

Answer on Question #72678, Math / Statistics and Probability

A box contains 4 red and 5 blue marbles. Michele picks three marbles at random from this box. If  $Z$  is a random variable representing the # of blue marbles picked from the box, do the following:

- Express the probability mass function of  $Z$  in tabular form.
- Draw the corresponding histogram.
- Compute the probability that Michele can pick more red marbles than blue from the box.

Solution

- Express the probability mass function of  $Z$  in tabular form.

Let  $Z$  = number of times the blue marble is picked from the box. The 8 possible elementary events and the corresponding values for  $Z$ , are

Elementary event	Value of $Z$
$RRR$	0
$RRB$	1
$RBR$	1
$BRR$	1
$RBB$	2
$BRB$	2
$BBR$	2
$BBB$	3

If 3 three marbles are picked at random from the box, what is the probability that none is blue?

$$P(RRR) = \frac{4}{9} \cdot \frac{3}{8} \cdot \frac{2}{7} = \frac{1}{21}$$

If 3 three marbles are picked at random from the box, what is the probability that one marble is blue?

$$P(RRB) + P(RBR) + P(BRR) = \frac{4}{9} \cdot \frac{3}{8} \cdot \frac{5}{7} + \frac{4}{9} \cdot \frac{5}{8} \cdot \frac{3}{7} + \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{3}{7} = \frac{5}{14}$$

If 3 three marbles are picked at random from the box, what is the probability that two marbles are blue?

$$P(RBB) + P(BBR) + P(BRB) = \frac{4}{9} \cdot \frac{5}{8} \cdot \frac{4}{7} + \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{4}{7} + \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{4}{7} = \frac{10}{21}$$

If 3 three marbles are picked at random from the box, what is the probability that three marbles are blue?

$$P(BBB) = \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{3}{7} = \frac{5}{42}$$

Check

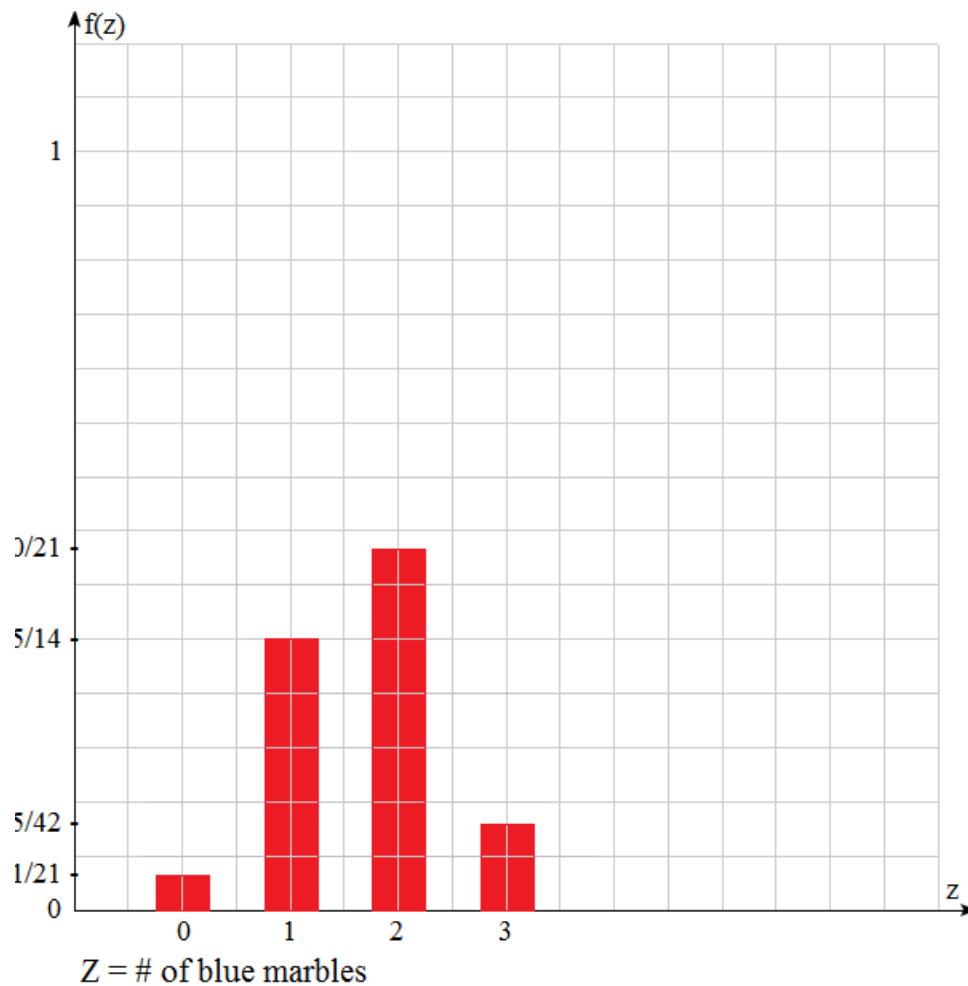
$$\frac{1}{21} + \frac{5}{14} + \frac{10}{21} + \frac{5}{42} = \frac{2 + 15 + 20 + 5}{42} = 1$$

Therefore, the probability distribution for the number of heads occurring in three coin tosses is:

$z$	$f(z) = P(Z = z)$
0	$1/21$
1	$5/14$
2	$10/21$
3	$5/42$

b. Draw the corresponding histogram.

Probability Mass Function



c. Compute the probability that Michele can pick more red marbles than blue from the box.

This is the probability of picking either 2 or 3 red marbles (0 or 1 blue marbles)

$$P(RRB) + P(RBR) + P(BRR) + P(RRR) = \frac{5}{14} + \frac{1}{21} = \frac{17}{42}$$