1. $X \sim \mathrm{Bin}(n, p)$ **X is a Rv, that is distributed as Binomial Dist. with parameter n and p**

**2. Possible Values of the Random Variable - 0, 1, 2, 3, …., n**

**3.** $\mathbb{P}(X = x) =?$

$f(x) = nC_x \times (p)^x \times (1-p)^{n-x}$

**4. Mean (Expected Value / Expectation) and Variance**

$$\mathbb{E}(X) = np$$

$$\mathbb{V}\mathrm{ar}(X) = np(1-p)$$

2. $X \sim Ber(p)$ is same as $X \sim \mathrm{Bin}(1, p)$

**Possible Values - 0, 1**

$$f(x) = p^x(1-p)^{1-x}$$

$$\mathbb{E}(X) = p$$

$$\mathbb{V}\mathrm{ar}(X) = p(1-p)$$

**3. Discrete Uniform**

## 1. Normal Distribution

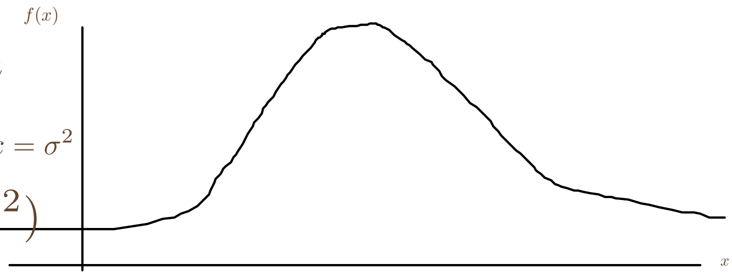
$$X \sim \mathcal{N}(\mu, \sigma^2)$$

$$f\left(x;\mu,\sigma^2\right) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

$$\mathbb{E}(X) = \int_{-\infty}^{\infty} x f(x) dx = \mu$$

$$\mathbb{V}\mathrm{ar}(X) = \int_{-\infty}^{\infty} (x-\mu)^2 f(x) dx = \sigma^2$$

$$\mathrm{Var}(X) = \mathbb{E}((X-\mu)^2)$$



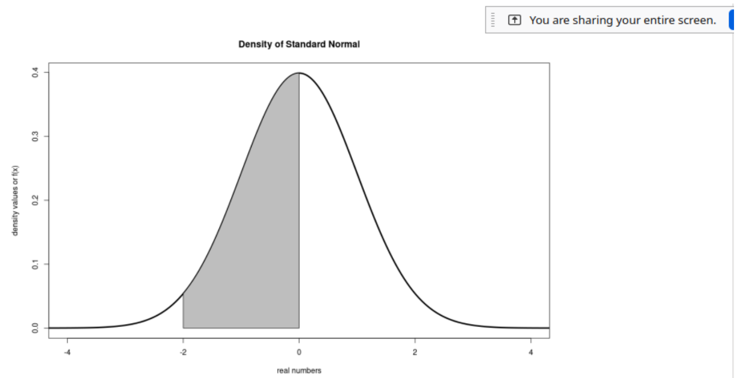



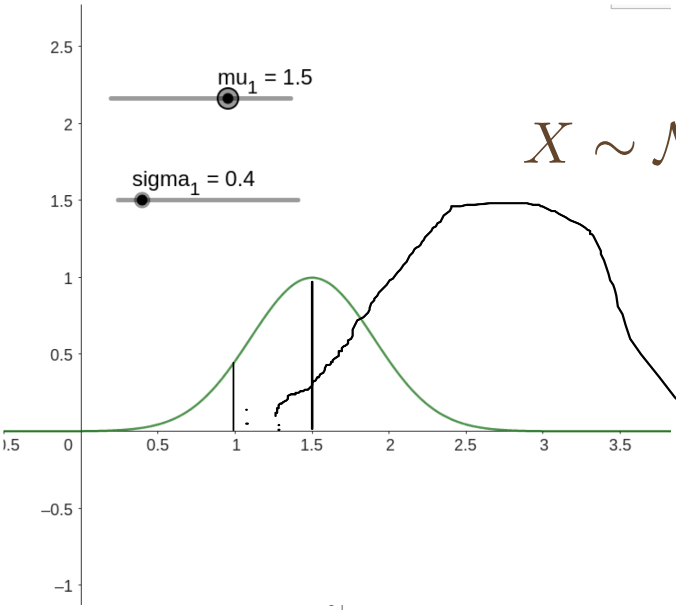

Figure 11: This is a density function of a normal distribution with $\mu = 0$, and $\sigma^2 = 1$. The shaded are is a probability, this is $\mathbb{P}(X \in (-2, 0)) = \int_{-2}^{0} f(x; 0, 1) dx = 0.4772499$

$f(x; 0, 1) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$.

$$X \sim \mathcal{N}(10, 4)$$

$$\mu = 10, \sigma = 2$$

$$Z \sim \mathcal{N}(0, 1)$$

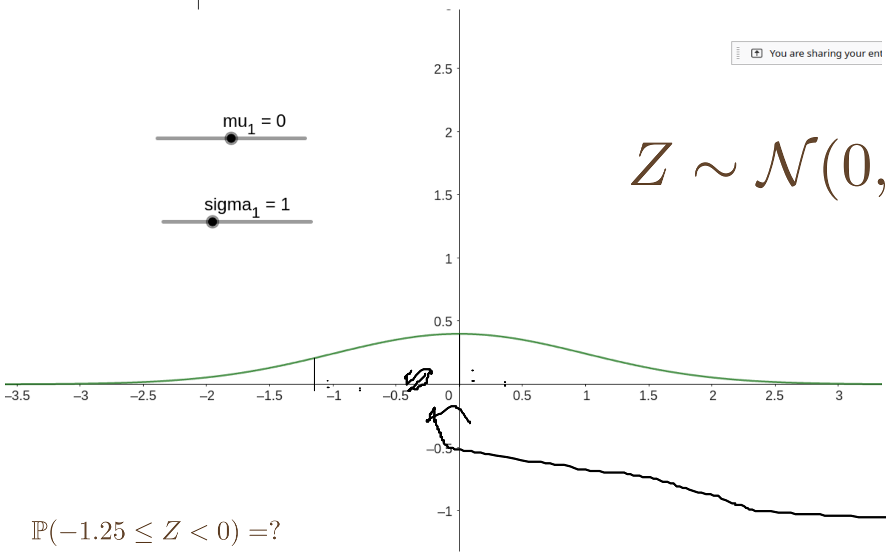



$$X \sim \mathcal{N}(1.5, .4^2)$$

$\mathbb{P}(1 \leq X < 1.5) = ?$

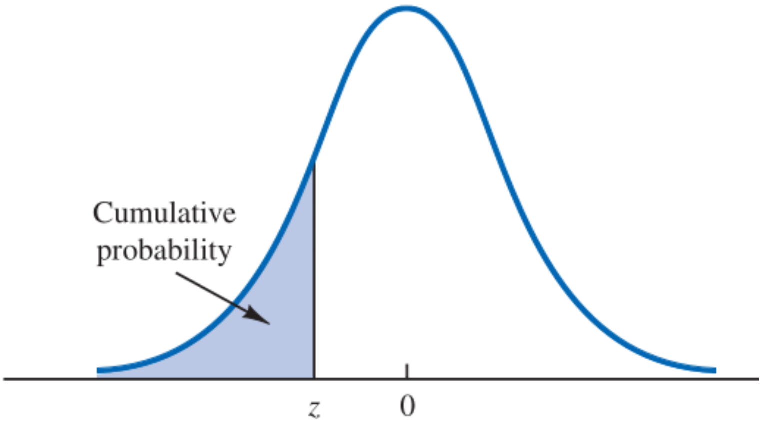
$$Z = \frac{X - \mu}{\sigma}$$

$$Z = \frac{1.4 - 1.5}{0.4} = -0.25$$




$$Z \sim \mathcal{N}(0, 1)$$

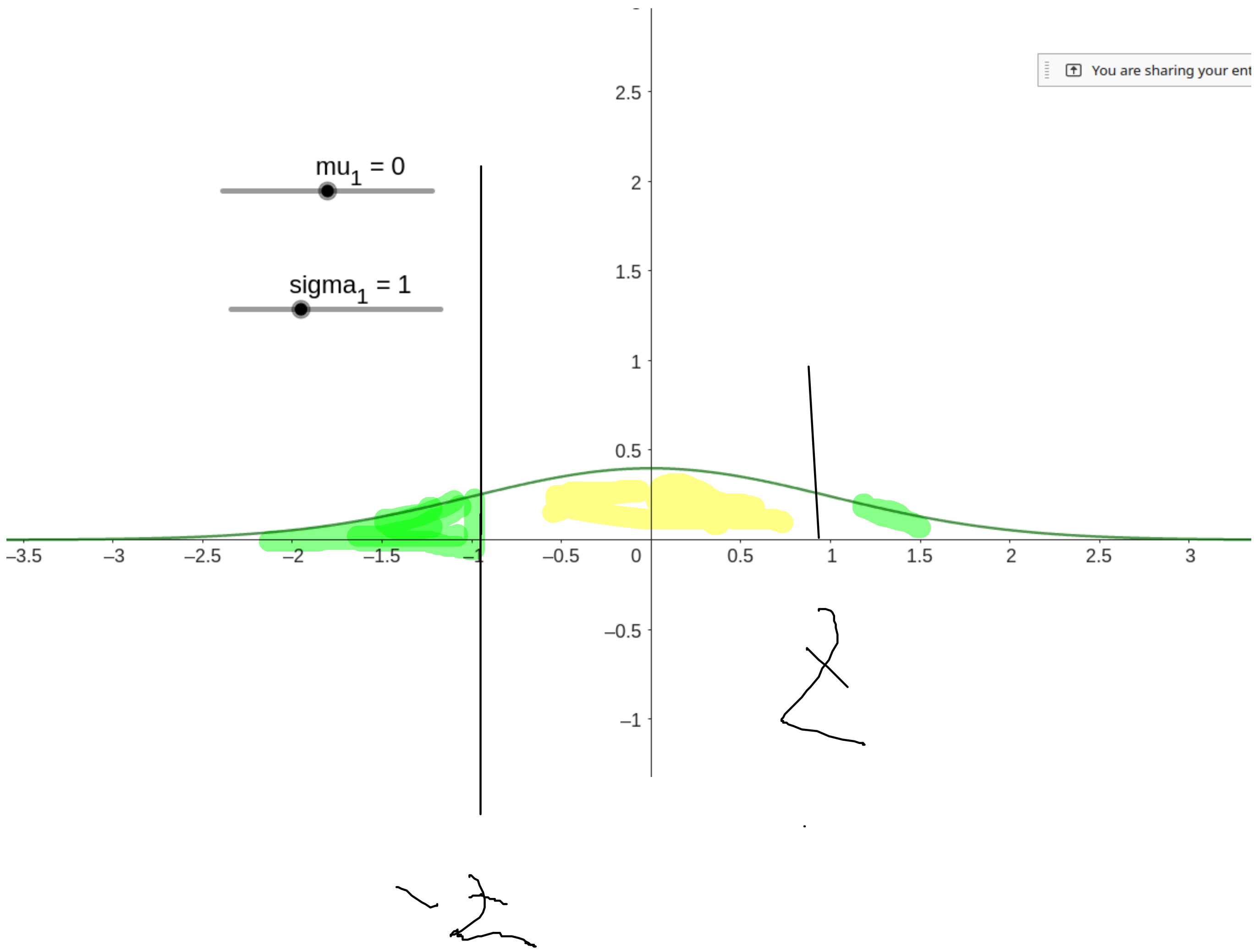
$\mathbb{P}(-1.25 \leq Z < 0) = ?$




$$\mathbb{P}(Z \leq z) = ?$$

$$\mathbb{P}(Z \leq -2.00) = .0028$$

$$\mathbb{P}(Z \leq -2.03) = .0212$$



mu1 = 0
sigma1 = 1
You are sharing your ent

$$X \sim \mathcal{N}(183, 10.5^2)$$

$$\mathbb{P}(X < 175) = ?$$

$$\mathbb{P}(Z < \frac{175 - 183}{10.5}) = ?$$