

Excel & Business Math
Video/Class Project #42
Simple Interest & Short-Term Loans

Topics

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1) What is Debt?

1. **"Owe Money" or "Loan"**
2. Synonyms:
 - Debt = Loan = Liability = Owe Money
3. Example:
 - You borrow \$100 from Bank
 - The Bank Lends you \$100
 - This means you owe \$100 to the Bank
4. In this video the Debt we look at is: Short Term Loans (usually 1 year or less)

2) What is Interest?

1. **"Rent on Money"**
2. Contractual fee charged to borrow money
3. If you are the borrower, you pay interest to the lender
4. If you are the lender, you get interest from the borrower
5. Example for Borrower:
 - The Bank Lends you \$100
 - In 1 year you pay back \$110
 - You Pay Interest on Debt of $= 110 - 100 = \$10$
6. Example for Lender:
 - The Bank Lends you \$100
 - In 1 year you pay back \$110
 - Bank Earns Interest on Investment $= 110 - 100 = \$10$

3) Simple Interest Terms:

- 1) Principal:
 - Loan Amount = Amount borrowed, lent out, or invested
 - From the borrower's point of view, it is DEBT
 - From the lender's point of view, it is an INVESTMENT
- 2) Interest:
 - Contractual fee charged to borrow money
- 3) Simple Interest:
 - Interest paid on only the principal
 - Usually used for loans lasting less than 1 year
- 4) Compound Interest:
 - Interest paid on principal and past interest also known as "interest on interest"
 - Usually used for loans lasting more than 1 year
- 5) Interest Rate:
 - i. % of Principal that Borrower must pay as Interest
- 6) Maker or Payer or Debtor or Borrower:
 - The person borrowing the money
- 7) Payee or Creditor or Lender:
 - The person lending the money

- 8) Term:
- Length of time until the loan is due - given in days, months or years
- 9) Issue Date:
- Day Loan is made
- 10) Maturity Date:
- The Date that the Principal and Interest is Due
- 11) Maturity Value:
- Total Amount to pay on Maturity Date = Principal + Interest
- 12) Promissory Note = Note:
- A legal document in which a person or firm agrees to pay to another:
 - A stated amount of money
 - Plus interest computed at a stated rate
 - At a stated time in the future
 - Example:

<u>Promissory Notes</u>					
Borrower:	Sioux Radcoolinator				
Lender:	BECU Bank				
Principal:	\$100.00				
Annual Simple Interest Rate:	10.00%				
Term:	12 Months				
<table border="1" style="width: 50%; float: right; border-collapse: collapse;"> <tr> <td style="width: 30%;">Issue Date:</td> <td>3/31/2017</td> </tr> <tr> <td>Maturity Date:</td> <td>3/31/2018</td> </tr> </table>		Issue Date:	3/31/2017	Maturity Date:	3/31/2018
Issue Date:	3/31/2017				
Maturity Date:	3/31/2018				
Signature <u>Sioux Radcoolinator</u>					

4) Example #1 of Simple Interest

	Q	R	S	T	U
1	Example 01:				
2					
3	Borrower	Sioux Radcoolinator			
4	Lender	BECU Bank			
5	P = Principal Amount Borrowed =	\$100.00			
6	R = Annual Simple Interest Rate =	10.00%			
7	Term Unit	Months			
8	Term = Length of Loan	12			
9	T = Time (Fraction of a Year) =	1			
10	I = Simple Interest \$ = P*R*T	\$10.00			
11	Maturity Value =	\$110.00			
12	Issue Date =	3/31/2017			
13	Maturity Date =	3/31/2018			

Months
=R8/12

=R5*R6*R9

=R5+R10

=EDATE(R12,R8)

5) Simple Interest Formulas:

Simple Interest Formulas

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I = Simple Interest \$

P = Principal Amount Borrowed \$

R = Annual Simple Interest Rate %

T = Time as a Fraction of a Year

$$\boxed{I} = P * R * T$$

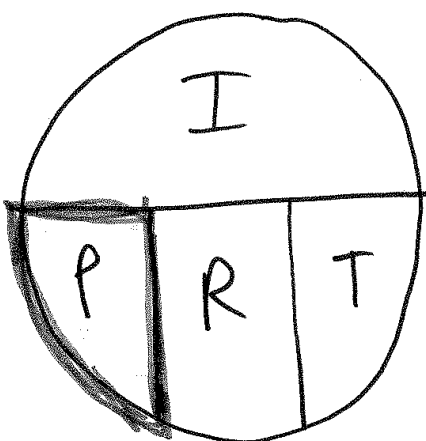
If time is given in months or days, you must convert to Fraction of a Year:

$$\left\{ \begin{array}{l} \text{Fraction of Year} \\ \text{from Months} \end{array} \right\} = \frac{\# \text{ of Months}}{12}$$

$$\left\{ \begin{array}{l} \text{Fraction of Year} \\ \text{from Days} \\ \text{Exact Method} \end{array} \right\} = \frac{\# \text{ of Days}}{365} \quad \begin{array}{l} \text{Leap} \\ \text{Year} \\ \downarrow \\ \text{or } 366 \end{array}$$

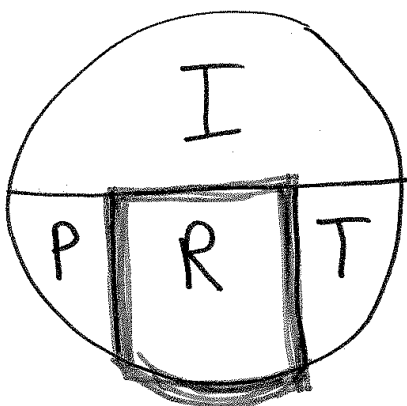
$$\left\{ \begin{array}{l} \text{Fraction of Year} \\ \text{from Days} \\ \text{Banker's Method} \end{array} \right\} = \frac{\# \text{ of Days}}{360} \quad \left(\begin{array}{l} \text{only used} \\ \text{for some} \\ \text{Government} \\ \text{Debt} \end{array} \right)$$

2



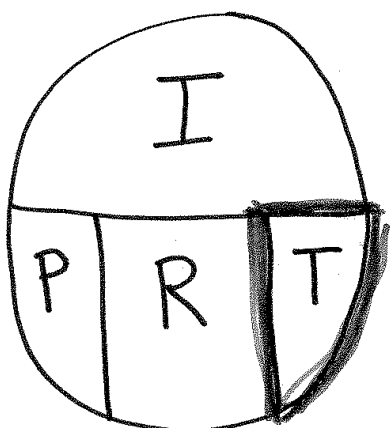
$$P = \frac{I}{(R * T)}$$

in Excel = $I / (R * T)$



$$R = \frac{I}{(P * T)}$$

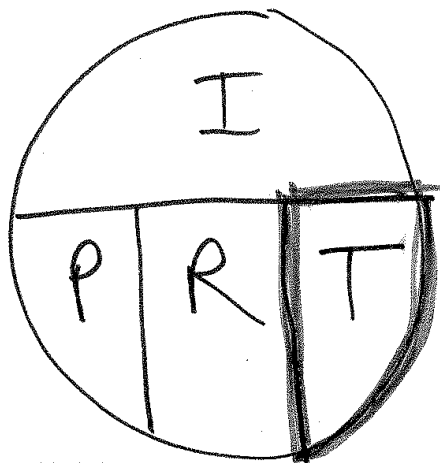
in Excel = $I / (P * T)$



$$T = \frac{I}{(P * R)}$$

in Excel = $I / (P * R)$

(3)



$$T = \frac{I}{(P * R)}$$

{ Fraction
of
year }

$$= T_y = \frac{I}{(P * R)}$$

{ In
Months }

$$= T_m = \frac{I}{(P * R)} * 12$$

$$\text{Excel} = I / (P * R) * 12$$

{ In
Days

Exact
Method }

$$= T_d = \frac{I}{(P * R)} * 365$$

$$\text{Excel} = I / (P * R) * 365$$

* Bankers would use 360

** Leap year would use 366

6) Video Examples 02-04, Calculate Simple Interest when Time is Given as a Fraction of Year

	A	B	C	D	E	F	G
1	Simple Interest \$ Amount = Principal * Simple Annual Interest Rate * Time (Fraction of Year)						
2							
3	Example 02:						
4	Principal	\$100.00					
5	Simple Annual Interest Rate	10.00%					
6	Time (Fraction of Year)	1					
7	Simple Interest \$ Amount	\$10.00		=ROUND(B4*B5*B6,2)			
8							
9	Example 03:						
10	Principal	\$100.00					
11	Simple Annual Interest Rate	10.00%					
12	Time (Fraction of Year)	0.5					
13	Simple Interest \$ Amount	\$5.00		=ROUND(B10*B11*B12,2)			
14							
15	Example 04:						
16	Principal	\$100.00					
17	Simple Annual Interest Rate	10.00%					
18	Time (Fraction of Year)	0.75					
19	Simple Interest \$ Amount	\$7.50		=ROUND(B16*B17*B18,2)			

7) Video Examples 05-08, Calculate Simple Interest when Time is Given in Days or Months

	A	B	C	D	E	F	G	H	I	J
24	Example 05:									
25	If you borrow \$4,500.00 at an Annual Simple Interest Rate of 6.50% for a 9 month term,									
26	what is the maturity value and what is the maturity date?									
27										
28	Principal	\$4,500.00	P							
29	Annual Simple Interest Rate	6.50%	R							
30	Time (in Months)	9 months								
31	Loan Issue Date	11/21/2017								
32	Formula	I = P * R * T								
33	Time (in Years)	0.75	T	=B30/12			=Months/12			
34	Interest	\$219.38	I	=ROUND(B28*B29*B33,2)			=ROUND(P*R*T,2)			
35	Maturity Value	\$4,719.38	M	=B28+B34			=P + I			
36	Loan Maturity Date	8/21/2018		=EDATE(B31,B30)			=EDATE(Loan Issue Date,Time (in Months))			
37				For Months use EDATE Function. EDATE function tells you a						
38				date a given number of months in the future.						


	A	B	C	D	E	F	G	H	I	J	K	L
40	Example 06:											
41	If you borrow \$150,000.00 at an Annual Simple Interest Rate of 6.75% for a 180 day term,											
42	what is the interest paid for both the exact and banker's interest methods? What is Maturity Date?											
43												
44	Principal	\$150,000.00	P									
45	Annual Simple Interest Rate	6.75%	R									
46	Time (in Days)	180	days									
47	Loan Issue Date	7/11/2018										
48	Exact Interest											
49	Days In Year	365										
50	Fraction of Year	0.49315068	T	=B46/B49			Days/365					
51	Interest	\$4,993.15	I	=ROUND(B44*B45*B50,2)			=ROUND(P * R * T,2)					
52	Ordinary or Banker's Interest											
53	Days In Year	360										
54	Fraction of Year	0.5	T	=B46/B53			Days/360					
55	Interest	\$5,062.50	I	=ROUND(B44*B45*B54,2)			=ROUND(P * R * T,2)					
56	Maturity Date	1/7/2019		=B47+B46								

	A	B	C	D	E	F	G	H	I	J
58	Example 07:									
59	If you borrow \$18,500.00 at an Annual Simple Interest Rate of 7.00% for a 10 month term,									
60	what is the maturity value and what is the maturity date?									
61										
62	Principal	\$18,500.00	P							
63	Annual Simple Interest Rate	7.00%	R							
64	Time (in Months)	10	months							
65	Loan Issue Date	9/14/2020								
66	Interest	\$1,079.17	I		=ROUND(B62*B63*B64/12,2)		=ROUND(P*R*Months/12,2)			
67	Maturity Value	\$19,579.17	M		=B62+B66		=P + I			
68	Loan Maturity Date	7/14/2021			=EDATE(B65,B64)		=EDATE(Loan Issue Date,Time (in Months))			
69				For Months use EDATE Function. EDATE function tells you a						
70				date a given number of months in the future.						
71										
72	Example 08:									
73	If you borrow \$18,500.00 at an Annual Simple Interest Rate of 7.00% on 9/14/2017 and pay the loan back on 1/12/2018,									
74	what is the maturity value and what was the term of the loan (interest calculated using Exact Method)?									
75										
76	Principal	\$18,500.00	P							
77	Annual Simple Interest Rate	7.00%	R							
78	Loan Issue Date	9/14/2017								
79	Maturity Date	1/12/2018								
80	Number Of Days in Term	120		=B79-B78			=Maturity Date - Loan Issue Date			
81	Interest	\$425.75		=ROUND(B76*B77*B80/365,2)			=ROUND(P*R*Months/12,2)			
82	Maturity Value	\$18,925.75		=B76+B81			=P + I			

8) Video Examples 09-10, Solve for Principal

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
28	Solve For Principal													
29														
30	Example 09:													
31	If you paid \$225.00 in interest, the term of the loan was 90 Days,													
32	and the Annual Simple Interest Rate was 8.75%,													
33	what was the original borrowed amount (Principal)? Use Exact Method.													
34	Annual Simple Interest Rate	8.75%	R											
35	Term	90	days											
36	Days In Year	365												
37	Simple Interest Paid	\$225.00	I											
38	Fraction of Year	0.246575342	T	=B35/B36			Days/365							
39	Principal	10428.57143	P	=B37/(B34*B38)			=I/(R*T)							
40	Principal Rounded	\$10,428.57		=ROUND(B39,2)			=ROUND(I/(R*T),2)							
41	Check I:	\$225.00		=B39*B34*B38			=P*R*T							
42														
43	Example 10:													
44	If you paid \$110.00 in interest, the term of the loan was 4 Months,													
45	and the Annual Simple Interest Rate was 5.25%,													
46	what was the original borrowed amount (Principal)?													
47	Annual Simple Interest Rate	5.25%	R											
48	Term	4	Months											
49	Simple Interest Paid	\$110.00	I											
50	Fraction of Year	0.333333333	T	=B48/12			Months/12							
51	Principal	6285.714286	P	=B49/(B47*B50)			=I/(R*T)							
52	Principal Rounded	\$6,285.71		=ROUND(B51,2)			=ROUND(I/(R*T),2)							
53														
54	Check I:	110		=B51*B47*B50										
55														


②



$$P = \frac{I}{(R * T)}$$

in Excel = I/(R*T)

②

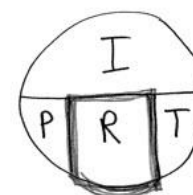


$$P = \frac{I}{(R * T)}$$

in Excel = I/(R*T)

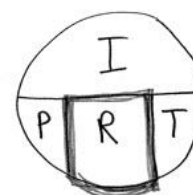
9) Video Examples 11-12, Solve for Annual Simple Interest Rate

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
57	Solve For Rate													
58														
59	Example 11:													
60	If you borrow \$50,000.00 for 4 months and pay \$1,000.00 in Simple Interest,													
61	what is the Annual Simple Interest Rate?													
62														
63														
64	Principal	\$50,000.00	P											
65	Term	4 months												
66	Simple Interest Paid	\$1,000.00	I											
67	Fraction of Year	0.33333333	T	=B65/12			Months/12							
68	Annual Simple Interest Rate	0.06	R	=B66/(B64*B67)			=I/(P*T)							
69														
70	Check I:	\$1,000.00		=B64*B68*B67			=P * R * T							
71														
72	Example 12:													
73	If you borrow \$2,500.00, pay simple interest of \$10.00,													
74	have an issue date of 11/22/2021 and a maturity date of 12/12/2021,													
75	what was the simple interest rate?													
76														
77	Principal	\$2,500.00	P											
78	Simple Interest Paid	\$10.00	I											
79	Issue Date	11/22/2021												
80	Maturity Date (Due Date)	12/12/2021												
81	Days	20		=B80-B79			=Due Date - Issue Date							
82	Days In Year	365												
83	Fraction of Year	0.054794521	T	=B81/B82			=Days/365							
84	Annual Simple Interest Rate	0.073	R	=B78/(B77*B83)			=I/(P*T)							
85														
86	Check I:	\$10.00		=B77*B84*B83			=ROUND(P * R * T,2)							



$$R = \frac{I}{(P * T)}$$

in Excel = I/(P*T)



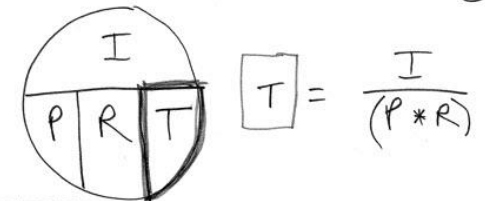
$$R = \frac{I}{(P * T)}$$

in Excel = I/(P*T)

10)Video Examples 13-14, Solve for Time

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
89	Solve For Time															
90																
91	Example 13:															
92	If you borrowed \$5,000.00 at a Annual Simple Interest Rate of 5.00% and the															
93	Simple Interest Paid was \$200.00, what was the term of the loan in Days?															
94	Use Exact Method.															
95																
96	Principal	\$5,000.00	P													
97	Annual Simple Interest Rate	5%	R													
98	Simple Interest Paid	\$200.00	I													
99	Days In Year	365														
100	Time (Fraction of Year)	0.8	T		=B98/(B96*B97)		=I/(P*R)									
101	Days (Exact Method)	292	Days		=ROUND(B100*B99,0)		=ROUND(I/(P*R)*365,0)		---	Round to the ones postior						
102	Check I:	\$200.00			=B96*B97*B100		=P * R * T									
103																
104	Example 14:															
105	If you borrowed \$4,800.00 at a Annual Simple Interest Rate of 8.00% and the															
106	Simple Interest Paid was \$160.00, what was the term of the loan in Months?															
107																
108																
109	Principal	\$4,800.00	P													
110	Annual Simple Interest Rate	8%	R													
111	Simple Interest Paid	\$160.000	I													
112	Time (Fraction of Year)	0.416666667	T		=B111/(B109*B110)		=I/(P*R)									
113	Months	5	Months		=ROUND(B112*12,0)		=ROUND(I/(P*R)*12,0)		---	Round to the ones postion						
114																
115	Check I:	160			=ROUND(B109*B110*B112,2)		=ROUND(P * R * T,2)									

③



$$T = \frac{I}{(P * R)}$$

{ Fraction of year } = $T_y = \frac{I}{(P * R)}$

{ In Months } = $T_m = \frac{I}{(P * R)} * 12$
Excel = $I / (P * R) * 12$

{ In Days } = $T_d = \frac{I}{(P * R)} * 365$
Excel = $I / (P * R) * 365$
Exact Method)

* Bankers would use 360
** Leap year would use 366