Spring '07/MAT 117/Worksheet 4 **Name:** Solution - for group 4 *Show all your work.*

Group	1	2	3	4	5	6	7	8	9
15-year	5.20	5.20	5.20	6.05	6.05	6.05	7.55	7.55	7.55
30-year	5.88	5.88	5.88	6.33	6.33	6.33	8.00	8.00	8.00
savings	7	9	11	7	9	11	7	9	11

A family buying a home will need to take out a loan for \$150,000. They can afford payments both on a 15-year loan (which are higher) and a 30-year loan, but are trying to decide what is better for them in the long term.

1. (7pts) Compute the monthly payment R_1 on the 15-year loan if the interest rate is 6.05 %, compounded monthly. Find the total payments that the family made on this loan.

$$150000 = R\,\frac{1-\left(1+\frac{0.0605}{12}\right)^{-12\cdot 15}}{\frac{0.0605}{12}}$$

$$150000 = R\,\frac{1-(1.005041\ldots)^{-180}}{0.005041\ldots}$$

$$150000 = R\cdot 118.1250\ldots$$

$$R = \frac{150000}{118.125\ldots} = 1269.84$$

Total payments:

$$1269.84 \cdot 180 = 228{,}571.34$$

2. (7pts) Compute the monthly payment R_2 on the 30-year loan if the interest rate is 6.33 %, compounded monthly. Find the total payments that the family made on this loan.

$$150000 = R\,\frac{1-\left(1+\frac{0.0633}{12}\right)^{-12\cdot 30}}{\frac{0.0633}{12}}$$

$$150000 = R\,\frac{1-(1.005275)^{-360}}{0.005275}$$

$$150000 = R\cdot 161.0488\ldots$$

$$R = \frac{150000}{161.0488} = 931.39$$

Total payments:

$$931.39 \cdot 360 = 335{,}302.02$$

Now we consider how much this family could save in 30 years. Suppose they can deposit money in an account bearing 7 % compounded monthly.

3. (7pts) If the family took the 15-year loan, after 15 years it doesn't have a monthly payment, so for the remaining 15 years it can put the monthly payment R_1 into savings. How much is in the savings account after 15 years?

$$F = 1269.84 \cdot \frac{\left(1+\frac{0.07}{12}\right)^{12\cdot 15}-1}{\frac{0.07}{12}}$$

$$= 1269.84 \cdot \frac{(1.0058\ldots)^{180}-1}{0.0058\ldots}$$

$$= 1269.84 \cdot 316.962\ldots = 402,491.40$$

4. (7pts) If the family took the 30-year loan, it will have a monthly payment throughout the 30 years. However, since the family could have afforded the higher payment R_1, we assume they can put the difference $D = R_1 - R_2$ into a savings account every month for all of the 30 years. How much is in the savings account after 30 years?

$$D = 1269.84 - 931.39 = 338.45$$

$$F = 338.45 \cdot \frac{\left(1+\frac{0.07}{12}\right)^{12\cdot 30}-1}{\frac{0.07}{12}}$$

$$= 338.45 \cdot \frac{(1.0058\ldots)^{360}-1}{0.0058\ldots} = 338.45 \cdot 1219.97\ldots = 412,859.18$$

5. (2pts) What option ends up with more money in the savings account at the end of 30 years? What other considerations might come in when choosing the term of the loan?

- personal taste (whether you like to owe money for a long time)
- whether people actually can save the difference in #4, rather than spend it.

Spring '07/MAT 117/Worksheet 4 **Name:** Answers for all groups *Show all your work.*

Group	1	2	3	4	5	6	7	8	9
15-year	5.20	5.20	5.20	6.05	6.05	6.05	7.55	7.55	7.55
30-year	5.88	5.88	5.88	6.33	6.33	6.33	8.00	8.00	8.00
savings	7	9	11	7	9	11	7	9	11

A family buying a home will need to take out a loan for \$150,000. They can afford payments both on a 15-year loan (which are higher) and a 30-year loan, but are trying to decide what is better for them in the long term.

1. (7pts) Compute the monthly payment R_1 on the 15-year loan if the interest rate is _____%, compounded monthly. Find the total payments that the family made on this loan.

Group	1-3	4-6	7-9
monthly payment	1201.88	1269.84	1394.78
total payments	216,338.40	228,571.34	251,060.40

2. (7pts) Compute the monthly payment R_2 on the 30-year loan if the interest rate is _____%, compounded monthly. Find the total payments that the family made on this loan.

Group	1-3	4-6	7-9
monthly payment	887.79	931.39	1,100.65
total payments	319,604.40	335,302.02	396,234.00

Now we consider how much this family could save in 30 years. Suppose they can deposit money in an account bearing _____% compounded monthly.

3. (7pts) If the family took the 15-year loan, after 15 years it doesn't have a monthly payment, so for the remaining 15 years it can put the monthly payment R_1 into savings. How much is in the savings account after 15 years?

Group	1	2	3	4	5
	380,949.60	454,797.08	546,480.81	402,491.65	480,515.08

Group	6	7	8	9
	577,383.34	442,093.92	527,794.29	634,193.71

4. (7pts) If the family took the 30-year loan, it will have a monthly payment throughout the 30 years. However, since the family could have afforded the higher payment R_1, we assume they can put the difference $D = R_1 - R_2$ into a savings account every month for all of the 30 years. How much is in the savings account after 30 years?

Group	1	2	3	4	5
	383,181.51	575,019.46	880,873.50	412,894.65	619,608.61

Group	6	7	8	9
	949,179.28	358,838.70	538,489.53	824,913.23

5. (2pts) What option ends up with more money in the savings account at the end of 30 years? What other considerations might come in when choosing the term of the loan?