

Name: Answer Key

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
Actuarial Science Program
DEPARTMENT OF MATHEMATICS

Math 370 (Z)
Exam 2/FM Preparation

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Loans and Sinking Funds
Summary Quiz

- (1) A 30-year loan has an initial balance of 250,000. The effective annual interest rate is 8%, and level payments are made at the end of each year. What is the total amount of interest paid over the life of the loan?

(A) 386,200 (B) 396,200 (C) 406,200 (D) 416,200 (E) 426,200

$$R \cdot a_{\overline{30}|.08} = 250,000 \Rightarrow R = 22,206.86$$

$$\text{TOTAL INTEREST} = 30(R) - 250,000 = \underline{\underline{416,205.75}}$$

- (2) You take out a 400,000 loan today. To pay off this loan, you will make 240 level monthly payments of R , with the first payment due seven months from now. The interest rate on the loan is 12% convertible monthly. Find R .

(A) 4,325 (B) 4,400 (C) 4,560 (D) 4,675 (E) 4,790

$$400,000(1.01)^6 = R \cdot a_{\overline{240}|.01} \Rightarrow R = \underline{\underline{4675.30}}$$

- (3) You take out a 30-year, 300,000 mortgage, at an effective annual interest rate of 9%. Immediately after the 8th payment, you refinance your mortgage with a new 15-year mortgage at a 5% effective annual interest rate. Both mortgages require annual year-end payments. What is the size of each payment under the 15-year refinanced mortgage?

(A) 26,564 (B) 27,564 (C) 28,564 (D) 29,564 (E) 30,564

$$R = 300,000 / a_{\overline{30}|.09} = 29,200.91$$

$$B_8 = R \cdot a_{\overline{22}|.09} = 275,727.37 \quad R^* = \frac{275,727.37}{a_{\overline{15}|.05}} = \underline{\underline{26,564.21}}$$

- (4) You want to accumulate a sinking fund over 25 years in order to pay off the principal on a 150,000 loan. You make payments of X into the sinking fund at the end of each quarter. The nominal interest rate is 8% convertible quarterly. Find the value of X necessary to achieve your objective?

(A) 480 (B) 500 (C) 520 (D) 540 (E) 560

$$150,000 = X \cdot s_{\overline{100}|.02} \Rightarrow X = \underline{\underline{480.41}}$$