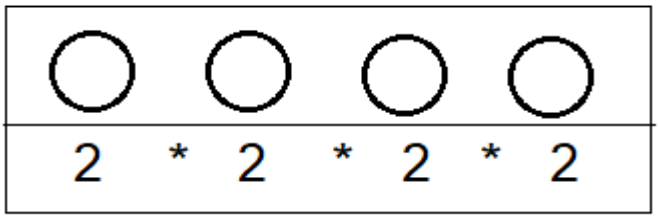
The Better Choice

Game 1

The game has 4 coins and each coin can take up 2 positions. So the total number of outputs that can be obtained from tossing the 4 coins is going to be $2^4 = 16$.



Favourable outcomes include results with 2 heads and 2 tails, which are as follows:

H H T T

T T H H

H T H T

T H T H

T H H T

H T H T

As there are 6 favourable results and the total number of results are 16, the probability of winning 3 points is $\frac{6}{16}$.

Game 2

The probability of getting one 6 is 1/6 and thus the probability of getting three sixes is $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$. Three sixes will give 6 points. Therefore the probability of getting 6 points in this game is $\frac{1}{216}$.

There are many ways of getting 4 points as the 2 sixes can be distributed in 3 ways amongst the 3 spinners.

Spinner A	Spinner B	Spinner C
6	Any no. other than 6	Any no. other than 6
Any no. other than 6	6	Any no. other than 6
Any no. other than 6	Any no. other than 6	6

And their corresponding probabilities will be:

Spinner A	Spinner B	Spinner C	Probability
1/6	5/6	5/6	25/216
5/6	1/6	5/6	25/216
5/6	5/6	1/6	25/216

∴The total probability of getting 2 points is $\frac{75}{216}$.

We can do the same for figuring the probability of getting 2 sixes (4 points).

Spinner A	Spinner B	Spinner C
6	6	Any no. other than 6
Any no. other than 6	6	6
6	Any no. other than 6	6

Their corresponding probabilities:

Spinner A	Spinner B	Spinner C	Probability
$1/6$	$1/6$	$5/6$	$5/216$
$5/6$	$1/6$	$1/6$	$5/216$
$1/6$	$5/6$	$1/6$	$5/216$

So the probability of getting 4 points is $\frac{15}{216}$.

<u>Summary of All Probabilities:</u>

<u>Game 1</u>

Points	Probability
3	$6/16 = 162/432$

Game 2

Points	Probability
2	$75/216 = 150/432$
4	$15/216 = 30/432$
6	$1/216 = 2/432$

These probabilities have different weights due to the difference in points. To remove that, we can bring all the probabilities to the same denominator and then cancel out the denominators. We can then multiply the resultant numbers with their respective points to bring them to the same terms.

Game 1

Points	Weightage
3	486

Total: 486

Game 2

Points	Weightage
2	300
4	120
6	12

Total: 432

Comparing the totals, we can deduce that there is a likeliness of getting 112.5% points of game 2 in game 1. As 112.5% of 432 is 486.

Game 1 with costs:

The probability of winning points in this game is 162/432=37.5%

So if the game is played 'n' times, the number of points you might get is

$$\frac{37.5 \times 3 \times n}{100} - n = \frac{12.5n}{100}$$

Game 2 with costs:

Points	Probability	Percentage
2	$150/432$	$625/18\ \%$
4	$30/432$	$125/18\ \%$
6	$2/432$	$25/54\ \%$

So the total points you will get if you play n games will roughly be

$$\left(\frac{625\times2\times n}{1800}+\frac{125\times4\times n}{1800}+\frac{25\times6\times n}{5400}\right)-n=0$$