S.9-1 Because of general price inflation in our economy, the purchasing power of the dollar shrinks with the passage of time. If the average general inflation rate is expected to be 8% per year for the foreseeable future, how many years will it take for the dollar's purchasing power to be one-third of what it is now?

S.9-2 The average starting salary for engineers was $8,000 a year in 1985. John, a mechanical engineer, got an offer for $48,000 a year in 2012. Knowing that the CPIs for 1985 and 2012 are 36.87 and 205.43, respectively, what is John's real salary in terms of constant 1985 dollars?

S.9-3 Suppose natural gas experiences a 1.8% increase per year in real terms over the foreseeable future. The cost of a 1,000 cubic feet of natural gas is now $7.50.

a. What will be the cost in real terms of 1,000 cubic feet of natural gas in 22 years?

b. If the general price inflation rate (e.g., the CPI) for the next 22 years is expected to average 3.2% per year, what will a 1,000 cubic feet of natural gas cost in actual dollars 22 years from now?

S.9-4 Twenty years ago your rich uncle invested $10,000 in an aggressive (i.e., risky) mutual fund. Much to your uncle's chagrin, the value of his investment declined by 18% during the first year and then declined another 31% during the second year. But your uncle decided to stick with this mutual fund, reasoning that longterm sustainable growth of the U.S. economy was bound to occur and enhance the value of his mutual fund. Eighteen more years have passed, and your uncle's cumulative return over the 20-year period is a whopping 507%!

a. What is the value of the original investment now?

b. If inflation has averaged 6% per year over the past 20 years, what is the spending power equivalent of the answer to Part (a) in terms of real dollars 20 years ago?

c. What is the real compound interest rate earned over the 20-year period?

d. During the past 18 years, what compound annual rate of return (yield) was earned on your uncle's investment?

S.9-5 Five engineering projects are being considered for the upcoming capital budget period. The interrelationships among the projects and the estimated net cash flows of the projects are summarized in the following table.

	Cash Flow ($000s) for End of Year *k*					
Project	0	1	2	3	4	PW ($000s) at MARR = 10% per year
B1	−50	20	20	20	20	13.4
B2	−30	12	12	12	12	8.0
C1	−14	4	4	4	4	−1.3
C2	−15	5	5	5	5	0.9
D	−10	6	6	6	6	9.0

Projects B1 and B2 are mutually exclusive. Projects C1 and C2 are mutually exclusive and dependent on the acceptance of B2. Finally, project D is dependent on the acceptance of C1. Using the PW method, and assuming that MARR = 10% per year, determine which combination (portfolio) of projects is best if the availability of capital is limited to $48,000.

S.9-6 The engineer at Clean Water Engineering (CWE) has established a capital investment limit of $700,000 for next year's projects that target improved recovery of highly brackish groundwater. The following projects are under consideration, using an MARR of 10% per year.

Project	Initial Investment ($)	Annual net cash flow ($/year)	Life (years)	Salvage value ($)
1	−150,000	50,000	4	45,000
2	−300,000	90,000	5	10,000
3	−450,000	100,000	6	100,000

(a) Select the project(s) that are guaranteed to maximize(s) CWE's wealth.

(b) Redo (a) based on the benefit to cost ratio heuristic.

(c) Formulate CWE problem as an integer linear program (ILP).

(d) Solve CWE problem using Excel solver.

(e) Compare the solution in (d) with that in (b).