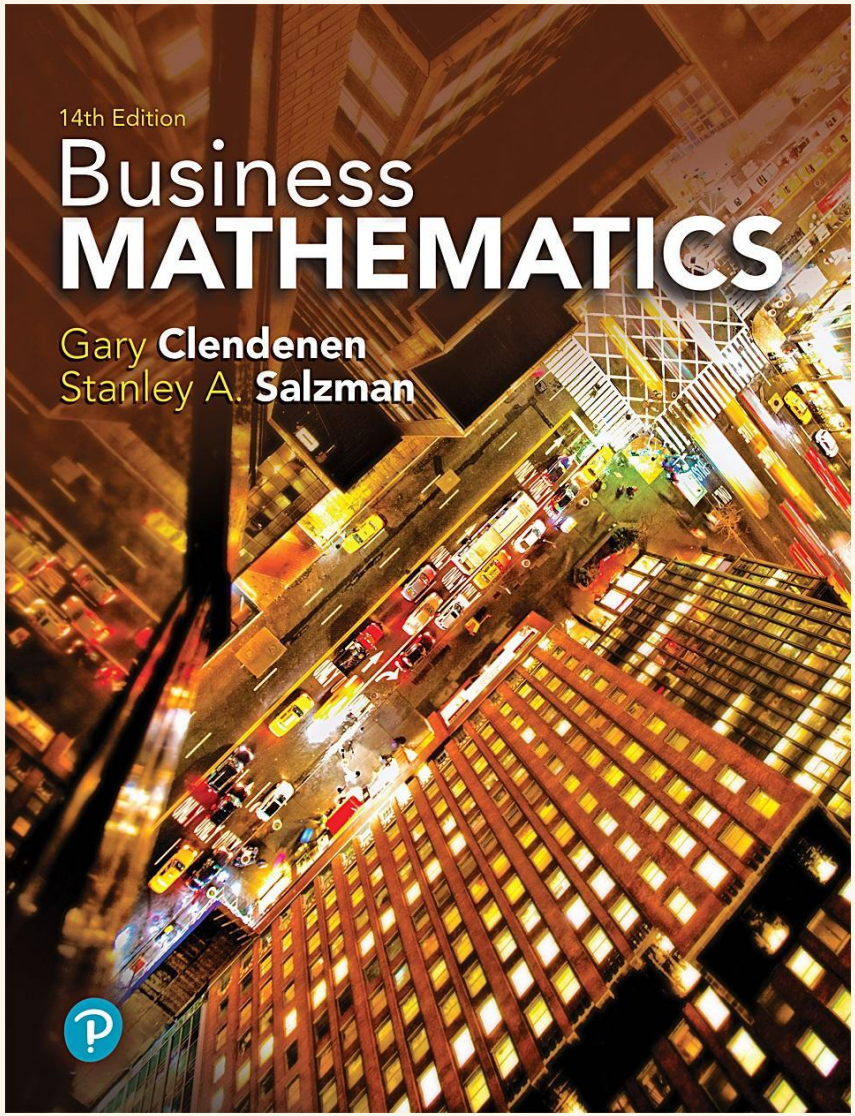
Chapter 9
Simple Interest



Section 1
Basics of Simple Interest

Objectives

1. Solve for simple interest.
2. Calculate maturity value.
3. Use a table to find the number of days from one date to another.
4. Use the actual number of days in a month to find the number of days from one date to another.

Objectives

5. Find exact and ordinary interest.
6. Define the basic terms used with notes.
7. Find the due date of a note.

Solve for Simple Interest

Simple Interest is interest charged on entire principal for entire length of loan

Principal is the loan amount

Rate is the annual interest rate

Time is the length of the loan *in years*

Simple interest = Principal × Rate × Time

$$I = P \times R \times T$$

When Using the Formula $I = PRT$

1. Rate (R) must first be changed to a decimal or fraction.
2. Time (T) must first be converted to years.

Example 1 (1 of 4)

Jessica Hernandez needs to borrow $85,000 for 9 months. Her bank would not lend her the money since she has no experience or assets. She found an individual who would lend her the money at 18.5%. However, her uncle agreed to go to the bank and **cosign** on a loan to her, which means he will have to repay the loan if Jessica fails to do so. On this basis, the bank agreed to lend her the money at 10% simple interest. Find the interest at (**a**) 18.5% and (**b**) 10%. (**c**) Then find the amount saved using the lower interest rate.

Example 1 (2 of 4)

(a) First, convert 18.5% to .185 and 9 months to 9/12 year. Then substitute values into $I = PRT$ to find the interest. The principal is the amount of the loan.

P=BRT

$I = PRT$ *is the same as* *P=BRT*

$I = \$85{,}000 \times .185 \times 9/12$

$I = \$11{,}793.75$

Example 1 (3 of 4)

(b) First, convert 10% to .10 and proceed as in (a).

$$I = PRT$$

$$I = \$85{,}000 \times .10 \times 9/12$$

$$I = \$6375$$

(c) Difference = \$11,793.75 – \$6375

= \$5418.75

Example 1 (4 of 4)

Hernandez quickly learned an important lesson: Interest costs can be very high. She was delighted that her uncle had agreed to cosign for her. It saved her nearly $5500 in interest charges in only 9 months.

Calculate Maturity Value

Maturity Value is the amount that must be repaid when the loan is due

Found by adding principal and interest

Maturity value = Principal + Interest

$$M = P + I$$

Example 2 (1 of 2)

Tom Swift needs to borrow $28,300 to remodel his bookstore so that he can serve coffee to customers as they browse or sit at their computers. He borrows the funds for 10 months at an interest rate of 9.25%. Find the interest due on the loan and the maturity value at the end of 10 months.

Example 2 (2 of 2)

Interest due is found using $I = PRT$, where T must be in years (10 months = 10/12 yr.)

$$Interest = PRT$$

$$I = \$28{,}300 \times .0925 \times 10/12$$

$$I = \$2181.46$$

$$Maturity\ value = P + I$$

$$M = \$28{,}300 + \$2181.46$$

$$M = \$30{,}481.46$$

Use a Table to Find the Number of Days from One Date to Another

Loan may be given in days

Loan may be due at a fixed date

So we may have to figure out the number of days until the loan must be paid off

One way to do this is to use a table as seen on the next slide and the back cover of the text

The Number of Each of the Days of the Year*

DAY OF MONTH	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	DAY OF MONTH
1	1	32	60	91	121	152	182	213	244	274	305	335	1
2	2	33	61	92	122	153	183	214	245	275	306	336	2
3	3	34	62	93	123	154	184	215	246	276	307	337	3
4	4	35	63	94	124	155	185	216	247	277	308	338	4
5	5	36	64	95	125	156	186	217	248	278	309	339	5
6	6	37	65	96	126	157	187	218	249	279	310	340	6
7	7	38	66	97	127	158	188	219	250	280	311	341	7
8	8	39	67	98	128	159	189	220	251	281	312	342	8
9	9	40	68	99	129	160	190	221	252	282	313	343	9
10	10	41	69	100	130	161	191	222	253	283	314	344	10
11	11	42	70	101	131	162	192	223	254	284	315	345	11
12	12	43	71	102	132	163	193	224	255	285	316	346	12
13	13	44	72	103	133	164	194	225	256	286	317	347	13
14	14	45	73	104	134	165	195	226	257	287	318	348	14

15	15	46	74	105	135	166	196	227	258	288	319	349	15
16	16	47	75	106	136	167	197	228	259	289	320	350	16
17	17	48	76	107	137	168	198	229	260	290	321	351	17
18	18	49	77	108	138	169	199	230	261	291	322	352	18
19	19	50	78	109	139	170	200	231	262	292	323	353	19
20	20	51	79	110	140	171	201	232	263	293	324	354	20
21	21	52	80	111	141	172	202	233	264	294	325	355	21
22	22	53	81	112	142	173	203	234	265	295	326	356	22
23	23	54	82	113	143	174	204	235	266	296	327	357	23
24	24	55	83	114	144	175	205	236	267	297	328	358	24
25	25	56	84	115	145	176	206	237	268	298	329	359	25
26	26	57	85	116	146	177	207	238	269	299	330	360	26
27	27	58	86	117	147	178	208	239	270	300	331	361	27
28	28	59	87	118	148	179	209	240	271	301	332	362	28
29	29		88	119	149	180	210	241	272	302	333	363	29
30	30		89	120	150	181	211	242	273	303	334	364	30
31	31		90		151		212	243		304		365	31

Example 3 (1 of 4)

Use the table to find the number of days from

(a) March 24 to July 22,

(b) April 4 to October 10,

(c) November 8 to February 17 of the following year, and

(d) December 2 to January 17 of the following year. Assume that it is not a leap year.

Example 3 (2 of 4)

(a) July 22 is day 203

March 24 is day $-\ 83$

120

120 days from March 24 to July 22.

(b) October 10 is day 283

April 4 is day $-\ 94$

189

189 days from April 4 to October 10.

Example 3 (3 of 4)

(c) November 8 is day 312, so there are 365 – 312 = 53 days from November 8 to the end of the year. Add days until the end of the year plus days into the next year to find the total.

November 8 to end of year	53
February 17 is day	+ 48
	101

101 days from November 8 to February 17 of the next year.

Example 3 (4 of 4)

(d) December 2 is day 336, so there are 365 – 336 = 29 days from December 2 to the end of the year. Add days until the end of the year plus days into the next year to find the total.

December 2 to end of year	29
January 17 is day	+ 17
	46

46 days from December 2 to January 17 of the next year.

Use the Actual Number of Days in a Month to Find the Number of Days from One Date to Another

The number of days between specific dates can be found using the number of days in each month of the year as shown in the table.

Number of Days in Each Month

31 DAYS		30 DAYS	28 DAYS
January	August	April	February
March	October	June	(29 days in leap year)
May	December	September	
July		November	

Rhyme Method

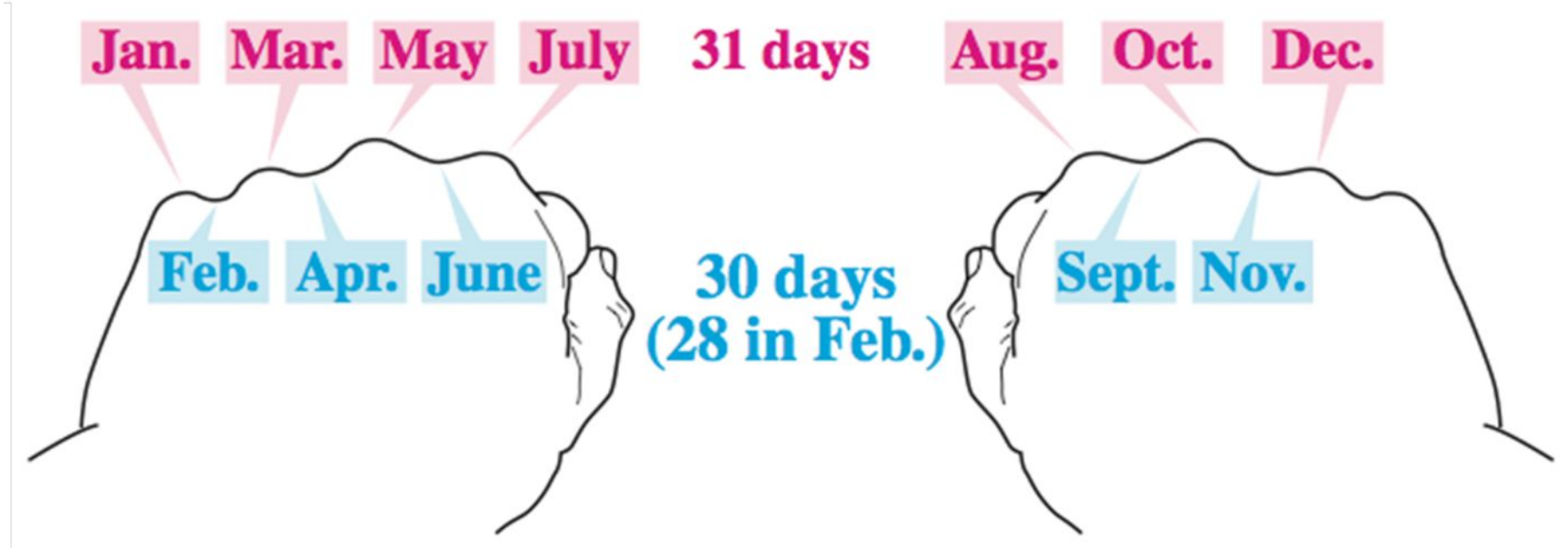
Rhyme Method:

30 days hath September,
April, June, and November.
All the rest have 31, except February,
which has 28 and in a leap year 29.

Leap years occur every 4 years: 2020, 2024, 2028, ...

Knuckle Method

Knuckle Method:



Example 4 (1 of 3)

Find the number of days from

(a) June 3 to August 14 and

(b) November 4 to February 21.

Example 4 (2 of 3)

(a) June has 30 days, so there are 30 – 3 = 27 days from June 3 to the end of June.

June 3 to the end of June	27
31 days in July	31
14 days in August	+ 14
	72

72 days from June 3 to August 14.

Example 4 (3 of 3)

(b) November has 30 days, so there are $30 - 4 = 26$ days from November 4 to the end of November.

Nov 4 to end of November	26
31 days in December	31
31 days in January	31
21 days in February	+ 21
	109

109 days from November 4 to February 21.

Find Exact and Ordinary Interest

Exact Interest calculations require the use of the exact number of days in the year, 365 or 366 if a leap year

Ordinary Interest, or **banker's interest**, calculations require the use of 360 days

Finding Time in Fraction of a Year

When using $I = PRT$, since the rate (R) is given in years, time (T) must also be given in years, so you may have to convert the given time.

$$T = \frac{\text{Number of days in the loan period}}{\text{Number of days in a year}}$$

Find Exact and Ordinary Interest

For exact interest: Use 365 days (or 366)

$$T = \frac{\text{Number of days in the loan period}}{365}$$

For ordinary, or banker's interest: Use 360 days

$$T = \frac{\text{Number of days in the loan period}}{360}$$

Example 5 (1 of 3)

Radio station KOMA borrowed $148,500 on May 12 with interest due on August 27. If the interest rate is 10%, find the interest on the loan using

(a) exact interest and

(b) ordinary interest.

Example 5 (2 of 3)

Either the table method or the method of the number of days in a month can be used to find that there are 107 days from May 12 to August 27.

(a) Exact interest is found from $I = PRT$ with $P = \$148{,}500$, $R = .10$ and $T = 107/365$

$$I = PRT$$

$$I = \$148{,}500 \times .1 \times 107/365$$

$$I = \$4353.29$$

Example 5 (3 of 3)

(b) Find ordinary interest with the same formula and values, except $T = 107/360$

$$I = PRT$$

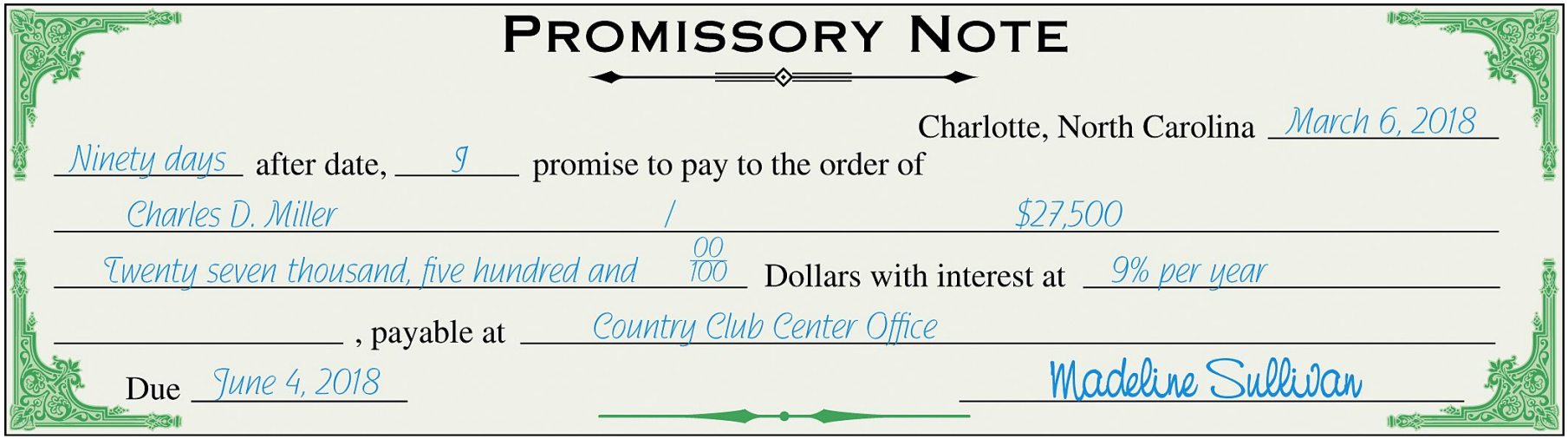
$$I = \$148{,}500 \times .1 \times 107/360$$

$$I = \$4413.75$$

In this example, the ordinary interest is $\$4413.75 - \$4353.29 = \$60.46$ more than the exact interest.

Define the Basic Terms with Notes

A **promissory note** is a *legal document* in which one person or firm agrees to pay a certain amount of money, on a specific day in the future, to another person or firm.



PROMISSORY NOTE

Charlotte, North Carolina March 6, 2018

Ninety days after date, I promise to pay to the order of

Charles D. Miller / $27,500

Twenty seven thousand, five hundred and 00/100 Dollars with interest at 9% per year

, payable at Country Club Center Office

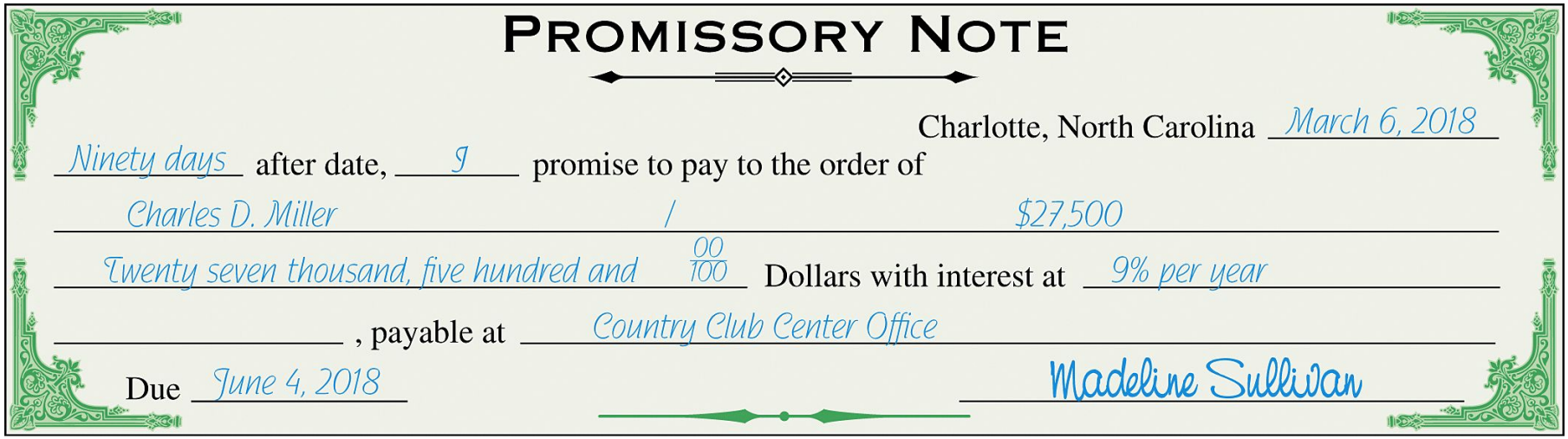
Due June 4, 2018

Madeline Sullivan

Simple Interest Note

Maker or payer: The person borrowing the money. (Madeline Sullivan)

Payee: The person who loaned the money and who will receive the payment (Charles D. Miller)



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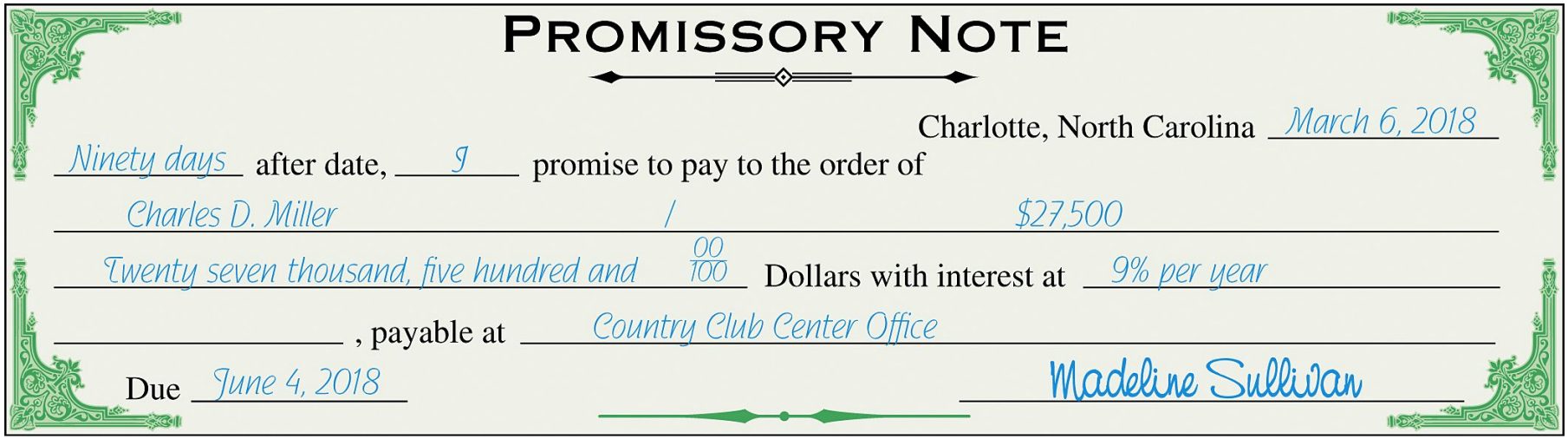
Simple Interest Note

Term: The length of time until the note is due (90 days)

Face value or principal: The amount being borrowed ($27,500)



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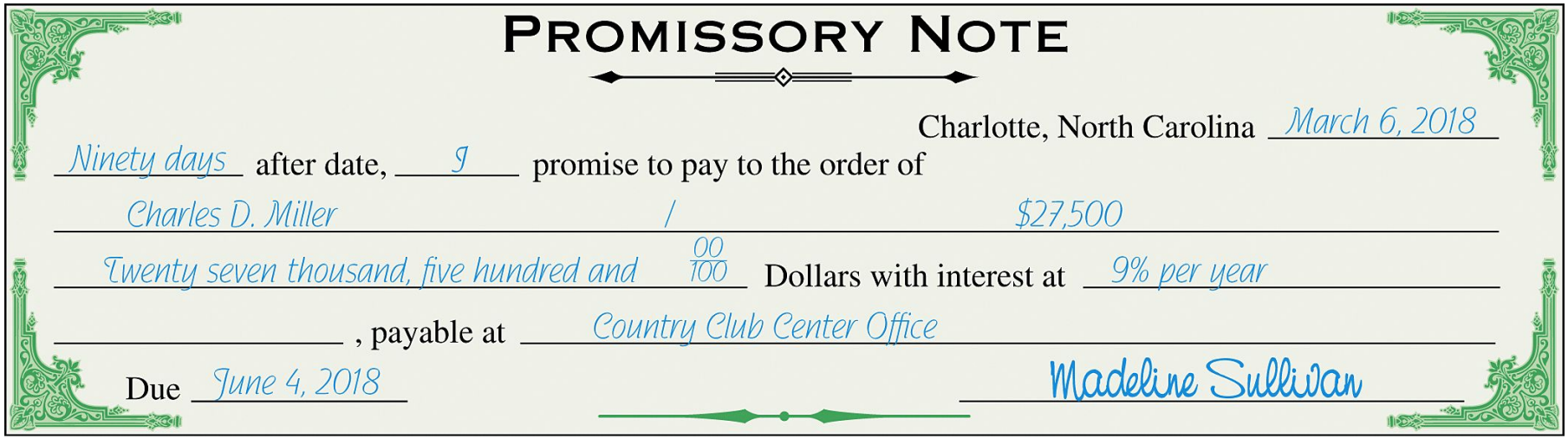
Simple Interest Note

Maturity value: The face value plus interest, also the amount due at maturity

Maturity date or due date: The date the loan must be paid off with interest (June 4)



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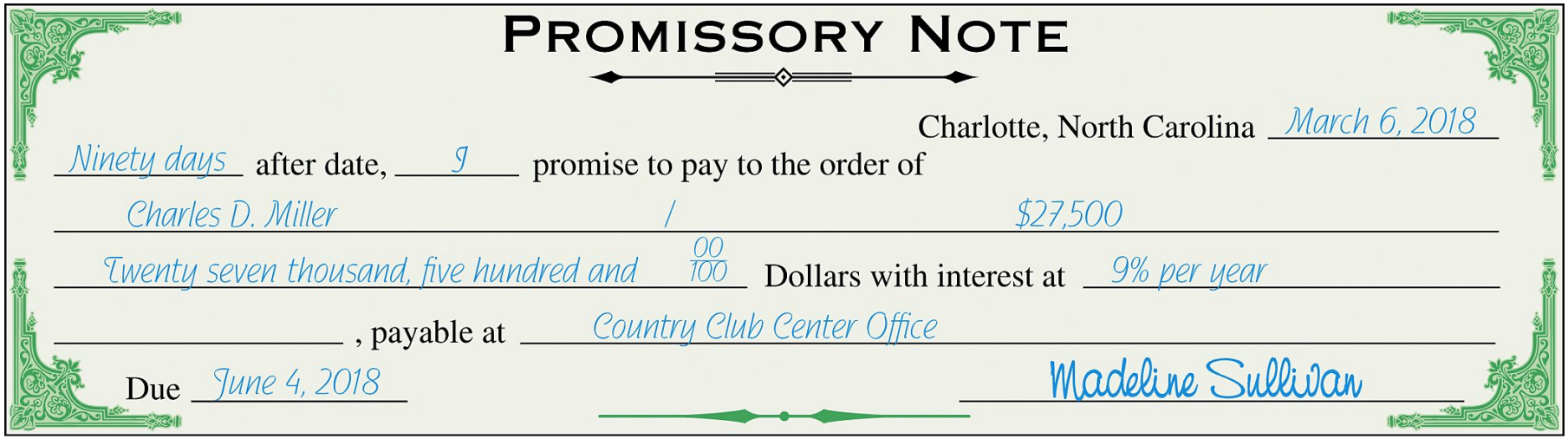
Find Interest and Maturity Value

Interest = Face Value × Rate × Time

Interest = $27,500 × .09 × 90/360 = $618.75

Maturity Value = Face Value + Interest

Maturity Value = $27,500 + $618.75 = $28,118.75



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Find the Due Date of a Note

Time in months

Loan is due after given number of months has passed, on the same day of the month as the original loan was made

DATE MADE	LENGTH OF LOAN	DATE DUE
March 12	5 months	August 12
April 24	7 months	November 24
October 7	9 months	July 7
January 31	3 months	April 30

Example 6 (1 of 2)

Find the due date, interest, and maturity value for a $600,000 loan made to Benson Automotive on July 31 for 7 months at 7.5% interest.

Example 7 (2 of 2)

Interest and principal are due 7 months from July 31 or February 31, which *does not exist.* Since February has only 28 days (unless it is a leap year), interest and principal are due on the last day of February, or February 28 (February 29, if it were a leap year).

$I = PRT = \$600{,}000 \times .075 \times 7/12 = \$26{,}250$

$M + I = \$600{,}000 + \$26{,}500 = \$626{,}250$

A total of $626,250 must be repaid on February 28.