Additional Mortgage Math

Mortgage Educators and Compliance

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Additional Mortgage Math Examples

IN this worksheet, we are going to provide additional mortgage math examples. Then we will provide additional problems to work through separately.

Debt to Income

There are two types of debt-to-income, front-end DTI (housing expense) and back-end DTI (total debt to income).

Front-End DTI (Housing Expense)

The front end is calculated by taking the total housing expense (PITI) and dividing it by gross income of the borrower

Example

A borrower's monthly income is $3000. Their current PITI payment is $900. What is their front-end DTI?

$900/$3000 = .30 or 30%

Back-End DTI (Total-Debt-to-Income)

The back end is calculated by taking the total amount of debts that the borrower has including the housing expense and dividing it by the gross income of the borrower.

Example

A borrower's monthly income is $3000, their current PITI is $900, they have a car payment of $300, a credit card payment of $45 and a cell phone bill of $100. Their back-end DTI will include the car payment, mortgage payment and credit card payment but does not need to include their cell phone bill. Remember that it's only bills that are debts need to be included in calculating DTI. What is their back-end DTI?

Step 1: 900+300+45 = $1245

Step 2: $1245/$3000 = 42%

Answer: 42%

Monthly Payment

Use the following equation to determine how much of a mortgage payment someone can afford. Remember your acceptable DTI ratios!

Income x housing expense ratio = X

Income x total debt to income ratio – consumer debt = Y The correct answer is whichever is less

Example

A borrower makes $6000 a month, they also have a car payment of $300 a month, and two credit card payments of $55 and $100. What is the maximum monthly payment they can afford on a conventional loan?

Step 1: $6000 x 28%= $1680

Step 2: $6000 x 36% - 300 – 155 = $1705

Answer: The answer is whichever is less so the correct answer in this situation is $1680

Loan to Value (LTV)

There are three types of Loan to Value Calculations. The first is simple.

Loan amount divided by the appraised value or purchase price whichever is less = LTV

Example

In this refinance transaction the borrower's property appraised for $250,000. The loan amount for their refinance is $110,000.

$110,000 / $250,000 = 44% LTV

Answer: 44% LTV

CLTV (Combined Loan to Value)

The CLTV is calculated by dividing the amount of a 1st lien loan and the amount drawn on the HELOC divided by the appraised value of the property

Example

In this refinance transaction, the borrower has a first lien loan of $110,000, they also have a HELOC that has a total line of $40,000, though they've only borrowed

$20,000. Their property appraised for $220,000. What is their CLTV?

Step 1: $110,000 + $20,000 = $130,000

Step 2: $130,000/$220,000 = 59.09% CLTV

Answer: 59.09% CLTV

Remember – you need the amount of the 1st and the draw from the HELOC for the CLTV

TLTV (Total Loan to Value)

TLTV is calculated by dividing the sum of the 1st lien mortgage amount and the total amount of a HELOC or a 2nd mortgage by either the property's appraised value

Example

The borrower has a first lien loan of $150,000. They have a total line of

$100,000 on their HELOC but have only borrowed $75,000. Their house appraised for $200,000. What is their TLTV?

Step 1: $150,000 + $100,000 = $250,000

Step 2: $250,000/$200,000 = 125% TLTV

Answer: 125% TLTV

Remember, you need the total amount of the HELOC to determine TLTV.

Cash Available at Closing

To determine cash available at closing, multiply the value by the LTV then subtract the payoff of the existing 1st then subtract the closing costs. The amount that remains is what the borrower will have available in cash at closing.

Example

A refinance transaction for a borrower who qualifies at 80% LTV and has a payoff of $100,000. How much cash is available if the appraisal is $150,000 and the closing costs are $2,500?

Step 1: 150,000 x 80% = $120,000

Step 2: $120,000 - $100,000= $20,000

Step 3: $20,000 - $2,500 = $17,500

Answer: $17,500 is available in cash to the borrower at closing

Interest-Only

Interest only payments are calculated by multiplying the loan amount by the interest rate and then dividing by 12.

Example

The borrower's loan amount is $100,000 their interest rate is 3.4%. What would be an interest only payment on their loan?

Step 1: $100,000 x 3.4% = $3400

Step 2: $3400 / 12 = $283.33

Answer: $283.33 would be the Interest-Only (I/O) payment

Balloon Payments on Interest Only Loans

If a loan is interest only then the balloon payment on the loan is going to be the original principal amount as no principal has been paid on the loan. So, in the above example, the balloon payment is $100,000.

Discount Points

Discount points are calculated by multiplying the loan amount by the number of points the borrower is paying. If a borrower is paying 1 point to get the loan, then multiply the loan amount by 1% and that will equal the dollar amount the borrower will pay.

Example

A borrower is buying a house that is $175,000. She provides a down-payment of $5,000. If she pays for 2 discount points, what is the total cost of the points?

Step 1: $175,000-$5,000 = $170,000

Step 2: $170,000 x 2% = $3400

Answer: $3400 would be the cost of the points on this loan

Calculating Hourly Income & Overtime

To calculate hourly income, take the hourly wage x 40 hours x 52 divided by 12. This equals the regular pay per month.

For overtime income, take the hourly wage x 1.5 for time and a half or times 2 for double time. Then multiply that number by the number of overtime hours worked per week, multiply by 52 and then divide by 12.

Example

The borrower makes $17.50 an hour. What is their income per month? (Assuming 40 hours per week)

Step 1: $17.50 x 40 = $700.00

Step 2: $700.00 x 52 = $36,400

Step 3: $36,400/12 = $3033.33

Answer: $3033.33 per month

Continuing with the example above, the borrower's income is $17.50. He works an additional 10 hours per week of overtime. What's his overtime income per month?

Step 1: $17.50 x 1.5 = $26.25

Step 2: $26.25 x 10 = $262.50

Step 3: $262.50 x 52 = $13,650

Step 4: $13,650 / 12 = $1137.50

Answer an additional $1137.50 in overtime income per month

Total income per month: $4,170.83 per month

HOEPA Triggers

HOEPA has three tests, the APOR test, the points and fees test and the prepayment penalty test. We are going to take a look at the first two tests and determine whether a loan is a high-cost home loan or not.

HOEPA has a 5% points and fees threshold. To determine if a loan is high-cost based on the points an fees test, multiple the loan amount by 5%. If the points and fees exceed that, then the loan is a high-cost home loan.

The HOEPA triggers for APOR are 6.5% on a first-lien loan and 8.5% on a first lien that less than $50,000 or a second lien loan. If the APR on the loan is higher than the APOR + the HOEPA trigger then the loan is a HOEPA loan

Example 1: Points and Fees Test

The loan amount is $200,000 on a first lien loan. The points and fees on the loan are $6,000.

$200,000 x 5% = $10,000

Is this loan a HOEPA loan?

Answer: This is not a HOEPA loan.

Example 2: APR Test

The APR on a loan is 4.5%. The loan amount is $115,000. The APOR is 3.2%.

3.2% + 6.5% = 9.7%.

Is this loan a HOEPA loan?

Answer: This is not a HOEPA loan.

Adjustable Rate Mortgages (ARMs)

Most ARMS have caps. An example is a 2/2/7 cap structure. The 1st cap is the maximum the interest rate can adjust the first time. The second number is the maximum the interest rate can adjust on any other adjustment. The third cap is added to the starting interest rate thus resulting the highest the interest rate can ever be on the loan.

If you only have 2 caps like 3/7, the first number signifies that the rate will not adjust more than 3% over what it was every time it adjusts, and the last number says the interest rate on the loan cannot exceed the starting interest plus 7%.

Example

The borrower's initial interest rate is 3.5%. The caps on the ARM are 2/2/7. What is the maximum interest rate for the initial adjustment?

3.5% + 2% = 5.5% is the maximum interest rate for the initial adjustment

What is the maximum interest rate it can go to on the second adjustment?

Step 1: 5.5% + 2 =7.5%

Step 2: Is 7.5% over the maximum cap of 10.5%? NO

Step 3: The maximum interest rate can go on the loan is 10.5%

What is the maximum interest rate the loan can ever go to? Answer: 10.5%

Example 2

The borrower's interest rate is 2.3% to start off with and this is a 3/7 ARM What is the maximum interest rate it can go to on the first adjustment?

2.3% + 3% = 5.3% is the maximum interest rate at the first adjustment What's the maximum interest rate it can go to on the second adjustment?

5.3% (Rate from the previous adjustment) + 3% (Maximum it can increase over the previous adjustment) = 8.3%

What is the maximum interest rate the loan can ever go to? 2.3% (Start rate) + 7% (Lifetime cap) = 9.3%

Answer: 9.3%

Additional Math Problems

In this section, we are providing blank problems for you to work out on your own. The answer key is at the end of this worksheet.

Problem #1

Sandy and John are looking to purchase a new home. The new home's purchase price is $120,000. The appraised value is $130,000. Their down payment is $10,000. What is their LTV?

Problem #2

Andrew and Colleen are refinancing their property. They have a first lien mortgage on their home that is $319,000. They also have a HELOC that has a total line of $100,000. They have only used $44,000. Their property appraised at $500,000. What is their CLTV and their TLTV?

Problem #3

George and Laure are looking to refinance their property. They have a first lien mortgage of $150,000. They also have a second mortgage of $50,000. Their house appraised for $250,000. What is their LTV, TLTV and CLTV?

Problem #4

Cassie and Alex are looking to purchase their first home, but they are not sure how much of a mortgage payment they can afford. They make $7000 a month. They have car payments totaling $500 and they have credit card payments totaling $300 a month.
What is the maximum payment they can afford on an FHA loan?

Problem #5

Frankie is looking to get an ARM with a starting rate of 3.5%. He qualifies for a 2/2/7 ARM.
What is the maximum interest rate that can be charged on the initial interest rate adjustment?
What is the maximum interest rate that can be charged on the second interest rate adjustment?
What is the maximum interest rate that can be charged ever on the life of the ARM?

Problem #6

Tyler and Erin are looking to purchase their first home. Tyler makes $23.50 an hour and works 40 hours per week. Erin makes $21.50 an hour and works 40 hours of regular time and 5 hours of overtime a week. They have two car payments totaling $500 a month and one credit card with a minimum payment of $50 a month. How much income do each of them make? What is the maximum mortgage payment they can afford, if they are applying for a conventional conforming loan?

Problem # 7

Jordan is purchasing his first property. He is looking to purchase 2 discount points on his loan. The loan amount is $250,000 and his closing costs are $4500. How much will Jordan pay for his discount points?

Problem #8

Henry is looking to do a cash-out refinance. You are trying to determine the maximum amount he can receive from his property. He qualifies at a LTV of 85%. His property appraised at $450,000. He has a first lien mortgage on his property of $100,000 and a 2nd lien mortgage of $50,000. The closing costs on the refinance will be $6500. How much extra cash is available at closing?

Problem #9

Kyle and Vivian are going to purchase their new home together. Kyle makes $55,000 a year and Vivian makes $26.50 an hour at 40 hours a week and works an additional 10 hours a week in overtime.

What is their monthly income?

Answer Key

Problem #1

Sandy and John are looking to purchase a new home. The new home's purchase price is $120,000. The appraised value is $130,000. Their down payment is $10,000. What is their LTV?

$110,000 / $120,000 = 91.66%

Problem #2

Andrew and Colleen are refinancing their property. They have a first lien mortgage on their home that is $319,000. They also have a HELOC that has a total line of $100,000. They have only used $44,000. Their property appraised at $500,000. What is their CLTV and their TLTV?

$319,000 +$44,000 = $363,000 / $500,000 = 72.6% CLTV
$319,000 +$100,000 = $419,000 / $500,000= 83.8% TLTV

Problem #3

George and Laure are looking to refinance their property. They have a first lien mortgage of $150,000. They also have a second mortgage of $50,000. Their house appraised for $250,000. What is their LTV, TLTV and CLTV?

$150,000 / $250,000 = 60%LTV
$150,000 + $50,000 = $200,000 / $250,000 = 80% CLTV and TLTV

Problem #4

Cassie and Alex are looking to purchase their first home, but they are not sure how much of a mortgage payment they can afford. They make $7000 a month. They have car payments totaling $500 and they have credit card payments totaling $300 a month.
What is the maximum payment they can afford on an FHA loan?

$7,000 X 31% (front ratio on FHA) = $2,170
$7,000 X 43% (overall ratio on FHA) = $3,010

$3,010 - $500- $300 = $2,210

Maximum PITI is $2,170 because the maximum they can afford per the front-end ratio.

Problem #5

Frankie is looking to get an ARM with a starting rate of 3.5%. He qualifies for a 2/2/7 ARM.
What is the maximum interest rate that can be charged on the initial interest rate adjustment?
What is the maximum interest rate that can be charged on the second interest rate adjustment?
What is the maximum interest rate that can be charged ever on the life of the ARM?

First adjustment – 3.5% + 2% = 5.5%
Second Adjustment - 5.5% +2% = 7.5%
Life Cap = 3.5% +7% = 10.5% max rate over the life of the loan

Problem #6

Tyler and Erin are looking to purchase their first home. Tyler makes $23.50 an hour and works 40 hours per week. Erin makes $21.50 an hour and works 40 hours of regular time and 5 hours of overtime a week. They have two car payments totaling $500 a month and one credit card with a minimum payment of $50 a month. How much income do each of them make? What is the maximum mortgage payment they can afford, if they are applying for a conventional conforming loan?

$23.50 X 40hours X 52weeks / 12months = $4073.
$21.50 X 40hours X 52weeks / 12months = $3,726.
Overtime $21.50 + $10.75 = 5 hours X 52 weeks / 12 months = $698.
Gross income is $8,497.

$8,497 X 28% (Housing ratio) $2379.16
$8,497 X 36% (overall ratio) = $3,058. 92 - $500. - $50. = $2,508.92

Maximum PITI is $2,379.16 (lowest of the two)

Problem # 7

Jordan is purchasing his first property. He is looking to purchase 2 discount points on his loan. The loan amount is $250,000 and his closing costs are $4500. How much will Jordan pay for his discount points?

$250,000 x 2% - $5,000. (closing costs are not in the calculation)

Problem #8

Henry is looking to do a cash-out refinance. You are trying to determine the maximum amount he can receive from his property. He qualifies at a LTV of 85%. His property appraised at $450,000. He has a first lien mortgage on his property of $100,000 and a 2nd lien mortgage of $50,000. The closing costs on the refinance will be $6500. How much extra cash is available at closing?

$450,000 x 85% = $382,500

$382,500 - $100,000 - $50,000 - $6,500 = $226,000

Problem #9

Kyle and Vivian are going to purchase their new home together. Kyle makes $55,000 a year and Vivian makes $26.50 an hour at 40 hours a week and works an additional 10 hours a week in overtime.

What is their monthly income?

Kyle - $55,000 / 12 = $4583.33
Vivian – $6,315.83
$26.50 X 40hours X 52 weeks / 12 months = $4593.33
$26.50 + $13.25 = $39.74 X 10hours X 52 weeks / 12 months = $1,722.50

Total monthly income = $10,899.16