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MA 1023

1). The amount of interest to be paid can be determined using the geometric series method. This is because loan repayments are made repeatedly, and each payment can be expressed in relation to the initial payment as the payments are interconnected.

2).

a).   b). The Difference is 664.400

$P_0 = 25\,000$

-10   25 000

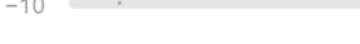$r = \dfrac{0.0229}{12}$

$0 \quad \le \theta \le \pi$

$n = 60$

-10   60

$M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$

$M = 441.37296051$

$T_{otalPaid} = M(n)$

$T_{otalPaid} = 26\,482.3776306$

$I_{TotalInterest} = T_{otalPaid} - P_0$

$I_{TotalInterest} = 1482.3776306$

$P_0 = 25\,000$

-10   25 000

$r = \dfrac{0.0329}{12}$

$0 \quad \le \theta \le \pi$

$n = 60$

-10   60

$M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$

$M = 452.446304502$

$T_{otalPaid} = M(n)$

$T_{otalPaid} = 27\,146.7782701$

$I_{TotalInterest} = T_{otalPaid} - P_0$

$I_{TotalInterest} = 2146.77827014$

c).

The Difference is 5315.205

$P_0 = 200\,000$	$P_0 = 200\,000$
-10 $200\,000$	-10 $200\,000$
$r = \dfrac{0.0329}{12}$	$r = \dfrac{0.0229}{12}$
$0 \quad \le \theta \le \pi$	$0 \quad \le \theta \le \pi$
$n = 60$	$n = 60$
-10 60	-10 60
$M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$	$M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$
$M = 3619.57043602$	$M = 3530.98368408$
$T_{otalPaid} = M(n)$	$T_{otalPaid} = M(n)$
$T_{otalPaid} = 217\,174.226161$	$T_{otalPaid} = 211\,859.021045$
$I_{TotalInterest} = T_{otalPaid} - P_0$	$I_{TotalInterest} = T_{otalPaid} - P_0$
$I_{TotalInterest} = 17\,174.2261611$	$I_{TotalInterest} = 11\,859.0210448$

3).

a). The Difference is 858.509

Left panel:

$P_0 = 25\,000$

$-10 \quad\bullet\quad 25\,000$

$r = \dfrac{0.0329}{12}$

$0 \quad \leq \theta \leq \pi$

$n = 36$

$-10 \quad\bullet\quad 36$

$M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$

$M = 730.229703637$

$T_{otalPaid} = M(n)$

$T_{otalPaid} = 26\,288.2693309$

$I_{TotalInterest} = T_{otalPaid} - P$

$I_{TotalInterest} = 1288.26933093$

Right panel:

$P_0 = 25\,000$

$-10 \quad\bullet\quad 25\,000$

$r = \dfrac{0.0329}{12}$

$0 \quad \leq \theta \leq \pi$

$n = 60$

$-10 \quad\bullet\quad 60$

$M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$

$M = 452.446304502$

$T_{otalPaid} = M(n)$

$T_{otalPaid} = 27\,146.7782701$

$I_{TotalInterest} = T_{otalPaid} - P$

$I_{TotalInterest} = 2146.77827014$

3).

b). The Difference is 6868.07

Left panel:

1. $P_0 = 200\,000$

   -10 ———————— $200\,000$

2. $r = \dfrac{0.0329}{12}$

   $0 \quad \le \theta \le \pi$

3. $n = 36$

   -10 ———————— 36

4. $M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$

   $M = 5841.8376291$

5. $T_{otalPaid} = M(n)$

   $T_{otalPaid} = 210\,306.154647$

6. $I_{TotalInterest} = T_{otalPaid} - P$

   $I_{TotalInterest} = 10\,306.1546475$

Right panel:

1. $P_0 = 200\,000$

   -10 ———————— $200\,000$

2. $r = \dfrac{0.0329}{12}$

   $0 \quad \le \theta \le \pi$

3. $n = 60$

   -10 ———————— 60

4. $M = \dfrac{rP_0(1+r)^n}{(1+r)^n - 1}$

   $M = 3619.57043602$

5. $T_{otalPaid} = M(n)$

   $T_{otalPaid} = 217\,174.226161$

6. $I_{TotalInterest} = T_{otalPaid} - P$

   $I_{TotalInterest} = 17\,174.2261611$

4).

a).

$$P_0 = \frac{M\left((1+r)^n - 1\right)}{r(1+r)^n}$$

$$P_0 = 23\,263.4943884$$

$M = 300$

−10   300

$$r = \frac{0.0229}{12}$$

$0 \leq \theta \leq \pi$

$n = 84$

−10   84

b).

$$P_0 = \frac{M\left((1+r)^n - 1\right)}{r(1+r)^n}$$

$$P_0 = 10\,427.7626054$$

$M = 300$

−10   300

$$r = \frac{0.0229}{12}$$

$0 \leq \theta \leq \pi$

$n = 36$

−10   36