIIIIIII	10
Black	6	III	4
Black	7	I	1
Black	8	I	1
Red	9	III	3
Red	10	III	3
Red	11	II	2
Red	12	II	2
Red	13	IIII III	8
Black	14	III	3
Black	15	IIII I	5
Black	16	III	3
Black	17	II	2
Black	18	IIII I	5
Red	19	III	3
Red	20	III	3

Actual Data Recorded

Red	21	III	3
Red	22	II	2
Red	23	III	3
Black	24	IIII I	5
Black	25	III	4
Black	26	I	1
Black	27	III	3
Black	28	IIII II	6
Red	29	II	2
Red	30	IIII I	5
Red	31	IIII	4
Red	32	II	2
Red	33	III	3
Black	34	III	3
Black	35	IIII	5
Black	36	IIII II	6
Black	37	II	2
Black	38	IIII	4
Red	39	III	3
Red	40	II	2

Total: 139 spins

We had to spin the wheel 139 times for every number to come out at least once.

2nd Trial

Actual Percentage Recorded

Green	1	$3/139=.0216=2.2\%$
Red	2	$4/139=.0288=2.9\%$
Red	3	$2/139=.0144=1.4\%$
Green	4	$3/139=.0216=2.2\%$
Black	5	$10/139=.0719=7\%$
Black	6	$4/139=.0288=2.9\%$
Black	7	$1/139=.0072=7\%$
Black	8	$1/139=.0072=7\%$
Red	9	$3/139=.0216=2.2\%$
Red	10	$3/139=.0216=2.2\%$
Red	11	$3/139=.0216=2.2\%$
Red	12	$2/139=.0144=1.4\%$
Red	13	$8/139=.0576=5.7\%$
Black	14	$3/139=.0216=2.2\%$
Black	15	$5/139=.0360=3.6\%$
Black	16	$3/139=.0216=2.2\%$
Black	17	$2/139=.0144=1.4\%$
Black	18	$5/139=.0360=3.6\%$
Red	19	$3/139=.0216=2.2\%$
Red	20	$3/139=.0216=2.2\%$
Red	21	$3/139=.0216=2.2\%$
Red	22	$2/139=.0144=1.4\%$
Red	23	$3/139=.0216=2.2\%$
Black	24	$5/139=.0360=3.6\%$
Black	25	$4/139=.0288=2.9\%$
Black	26	$1/139=.0072=7\%$
Black	27	$3/139=.0216=2.2\%$
Black	28	$6/139=.0432=4.3\%$
Red	29	$2/139=.0144=1.4\%$
Red	30	$5/139=.0360=3.6\%$
Red	31	$4/139=.0288=2.9\%$
Red	32	$2/139=.0144=1.4\%$
Red	33	$3/139=.0216=2.2\%$
Black	34	$3/139=.0216=2.2\%$
Black	35	$5/139=.0360=3.6\%$
Black	36	$6/139=.0432=4.3\%$
Black	37	$2/139=.0144=1.4\%$
Black	38	$4/139=.0288=2.9\%$
Red	39	$3/139=.0216=2.2\%$
Red	40	$2/139=.0144=1.4\%$

2nd Trial

	Probable	Vs.	Actual
Single Digit Number	22.5%	>	15.9%
Green, Single Digit Number	5%	>	4.4%
Black, Single Digit Number	10%	>	5%
Red, Single Digit Number	7.5%	>	6.5%
Double Digit Number	77.5%	<	77.9%
Green, Double Digit Number	0%	=	0%
Black, Double Digit	37.5%	<	41.1%
Red, Double Digit	40%	>	8%
Black Numbers	47.5%	>	46.1%
Black, Odd Numbers	20%	>	16.5%
Black, Even Numbers	27.5%	<	29.6%
Red Numbers	47.5%	>	43.3%
Red, Odd Numbers	27.5%	>	26.8%
Red, Even Numbers	20%	>	16.5%
Green Numbers	5%	>	4.4%
Green, Odd Numbers	2.5%	>	2.2%
Green, Even Numbers	2.5%	>	2.2%
Multiples of Ten	10%	>	9.4%

2nd Trial

for every number to come out at least once.

green 1 - III - 3
red 2 - IIII - 4
red 3 - II - 2
green 4 - III - 3
black 5 - ~~II~~ IIII - 10
black 6 - IIII - 4
black 7 - I - 1
black 8 - I - 1
red 9 - III - 3
red 10 - III - 3
red 11 - III - 3
red 12 - II - 2
red 13 - ~~III~~ IIII - 8
black 14 - III - 3
black 15 - ~~III~~ - 5
black 16 - III - 3
black 17 - II - 2
black 18 - ~~II~~ - 5
red 19 - III - 3
red 20 - IIII - 4
red 21 - IIII - 4
red 22 - II - 2
red 23 - III - 3
black 24 - ~~II~~ - 5
black 25 - IIII - 4
black 26 - I - 1
black 27 - III - 3
black 28 - ~~II~~ III - 6
red 29 - II - 2
red 30 - ~~III~~ - 5

red 31 - IIII - 4
red 32 - II - 2
red 33 - III - 3
black 34 - III - 3
black 35 - ~~II~~ - 5
black 36 - ~~III~~ I - 6
black 37 - II - 2
black 38 - IIII - 4
red 39 - III - 3
red 40 - II - 2

Total - 139

Actual Percentage Recorded and Calculated

2nd Trial

green 1 - $3/139$ - .0216 - 2.2%

red 2 - $4/139$ - .0288 - 2.9%

red 3 - $2/139$ - .0144 - 1.4%

green 4 - $3/139$ - .0216 - 2.2%

black 5 - $10/139$ - .0719 - 7.1%

black 6 - $4/139$ - .0288 - 2.9%

black 7 - $1/139$ - .0072 - .7%

black 8 - $1/139$ - .0072 - .7%

red 9 - $3/139$ - .0216 - 2.2%

red 10 - $3/139$ - .0216 - 2.2%

red 11 - $3/139$ - .0216 - 2.2%

red 12 - $2/139$ - .0144 - 1.4%

red 13 - $8/139$ - .0576 - 5.7%

(black 14 - $3/139$ - .0216 - 2.2%

black 15 - $5/139$ - .0360 - 3.6%

black 16. $3/139 - .0216 - 2.2\%$

black 17. $2/139 - .0144 - 1.4\%$

black 18. $5/139 - .0360 - 3.6\%$

red 19. $3/139 - .0216 - 2.2\%$

red 20. $3/139 - .0216 - 2.2\%$

red 21. $3/139 - .0216 - 2.2\%$

red 22. $2/139 - .0144 - 1.4\%$

red 23. $3/139 - .0216 - 2.2\%$

black 24. $5/139 - .0360 - 3.6\%$

black 25. $4/139 - .0288 - 2.9\%$

black 26. $1/139 - .0072 - .7\%$

black 27. $3/139 - .0216 - 2.2\%$

black 28. $6/139 - .0432 - 4.3\%$

red 29. $2/139 - .0144 - 1.4\%$

red 30. $5/139 - .0360 - 3.6\%$

Actual Percentage Recorded and Calculated

red 31. $4/139 - .0288 - 2.9\%$

red 32. $2/139 - .0144 - 1.4\%$

red 33. $3/139 - .0216 - 2.2\%$

black 34. $3/139 - .0216 - 2.2\%$

black 35. $5/139 - .0360 - 3.6\%$

black 36. $6/139 - .0432 - 4.3\%$

black 37. $2/139 - .0144 - 1.4\%$

black 38. $4/139 - .0288 - 2.9\%$

red 39. $3/139 - .0216 - 2.2\%$

red 40. $2/139 - .0144 - 1.4\%$

Trial 2 Actual Vs. Probable

Single Digit -

$$2.2 + 2.9 + 1.4 + 2.2 + .7 + 2.9 + .7 + .7 + 2.2 = 15.9\%$$

Double Digit -

$$\begin{aligned} &2.2 + 2.2 + 2.2 + 1.4 + 3.7 + 2.2 + 3.6 + 2.2 + 1.4 + \\ &3.6 + 2.2 + 2.2 + 2.2 + 1.4 + 2.2 + 3.6 + 2.9 + .7 + \\ &2.2 + 4.3 + 1.4 + 3.6 + 2.9 + 1.4 + 2.2 + 2.2 + \\ &3.6 + 4.3 + 1.4 + 2.9 + 2.2 + 1.4 = 77.9\% \end{aligned}$$

Black number

$$\begin{aligned} &.7 + .7 + 2.9 + .7 + 2.2 + 3.6 + 2.2 + 1.4 + 3.6 + \\ &3.6 + 2.9 + .7 + 2.2 + 4.3 + 2.2 + 3.6 + 4.3 + 1. \\ &2.9 = 46.1\% \end{aligned}$$

red numbers

$$\begin{aligned} &2.9 + 1.4 + 2.2 + 2.2 + 2.2 + 1.4 + 3.7 + 2.2 + \\ &2.2 + 2.2 + 1.4 + 2.2 + 1.4 + 3.6 + 2.9 + 1.4 + \\ &2.2 + 2.2 + 1.4 = 43.3\% \end{aligned}$$

green numbers -

$$2.2 + 2.2 = 4.4\%$$

Multiples of 2 -

$$2.2 + 2.2 + 3.6 + 1.4 = 9.4\%$$

Green Single Digit Number -

$$2.2 + 2.2 = 4.4\%$$

Black Single Digit Number -

$$.7 + 2.9 + .7 + .7 = 5\%$$

Green Double Digit number -

0

Black Double Digit -

$$2.2 + 3.6 + 2.2 + 1.4 + 3.6 + 3.6 + 2.9 + .7 +$$

$$2.2 + 4.3 + 2.2 + 3.6 + 4.3 + 1.4 + 2.9 = 41.1\%$$

Red Double Digit -

$$2.2 + 2.2 + 1.4 + 6.7 + 2.2 + 2.2 + 2.2 +$$

$$1.4 + 2.2 + 1.4 + 3.6 + 2.9 = 16.4 + 2.2 + 2.2 +$$

$$1.4 = 36.8\%$$

Black Odd Numbers -

$$.7 + .7 + 3.6 + 1.4 + 2.9 + 2.2 + 3.6 +$$

$$1.4 = 16.5\%$$

Black Even numbers -

$$2.9 + .7 + 2.2 + 2.2 + 3.6 + 3.6 + .7 +$$

$$4.3 + 2.2 + 4.3 + 2.9 = 29.6$$

Red Odd Numbers -

$$1.4 + 2.2 + 2.2 + 5.7 + 2.2 + 2.2 + 2.2 +$$

$$1.4 + 2.9 + 2.2 + 2.2 = 26.8$$

Red Even Numbers -

$$2.9 + 2.2 + 1.4 + 2.2 + 1.4 + 3.6 + 1.4 +$$

$$1.4 = 16.5$$

Green Odd Numbers -

$$2.2\%$$

Green Even Numbers -

$$\underline{2.2\%}$$

Red Single Digit

$$2.9 + 1.4 + 2.2 = 6.5$$

3rd Trial

Green	1	I	1
Red	2	III	3
Red	3	IIII	4
Green	4	III	3
Black	5	IIIIIIII	10
Black	6	III	3
Black	7	I	1
Black	8	II	2
Red	9	III	3
Red	10	IIII	4
Red	11	III	3
Red	12	I	1
Red	13	II	2
Black	14	IIII II	6
Black	15	III	3
Black	16	I	1
Black	17	IIII	4
Black	18	IIII II	6
Red	19	IIII	5
Red	20	III	3

Actual Data Recorded

Red	21	II	2
Red	22	I	1
Red	23	IIII II	6
Black	24	II	2
Black	25	III	3
Black	26	IIII III	7
Black	27	II	2
Black	28	II	2
Red	29	III	3
Red	30	II	2
Red	31	IIII	4
Red	32	II	2
Red	33	I	1
Black	34	IIII II	6
Black	35	IIIIII	7
Black	36	I	1
Black	37	IIII	4
Black	38	IIII II	6
Red	39	IIII III	7
Red	40	IIII I	5

Total: 141 spins

We had to spin the wheel 141 times for every number to come out at least once.

3rd Trial

Actual Percentage Recorded

Green	1	1/141=.0070=.7%
Red	2	3/141=.0212=2.1%
Red	3	4/141=.0283=2.8%
Green	4	3/141=.0212=2.1%
Black	5	10/141=.0709=7%
Black	6	3/141=.0212=2.1%
Black	7	1/141=.0070=.7%
Black	8	2/141=.0141=1.4%
Red	9	3/141=.0212=2.1%
Red	10	4/141=.0283=2.8%
Red	11	3/141=.0212=2.1%
Red	12	1/141=.0070=.7%
Red	13	2/141=.0141=1.4%
Black	14	6/141=.0425=4.3%
Black	15	3/141=.0212=2.1%
Black	16	1/141=.0070=.7%
Black	17	4/141=.0283=2.8%
Black	18	6/141=.0425=4.3%
Red	19	5/141=.0354=3.5%
Red	20	3/141=.0212=2.1%
Red	21	2/141=.0141=1.4%
Red	22	1/141=.0070=.7%
Red	23	6/141=.0425=4.3%
Black	24	2/141=.0141=1.4%
Black	25	3/141=.0212=2.1%
Black	26	7/141=.0496=5%
Black	27	2/141=.0141=1.4%
Black	28	2/141=.0141=1.4%
Red	29	3/141=.0212=2.1%
Red	30	2/141=.0141=1.4%
Red	31	4/141=.0283=2.8%
Red	32	2/141=.0141=1.4%
Red	33	1/141=.0070=.7%
Black	34	6/141=.0425=4.3%
Black	35	7/141=.0496=5%
Black	36	1/141=.0070=.7%
Black	37	4/141=.0283=2.8%
Black	38	6/141=.0425=4.3%
Red	39	7/141=.0496=5%
Red	40	5/141=.0354=3.5%

3rd Trial

	Probable	Vs.	Actual
Single Digit Number	22.5%	>	14.7%
Green, Single Digit Number	5%	>	2.8%
Black, Single Digit Number	10%	>	4.9%
Red, Single Digit Number	7.5%	>	7%
Double Digit Number	77.5%	<	78.5%
Green, Double Digit Number	0%	=	0%
Black, Double Digit	37.5%	<	42.6%
Red, Double Digit	40%	>	35.9%
Black Numbers	47.5%	=	47.5%
Black, Odd Numbers	20%	>	17.6%
Black, Even Numbers	27.5%	<	29.9%
Red Numbers	47.5%	>	42.9%
Red, Odd Numbers	27.5%	<	28.2%
Red, Even Numbers	20%	>	14.7%
Green Numbers	5%	>	2.8%
Green, Odd Numbers	2.5%	>	.7%
Green, Even Numbers	2.5%	>	2.1%
Multiples of Ten	10%	>	9.8%

Trial 3 for every number to come out at least once.

green	1 - 1	1
red	2 - III	3
red	3 - IIII	4
green	4 - II	3
black	5 - IIII IIII	10
black	6 - III	3
black	7 - I	1
black	8 - II	2
red	9 - III	3
red	10 - IIII	4
red	11 - III	3
(red	12 - I	1
red	13 - II	2
black	14 - IIII	6
black	15 - III	3
black	16 - I	1
black	17 - IIII	4
black	18 - IIII	6
red	19 - IIII	5
red	20 - IIII	3
red	21 - II	2
red	22 - I	1
red	23 - IIII	6
black	24 - II	2
black	25 - III	3
black	26 - IIII II	7
(black	27 - II	2
black	28 - I	2
red	29 - III	3

red	30 - II	2
red	31 - IIII	4
red	32 - II	2
red	33 - I	1
black	34 - IIII	6
black	35 - IIII II	7
black	36 - I	1
black	37 - IIII	4
black	38 - IIII	6
red	39 - IIII III	7
red	40 - IIII	5

Total - 141

Actual Percentage
Recorded and Calculated

Trial 3

green 1 - $\frac{1}{141}$ - .0070 - .7%

red 2 - $\frac{3}{141}$ - .0212 - 2.10%

red 3 - $\frac{4}{141}$ - .0283 - 2.8%

green 4 - $\frac{3}{141}$ - .0212 - 2.1%

black 5 - $\frac{10}{141}$ - .0709 - .7%

black 6 - $\frac{3}{141}$ - .0212 - 2.1%

black 7 - $\frac{1}{141}$ - .0070 - .7%

black 8 - $\frac{2}{141}$ - .0141 - 1.4%

red 9 - $\frac{3}{141}$ - .0212 - 2.10%

red 10 - $\frac{4}{141}$ - .0283 - 2.8%

red 11 - $\frac{3}{141}$ - .0212 - 2.10%

red 12 - $\frac{1}{141}$ - .0070 - .7%

red 13 - $\frac{3}{141}$ - .0141 - 1.4%

black 14 - $\frac{6}{141}$ - .0425 - 4.3%

black 15 - $\frac{3}{141}$ - .0212 - 2.10%

black 16 - $\frac{1}{141}$ - .007 - .7%

black 17 - $\frac{4}{141}$ - .0283 - 2.8%

black 18 - $\frac{6}{141}$ - .0425 - 4.3%

red 19 - $\frac{5}{141}$ - .0354 - 3.5%

red 20 - $\frac{3}{141}$ - .0212 - 2.1%

red 21 - $\frac{2}{141}$ - .0141 - 1.4%

red 22 - $\frac{1}{141}$ - .007 - .7%

red 23 - $\frac{6}{141}$ - .0425 - 4.3%

black 24 - $\frac{2}{141}$ - .0141 - 1.4%

black 25 - $\frac{3}{141}$ - .0212 - 2.1%

black 26 - $\frac{7}{141}$ - .0496 - 5%

black 27 - $\frac{2}{141}$ - .0141 - 1.4%

black 28 - $\frac{2}{141}$ - .0141 - 1.4%

red 29 - $\frac{3}{141}$ - .0212 - 2.1%

red 30 - $\frac{2}{141}$ - .0141 - 1.4%

red 31 - $\frac{4}{41}$ - .0283 - 2.8%

red 32 - $\frac{2}{41}$ - .0141 - 1.4%

red 33 - $\frac{1}{41}$ - .007 - .7%

black 34 - $\frac{6}{41}$ - .0425 - 4.3%

black 35 - $\frac{7}{41}$ - .0496 - 5%

black 36 - $\frac{1}{41}$ - .007 - .7%

black 37 - $\frac{4}{41}$ - .0283 - 2.8%

black 38 - $\frac{6}{41}$ - .0425 - 4.3%

red 39 - $\frac{7}{41}$ - .0496 - 5%

red 40 - $\frac{5}{41}$ - .0384 - 3.5%

Single Digit Number Actual Vs. Probable

$$.7\% + 2.10 + 2.8 + 2.1 + .7 + 2.1 + .7 + 1.4 + 2.10 = 14.7\%$$

Green, Single Digit Number

$$.7 + 2.1 = 2.8\%$$

Black, Single Digit Number

$$.7 + 2.1 + .7 + 1.4 = 4.9\%$$

Red, Single Digit Number

$$2.10 + 2.8 + 2.10 = 7$$

Double Digit Number

$$2.8 + 2.10 + .7 + 1.4 + 4.3 + 2.10 + .7 + 2.8 + 4.3 + 3.5 + 2.1 + 1.4 + .7 + 4.3 + 1.4 = 34.6$$

$$2.1 + 5 + 1.4 + 1.4 + 2.1 + 1.4 + 2.8 + 1.4 + .7 + 4.3 + 5 + .7 + 2.8 + 4.3 + 5 + 3.5 = 43.9$$

$$\begin{array}{r} 34.6 \\ + 43.9 \\ \hline 78.5 \end{array}$$

Green Double Digit Number = 0

Black, Double Digit

$$4.3 + 2.10 + .7 + 2.8 + 4.3 + 1.4 + 2.1 + 5 + 1.4 + 1.4 + 4.3 + 5 + .7 + 2.8 + 4.3 = 42.6$$

Red Double Digit

$$2.8 + 2.10 + .7 + 1.4 + 3.5 + 2.1 + 1.4 + .7 + 4.3 + 2.1 + 1.4 + 2.8 + 1.4 + .7 + 5 + 3.5 = 35.9$$

Black Numbers

$$.7 + 2.1 + .7 + 1.4 + 4.3 + 2.1 + .7 + 2.8 + 4.3 + 1.4 + 2.1 + 5 + 1.4 + 1.4 + 4.3 + 5 + .7 + 2.8 + 4.3 = 47.5$$

Black, Odd Numbers

$$.7 + .7 + 2.1 + 2.8 + 2.1 + 1.4 + 5 + 2.8 = 17.6$$

$$+ 1.4 + 4.3 + .7 + 4.3 + 1.4 + 5 + 1.4 + 4.3 + .7 + 4.3 = 27.7$$

ed Numbers

$$+ 2.8 + 2.1 + 2.8 + 2.1 + .7 + 1.4 + 3.5 + 2.1 + 1.4 + .7 + 4.3 + 2.1 + 1.4 + 2.8 + 1.4 + .7 + 5 + 5 = 42.9$$

ed Odd Numbers

$$1.8 + 2.1 + 2.1 + 1.4 + 3.5 + 1.4 + 4.3 + 2.1 + 2.8 + .7 + 5 = 28.2$$

2ed Even Numbers

$$2.1 + 2.8 + .7 + 2.1 + .7 + 1.4 + 1.4 + 3.5 = 14.7$$

3reen Numbers

$$7 + 2.1 = 2.8$$

3reen Odd Numbers - 0

3reen Even Numbers

$$2.1 + .7 = 2.8$$

Multiples of Ten

$$2.8 + 2.1 + 1.4 + 3.5 = 9.8$$

4th Trial

Green	1	IIII	4
Red	2	I	1
Red	3	I	1
Green	4	IIII	4
Black	5	III	3
Black	6	IIII	5
Black	7	I	1
Black	8	I	1
Red	9	IIII	5
Red	10	I	1
Red	11	III	3
Red	12	IIIIII	7
Red	13	I	1
Black	14	II	2
Black	15	IIII	5
Black	16	II	2
Black	17	III	4
Black	18	I	1
Red	19	II	2
Red	20	I	1

Actual Data Recorded

Red	21	II	2
Red	22	III	3
Red	23	III	3
Black	24	IIII	4
Black	25	IIII	4
Black	26	IIII	5
Black	27	I	1
Black	28	III	3
Red	29	II	2
Red	30	II	2
Red	31	I	1
Red	32	II	2
Red	33	IIII	4
Black	34	III	3
Black	35	IIII	4
Black	36	II	2
Black	37	II	2
Black	38	III	3
Red	39	IIII	4
Red	40	III	3

Total: 111 spins

We had to spin the wheel 111 times for every number to come out at least once.

4th Trial

Actual Percentage Recorded

Green	1	$4/111=.0360=3.6\%$
Red	2	$1/111=.009=1\%$
Red	3	$1/111=.009=1\%$
Green	4	$4/111=.0360=3.6\%$
Black	5	$3/111=.0270=2.7\%$
Black	6	$5/111=.0450=4.5\%$
Black	7	$1/111=.009=1\%$
Black	8	$1/111=.009=1\%$
Red	9	$5/111=.0450=4.5\%$
Red	10	$1/111=.009=1\%$
Red	11	$3/111=.0270=2.7\%$
Red	12	$7/111=.063=6.3\%$
Red	13	$1/111=.009=1\%$
Black	14	$2/111=.0180=1.8\%$
Black	15	$5/111=.0450=4.5\%$
Black	16	$2/111=.0180=1.8\%$
Black	17	$4/111=.0360=3.6\%$
Black	18	$1/111=.009=1\%$
Red	19	$2/111=.0180=1.8\%$
Red	20	$1/111=.009=1\%$
Red	21	$2/111=.0180=1.8\%$
Red	22	$3/111=.0270=2.7\%$
Red	23	$3/111=.0270=2.7\%$
Black	24	$4/111=.0360=3.6\%$
Black	25	$4/111=.0360=3.6\%$
Black	26	$5/111=.0450=4.5\%$
Black	27	$1/111=.009=1\%$
Black	28	$3/111=.0270=2.7\%$
Red	29	$2/111=.0180=1.8\%$
Red	30	$2/111=.0180=1.8\%$
Red	31	$1/111=.009=1\%$
Red	32	$2/111=.0180=1.8\%$
Red	33	$4/111=.0360=3.6\%$
Black	34	$3/111=.0270=2.7\%$
Black	35	$4/111=.0360=3.6\%$
Black	36	$2/111=.0180=1.8\%$
Black	37	$2/111=.0180=1.8\%$
Black	38	$3/111=.0270=2.7\%$
Red	39	$4/111=.0360=3.6\%$
Red	40	$3/111=.0270=2.7\%$

4th Trial

	Probable	Vs.	Actual
Single Digit Number	22.5%	<	22.9%
Green, Single Digit Number	5%	<	7.2%
Black, Single Digit Number	10%	>	9.2%
Red, Single Digit Number	7.5%	>	6.5%
Double Digit Number	77.5%	<	78%
Green, Double Digit Number	0%	=	0%
Black, Double Digit	37.5%	<	41.7%
Red, Double Digit	40%	>	36.3%
Black Numbers	47.5%	>	50.9%
Black, Odd Numbers	20%	<	22.8%
Black, Even Numbers	27.5%	<	28.1%
Red Numbers	47.5%	>	42.8%
Red, Odd Numbers	27.5%	>	24.5%
Red, Even Numbers	20%	>	18.3%
Green Numbers	5%	<	7.2%
Green, Odd Numbers	2.5%	<	3.6%
Green, Even Numbers	2.5%	<	3.6%
Multiples of Ten	10%	>	6.5%

4th Trial for every number to come out once.

green	1- IIII	4
red	2- I	1
red	3- I	1
green	4- IIII	4
black	5- II	3
black	6- IIII	5
black	7- I	1
black	8- I	1
red	9- IIII	5
red	10- I	1
red	11- III	3
red	12- IIII	11
red	13- I	1
black	14- II	2
black	15- IIII	5
black	16- II	2
black	17- IIII	4
black	18- I	1
red	19- II	2
red	20- I	1
red	21- II	2
red	22- IIII	3
red	23- III	3
black	24- IIII	4
black	25- IIII	4
black	26- IIII	5
black	27- I	1
black	28- III	3
red	29- II	2
red	30- II	2

red	31- I	1
red	32- II	2
red	33- IIII	4
black	34- III	3
black	35- IIII	4
black	36- II	2
black	37- II	2
black	38- III	3
red	39- IIII	4
red	40- III	3

Total - III

Actual Percentage Recorded and Calculated

4th Trial

green	1 - IIII - 4/III = .0360 = 3.6%
red	2 - I - 1/III = .009 = 1%
red	3 - I - 1/III = .009 = 1%
green	4 - IIII - 4/III = .0360 = 3.6%
black	5 - III - 3/III = .0270 = 2.7%
black	6 - IIII - 5/III = .0450 = 4.5%
black	7 - I - 1/III = .009 = 1%
black	8 - I - 1/III = .009 = 1%
red	9 - IIII - 5/III = .0450 = 4.5%
red	10 - I - 1/III = .009 = 1%
red	11 - III - 3/III = .027 = 2.7%
red	12 - IIII - 7/III = .063 = 6.3%
black	13 - I - 1/III = .009 = 1%
black	14 - II - 2/III = .018 = 1.8%
black	15 - IIII - 6/III = .045 = 4.5%
black	16 - II - 2/III = .0180 = 1.8%
black	17 - IIII - 4/III = .036 = 3.6%

black 18-1- $\frac{1}{111}$ - .009 - 1%

red 19-11- $\frac{2}{111}$ - .018 - 1.8%

red 20-1- $\frac{1}{111}$ - .009 - 1%

red 21-11- $\frac{2}{111}$ - .018 - 1.8%

red 22-111- $\frac{3}{111}$ - .027 - 2.7%

red 23-111- $\frac{3}{111}$ - .027 - 2.7%

black 24-1111- $\frac{4}{111}$ - .036 - 3.6%

black 25-1111- $\frac{4}{111}$ - .036 - 3.6%

black 26-1111- $\frac{5}{111}$ - .0450 - 4.5%

black 27-1- $\frac{1}{111}$ - .009 - 1%

black 28-111- $\frac{3}{111}$ - .027 - 2.7%

red 29-11- $\frac{2}{111}$ - .018 - 1.8%

red 30-11- $\frac{2}{111}$ - .018 - 1.8%

red 31-1- $\frac{1}{111}$ - .009 - 1%

red 32-11- $\frac{2}{111}$ - .018 - 1.8%

red 33-1111- $\frac{4}{111}$ - .036 - 3.6%

black 34-111- $\frac{3}{111}$ - .027 - 2.7%

Actual Percentage Recorded and Calculated

black 35 - IIII - 4/III - .036 - 3.6%

black 36 - II - 2/III - .018 - 1.8%

black 37 - II - 2/III - .018 - 1.8%

black 38 - III - 3/III - .027 - 2.7%

red 39 - IIII - 4/III - .036 - 3.6%

red 40 - III - 3/III - .027 - 2.7%

Trial 4

Actual Vs. Probable

Actual

single digit

$$3.6 + 1 + 1 + 3.6 + 2.7 + 4.5 + 1 + 1 + 4.5 = 22.9 \text{ d.o.}$$

single digit green

$$3.6 + 3.6 = 7.2 \text{ d.o.}$$

single digit black

$$2.7 + 4.5 + 1 + 1 = 9.2 \text{ d.o.}$$

single digit red

$$1 + 1 + 4.5 = 6.5 \text{ d.o.}$$

double digit number

$$1 + 2.7 + 6.3 + 1 + 1.8 + 4.5 + 1.8 + 3.6 + 1 + 1.8 + 1.8 + 2.7 + 2.7 + 3.6 + 3.6 + 4.5 + 1 + 2.7 + 1.8 + 1.8 + 1 + 1.8 + 3.6 + 2.7 + 3.6 + 1.8 + 1.8 + 2.7 + 3.6 + 2.7 = 78 \text{ d.o.}$$

$$1.8 + 2.7 + 2.7 + 3.6 + 3.6 + 4.5 + 1 + 2.7 + 1.8 + 1.8 + 1 + 1.8 + 3.6 + 2.7 + 3.6 + 1.8 + 1.8 + 2.7 + 3.6 + 2.7 = 78 \text{ d.o.}$$

double digit green

$$0 = 0 \text{ d.o.}$$

double digit black

$$1 + 1.8 + 4.5 + 1.8 + 3.6 + 1 + 3.6 + 3.6 + 4.5 + 1 + 2.7$$

$$2.7 + 3.6 + 1.8 + 1.8 + 2.7 = 41.7 \text{ d.o.}$$

double digit red

$$1 + 2.7 + 6.3 + 1.8 + 1 + 1.8 + 2.7 + 2.7 + 1.8 + 1.8 +$$

$$1 + 1.8 + 3.6 + 3.6 + 2.7 = 36.3 \text{ d.o.}$$

black numbers

$$2.7 + 4.5 + 1 + 1 + 1 + 1.8 + 4.5 + 1.8 + 3.6 + 1 + 3.6 + 3.6 +$$

$$4.5 + 1 + 2.7 + 2.7 + 3.6 + 1.8 + 1.8 + 2.7 = 77 \text{ d.o.}$$

black odd numbers

$$2.7 + 1 + 1 + 4.5 + 3.6 + 3.6 + 1 + 3.6 + 1.8 = 22.8$$

black even numbers

$$4.5 + 1 + 1.8 + 1.8 + 1 + 3.6 + 4.5 + 2.7 + 2.7 + 1.8 + 2.7 = 28.10$$

red numbers

$$1 + 1 + 4.5 + 1 + 2.7 + 6.3 + 1.8 + 1 + 1.8 + 2.7 + 2.7 + 1.8 + 1.8 + 1 + 1.8 + 13.6 + 3.6 + 2.7 = 42.80$$

red odd numbers

$$1 + 4.5 + 2.7 + 1.8 + 1.8 + 2.7 + 1.8 + 1 + 3.6 + 3.6 = 24.5$$

red even numbers

$$1 + 1 + 6.3 + 1 + 2.7 + 1.8 + 1.8 + 2.7 = 18.30$$

green numbers

$$3.6 + 3.6 = 7.20$$

green odd numbers

$$3.6 = 3.60$$

green even numbers

$$3.6 = 3.60$$

multiples of 10

$$1 + 1 + 1.8 + 2.7 = 6.50$$

