

Ü a) $\Phi(0.588) = ?$

b) $\Phi(?) = 0.527$

a) $z = 0.588 \approx 0.59 \Rightarrow \Phi(z) = 0.7224$

b) $q = 0.527 \Rightarrow z_q = 0.07$
↑
im Tabellen-
Inversen q suchen

Erklärung zu "Regeln" S 10-12

- 1) s. vorige Woche
- 2) anschaulich: Stauchung und Streckung
- 3) $P(X \leq b) = P\left(\underbrace{\frac{X-\mu}{\sigma}}_{\bar{z}} \leq \frac{b-\mu}{\sigma}\right) = P(\bar{z} \leq \frac{b-\mu}{\sigma})$
 $= \Phi\left(\frac{b-\mu}{\sigma}\right)$
- 4) $P(a < X \leq b) = F(b) - F(a) \stackrel{\text{Nr. 3}}{=} \Phi\left(\frac{b-\mu}{\sigma}\right) - \Phi\left(\frac{a-\mu}{\sigma}\right)$
- 5) Hinten anfangen
 $1 - q = \Phi(-z_q) \stackrel{\text{Nr. 1}}{\Leftrightarrow} 1 - q = 1 - \Phi(z_q)$
 $\Leftrightarrow q = \Phi(z_q)$
- 6) $z_q = \frac{x_q - \mu}{\sigma} \Leftrightarrow z_q \cdot \sigma + \mu = x_q$

Bsp 1. $N(\mu, \sigma^2)$ mit $\mu = 1.75$, $\sigma = 0.2$
 für Körpergrößen

$$q = 0.06 \quad P(X \leq b) = q$$

q, μ, σ , bekannt, b gesucht

Lösung: Aufg. typ 2

z_q bestimmen

$$0.06 = \Phi(z_q)$$

$$0.94 = 1 - 0.06 = \Phi(-z_q)$$

$$\stackrel{\text{Tab.}}{\Rightarrow} -z_q = 1.56 \Rightarrow z_q = -1.56$$

Regel 6

$$\Rightarrow x_q = z_q \cdot \sigma + \mu = \underline{\underline{1.438 \text{ [m]}}}$$

Ü1 $\mu = 1.75$, $\sigma = 0.2$ gilt für X . Aufg. Typ 1

$$P(X \geq 2.0) = 1 - P(X \leq 2.0)$$

$$\text{Nr. 3} \left(= 1 - P\left(\frac{X - \mu}{\sigma} \leq \frac{2.0 - \mu}{\sigma}\right) \right)$$

$$\rightarrow = 1 - \Phi\left(\frac{2.0 - \mu}{\sigma}\right) = 1 - \Phi(1.25)$$

Tabelle $\Rightarrow \Phi(1.25) = 0.8944 \Rightarrow P(X > 2.0) = 0.1056$
 $= \underline{\underline{10.56\%}}$

Ü2 Aufg. Typ 1

$$P(\mu - \sigma \leq X \leq \mu + \sigma)$$

$$\text{Nr. 4} \quad \Phi\left(\frac{\overset{b}{\mu + \sigma} - \mu}{\sigma}\right) - \Phi\left(\frac{\overset{a}{\mu - \sigma} - \mu}{\sigma}\right)$$

$$= \Phi\left(\frac{\sigma}{\sigma}\right) - \Phi\left(\frac{-\sigma}{\sigma}\right)$$

$$= \Phi(1) - \Phi(-1)$$

$$= \Phi(1) - (1 - \Phi(1))$$

$$= 2\Phi(1) - 1 = \underline{\underline{68.2\%}}$$

Analog $P(\mu - 2\sigma \leq X \leq \mu + 2\sigma) = 2\Phi(2) - 1 = \underline{\underline{95.5\%}}$

$$P(\mu - 3\sigma \leq X \leq \mu + 3\sigma) = 2\Phi(3) - 1 = \underline{\underline{99.7\%}}$$

Ü4 $X \sim N(2, 1^2) \Rightarrow \mu = 2, \sigma = 1$

$$P(1.5 < X < 2.5)$$

Nr. 4
$$\Phi\left(\frac{2.5-2}{1}\right) - \Phi\left(\frac{1.5-2}{1}\right) = \Phi(0.5) - \Phi(-0.5)$$

$$= 2\Phi(0.5) - 1 \approx \underline{\underline{40\%}}$$

(Tabelle)

$$= 2 \cdot 0.6915 - 1$$

Ü5 $X \sim N(3, 2^2) \quad \mu = 3, \sigma = 2$

$$P(X \leq b) = \Phi\left(\underbrace{\frac{b-3}{2}}_{z_{0.8}}\right) = 0.8 \quad \begin{array}{l} \text{Tabelle} \\ \Rightarrow \\ \text{rückwärts} \end{array} \quad z_{0.8} = 0.84$$

$$\Rightarrow 0.84 = \frac{b-3}{2} \Rightarrow \underline{\underline{b = 4.68}}$$

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

$$N(5, \underbrace{25}_{\sigma^2})$$

$$\Rightarrow \mu = 5, \sigma = 5$$