Samples **Compounding interest SOLUTIONS**

1. Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 300$. Then:

(1) Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r = 9.0\% = 0.09$ and $n = 5$, so $F = 300 \times (1 + 0.09)^5 = 300 \times 1.09^5 \approx 461.59$.
The final balance is \$461.59.

(2) Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r = 4.5\% = 0.045$ and $n = 10$, so $F = 300 \times (1 + 0.045)^{10} = 300 \times 1.045^{10} \approx 465.89$.
The final balance is \$465.89.

(3) Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.
Hence $r = 2.3\% = 0.0225$ and $n = 20$, so $F = 300 \times (1 + 0.0225)^{20} = 300 \times 1.0225^{20} \approx 468.15$.
The final balance is \$468.15.

(4) Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r = 0.8\% = 0.0075$ and $n = 60$, so $F = 300 \times (1 + 0.0075)^{60} = 300 \times 1.0075^{60} \approx 469.70$.
The final balance is \$469.70.

(5) Interest compounds continuously, so $F = 300e^{0.09\times 5} = 300e^{0.45} \approx 470.49$.
The final balance is \$470.49.

2. Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 400$. Then:

(1) Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r = 9.0\% = 0.09$ and $n = 2$, so $F = 400 \times (1 + 0.09)^2 = 400 \times 1.09^2 \approx 475.24$.
The final balance is \$475.24.

(2) Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r = 4.5\% = 0.045$ and $n = 4$, so $F = 400 \times (1 + 0.045)^4 = 400 \times 1.045^4 \approx 477.01$.
The final balance is \$477.01.

(3) Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.
Hence $r = 2.3\% = 0.0225$ and $n = 8$, so $F = 400 \times (1 + 0.0225)^8 = 400 \times 1.0225^8 \approx 477.93$.
The final balance is \$477.93.

(4) Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r = 0.8\% = 0.0075$ and $n = 24$, so $F = 400 \times (1 + 0.0075)^{24} = 400 \times 1.0075^{24} \approx 478.57$.
The final balance is \$478.57.

(5) Interest compounds continuously, so $F = 400e^{0.09\times 2} = 400e^{0.18} \approx 478.89$.
The final balance is \$478.89.

3. Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 100$. Then:

(1) Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r = 9.0\% = 0.09$ and $n = 5$, so $F = 100 \times (1 + 0.09)^5 = 100 \times 1.09^5 \approx 153.86$.
The final balance is \$153.86.

(2) Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r = 4.5\% = 0.045$ and $n = 10$, so $F = 100 \times (1 + 0.045)^{10} = 100 \times 1.045^{10} \approx 155.30$.
The final balance is \$155.30.

(**3**) Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.
Hence $r = 2.3\% = 0.0225$ and $n = 20$, so $F = 100 \times (1 + 0.0225)^{20} = 100 \times 1.0225^{20} \approx 156.05$.
The final balance is \$156.05.

(**4**) Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r = 0.8\% = 0.0075$ and $n = 60$, so $F = 100 \times (1 + 0.0075)^{60} = 100 \times 1.0075^{60} \approx 156.57$.
The final balance is \$156.57.

(**5**) Interest compounds continuously, so $F = 100e^{0.09 \times 5} = 100e^{0.45} \approx 156.83$.
The final balance is \$156.83.