Topic: Drop and Balloon Payments

Liu Manufacturing borrows 1,000,000 to be repaid with annual payments of 90,000 followed by a drop payment. The annual effective interest rate on the loan is 6.3%.

Determine the amount of the drop payment.

Solution:

Using the BA-II+ Calculator:

$$\boxed{PV} \leftarrow 1,000,000; \boxed{I/Y} \leftarrow 6.3; \boxed{PMT} \leftarrow -90,000$$

$$\boxed{CPT}\,\boxed{N} \Rightarrow 19.7065$$

Round down to 19

$$\boxed{2nd}\,\boxed{Amort}\,\boxed{P1} \leftarrow 19; \boxed{P2} \leftarrow 19; \boxed{\downarrow}\,\boxed{Bal} \Rightarrow 60,353.61$$

$$Drop = (60,353.61)(1.063) = 64,155.89$$

Or mathematically:

$$1,000,000(1.063)^{20} - 90,000\ddot{s}_{\overline{19|}} = 64,155.89$$

*Logic check: your solution should be less than the amount of a single payment (90,000)

Mattie is the beneficiary of a perpetuity due with quarterly payments of 1000. The present value of Mattie's perpetuity is 40,000.

Mitch borrows 500,000 which will be repaid with quarterly payments of 16,000 plus a drop payment. The interest rate on the loan is the same as the interest rate on Mattie's perpetuity.

Calculate the drop payment on Mitch's loan.

Solution:

Mattie

Note that it is a perpetuity due with quarterly payments

$$1000\left(\frac{1}{\frac{i^{(4)}}{4}}\right)\left(1+\frac{i^{(4)}}{4}\right)=40,000 \implies \left(\frac{1000}{\frac{i^{(4)}}{4}}\right)+1000=40,000 \implies \frac{i^{(4)}}{4}=\frac{1}{39}=0.025641026$$

Mitch

We note that Mitch's payments are also quarterly so we just use $\dfrac{i^{(4)}}{4}$.

$\boxed{I/Y} \leftarrow 2.5641026$ <== Note that this must go in as a percent and not as a decimal.

$\boxed{PV} \leftarrow 500,000$

$\boxed{PMT} \leftarrow -16,000$

$\boxed{CPT}\boxed{N} \Rightarrow 63.823$ Round down to 63

$\boxed{2nd}\boxed{Amort}\boxed{P1}\leftarrow 1\boxed{P2}\leftarrow 63\boxed{\downarrow}\boxed{Bal}\Rightarrow 12,873.81$

$Drop = (12,873.81)(1.025641026)=13,203.91$

Or mathematically

$$500,000(1.025641026)^{64}-16,000\ddot{s}_{\overline{63|}}=13,203.91$$

*Logic check: your solution should be less than the amount of a single payment (16,000)

Jacque borrows 100,000 and is repaying it with annual payments of 9000 plus a balloon payment. The annual effective interest rate on the loan is 5%.

Calculate the balloon payment.

Solution:

$$PV = 100,000$$
$$PMT = -9000$$
$$I/Y = 5$$
$$CPT\ N = 16.62$$
$$2nd\ Amort$$
$$P1 = 1$$
$$P2 = 16$$
$$Bal = 5370.03$$
$$Ballon = 9000 + 5370.03 = 14,370.03$$

<u>Or</u> mathematically

$$100,000(1.05)^{16} - 9000\ddot{s}_{\overline{15|}} = 14,370.03$$

*Logic check: your solution should be greater than the amount of a single payment (9,000), but less than double the amount of a single payment (18,000)

Giacomo Inc. borrows 60,000 which will be repaid with monthly payments of 500 plus a balloon payment of B. The interest rate on the loan is 5.8% compounded monthly.

Freija has an identical loan except her loan calls for the final payment to be a drop payment of D.

Determine $B - D.$

Solution:

Use your calculator to find n.

$$\boxed{PV} \leftarrow 60,000; \boxed{I/Y} \leftarrow 5.8/12 = 0.48333333; \boxed{PMT} \leftarrow -500$$

$$\boxed{CPT}\,\boxed{N} \rightarrow 179.916 ==> \text{round down to } 179$$

$$\boxed{2nd}\,\boxed{Amort}\,\boxed{P1} \leftarrow 1; \boxed{P2} \leftarrow 179; \boxed{\downarrow}\,\boxed{Bal} \rightarrow 456.0271744$$

$$Balloon = Bal + Q = 456.03 + 500 = 956.03$$

$$Drop = (Bal)(1.00483333333) = 458.23$$

$$B - D = 956.03 - 458.23 = 497.80$$

Or mathematically

$$B = 60,000(1.04833333)^{179} - 500\ddot{s}_{\overline{178|}} = 956.03$$
$$D = 60,000(1.04833333)^{180} - 500\ddot{s}_{\overline{179|}} = 458.23$$
$$B - D = 956.03 - 458.23 = 497.80$$

*Logic check: your solution for B should be greater than the amount of a single payment (500), but less than double the amount of a single payment (1,000); your solution for D should be less than the amount for a single payment (500)