

# Binomial Probability Distribution

## Worked Example using Statistical Tables

[www.Stats-Lab.com](http://www.Stats-Lab.com)

<http://bit.ly/StatsIntro>

# Binomial Distribution

- Suppose 40% of employees in a large company favour unionisation.
- A poll of 10 employees in this company is taken.
- This poll can be considered as binomial experiment with  **$n=10$**  and  **$p=0.40$** .

## Question 1

- What is the probability that 4 or more employees polled favour unionisation?

# Binomial Distribution

## Solution

Binomial distribution with  **$n=10$**  and  **$p=0.4$** .

Using Murdoch Barnes Table 1.

$$P(X \geq 4) = \mathbf{0.6177}$$

# Binomial Distribution

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- This poll can be considered as binomial experiment with  **$n=10$**  and  **$p=0.40$** .

## Question 2

- What is the probability that less than 2 employees polled favour unionisation?

# Binomial Distribution

## Solution

Binomial distribution with  **$n=10$**  and  **$p=0.4$** .  
Using Murdoch Barnes Table 1.

$$P(X < 2)$$

$$\begin{aligned} P(X < 2) &= 1 - P(X \geq 2) \\ &= 1 - (0.9536) \\ &= \mathbf{0.0464} \end{aligned}$$

# Binomial Distribution

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- This poll can be considered as binomial experiment with  **$n=10$**  and  **$p=0.40$** .

## Question 3

- What is the probability that exactly 5 employees polled favour unionisation?

# Binomial Distribution

## Solution

Binomial distribution with  **$n=10$**  and  **$p=0.4$** .  
Using Murdoch Barnes Table 1.

$P(X=5)$

$$\begin{aligned} P(X=5) &= P(X \geq 5) - P(X \geq 6) \\ &= 0.3669 - 0.1662 \\ &= \mathbf{0.2007} \end{aligned}$$

# Binomial Distribution

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- This poll can be considered as binomial experiment with  **$n=10$**  and  **$p=0.40$** .

## Question 4

- What is the mean and variance for this distribution?



# Binomial Distribution

## Solution

Binomial distribution with  **$n=10$**  and  **$p=0.4$** .

$$\begin{aligned}\text{Mean} &= np \\ &= 10 \times 0.4 \\ &= \mathbf{4 \text{ employees}}\end{aligned}$$

$$\begin{aligned}\text{Variance} &= np(1-p) \\ &= 10 \times 0.4 \times 0.6 \\ &= \mathbf{2.4 \text{ employees}}\end{aligned}$$



- **Solution**
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- Binomial distribution with  $n=10$   $p=0.4$
- Using Murdoch Barnes Table 1
- 
- 1)  $P(X \geq 4)$                       = **0.6177**
- 
- 2)  $P(X < 2)$                        $P(X < 2) = 1 - P(X \geq 2)$
- =  $1 - (0.9536)$
- = **0.0464**
- 
- 3)  $P(X=5)$                        $P(X=5) = P(X \geq 5) - P(X \geq 6)$
- =  $0.3669 - 0.1662$
- = **0.2007**
- 
- 4)            mean                      =  $np$                                       =  $10 \times 0.4$     = **4 employees**
- Variance    =  $np(1-p)$     =  $10 \times 0.4 \times 0.6$                       = **2.4 employees**