

Actuarial Science 2053 – Test 1 -- Practice 2

Use the following information for the first two questions:

A promissory note for \$5000 is written on October 23, 2010. The due date is March 20, 2011. The simple interest rate on the note is $r = 8.25\%$.

- What is the maturity value of the note if ordinary interest (banker's rule) is used?
(A) \$5173.02 (B) \$5170.65 (C) \$5169.58 (D) \$5167.26
- The note is sold on January 9, 2011 to a bank for \$5086.12. What rate of return, r , is earned by the original owner (payee) of the note (using exact interest)?
(A) 7.95% (B) 8.06% (C) 8.40% (D) 8.61%
- A loan of \$4000 is taken out on May 10 at a simple interest rate of $r = 10\%$. A payment of \$125 is made 95 days later. A final payment, X , is due 180 days after May 10. What is X if the declining balance method is used?
(A) \$4197.26 (B) \$4072.26 (C) \$4071.77 (D) \$4069.35
- You invest \$50,000 today. It earns simple interest at 15% for the first 5 months, 10% for the next 3 months and 12% for the last 2 months. What is the accumulated value at the end of 10 months?
(A) \$56,450 (B) \$56,250 (C) \$55,542 (D) \$55,375
- Jim lends \$6000 to Sally on January 23, 2010. Sally signs a promissory note, with the note due in 10 months. The maturity value of the note is \$6402.41. Jim sells the note to a bank on May 23, 2010. If the bank wishes to earn $r = 9\%$, what price does Jim get for the note?
(A) \$6120.21 (B) \$6124.54 (C) \$6125.99 (D) \$6126.71
- You owe the bank \$3000 in 10 months. Instead you negotiate with the bank to pay \$1500 in 4 months and \$ X in 8 months to fully pay off the loan. Using a simple interest rate of $r = 7\%$ and a focal date of 8 months from now, what is X ?
(A) \$1570.41 (B) \$1464.16 (C) \$1430.40 (D) \$1429.16
- You buy a stove for \$900. The store gives you 4 months "interest free", after which you must pay the \$900. However, the store charges an administration fee of \$40, to be paid today. What rate of simple interest, r , are you being charged for this "interest free" plan?
(A) 13.95% (B) 13.33% (C) 12.77% (D) 11.16%
- Jacob owes Kieran \$10,000. Kieran agrees to accept as payment a non-interest bearing promissory note for 93 days (this includes the days of grace) from Jacob that can be discounted immediately at a local bank that charges a simple discount rate of $d = 10\%$. What should be the face value of the promissory note so that Kieran will receive \$10,000 as the proceeds?
(A) \$9,745.21 (B) \$9,751.54 (C) \$10,254.79 (D) \$10,261.46
- Three payments of \$10,000 are made at the end of 5, 10 and 15 months respectively. Calculate the total accumulated value of these payments at the end of two years using the exact method with $j_4 = 8\%$.
(A) \$32,936.74 (B) \$32,917.43 (C) \$32,916.46 (D) \$32,159.59

10. You are given: (i) Money doubles in value in n -years at $j_1 = i$ and (ii) An investment of \$1000 at i accumulates to \$1878 after $(n - 2)$ years. What is $j_1 = i$?
- (A) 6.50% (B) 6.39% (C) 3.25% (D) 3.20%
11. An investment has the following interest rates: $j_{52} = 9\%$ for the first 2 years, followed by $j_6 = 8\%$ for the next 4 years, followed by $j_2 = 7\%$ for the last 18 months. What is the equivalent nominal rate of interest, compounded quarterly, earned over this time period?
- (A) Less than 8.15% (B) At least 8.15%, but less than 8.25%
(C) At least 8.25%, but less than 8.35% (D) At least 8.35%
12. A deposit of \$100 is made into account 1 earning $j_{12} = 18\%$. A deposit of \$100 is made into account 2 earning $j_2 = 10\%$. At what time, n (where n is in years), would the accumulated value of account 1 be twice as much as the accumulated value of account 2? (Answer is in years)
- (A) 8.5 (B) 9.3 (C) 9.9 (D) 10.2
13. You shop around for the best interest rate and have narrowed your choices to the following:
Bank I: $j_1 = 12\%$ Bank II: $j_4 = 11.55\%$ Bank III: $j_{12} = 11.30\%$
You wish to have \$ S in 3 years. What is the present value of S ? Put the banks in order, from lowest to highest present value of S .
- (A) I < II < III (B) III < II < I (C) III < I < II (D) II < I < III
14. A loan of \$ A is taken out today. You are given that this loan is to be paid off with a payment of \$20,000 in 2 years and 8 months. Determine A , if $j_4 = 10\%$ and the practical method of crediting/charging interest is used.
- (A) \$15,274.65 (B) \$15,367.84 (C) \$15,368.88 (D) \$15,369.92
15. A student borrows \$2000 today and he/she agrees to pay off the loan with one payment of \$2500 to be made at the end of 3 years time. The interest rate is j_4 . It is then agreed that, instead of paying off the loan with one payment, the student can pay off the loan with a payment of X in 9 months from now and $2X$ in 15 months from now at the same interest rate, j_4 . Determine \$ X .
- (A) \$684.35 (B) \$722.50 (C) \$783.45 (D) \$825.62
16. What simple discount rate d is equivalent to $j_{12} = 8\%$ if money is invested for 30 months?
- (A) 7.23% (B) 7.69% (C) 8.43% (D) 8.82%
17. If there will be 4 times as many fruit flies in a vegetable garden in 12 days as there are today, what rate of growth, compounded twice a day, does this represent?
- (A) 24.49% (B) 13.00% (C) 12.25% (D) 11.89%
18. Sally wishes to accumulate \$34,000. She deposits \$1500 every 6-months in a fund earning $j_2 = 8\%$. It turns out she needs 16 deposits, plus a bit more. What is the size of the drop payment she needs to make, if it is made 6-month after the last regular \$1500 deposit? Given: $s_{\overline{16}|0.04} = 21.82453$
- (A) \$0 (B) \$46.27 (C) \$1263.20 (D) \$1313.73
19. You are given: $a_{\overline{n}|i} = 15.20$ and $s_{\overline{n}|i} = 221.92$. What is the value of i ?
- (A) $i < 0.06$ (B) $0.06 \leq i < 0.062$ (C) $0.062 \leq i < 0.064$ (D) $0.064 \leq i$

20. You can buy a used car for cash of \$A on August 12, 2010, OR make quarterly payments of \$500, starting August 12, 2010 and finishing on August 12, 2016. If the loan charges interest at $j_4 = 4\%$, what is the value of A?
- (A) \$10,621.69 (B) \$10,727.91 (C) \$11,011.58 (D) \$11,121.69
21. A loan of \$20,000 is to be paid back over 10 years with semi-annual payments of \$1600, with the first payment 6 months from today. Using linear interpolation, what nominal rate of interest, j_2 , is being charged? You are given: $a_{\overline{20}|.045} = 13.0079$, $a_{\overline{10}|.05} = 12.4622$, $a_{\overline{10}|.055} = 11.9504$
- (A) 9.07% (B) 9.75% (C) 9.93% (D) 10.07%
22. Let $S = s_{\overline{n-1}|i}$ be the accumulated value of $(n-1)$ payments immediately after the $(n-1)^{\text{st}}$ payment. Which of the following would give the correct value of $\ddot{s}_{\overline{n}|i}$?
- (A) $S(1+i)^2 + (1+i)$ (B) $S(1+i)^2 + 1$ (C) $S(1+i) + 1$ (D) $(S+1)(1+i)$
23. Billy deposits \$800 at the end of every 3-months in a fund earning interest at $j_4 = 12\%$. At the end of 3 years, the interest rate changes to $j_4 = 8\%$. What is the accumulated value immediately after his 20th deposit?
- (A) \$18,220.00 (B) \$20,168.96 (C) \$21,248.81 (D) \$21,496.30
24. Jacques takes out a loan and agrees to pay it back with payments of \$500 at the end of every 6-months for 10 years at $j_2 = 8\%$ (20 payments in total). He makes the first 3 payments (time 1 to 3), but misses the next 3 (time 4 to 6). What single payment would he need to pay at the time of the 7th payment (time 7) that would make up for the 3 missed payments AND pay off the remaining payments?
- (A) \$4992.82 (B) \$5492.82 (C) \$6326.15 (D) \$7116.05
25. Sally enters into a rental agreement for a new apartment. The contract calls for monthly payments of \$750 due at the beginning of each month. But since she is a new tenant, the first and last months' rent are due today (at the start of the agreement). If she is only planning on staying in the apartment for the next 24 months, which of the following would give the correct present value of the monthly payments?
- (A) $750 + 750\ddot{a}_{\overline{24}|i}$ (B) $750 + 750a_{\overline{23}|i}$ (C) $1500 + 750a_{\overline{23}|i}$ (D) $750 + 750\ddot{a}_{\overline{23}|i}$