Question 1. You've decided to buy a Hyundai Veloster. Like every car, a Veloster wears as it ages, providing less in psychological benefits and costing more for maintenance and repair in future years. Therefore you'd like to determine the optimal length of time to keep the car before buying a new one.

a) What might be one or more possible objectives ("wants")

Minimize average yearly cost
Maximize years of use
Maximize resale value
Minimize initial and annual CO_2 emissions

b) List three or more possible constraints ("needs")

Needs warranty throughout ownership period
Needs to be sold prior to major depreciation period
Availability during ownership period
Repair costs during ownership period

c) What are the decision variables for this problem?

How long to keep the car before buying a new one (years)

d) List at least five pieces of information you might need in order to make a rational decision.

The initial cost of the car
The trade in or selling value of the car
The average maintenance costs, with respect to year
How far the car will be driven in a year
The value psychological value per year of a new versus older vehicle

e) Track down a reputable source for one of the five bits, and report the value. List complete reference/contact information for the source.

The base price for a Veloster is $17,300. Source: Anon. 2012. Hyundai Veloster vs. Volkswagen Beetle. Consumer Reports 11(7): 62-64.

2.2 You deposit $3000 in a savings account that earns 8% simple interest per year. How many years will it take to double your balance?

$F = P (1 + \imath N)$,
where F = $6000, P = $3000, and $\imath = .08$
Solving for N = 12.5 years. (13 years since interest is paid at the end of the interest period)

If, instead, you deposit the $3,000 in another savings account that earns 7% interest compounded yearly, how many years will it take to double your balance?

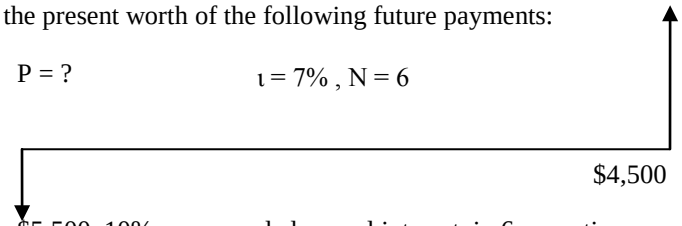
$F = P (1 + \imath)^N$
Where F = $6000, P = $3000, and $\imath = .07$
Solving for N = 10.24 years. (11 years since interest is paid at end of compounding period)

2.6 You are about to borrow $10,000 from a bank at an interest rate of 9% compounded annually. You are required to make five equal annual repayments in the amount of $2,570.92 per year, with the first repayment occurring at the end of year one. For each year, show the interest payment and principal payment.

Interest Payment = Last Year's Balance x Interest
Principal Payment = Annuity – Interest Payment
Loan Balance = Last Year's Balance – Principal Payment

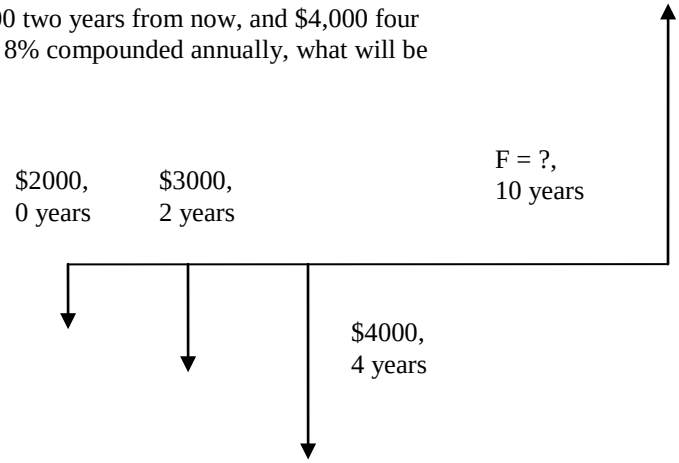
Period	Principal Payment	Interest Payment	Loan Balance
0			10000
1	1670.92	900.00	8329.08
2	1821.30	749.62	6507.78
3	1985.22	585.70	4522.56
4	2163.89	407.03	2358.67
5	2358.64	212.28	0.03

2.14a State the present worth of the following future payments:



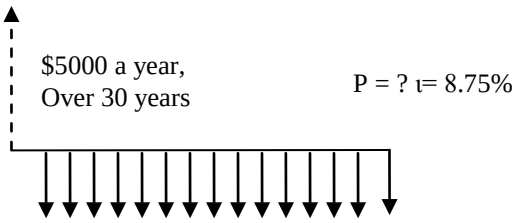
F = $5,500, 10% compounded annual interest, in 6 years time
$F = P(1 + \iota)^N$, Solve for P (2.3)
Or F*(P/F, ι,n) = P, with ι = .10 and N = 6
F*(P/F, 10%, 6) = 5,500 * .5645 = $3,105 (using appendix B)

2.25 If $2000 is invested now, $3,000 two years from now, and $4,000 four years from now at an interest rate of 8% compounded annually, what will be the total amount in 10 years.



$\Sigma P(1+\iota)^N = \Sigma P(F/P, \iota, N)$
2000 (F/P, 8%, 10) + 3000(F/P, 8%, 8) + 4000 (F/P, 8%, 6) = F
2000(2.1589) + 3000(1.8509) + 4000 (1.5869) = $16,218.

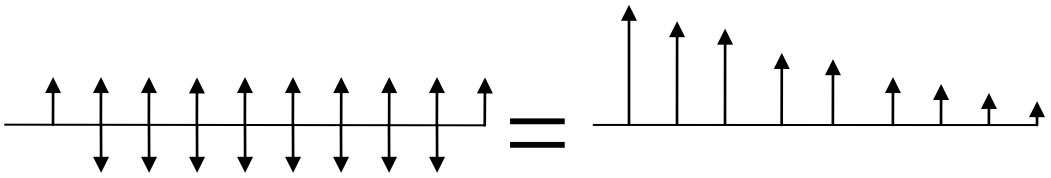
2.44d What is the present worth of $5000 at the end of each year for 30 years at 8.75% interest compounded annually? (use relationship, because Appendix B doesn't have ι= 8.75%)



$$A(P/A, \iota, N) = A\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right] = A\left[\frac{(1+.0875)^{30} - 1}{.0875(1+.0875)^{30}}\right] = 5000\left[\frac{11.38449}{1.08364}\right] = \$52{,}529.$$

2.54 What is the equal-payment series for 10 years that is equivalent to a payment series starting with $30,000 at the end of the first year, and decreasing by $3,000 each year over 10 years? Interest is 8% compounded annually.

Find an [equal-payment series] = [gradient series]



A = 30000 – G (A/G. ι, N) = 30000 – 3000 (A/G, 8%, 10)
A = 30000 – 3000 (3.8713) = 18,386. (using Appendix B)

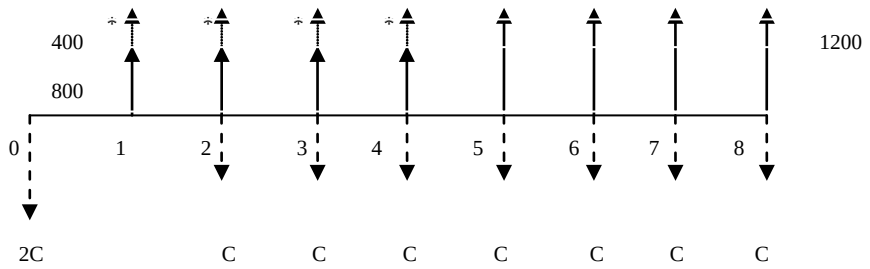
2.60a What is the amount of (each of) 10 equal annual deposits that can provide five annual withdrawals, when a first withdrawal of $3,000 is made at EOY 11 and subsequent withdrawals increase at the rate of 6% per year over the previous year's rate if the interest rate is 8% compounded annually?

A = $3,000($P/A_1$, 6%, 8%, 5)(A/F, 8%, 10) = $923.9

2.64 In computing the equivalent present worth of each of the given cash flow series at period zero, which of the following expressions is incorrect.

[A] Is the incorrect expression. Solving for the other three prove they are equal.
P = $100(P/A,ι,4)(P/F, ι,3) would be a correct expression.

2.71 Consider the accompanying cash flow diagram. What value of C makes the inflow series equivalent to the outflow series at an interest rate of 12% compounded annually?



Create an equation to solve for C. Subtract the * series to calculate the non-uniform series.

2C + C (P/A, 12%, 7) (P/F, 12 %, 1) = $1,200 (P/A, 12%, 8) – 400 (P/A, 12%, 4)

Down 7 payments, none in year 1 equivalent series difference in years 1-4.

2C + C (4.5638) (0.8929) = 1200 (4.9676) – 400 (3.0373)

6.075 C = $4746.2

C = $781.3

Note: There are several ways to solve this problem.

Problem	Pts	Notes
1a	2	Full credit for one objective. Should be stated as “Maximize (something)” or “Minimize (something).”
1b	6	2 pts for each constraint. Each should be something that is a “go or no go” criteria.
1c	2	Full credit for the length of time to keep.
1d	5	
1e	10	3 pts for the info, 7 pts for the source. The reference info must be complete – author (person or organization), date, title, location – not just a URL.
2.2	10	5 pts for each part.
2.6	10	
2.14a	5	
2.25	5	
2.44d	5	
2.54	10	
2.60a	5	
2.64	5	
2.71	10	
(total)	90	