Solution: From the Given information, we know that this is a hypergeomic distribution problem.

Total 69 white balls and 26 red balls.

Assuming powerball Lottery can be won by matching 5 white balls and one red ball.

Here 5 white balls are drawn from bag containing 69 white balls and 1 red ball is drawn from 26 red balls.

So, clearly there are two classes within white balls

1) winning white balls → Total 5

2) Losing white balls → Total 64

Similarly,

Two classes for red balls

1) winning red ball → Total 1

2) Losing red ball → Total 25.

So, Using above information we can easily say:-

There are two geometric distributions.

1) one for white balls.

2) Second for red balls.

(a): Odds value in first row can not be

$69 \times 68 \times 67 \times 66 \times 65 \times 26 = 35,064,160,560.$

because, we want to match 5 white balls out of 69 white balls & 1 red ball out of 26 in any order.

So, if we have to select all balls in specific order, Then 1 : 35,064,160,560 odd ratio would be correct.

So, in order to achieve above

$$= \left[\frac{({}^{5}C_5 \times {}^{64}C_0)}{({}^{69}C_5)}\right] \left[\frac{({}^{1}C_1 \times {}^{25}C_0)}{({}^{26}C_1)}\right]$$

$$= \frac{5\times4\times3\times2\times1}{69\times68\times67\times66\times65} \times \frac{1}{26}$$

So, odd ratio = 1 : 292,201,338

(b):- odds value for second prize.

i.e. All five whites and any non-matching red

$$= \left[\frac{{}^{5}C_5 \times {}^{64}C_0}{{}^{69}C_5}\right] \left[\frac{{}^{1}C_0 \times {}^{25}C_1}{{}^{26}C_1}\right]$$

$$= \frac{5\times4\times3\times2\times1}{69\times68\times67\times66\times65} \times \frac{25}{26}$$

$$= \frac{1}{11,688,053.52}$$

So, odds ratio 1 : 11,688,053.52

(c):- P(K whites & the red) :- (K = no. of white ball matched)

numerator :-

There are total 5 correct white balls and you are Selecting "K" no. of white balls out of 5. and the correctly matched red ball is selected. Then,

we also want to pick 5 balls out of which "K" are correctly matched,

So, no. of "not-matched" balls = (5-K)

These unmatched balls must be selected from

69 - 5 = 64 balls.

Similarly for red balls,

Here red ball is already matched

So, $26-1 = 25$.

Selecting '0' balls from 25 balls.

Similarly For

P (k white and not the red)

$\Rightarrow$ k = no. of white ball selected.

denominator $\Rightarrow$ $^{69}C_5$ $\Rightarrow$ selecting 5 balls from 69 white balls.

$^{26}C_1$ $\Rightarrow$ Selecting one ball from 26 red balls.

Numerator $\Rightarrow$ ^5C_k $\Rightarrow$ Selecting k white balls from 5 white balls.

$^{64}C_{(5-k)}$ $\Rightarrow$ Selecting $5-k$ non-matching white balls from 64 white balls.

$^1C_0$ $\Rightarrow$ Selecting zero red ball from correctly matched balls.

$^{25}C_1$ $\Rightarrow$ Selecting one red ball from unmatched 25 balls.

we have already matched first two entries:

$\Rightarrow$ For Third entry: Four white & the red.

$$= \left(\frac{^5C_4 \times {}^{64}C_1}{^{69}C_5} \right) \left[\frac{^1C_1 \times {}^{25}C_0}{^{26}C_1} \right]$$

$$\Rightarrow \frac{5 \times 64 \times 5 \times 4 \times 3 \times 2}{69 \times 68 \times 67 \times 66 \times 65} \times \frac{1}{26}$$

$$= \frac{1}{913,129.1812}$$

$$\boxed{\text{odds} \Rightarrow 1 : 913,129.1812}$$

→ For fourth entry:- Four whites & no red

$$= \left[\frac{{}^5C_4 \times {}^{64}C_1}{{}^{69}C_5}\right]\left[\frac{{}^1C_0 \times {}^{25}C_1}{{}^{26}C_1}\right]$$

$$= \frac{1}{36,525.167}$$

$$\boxed{\text{odds} \rightarrow 1 : 36525.167}$$

→ Fifth Entry: Three whites & not the red

$$= \left[\frac{{}^5C_3 \times {}^{64}C_2}{{}^{69}C_5}\right]\left[\frac{{}^1C_0 \times {}^{25}C_1}{{}^{26}C_1}\right]$$

$$= \frac{1}{579.76}$$

$$\boxed{\text{odds} = 1 : 579.76}$$

→ Sixth Entry: Three whites & red

$$= \left[\frac{{}^5C_3 \times {}^{64}C_2}{{}^{69}C_5}\right]\left[\frac{{}^1C_1 \times {}^{25}C_0}{{}^{26}C_1}\right]$$

$$= \frac{1}{14494.11}$$

$$\boxed{\text{odds} = 1 : 14494.11}$$

→ Seventh Entry: Two whites & the red

$$= \left[\frac{{}^5C_2 \times {}^{64}C_3}{{}^{69}C_5}\right]\left[\frac{{}^1C_1 \times {}^{25}C_0}{{}^{26}C_1}\right]$$

$$= \frac{1}{701.33}$$

$$\boxed{\text{odds} = 1 : 701.33}$$

→ Eight Entry: one white & the red

$$= \left[\frac{{}^5C_1 \times {}^{64}C_4}{{}^{69}C_5}\right]\left[\frac{{}^1C_1 \times {}^{25}C_0}{{}^{26}C_1}\right]$$

$$= \frac{1}{91.98}$$

→ ninth entry : The red & not white ball

$$= \left[\frac{{}^{5}C_0 \times {}^{64}C_1}{{}^{69}C_5}\right]\left[\frac{{}^{1}C_1 \times {}^{25}C_0}{{}^{26}C_1}\right]$$

$$= \frac{1}{38.32}$$

$$\boxed{\text{odds} = 1 : 38.32}$$

(d) :- By overall odds ⇒ combining all odds

$$\Rightarrow \frac{1}{292,201,338} + \frac{1}{11688053352} + \frac{1}{913129.18} + \frac{1}{36525.17} + \frac{1}{14494.11} + \frac{1}{579.76} + \frac{1}{701.3} + \frac{1}{91.98} + \frac{1}{38.32}$$

$$\Rightarrow \frac{1}{24.87}$$

$$\therefore \boxed{\text{Hence overall odds} = 1 : 24.87}$$