# Assignment 02

## Domain Example: Heights of Adult Men

- Suppose we study adult men in a city.
- Heights are roughly **normally distributed**.
  - Mean ($\mu$) = 70 inches
  - Standard deviation ($\sigma$) = 3 inches

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### Empirical Rule (68-95-99.7 Rule)

For a normal distribution:

| **Range** | **% of data (approx)** |
|---|---|
| $\mu \pm 1\sigma$ | 68% |
| $\mu \pm 2\sigma$ | 95% |
| $\mu \pm 3\sigma$ | 99.7% |

**Applied to our example (Height in inches):**

- 68% of men → 67 to 73 inches
- 95% of men → 64 to 76 inches
- 99.7% of men → 61 to 79 inches

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### Normal Distribution Graph

Here's a simplified sketch:

```
Probability Density
|
|          *
|         * *
|        *   *
|       *     *
|      *       *
|     *         *
|    *           *
|   *             *
|_________*_______________*_________ Height
```

```
 64  67  70  73  76
-2σ  -1σ μ +1σ +2σ
```

- The **peak** is at mean μ = 70 inches.
- ±1σ range covers ~68% of the population.
- ±2σ covers ~95%, ±3σ covers ~99.7%.

## Normal Distribution Graph (Better Visual)

- Bell-shaped curve
- Symmetric around mean μ
- The curve never touches the x-axis
- ±1σ, ±2σ, ±3σ marked clearly

```
Probability Density
|
|            **68% (67–73)**
|            *****
|          *********
|         ***********
|        *************
|      61 **           ** 79 (±3σ)
|     64 **             ** 76 (±2σ)
|    67 **               ** 73 (±1σ)
|_______61___64___67___70___73___76___79___ Height
```

- **Shaded areas:**
  - Light shade → ±1σ (68%)
  - Medium shade → ±2σ (95%)
  - Darkest shade → ±3σ (99.7%)

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### 3. Real-life Insights

- If you measure 1000 adult men:
  - ~680 men will be 67–73 inches
  - ~950 men will be 64–76 inches
  - ~997 men will be 61–79 inches
- Extreme heights (below 61 or above 79) are **very rare**.

## 4. How This Relates to Other Domains

| Domain | Example Variable | Notes |
| --- | --- | --- |
| Education | Test scores (IQ) | Usually $\mu \approx 100$, $\sigma \approx 15$ |