Single Statistics – Normal Distribution

Here Z refers to the standard normal $Z \sim N(0, 1^2)$. X refers to a 'real life' normal $X \sim N(\mu, \sigma^2)$.

1. $\mathbb{P}(Z < 0)$. 0.5000
2. $\mathbb{P}(Z < 1)$. 0.8413
3. $\mathbb{P}(Z \geqslant 1.2)$. 0.1151
4. $\mathbb{P}(Z < -0.3)$. 0.3821
5. $\mathbb{P}(Z > 2.61)$. 0.0045
6. $\mathbb{P}(Z \geqslant -0.717)$. 0.7642
7. $\mathbb{P}(0 \leqslant Z < 2)$. 0.4772
8. $\mathbb{P}(-0.8 < Z < 0.4)$. 0.4435
9. $\mathbb{P}(|Z| \leqslant 1.35)$. 0.8230

Now for real life…

10. If $X \sim N(20, 2^2)$ calculate:
    (a) $\mathbb{P}(X > 20)$. 0.5000
    (b) $\mathbb{P}(X \leqslant 17)$. 0.0668
    (c) $\mathbb{P}(21 < X < 25)$. 0.3023
    (d) $\mathbb{P}(X \leqslant 200)$. 1.000
11. If $X \sim N(35, 10)$ calculate:
    (a) $\mathbb{P}(X < 34)$. 0.3761
    (b) $\mathbb{P}(X \geqslant 32)$. 0.8287
    (c) $\mathbb{P}(35 \leqslant X \leqslant 39)$. 0.3971
    (d) $\mathbb{P}(|X - \mu| < 5)$. 0.8860

Finding μ & σ

Answers are approximate…if you're in the vicinity of what I've got, you're probably right.

1. $X \sim N(\mu, 4^2)$ and $\mathbb{P}(X > 10) = 0.3$. Find μ. $\mu = 7.90$
2. $X \sim N(51, \sigma^2)$ and $\mathbb{P}(X < 48) = 0.21$. Find σ. $\sigma = 3.72$
3. $X \sim N(\mu, 17)$ and $\mathbb{P}(X > 13) = 0.8$. Find μ. $\mu = 16.47$
4. $X \sim N(900, \sigma^2)$ and $\mathbb{P}(X < 990) = 0.84$. Find σ. $\sigma = 90.54$
5. $X \sim N(\mu, 5^2)$ and $\mathbb{P}(X < 21) = 0.97$. Find μ. $\mu = 11.60$
6. $X \sim N(28, \sigma^2)$ and $\mathbb{P}(X > 23) = 0.527$. Find σ. $\sigma = 73.5$

Now for both…

7. $X \sim N(\mu, \sigma^2)$ and $\mathbb{P}(X > 7) = 0.3$ and $\mathbb{P}(X > 8) = 0.2$. Find μ and σ. $\mu = 5.35, \sigma = 3.14$

8. $X \sim N(\mu, \sigma^2)$ and $\mathbb{P}(X > 51) = 0.29$ and $\mathbb{P}(X < 20) = 0.13$. Find μ and σ. $\boxed{\mu = 40.79, \sigma = 18.45}$

Now for forward and backwards…

9. $X \sim N(\mu, \sigma^2)$ and $\mathbb{P}(X < 35) = 0.9$ and $\mathbb{P}(X < 40) = 0.95$. Find $\mathbb{P}(X > 42)$. $\boxed{0.0367}$