Note: In this problem set, expressions in green cells match corresponding expressions in the text answers.

```
Clear["Global`*"]
```

1. Let X be normal with mean 10 and variance 4. Find P(X > 12), P(X < 10), P(X < 11), P(9 < X < 13).

It is necessary to convert variance to standard deviation, since that is what the Mathematica function needs.

```
Probability[x > 12, x ≈ NormalDistribution[10, 2]] // N
```

```
0.158655
```

```
Probability[x < 10, x ≈ NormalDistribution[10, 2]] // N
```

```
0.5
```

```
Probability[x < 11, x ≈ NormalDistribution[10, 2]] // N
```

```
0.691462
```

```
Probability[9 < x < 13, x ≈ NormalDistribution[10, 2]] // N
```

```
0.624655
```

The green cells above match the answer in the text.

3. Let X be normal with mean 50 and variance 9. Determine c such that P(X < c) = 5%, P(X > c) = 1%, P(50 - c < X < 50 + c) = 50%.

```
Solve[Probability[x < c, x ≈ NormalDistribution[50, 3]] == 0.05, c]
```

Solve::ifun:
Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. >>

```
{{c → 45.0654}}
```

```
Solve[Probability[x > c, x ≈ NormalDistribution[50, 3]] == 0.01, c]
```

Solve::ifun:
Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. >>

```
{{c → 56.979}}
```

```
Solve[
 Probability[50 - c < x < 50 + c, x ≈ NormalDistribution[50, 3]] == 0.5, c]
```

Solve::ratnz : Solve was unable to solve the system with inexact coefficients. The answer was obtained by solving a corresponding exact system and numericizing the result. >>

```
{{c → 2.02347}}
```

The green cell above matches the answer in the text. The text answer corresponding to the top yellow is 56.978, and to the bottom yellow 2.022.

5. If the lifetime X of a certain kind of automobile battery is normally distributed with a mean of 5 years and a standard deviation of 1 year, and the manufacturer wishes to guarantee the battery for 4 years, what percentage of the batteries will he have to replace under the guarantee?

```
Probability[x < 4, x ≈ NormalDistribution[5, 1]] // N
```

```
0.158655
```

The green cell above matches the answer in the text.

7. A manufacturer knows from experience that the resistance of resistors he produces is normal with mean $\mu = 150\ \Omega$ and standard deviation $\sigma = 5\ \Omega$. What percentage of the resistors will have resistance between 148 Ω and 152 Ω? Between 140 Ω and 160 Ω?

```
Probability[148 < x < 152, x ≈ NormalDistribution[150, 5]] // N
```

```
0.310843
```

```
Probability[148 ≤ x ≤ 152, x ≈ NormalDistribution[150, 5]] // N
```

```
0.310843
```

```
Probability[140 < x < 160, x ≈ NormalDistribution[150, 5]] // N
```

```
0.9545
```

The green cells above match the answer in the text.

9. If the mathematics scores of the SAT college entrance exams are normal with mean 480 and standard deviation 100 (these are about the actual values over the past years) and if some college sets 500 as the minimum score for new students, what percent of students would not reach that score?

```
Probability[x < 500, x ≈ NormalDistribution[480, 100]] // N
```

```
0.57926
```

The green cell above matches the answer in the text.

11. If sick-leave time X used by employees of a company in one month is (very roughly) normal with mean 1000 hours and standard deviation 100 hours, how much time t should be budgeted for sick leave during the next month if t is to be exceeded with probability of only 20%?

```
Solve[Probability[x ≥ t, x ≈ NormalDistribution[1000, 100]] == 0.2, t]
```

Solve::ifun:
Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. >>

```
{{t → 1084.16}}
```

The green cell above matches the answer in the text.

13. If the resistance X of certain wires in an electrical network is normal with mean 0.01 Ω and standard deviation 0.001 Ω , how many of 1000 wires will meet the specification that they have resistance between 0.009 and 0.011 Ω?

The probability for any given wire in the 1000-wire bundle.

```
Probability[0.009 < x < 0.011, x ≈ NormalDistribution[0.01, 0.001]] // N
0.682689
```

Times the bundle population

```
1000 %
```

```
682.689
```

The green cell above matches the answer in the text.