P= amount of loan = total cost − down payment
n= # of monthly payments = 12(# of years)
r= interest rate (move decimal 2 places to left)

Name Schlansky m=mortgage payment Date ___________
Mr. Schlansky Algebra II

Mortgage Problems

1. Jim is looking to buy a vacation home for total $172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage. With a $20,000 down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

M=mortgage payment = m
P= principal amount of loan = 172600 − 20000 = 152600
r=monthly interest rate = .00305
n=# of monthly payments = 12(15)=180

$$M = 152600 \cdot \frac{.00305(1+.00305)^{180}}{(1+.00305)^{180} - 1}$$

M = $1103

find P

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be $900.

m

M= 900
P= P
r= .00305
n= 180

$$900 = P \cdot \frac{.00305(1+.00305)^{180}}{(1+.00305)^{180} - 1}$$

type into calc

$$\frac{900}{.007..} = \frac{P \cdot (.007..)}{.007...}$$

124521... = P

172,600
−124,521
$48,078

2. Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of \$21,000 and a \$1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed $= 21{,}000 - 1{,}000 = 20000$
n = number of monthly pay periods $= 5(12) = 60$
PMT = monthly payment $= x$
i = interest rate per month $= .00625$

$$20000 = x\left(\frac{1-(1.00625)^{-60}}{.00625}\right)$$

$$\frac{20{,}000}{49.9\ldots} = \frac{x(\cancel{49.9\ldots})}{\cancel{49.9\ldots}}$$

$$400.76 = x$$

$P=T-D$ The affordable monthly payment is \$300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

$P_n = x$

$n = 5(12) = 60$

$PMT = 300$

$i = .00625$

$$x = 300\left(\frac{1-(1.00625)^{-60}}{.00625}\right)$$

$$x = \cancel{300(} 14971\ldots$$

$$P = T - D$$

$$14971\ldots = 21{,}000 - D$$
$$-21000 \quad -21{,}000$$

$$\frac{-6028\ldots}{-1} = \frac{-D}{-1}$$

$$\$6028 = D$$

3. Monthly mortgage payments can be found using the formula below:

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment → m
P = amount borrowed $220{,}000 - 100{,}000 = 120{,}000$
r = annual interest rate $.048$
n = number of monthly payments $15(12) = 180$

The Banks family would like to purchase a home for \$220,000. They qualified for an annual interest rate of 4.8%. If they put make a down payment of \$100,000 and plan to spend 15 years to repay the loan, what will be the monthly payment rounded to the *nearest* cent?

$$m = \frac{120{,}000\left(\frac{.048}{12}\right)\left(1+\frac{.048}{12}\right)^{180}}{\left(1+\frac{.048}{12}\right)^{180}-1}$$

$$m = 936.50$$

If they want their monthly payment to be \$1500, what would their down payment have to be?

$m = 1500$
$P = x$
$r = .048$
$n = 180$

$$1500 = x\left(\frac{\left(\frac{.048}{12}\right)\left(1+\frac{.048}{12}\right)^{180}}{\left(1+\frac{.048}{12}\right)^{180}-1}\right)$$

$$\frac{1500}{.0078..} = \frac{x(\cancel{.0078...})}{\cancel{.0078...}}$$

$$192205... = x$$

$D = T - P$

$D = 220{,}000 - 192{,}205$

$D = 27{,}794.43$

$D = .2(380{,}000) = 76{,}000$

4 ~~3.~~ Mr. and Mrs. Jenkins just closed on a new home whose purchase price was $380,000 (T). At the closing, they supplied a down payment of ~~20% of the purchase price~~ 76,000. If on the day of the closing the ~~annual~~ monthly interest rate was .3125%, determine the Jenkins' monthly mortgage payment, to the *nearest cent*, if they were approved for a 30-year loan.

Use the formula $M = P \bullet \frac{r(1+r)^n}{(1+r)^n - 1}$ where M is the mortgage payment, P is the principal amount of the loan, r is the monthly interest rate, and n is the number of monthly payments.

$m = x$

$P = T - D \quad P = 380{,}000 - 76{,}000 = 304{,}000$

$r = .003125$

$n = 30(12) = 360$

$x = 304{,}000\left(\frac{.003125(1.003125)^{360}}{(1.003125)^{360} - 1}\right)$

$x = \$1407.87$

Algebraically determine and state the down payment, to the *nearest dollar*, Mr. and Mrs. Jenkins would need to initially supply in order to bring their monthly mortgage payment down to $1200.

$m = 1200$

$P = x$

$r = .003125$

$n = 30(12) = 360$

$1200 = x\left(\frac{.003125(1.003125)^{360}}{(1.003125)^{360} - 1}\right)$

$\frac{1200}{.00463\ldots} = \frac{x(.00463\ldots)}{.00463\ldots}$

$259114\ldots = x$

$P = T - D$

$259114\ldots = 380{,}000 - D$

$-380{,}000 \quad -380{,}000$

$\frac{-120885\ldots}{-1} = \frac{-D}{-1}$

$D = 120885$

5 ~~4~~. Malia wants to renovate the kitchen in her house and estimates that it will cost $39,000 to do so. She plans to make a down payment of $5,000 and then finance the rest at 0.25% interest per month over a ten-year period.
Use the following formula to determine Malia's monthly payment to the *nearest cent.*

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed $= 39{,}000 - 5{,}000 = 34{,}000$
n = number of monthly pay periods $10(12) = 120$
PMT = monthly payment $= x$
i = interest rate per month $= .0025$

$$34{,}000 = x\left(\frac{1-(1+.0025)^{-120}}{.0025}\right)$$

$$\frac{34{,}000}{103\ldots} = \frac{x(\cancel{103\ldots})}{\cancel{103\ldots}}$$

$$\$328.31 = x$$

Malia can reasonably only afford a monthly payment of $275 per month ~~at most Malia's parents decide to help her with the cost of her new kitchen.~~ What would her down payment have to be in order for her monthly payment to be $275?

find P

$P_n = P$

$n = 120$

$PMT = 275$

$i = .0025$

$$P = 275\left(\frac{1-(1+.0025)^{-120}}{.0025}\right)$$

$$P = 28479\ldots$$

$$D = T - P$$

$$D = 39{,}000 - 28479\ldots$$

$$D = \$10{,}520.52$$

6. Astrid just purchased a new car for $30,000. She traded in her old car and used the money she received from it to make a $4,000 down payment on the car. To the *nearest cent*, what will be Astrid's monthly payment on her new car if her loan has an interest rate of 0.05% per month and the life of the loan is ten years? Use the formula $A = R\left(\frac{1-(1+i)^{-n}}{i}\right)$ where A = present amount borrowed, R = monthly payment, n = number of monthly pay periods, and i = monthly interest rate.

A = amount borrowed : 30,000 − 4,000 = 26,000

R = monthly payment : R

n = # of monthly payments : 12(10) = 120

i = monthly interest rate = .0005

$$26000 = R\left(\frac{1-(1+.0005)^{-120}}{.0005}\right)$$

$$\frac{26000}{116...} = \frac{R(116...)}{116...}$$

$$223.29 = R$$

Astrid knows that she cannot afford a monthly payment of more than $200 for the same time period. What must her down payment be for her monthly payment to be $200?

find P(amount borrowed)

A = A

R = 200

n = 120

i = .0005

$$A = 200\left(\frac{1-(1+.0005)^{-120}}{.0005}\right)$$

$$A = 23288...$$

$$\begin{array}{r} 30000 \\ -23288.. \\ \hline \$6711.46 \end{array}$$

$n=30(12)=360$

7. The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is \$152,500 and they will make a \$15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$m=\frac{137250\left(\frac{.036}{12}\right)\left(1+\frac{.036}{12}\right)^{360}}{\left(1+\frac{.036}{12}\right)^{360}-1}$$

$$M=\frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment $=m$

P = amount borrowed $152{,}500-15{,}250=137250$

r = annual interest rate $.036$

n = total number of monthly payments $=360$

$m=624$

8. Monthly mortgage payments can be found using the formula below, where M is the monthly payment, P is the amount borrowed, r is the annual interest rate, and n is the total number of monthly payments. If Adam takes out a 15-year mortgage, borrowing \$240,000 at an annual interest rate of 4.5%, What will his monthly payment be?

$$m=\frac{240{,}000\left(\frac{.045}{12}\right)\left(1+\frac{.045}{12}\right)^{180}}{\left(1+\frac{.045}{12}\right)^{180}-1}$$

$$M=\frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment $=m$

P = amount borrowed $=240{,}000$

$r=.045$

$n=15(12)=180$

$m=\$1835.98$

9. Robert is buying a car that costs \$22,000. After a down payment of \$4000, he borrows the remainder from a bank, a six year loan at 6.24% annual interest rate. The following formula can be used to calculate his monthly loan payment. What will Robert's monthly payment be?

divide by 12 for monthly rate

$$R=\frac{18{,}000(.0052)}{1-(1+.0052)^{-72}}$$

$$R=\frac{(P)(i)}{1-(1+i)^{-t}}$$

R = monthly payment R

P = loan amount $22{,}000-4{,}000=18{,}000$

i = monthly interest rate $\frac{.0624}{12}=.0052$

t = time, in months $6(12)=72$

$R=300.36$