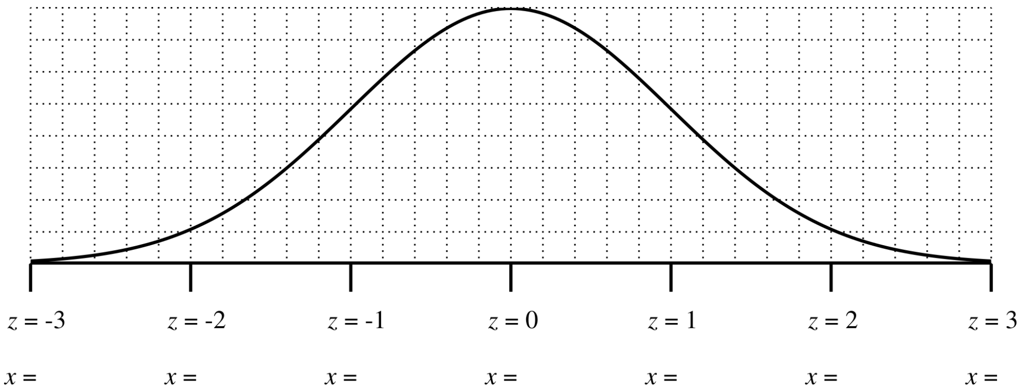
1: Let $X \sim \mathcal{N}(400,\ 10)$. You will calculate $P(414 < X < 422)$ after completing the diagram.



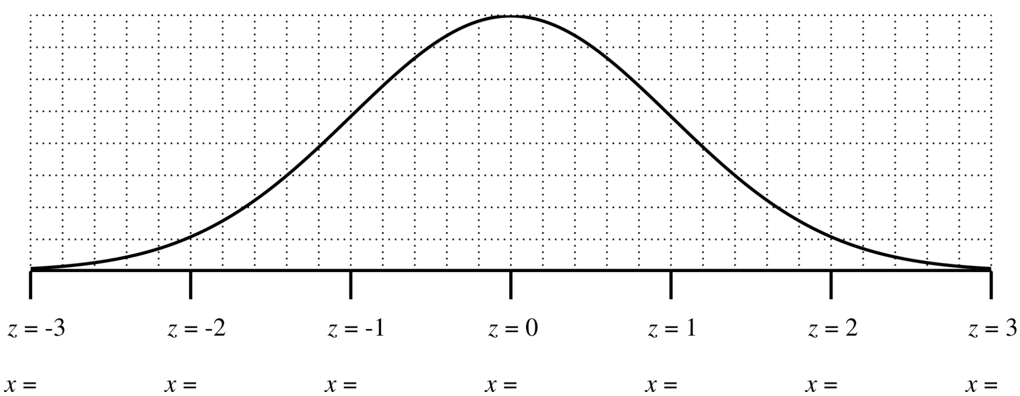
a: Determine the x values that correspond to the integer z values.

b: Find the z scores of the boundaries, and shade the appropriate section.

c: Estimate $P(414 < X < 422)$ by counting squares.

d: Calculate $P(414 < X < 422)$ by using a z table.

2: Let $X \sim \mathcal{N}(5.5,\ 0.1)$. You will calculate $P\left(\left|X - 5.5\right| > 0.13\right)$ after completing the diagram.



a: Determine the x values that correspond to the integer z values.

b: Find the z scores of the boundaries, and shade the appropriate section.

c: Estimate $P\left(\left|X - 5.5\right| > 0.13\right)$ by counting squares.

d: Calculate $P\left(\left|X - 5.5\right| > 0.13\right)$ by using a z table.

3: Let $X \sim \mathcal{N}\big(23.4,\ 5.6\big)$. Determine $P(X > 21)$.

4: Let $X \sim \mathcal{N}\big(100,\ 5\big)$. Determine x_0 such that $P(X < x_0) = 0.30$.

5: Let $X \sim \mathcal{N}\big(100,\ 5\big)$. Determine x_1 such that $P(X > x_1) = 0.30$.

6: Let $X \sim \mathcal{N}\big(100,\ 5\big)$. Determine r such that $P\big(|X - 100| < r\big) = 0.30$.

7: Let $X \sim \mathcal{N}\big(100,\ 5\big)$. Determine r such that $P\big(|X - 100| > r\big) = 0.30$.

8: Determine σ such that $X \sim \mathcal{N}(10,\ \sigma)$ and $P(X > 12.3) = 0.42$.

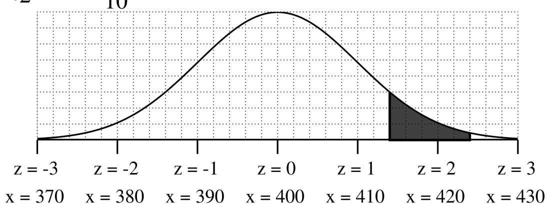
9: Let $X \sim \mathcal{N}(42.5,\ 0.15)$. Determine $P(|X - 42.5| < 0.25)$.

10: Determine μ such that $X \sim \mathcal{N}(\mu,\ 30)$ and $P(X > 150) = 0.8$.

11: Let $X \sim \mathcal{N}(1000,\ 30)$. Determine $P(930 < X < 991)$.

1: **a:** 370, 380, 390, 400, 410, 420, 430

b: $z_1 = \frac{414-400}{10} = 1.4$
$z_2 = \frac{422-400}{10} = 2.2$

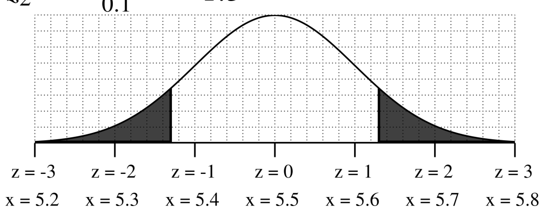


c: $P(414 < X < 422) \approx 7\%$

d: $\Phi(2.2) - \Phi(1.4) = \boxed{0.06685}$

2: **a:** 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8

b: $z_1 = \frac{5.37-5.5}{0.1} = -1.3$
$z_2 = \frac{5.63-5.5}{0.1} = 1.3$



c: $P(|X - 5.5| < 0.13) \approx 18\%$
$P(X < 5.37 \text{ OR } X > 5.63) \approx 18\%$

d: $2\Phi(-1.3) = \boxed{0.1936}$

3: $z = \frac{21-23.4}{5.6} = -0.43$
$P(X > 21) = P(Z > -0.43) =$
$= 1 - \Phi(-0.43) = \boxed{0.666}$

4: We recognize x_0 is 30th percentile.
$z = \Phi^{-1}(0.3) = -0.52$
$x_0 = z\sigma + \mu = (-0.52)(5) + 100 = \boxed{97.4}$

5: We recognize x_1 is 70th percentile.
$z = \Phi^{-1}(0.7) = 0.52$
$x_0 = z\sigma + \mu = (0.52)(5) + 100 = \boxed{102.6}$

6: This is harder. We recognize $(100 + r)$ is the 65th percentile. We get 65 by splitting 30 in half and adding it to 50. A sketch will help here.
$z_{\text{UPPER}} = \Phi^{-1}(0.65) = 0.38$
$x_{\text{UPPER}} = (0.38)(5) + 100 = 101.9$
$r = \boxed{1.9}$

7: We recognize $(100 + r)$ is the 85th percentile. We get 85 by splitting 30 in half and subtracting it from 100. A sketch will help here.
$z_{\text{UPPER}} = \Phi^{-1}(0.85) = 1.04$
$x_{\text{UPPER}} = (1.04)(5) + 100 = 105.2$
$r = \boxed{5.2}$

8: 42% is a right area corresponding to 58th percentile. We find the z score of 58th percentile.
$z = \Phi^{-1}(0.58) = 0.20$
$\sigma = \frac{x-\mu}{z} = \frac{12.3-10}{0.2} = \boxed{11.5}$

9: We want a central area with bounds 42.25 and 42.75.
$z_{\text{LOWER}} = \frac{-0.25}{0.15} = -1.67$
$z_{\text{UPPER}} = \frac{0.25}{0.15} = 1.67$
$P(|X-42.5| < 0.25) = \Phi(1.67) - \Phi(-1.67) =$
$\boxed{0.905}$

10: We want a z score of 20th percentile.
$z = \Phi^{-1}(0.2) = -0.84$
$\mu = x - z\sigma = 150 - (-0.84)(30) = \boxed{175.2}$

11: We find two z scores.
$z_{\text{LOWER}} = \frac{930-1000}{30} = -2.33$
$z_{\text{UPPER}} = \frac{991-1000}{30} = -0.3$
$P(930 < X < 991) = \Phi(-0.3) - \Phi(-2.33) =$
$\boxed{0.3722}$