We will use tables to find a multiplier,
which simplifies our formula.
We will also explore inflation.

Business Mathematics
Class notes
Interest Bearing Bank Accounts and Inflation (section 10.2)

In this section, we see accounts whose interest is compounded daily. That means 365 times a year. We could use our old formula $M = P\,(1 + i)^{n}$ or more accurately,

$$M = P\left(1 + \frac{\text{annual interest rate}}{365}\right)^{(\text{number of days total})}.$$

However, we will actually be using tables to look up the value of all that stuff in parentheses. The table value we get will be multiplied by the P to calculate the value of M.

Our first table is here. It shows some needed multipliers for accounts that are compounded daily. You have several (annual) interest rates and several time periods to choose from. The book has slightly different tables than those shown here.

Compound Interest for Time Deposit Accounts Compounded Daily

Number of Years	3%	4%	5%	6%	7%	Number of Years
1	1.03045326	1.04080849	1.05126750	1.06183131	1.07250098	**1**
2	1.06183393	1.08328232	1.10516335	1.12748573	1.15025836	**2**
3	1.09417024	1.12748944	1.16182231	1.19719965	1.23365322	**3**
4	1.12749129	1.17350058	1.22138603	1.27122408	1.32309429	**4**
5	1.16182708	1.22138937	1.28400343	1.34982553	1.41901993	**5**
10	1.34984217	1.49179200	1.64866481	1.82202895	2.01361756	**10**
15	1.56828318	1.82205890	2.11689128	2.45942119	2.85736345	**15**

This table calculates
$(1 + i)^{n}$ for us.

expl 1a: Find the multiplier from the table for an account that has an annual interest rate of 5% (compounded daily) for two years. Circle the value in the table.

These higher interest rates are often
seen in CDs (certificates of deposit).

expl 1b: Now, if we invest \$1000 into such an account, how much should we expect to have in two years? Round to two decimal places and use a dollar sign.

The next table is similar to the table we had in the last section, except that it only concerns itself with bank accounts that compound daily with an annual interest rate of 3.5%. We will again use it to simplify the calculation needed for the formula $M = P\,(1 + i)^{n}$.

Values of $(1+i)^n$ for 3½ % Compounded Daily

Number of Days	Compound Amount Multiplier	Number of Days	Compound Amount Multiplier	Number of Days	Compound Amount Multiplier	Number of Days	Compound Amount Multiplier
1	1.000095890	**41**	1.003939056	**81**	1.007796990	**121**	1.011669750
2	1.000191790	**42**	1.004035324	**82**	1.007893628	**122**	1.011766759
3	1.000287699	**43**	1.004131602	**83**	1.007990276	**123**	1.011863778
4	1.000383617	**44**	1.004227888	**84**	1.008086932	**124**	1.011960806
5	1.000479544	**45**	1.004324184	**85**	1.008183598	**125**	1.012057843
6	1.000575480	**46**	1.004420489	**86**	1.008280273	**126**	1.012154890
7	1.000671426	**47**	1.004516803	**87**	1.008376958	**127**	1.012251946
8	1.000767381	**48**	1.004613127	**88**	1.008473651	**128**	1.012349011
9	1.000863345	**49**	1.004709460	**89**	1.008570354	**129**	1.012446086
10	1.000959318	**50**	1.004805802	**90**	1.008667067	**130**	1.012543170
11	1.001055300	**51**	1.004902153	**91**	1.008763788	**131**	1.012640263
12	1.001151292	**52**	1.004998513	**92**	1.008860519	**132**	1.012737365
13	1.001247293	**53**	1.005094883	**93**	1.008957259	**133**	1.012834477
14	1.001343303	**54**	1.005191262	**94**	1.009054008	**134**	1.012931598
15	1.001439322	**55**	1.005287650	**95**	1.009150767	**135**	1.013028729
16	1.001535350	**56**	1.005384048	**96**	1.009247535	**136**	1.013125868
17	1.001631388	**57**	1.005480454	**97**	1.009344312	**137**	1.013223017
18	1.001727435	**58**	1.005576870	**98**	1.009441098	**138**	1.013320176
19	1.001823491	**59**	1.005673296	**99**	1.009537894	**139**	1.013417344
20	1.001919556	**60**	1.005769730	**100**	1.009634699	**140**	1.013514521
21	1.002015631	**61**	1.005866174	**101**	1.009731513	**141**	1.013611707
22	1.002111714	**62**	1.005962627	**102**	1.009828337	**142**	1.013708903
23	1.002207807	**63**	1.006059089	**103**	1.009925170	**143**	1.013806107
24	1.002303909	**64**	1.006155560	**104**	1.010022012	**144**	1.013903322
25	1.002400021	**65**	1.006252041	**105**	1.010118863	**145**	1.014000545
26	1.002496141	**66**	1.006348531	**106**	1.010215724	**146**	1.014097778
27	1.002592271	**67**	1.006445030	**107**	1.010312594	**147**	1.014195021
28	1.002688410	**68**	1.006541538	**108**	1.010409473	**148**	1.014292272
29	1.002784558	**69**	1.006638056	**109**	1.010506362	**149**	1.014389533
30	1.002880716	**70**	1.006734583	**110**	1.010603260	**150**	1.014486803
31	1.002976882	**71**	1.006831119	**111**	1.010700167	**151**	1.014584083
32	1.003073058	**72**	1.006927665	**112**	1.010797083	**152**	1.014681372
33	1.003169243	**73**	1.007024219	**113**	1.010894009	**153**	1.014778670
34	1.003265438	**74**	1.007120783	**114**	1.010990944	**154**	1.014875977
35	1.003361641	**75**	1.007217357	**115**	1.011087889	**155**	1.014973294
36	1.003457854	**76**	1.007313939	**116**	1.011184842	**156**	1.015070621
37	1.003554076	**77**	1.007410531	**117**	1.011281805	**157**	1.015167956
38	1.003650307	**78**	1.007507132	**118**	1.011378777	**158**	1.015265301
39	1.003746548	**79**	1.007603742	**119**	1.011475759	**159**	1.015362655
40	1.003842797	**80**	1.007700362	**120**	1.011572750	**160**	1.015460019

Values for $(1+i)^n$ were calculated using n as the number of days and i = .035/365 expl 2: Find the compound amount for the CD below. Assume daily compounding.

Amount deposited	\$8,000
Interest rate	4%
Time in years	1

Which table do we use?

expl 3: Find the interest earned for the account below. Assume it is compounded daily at 3.5%.

Amount	\$12,000
Date deposited	Dec. 3
Date withdrawn	Feb. 20

Make sure you answer the question!

Use our Number of Each of the Days of the Year table.

Multiple Withdrawals and Deposits:

Some problems will involve multiple withdrawals or deposits. These are more complicated. We will use the worksheet here to explore them. An example of multiple deposits is shown in the book.

Worksheet: Banking application: Savings account with multiple withdrawals:
The first example is done fully for you. Read it aloud to get the most out of it. There are two practice problems that follow.

Inflation:

Definition: Inflation: the continual rise in the price of goods and services. For example, every year stuff gets more expensive, say 3% more.

We might see a report that inflation is 5% per year. This means that, roughly speaking, $1,000 in merchandise this year will cost 105% of that next year. What is 105% of $1,000?

> What is 105% in decimal form?

Problems will involve inflation and **purchasing power**. The purchasing power is the amount of goods and services that can be purchased with a unit of currency. (source: Wikipedia)

expl 4: A family with an income and spending budget of $32,400 receives an increase in income of 1% (after taxes) in a year when inflation is 2.8%. Find the net gain or loss in purchasing power. Follow these steps.

> Do you *think* they will come out ahead or not? Why?

a.) What will the new wages be after that raise?

b.) How much will their spending budget be after inflation is taken into account?

> What cost $32,400 last year will cost how much this year?

c.) Does this family have a net gain or loss? How much?

Compound Accounts with Interest Withdrawn:

Some investments are set up so that the earned interest is *not* reinvested but, rather, withdrawn to be used as income. In these cases, the interest does *not* compound and so we will use simple interest for these problems. Look at the situation below.

expl 5: The Romero's have retired with $\$500,000$ to invest. They plan to use the interest for living expenses. The Romero's credit union offers a 5-year time deposit that earns 2.5%. A credit union across town offers a 5-year time deposit that earns 3%. Calculate the *annual* income for each of these investments. How much more would they make by investing with the second credit union?

Since the interest is *not* reinvested, we use simple interest $I = PRT$.

If we want the *annual* income, what should we let T be?