



## ***How to Calculate the Probabilities of Winning the Nine PowerBall Prize Levels:***

**Powerball** numbers are drawn from two sets of numbers. Five numbers are drawn from one set of 59 numbered white balls and one **Powerball** number is drawn from the second set of 35 numbered red balls. The odds of winning PowerBall are calculated by combining the odds for both sets of numbers for all prize levels. The first, third, fifth, and seventh through ninth prize level odds are determined by the chances of choosing both numbers correctly. The second, fourth and sixth prize level odds are determined by the chances of choosing the white balls correctly and the red **Powerball** incorrectly. Since the order of the items chosen is irrelevant the applicable probability rule is the formula to determine combinations.

### **I. Top Prize Level: Match all five numbers plus the **Powerball** (1 in 175,223,510 odds)**

**Step 1:** Calculate the number of combinations of 5 correct out of 5 draws from 59. The formula is as follows: (! indicates a factorial)

$$\frac{59!}{5!(59-5)!} = \frac{59 \cdot 58 \cdot 57 \cdot 56 \cdot 55 \cdot 54!}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 54!} = \frac{59 \cdot 58 \cdot 57 \cdot 56 \cdot 55}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \frac{600,766,320}{120} = 5,006,386$$

This means that there are 5,006,386 different ways in which 5 numbers can be chosen from a total of 59 numbers. Therefore, the chance of correctly choosing the correct five numbers in the first portion of **PowerBall** is 1 in 5,006,386.

**Step 2:** Calculate the number of combinations of 1 draw from 35. The chance of correctly choosing the **Powerball** is simply 1 in 35.

**Step 3:** Determine the chances of choosing both correctly by multiplying these figures together:

$$\frac{1}{5,006,386} * \frac{1}{35} = \frac{1}{175,223,510} \text{ or 1 chance in 175,223,510.}$$

**2. Second Prize Level: Match all five numbers only (1 in 5,153,632.65 odds)**

**Step 1:** The number of combinations of 5 correct out of 5 draws is 1 in 5,006,386 (see Step 1 above.)

**Step 2:** The chance of correctly choosing the **Powerball** is 1 in 35. Therefore, the chances of incorrectly choosing the **Powerball** are, conversely, 34 in 35.

**Step 3:** Determine the chances of choosing 5 out of 59 correctly and getting the **Powerball** incorrect by multiplying these figures together:

$$\frac{1}{5,006,386} * \frac{34}{35} = \frac{34}{175,223,510} = \frac{1}{5,153,632.65} \text{ or 1 chance in } 5,153,632.65.$$

**3. Third Prize Level: Match four numbers plus the Powerball (1 in 648,975.96 odds)**

**Step 1:** Calculate the number of combinations of 5 correct out of 5 draws from 59. The formula is as follows:

$$\frac{5!}{4! (5-4)!} * \frac{(59-5)!}{((59-5)-(5-4))! (5-4)!} = \frac{5*4!}{4! 1!} * \frac{54!}{(54-1)! 1!} = \frac{5}{1} * \frac{54*53!}{53! *1} = 5*54 = 270$$

This means that there are 270 different ways in which 4 correct numbers out of 5 numbers drawn from a field of 59 numbers can be chosen. Therefore, the chance of correctly choosing 4 out of 5 numbers correctly in the first portion of PowerBall is 270 in 5,006,386 or 1 in 18542.17.

**Step 2:** The chance of correctly choosing the Powerball is simply 1 in 35.

**Step 3:** Determine the chances of choosing 4 out of 5 of 59 correctly and getting the Powerball correct by multiplying these figures together:

$$\frac{270}{5,006,386} * \frac{1}{35} = \frac{270}{175,223,510} = \frac{1}{648,975.96} \text{ or 1 chance in } 648,975.96.$$

**4. Fourth Prize Level: Match four numbers only (1 in 19,087.53 odds)**

**Step 1:** The number of combinations of 4 correct out of 5 draws is 270 in 5,006,386 (see Step 1 above.)

**Step 2:** The chance of correctly choosing the **Powerball** is 1 in 35. Therefore, the chance of incorrectly choosing the **Powerball** are, conversely, 34 in 35.

**Step 3:** Determine the chances of choosing 4 out of 59 correctly and getting the **Powerball** incorrect by multiplying these figures together:

$$\frac{270}{5,006,386} * \frac{34}{35} = \frac{9,180}{175,223,510} = \frac{1}{19,087.53} \text{ or 1 chance in 19,087.53.}$$

**5. Fifth Prize Level: Match three numbers plus the Powerball (1 in 12,244.83 odds)**

**Step 1:** Calculate the number of combinations of 3 correct out of 5 draws from 59. The formula is as follows:

$$\frac{5!}{3! (5-3)!} * \frac{(59-5)!}{((59-5)-(5-3))! (5-3)!} = \frac{5*4*3!}{3! 2!} * \frac{54!}{(54-2)! 2!} = \frac{5*4}{2} * \frac{54*53*52!}{52! *2*1} = 5 * 54 * 53 = 14,310$$

This means that there are 14,310 different ways in which 3 correct numbers out of 5 numbers drawn from a field of 59 numbers can be chosen. Therefore, the chance of correctly choosing 3 out of 5 numbers correctly in the first portion of PowerBall is 14,310 in 5,006,386 or 1 in 349.85.

**Step 2:** The chance of correctly choosing the Powerball is simply 1 in 35.

**Step 3:** Determine the chances of choosing 3 out of 5 of 59 correctly and getting the Powerball correct by multiplying these figures together:

$$\frac{14,310}{5,006,386} * \frac{1}{35} = \frac{14,310}{175,223,510} = \frac{1}{12,244.83} \text{ or 1 chance in 12,244.83.}$$

**6. Sixth Prize Level: Match three numbers only (1 in 360.14 odds)**

**Step 1:** The number of combinations of 3 correct out of 5 draws is 14,310 in 5,006,386 (see Step 1 above.)

**Step 2:** The chance of correctly choosing the **Powerball** is 1 in 35. Therefore, the chance of incorrectly choosing the **Powerball** are, conversely, 34 in 35.

**Step 3:** Determine the chances of choosing 3 out of 59 correctly and getting the **Powerball** incorrect by multiplying these figures together:

$$\frac{14,310}{5,006,386} * \frac{34}{35} = \frac{486,540}{175,223,510} = \frac{1}{360.14} \text{ or 1 chance in 360.14.}$$

**7. Seventh Prize Level: Match two numbers plus the Powerball (1 in 706.43 odds)**

**Step 1:** Calculate the number of combinations of 2 correct out of 5 draws from 59. The formula is as follows:

$$\frac{5!}{2! (5-2)!} * \frac{(59-5)!}{((59-5)-(5-2))! (5-2)!} = \frac{5*4*3!}{2! 3!} * \frac{54!}{(54-3)! 3!} = \frac{5*4}{2} * \frac{54*53*52*51!}{51! *3*2*1} = \frac{5*54*53*52}{3} = 248,040$$

This means that there are 248,040 different ways in which 2 correct numbers out of 5 numbers drawn from a field of 59 numbers can be chosen. Therefore, the chance of correctly choosing 2 out of 5 numbers correctly in the first portion of PowerBall is 248,040 in 5,006,386 or 1 in 20.18.

**Step 2:** The chance of correctly choosing the Powerball is simply 1 in 35.

**Step 3:** Determine the chances of choosing 2 out of 5 of 59 correctly and getting the Powerball correct by multiplying these figures together:

$$\frac{248,040}{5,006,386} * \frac{1}{35} = \frac{248,040}{175,223,510} = \frac{1}{706.43} \text{ or 1 chance in 706.43.}$$

**8. Eighth Prize Level: Match one number plus the Powerball (1 in 110.81 odds)**

**Step 1:** Calculate the number of combinations of 1 correct out of 5 draws from 59. The formula is as follows:

$$\frac{5!}{1! (5-1)!} * \frac{(59-5)!}{((59-5)-(5-1))! (5-1)!} = \frac{5*4!}{1! 4!} * \frac{54!}{(54-4)! 4!} = \frac{5}{1} * \frac{54*53*52*51*50!}{50! *4*3*2*1} = \frac{5*54*53*52*51}{24} = 1,581,255$$

This means that there are 1,581,255 different ways in which 1 correct number out of 5 numbers drawn from a field of 59 numbers can be chosen. Therefore, the chance of correctly choosing 1 out of 5 numbers correctly in the first portion of PowerBall is 1,581,255 in 5,006,386 or 1 in 3.17.

**Step 2:** The chance of correctly choosing the Powerball is simply 1 in 35.

**Step 3:** Determine the chances of choosing 1 out of 5 of 59 correctly and getting the Powerball correct by multiplying these figures together:

$$\frac{1,581,255}{5,006,386} * \frac{1}{35} = \frac{1,581,255}{175,223,510} = \frac{1}{110.81} \text{ or 1 chance in 110.81.}$$

**9. Ninth Prize Level: Match the Powerball only (1 in 55.41 odds)**

**Step 1:** Calculate the number of combinations of 0 correct out of 5 draws from 59. The formula is as follows:

$$\frac{5!}{0! (5-0)!} * \frac{(59-5)!}{((59-5)-(5-0))! (5-0)!} = \frac{5!}{0! 5!} * \frac{54!}{(54-5)! 5!} = \frac{54*53*52*51*50*49!}{49! *5*4*3*2*1} = \frac{54*53*52*51*50}{120} = 3,162,510$$

This means that there are 3,162,510 different ways in which 0 correct numbers out of 5 numbers drawn from a field of 59 numbers can be chosen. Therefore, the chance of correctly choosing 0 out of 5 numbers correctly in the first portion of PowerBall is 3,162,510 in 5,006,386 or 1 in 1.58.

**Step 2:** The chance of correctly choosing the Powerball is simply 1 in 35.

**Step 3:** Determine the chances of choosing 1 out of 5 of 59 correctly and getting the Powerball correct by multiplying these figures together:

$$\frac{3,162,510}{5,006,386} * \frac{1}{35} = \frac{3,162,510}{175,223,510} = \frac{1}{55.41} \text{ or 1 chance in 55.41.}$$