

# Solution of Q11.16.3.7

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Question:- A fair coin is tossed four times, and a person win Re 1 for each head and lose Rs 1.5 for each tail that turns up.

From the sample space calculate how many different amounts of money you can have after four tosses and the probability of having each of these amounts.

**Solution:** Since coin is tossed four times, so the possible sample space:

$S = \{HHHH, HHHT, HHTH, HTHH, THHH, HHTT, HTHT, THHT, HTTH, THTH, TTHH, TTTH, TTHT, THTT, HTTT, TTTT\}$

As per the condition given in the question

1) For four heads:

$$1 + 1 + 1 + 1 = 4 \quad (1)$$

So, he wins Rs 4

2) For three heads and one tail:

$$1 + 1 + 1 - 1.5 = 1.5 \quad (2)$$

So, he wins Rs 1.5

3) For two heads and two tails:

$$1 + 1 - 1.5 - 1.5 = -1 \quad (3)$$

So, he loses Rs 1

4) For one head and three tails:

$$1 - 1.5 - 1.5 - 1.5 = -4.5 \quad (4)$$

So, he loses Rs 4.5

5) For four tails:

$$-1.5 - 1.5 - 1.5 - 1.5 = -6 \quad (5)$$

So, he loses Rs 6

Now, the sample space of amounts is:

$S = \{4, 1.50, 1.50, 1.50, 1.50, -1, -1, -1, -1, -1, -1, -3.50, -3.50, -3.50, -3.50, -6\}$

Then,  $n(S) = 16$

$$p_X(\text{winning Rs}4) = \frac{1}{16} \quad (6)$$

$$p_X(\text{winning Rs}1.5) = \frac{4}{16} = \frac{1}{4} \quad (7)$$

$$p_X(\text{loosing Rs}1) = \frac{6}{16} = \frac{3}{8} \quad (8)$$

$$p_X(\text{loosing Rs}3.5) = \frac{4}{16} = \frac{1}{4} \quad (9)$$

$$p_X(\text{loosing Rs}1.5) = \frac{1}{16} \quad (10)$$