Tossing a coin 3 times $2^3 = 8$

$S = \{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$

3 2 2 2 1 1 1 0

# of heads → Random var.

Section 7.1
Random Variables and Probability Distributions

A rule that assigns a number to each outcome of an experiment is called a **random variable.** Capital letters are often used to represent random variables.

For example, a random variable X can represent the sum of the face values of two six-sided dice. The random variable may take on any number in the set {2, 3, …, 12}.

We can construct the probability distribution associated with a random variable.

If $x_1, x_2, x_3, \ldots, x_n$ are values assumed by the random variable X with associated probabilities $P(X = x_1) = p_1$, $P(X = x_2) = p_2$, …, $P(X = x_n) = p_n$, respectively, then the probability distribution of X may be expressed in the following way.

x	$P(X = x)$
x_1	p_1
x_2	p_2
.	.
.	.
.	.
x_n	p_n

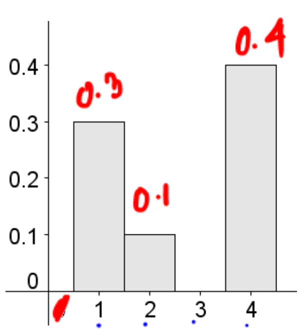
x	$P(X=x)$
0	1/8
1	3/8
2	3/8
3	1/8

We can also graphically represent the probability distribution of a random variable.

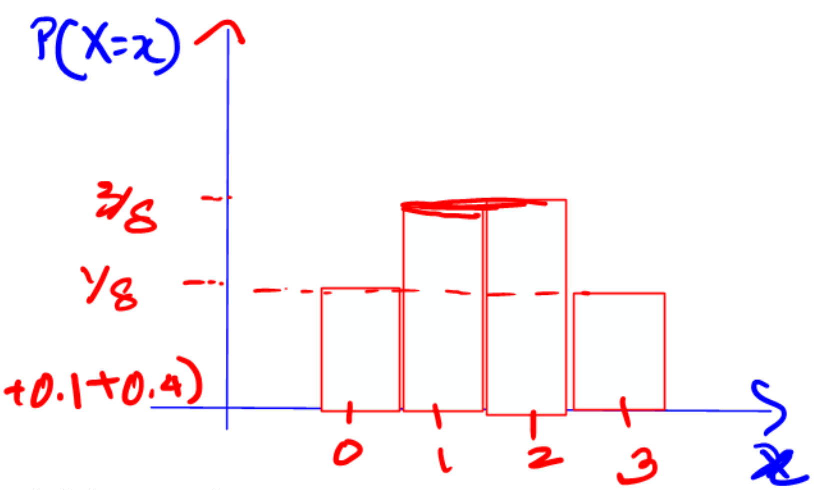
A bar graph which represents the probability distribution of a random variable is called a **histogram**.

Example 1: Given the following histogram, calculate the probability that $x = 3$.

$P(X=0)=0$
$P(X=1)=0.3$
$P(X=2)=0.1$
$P(X=3)=0$
$P(X=4)=0.4$



$P(X=3) = 1-(0.3+0.1+0.4)$
$= 0.2$



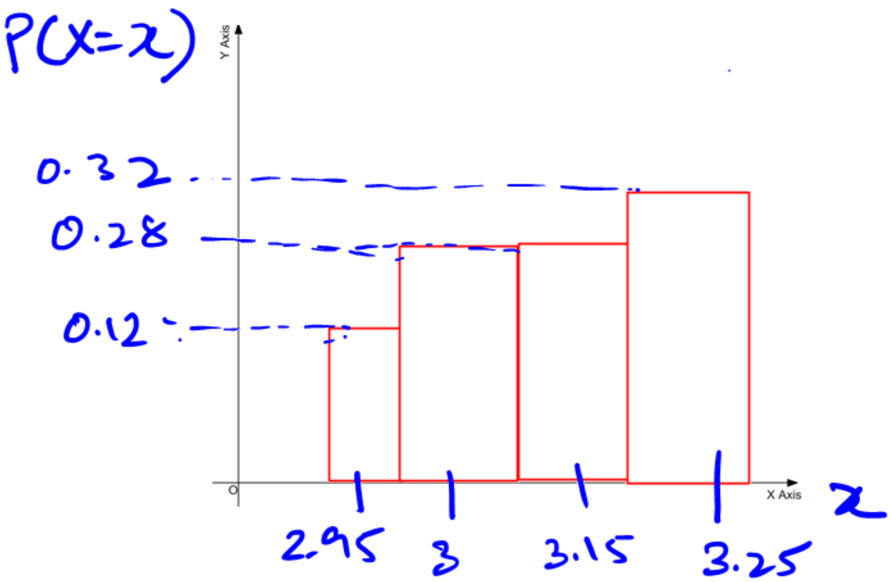
Example 2: The rates paid by 25 financial institutions on a certain day for money-market deposit accounts are shown in the accompanying table:

Rate, %	2.95	3.00	3.15	3.25	
Number of Institutions	3	7	7	8	Total = 25

a. Let the random variable X denote the interest paid by a randomly chosen financial institution on its money-market deposit accounts and find the probability distribution associated with these data.

x	2.95	3.00	3.15	3.25
$P(X=x)$	$3/25 = 0.12$	$7/25 = 0.28$	$7/25 = 0.28$	$8/25 = 0.32$

b. Draw the histogram associated with these data.



c. Find:

P(X $\geq$ 3.00) $= P(X=3) + P(X=3.15) + P(X=3.25)$

$= 0.28 + 0.28 + 0.32 = 0.88$

P(3.00 < X $\leq$ 3.25) $= P(X=3.15) + P(X=3.25)$

$= 0.28 + 0.32 = 0.6$