

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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Basic Interest Theory Material
Summary Quiz

1) Roger has \$1,000 to invest. Which of the following will yield him the greatest amount of interest after 1 year?

- (A) Simple annual interest rate of 9%. $1000(1.09) = 1090$
(B) Annual effective interest rate $i = 8.25\%$. $1000(1.0825) = 1082.5$
(C) Nominal discount rate $d^{(4)} = 8.75\%$. $1000 \cdot \left[1 - \frac{.0875}{4}\right]^{-4} = \underline{\underline{1092.5}}$
(D) Nominal interest rate $i^{(2)} = 8.5\%$. $1000(1.0425)^2 = 1086.8$
(E) Force of interest $\delta = 7.75\%$. $1000 \cdot e^{.0775} = 1080.6$

2) To save for a car, Hannah opens a bank account into which she deposits \$3,200 at $t = 0$, her family deposits \$3,500 six months later, and Hannah deposits another \$800 three months after that. If $i^{(2)} = 8\%$, which of the following is closest to the most expensive car Hannah can purchase, using just this account, at time $t = 1$ year?

- (A) \$7,509 (B) \$7,798 (C) \$7,851 (D) \$7,917 (E) \$8,012

$$3200(1.04)^2 + 3500(1.04) + 800(1.04)^{1/2} = \underline{\underline{7916.96}}$$

3) Bill opens up a savings account today that earns interest at a nominal rate of $i^{(4)}$ (convertible quarterly) and deposits \$1,750 into it. At the end of three years, the account has accumulated to \$2,104.73. Calculate $i^{(4)}$.

- (A) 6.20% (B) 6.25% (C) 6.30% (D) 6.35% (E) 6.40%
- $$\left[\left[\frac{2104.73}{1750} \right]^{1/12} - 1 \right] \times 4 = \underline{\underline{.0620}}$$

4) Jack and Jane both deposit \$200 into separate bank accounts on January 1, 2007. Jack earns interest at a simple annual interest rate of j , while Jane earns interest at a nominal rate of 3% convertible semi-annually. On January 1, 2012, their accounts have the same value. Calculate j .

- (A) 3.02% (B) 3.21% (C) 3.30% (D) 3.43% (E) 3.54%

$$200(1 + 5j) = 200(1.015)^{10} \Rightarrow j = \underline{\underline{.0321}}$$