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Compound Interest Tables

Compound interest tables are used in the direct sales comparison and income approaches. The tables are used for the conversion of cash equivalency in the direct sales approach and the determination of the capitalization rate in the income approach. An explanation of the derivation of these factors can be found in many mathematical, economic and appraisal texts. The following information will describe: (1) the six compound interest factors; (2) the relationship between the factors; and, (3) the determination of values using a financial calculator.

The basic tenet of compound interest is that interest payments left on deposit earn interest themselves. The original principal is increased by the amount of interest earned during the term of deposit; and, that interest amount will also earn interest during the subsequent terms of the deposit. This "compounding" of the principal by the earned interest is the basic principle from which each of the six compound interest factors are derived.

The six compound interest factors are often compiled into a table calculated on an expressed interest rate (e.g., 5-1/4%, 8%, 10-1/2%) over a range of years for a specified term (e.g., annual. semi-annual, quarterly, monthly). A conventional format is to arrange the values for the factors into six columns. Although the interest rate is always expressed as an annual rate, it is important to note that the calculations to determine the tabular factors use the appropriate periodic interest rate. For example, the calculations for a monthly table at an annual interest rate of 9%, use the monthly rate of .0075 (.09/12) instead of the .09 annual interest rate and the term is expressed in the number of months instead of the number of years.

The factors displayed in columns one through three address the future value of the given amount. The factors displayed in columns four through six address the present worth of the given amount. Examples of monthly tables at rates of 8%, 9%, and 10% are shown at the end of this section. Factors from these three tables are referred to in the previous cash equivalency adjustment problems and will be used in the Illustrations that follow. The formulas used to develop the tables are also described although a working knowledge of them is not necessary in order to use the tables.

Column One:

Future Value Of $1 At Interest - The total amount available in the future from the deposit of one dollar today. The total includes the initial deposit and the interest earned. The factor is calculated by adding the periodic interest rate (I) to the one dollar (1) and then raising that quantity by a power (n) that is equal to the number of terms in the deposit: $(1+I)^n$. For example, one dollar deposited for five years at an annual rate of 9%, paid monthly, has a future value of $1.57 at the end of the 60 month term: $(1+.0075)^{60}$ = 1.565681. Note that both the interest rate and the term of the deposit in this example are expressed in monthly quantities. The formula for column one is the basis for calculating all six compound interest tables.

This future value of 1.565681 in the above example may be obtained in several ways: by using column one of the 9% monthly compound interest table; by using the $(1+I)^n$ formula; or, by using a financial calculator. Financial calculators typically have the following special function keys: n = number of terms; I = interest rate; PV = present value; FV = future value; and, PMT = amount of the payment. By entering the appropriate interest rate, term, and present value (I, n, PV), a financial calculator can be used to determine the future value (FV) for a column one factor. The calculator's handbook will explain the proper way to use these keys.

The future value of a deposit of $2,500, made under the same conditions stated above, can be determined by multiplying the factor (1.565681) by the amount of the principal ($2,500). The $2,500 will be worth $3,914.20 at the end of the 60 month term: $2,500 x 1.565681 = $3,914.20. The future value can also be determined by using 2500 as the amount of the PV entry on a financial calculator (the I and n entries remain the same). The use of a financial calculator will save a step in the calculations, as opposed to using the formula method, since it is not necessary to first calculate the column one factor and then multiply that value by the principal amount in order to obtain the future worth of the deposit.

It is important to apply the appropriate interest rate and term in these calculations whether the future value is being determined by use of the compound interest table, the formula, or a financial calculator. For example, if the 9% interest in the above calculations is paid annually instead of monthly, the column one factor will be lowered to 1.538624 and the $2,500 deposit will be worth $3,846.56 at the end of five years since the factor will now be based on the calculation of $(1+.09)^5$. The factors in column one are reciprocals of the factors in column four, the present value of reversion. The reciprocal of a given quantity is the result of dividing 1 by that quantity. The reciprocal of x is equal to 1/x.

Column Two:

Accumulation Of 1 Per Period - Instead of having just the original deposit of one dollar compounding interest, as in the column one situation, one dollar is added to the deposit at the end of each term. Column two calculates the future worth of the deposit in this situation.

To calculate the future value of 1 for the column two factor, one dollar (1) is subtracted from the basic formula (since the deposits are made at the end of the terms); and, the remainder is divided by the periodic interest rate: $[(1+I)^n - 1]/I$. Expanding on the column one example, if one dollar is deposited each month for 60 months, the future value of 1 will be $75.42: (1.565681 - 1)/.0075 = 75.424136.

Again, the use of a financial calculator is much more convenient. In addition to making entries for the term and interest, only a payment entry (PMT) needs to be made to determine the future value (FV). A deposit of $50 per month for five years at an annual interest rate of 9%, paid monthly, will have a future value of $3,771.21 at the end of the 60 months. Making entries on a financial calculator for n, I, and PMT in order to calculate FV, is an easier process than having to first determine the column two factor (75.424136), and multiplying it by the amount of the payment ($50) to determine the future value of $3,771.21. The value for the column two factor obtained from a table must be multiplied by

the payment amount in order to calculate the future value. The factors in column two are reciprocals of the factors in column three, the sinking fund factor.

Column Three:

Sinking Fund Factor - The amount that must be deposited in order to accumulate one dollar at the end of the term, given the interest rate, is the factor shown in column three. This factor is the reciprocal of column two; therefore, it is calculated by dividing the periodic interest rate by the remainder of one subtracted from the basic formula:

$$I/[(1n+I)^n - 1].$$

How much must be deposited each month in order to accumulate $1,000 at the end of three years given an 8% annual interest rate? From the compound interest table or by the calculation of the formula, the Sinking Fund Factor is .02467. Multiplying the factor by $1,000 shows that $24.67 must be deposited each month in order to accumulate the desired amount. Monthly deposits of $24.67, plus the interest earned, will accumulate $1,000 at the end of three years.

Determining this value on a financial calculator requires entries for n, I, and FV. The FV entry will be the desired amount (1000) to be accumulated at the end of the period. The PMT is the value to be determined. The use of $24.67 as the PMT entry in a column two calculation, illustrates the reciprocal relationship between columns two and three, as that calculation will derive a future value of $1,000.01.

Column Four:

Present Value Of Reversion - The present worth of one dollar that will be obtained at a future date, is the factor shown in column four. That future dollar is discounted by the given interest rate for the time between the present and its future date of collection. This factor is the reciprocal of the future value of one and can be calculated by determining the reciprocal of column one's factor: $1/(1+I)^n$.

A property estimated to be worth $20,000 in three years, is currently worth how much given an 8% annual interest rate, paid monthly? From the compound interest table, or by calculation of the formula, the column four factor is .787255. Multiplying this value by the $20,000 future worth, indicates a present value of $15,745.10.

A financial calculator can determine this present value (PV) with n, I, and FV entries. The FV entry for this example will be the $20,000 future worth of the property. The indicated PV of $15,745.10 can be used with entries for n and I to determine a future value for the property in a column one calculation. This again illustrates the reciprocal relationship between columns one and four.

Column Five:

Present Worth Of 1 Per Period - The present value of the deposit needed in order to receive one dollar per period for a given number of periods, at a given interest rate, is the factor shown in column five. This factor is calculated by dividing the remainder of one subtracted

from the basic formula by the product of the periodic interest rate multiplied by the basic formula: $[(1+I)^n - 1]i(1+I)^n$.

What amount must be deposited today, given a 9% interest rate, in order to receive $50 per month for three years? The formula and the compound interest table will show a column five factor of 31.446805. Multiplying this factor by the desired payment of $50 shows that the percent value of the deposit is $1,572.34.

The financial calculator needs entries for n, I, and PMT in order to calculate the present value (PV) for this case. Since the PMT entry is the desired $50 per month, the use of a financial calculator will save time as opposed to calculating this value by use of the formula.

Column five factors were used in many of the cash equivalency problems in Chapter 7. The column five factors are the reciprocals of the column six factors, the installment to amortize.

Column Six:

Installment To Amortize - The factor shown in column six is the amount required to amortize the principal and interest in a given number of terms. This value can be calculated by dividing the product of the periodic interest rate multiplied by the basic formula, by the remainder of one subtracted from the basic formula: $I(1+I)^n/[(1+I)^n - 1]$.

What monthly payment, given a 9% annual interest rate, will be required in order to repay a $1,500 loan in three years? The formula and the compound interest table show a factor value of .031799. The multiplication of the loan amount by the factor results in a monthly payment amount of $47.70.

Entries of n, I, and PV are needed on a financial calculator in order to determine the PMT. The reciprocal relationship between columns five and six can be shown by using $47.70 as the PMT entry in a column five calculation. This will result in a PV of $1,500.01.

The value of a financial calculator can be seen in the cash equivalency adjustment determinations discussed in Chapter 7. For example, in the Discounting Payments section, the property is purchased at a favorable 8% rate as opposed to the normal 10% rate, the present value (PV) adjustment for cash equivalency can be readily determined. The loan amount of $75,000 is entered as the present value (PV); the term of the loan and the favorable interest rate are entered as n and I; and, a PMT can be determined. The normal interest rate (I) can then be entered (no need to re-key the value for n) and the cash equivalent value of financing (PV) can then be determined. These few entries will obtain the same results (with minor rounding variations) as the step-by-step calculations shown in the discounting payments section.

Summary:

The ability to use compound interest tables is essential to the solution of many income approach and direct sales comparison approach problems. The cash equivalency problems

show the importance of the tables. Deriving the formulas is not necessary in order to use the tables or a financial calculator. The use of the compound interest tables is not complicated, but the assessor should be careful to select the table (monthly, quarterly, annually) that reflects the conditions of the problem.

Column Relationships

This chart shows five ways that the compound interest table factors can be determined. The chart illustrates the relationships between the columns.

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
$(1+I)^n$	$[(1+.I)^n - 1]/I$	$I/[(1+I)^n - 1]$	$1/(1+I)^n$	$[(1+I)^n -1]/ I(1+I)^n$	$I(1+I)^n/ [(1+I)^n - 1]$
1/ Col. 4	1/ Col. 3	1/ Col. 2	1/ Col. 1	1/ Col. 6	1/ Col. 5
Col. 6 / Col. 3	Col. 1 / Col. 6	Col. 6 / Col. 1	Col. 3 / Col. 6	Col. 2 / Col. 1	Col. 1 / Col. 2
Col. 2 / Col. 5	Col. 5 / Col. 4	1/ Col. 5 x Col. 1	Col. 5 / Col. 2	Col. 4 / Col. 3	Col. 3 / Col. 4
Col. 6 x Col. 2	Col. 1 x Col.5	Col. 6 x Col.4	Col. 5 x Col. 3	1/ Col. 3 x Col. 1	Col. 1 x Col. 3

Compound Interest Tables

Monthly Payments
Interest Rate - 8.00%

	1	2	3	4	5	6	
Period	Amt of $1 at Interest	Accumulation of one per Period	Sinking Fund Factor	Present Value of Reversion	P.V. of Ord. Annuity 1 per Period	Installment to Amortize	Period
Interest = Rate Months	0.080 (Decimal)		Base =	0.006667			n Periods
1	1.006667	1.000000	1.000000	0.993377	0.993377	1.006667	1
2	1.013378	2.006667	0.498339	0.986799	1.980176	0.505006	2
3	1.020134	3.020044	0.331121	0.980264	2.960440	0.337788	3
4	1.026935	4.040178	0.247514	0.973772	3.934212	0.254181	4
5	1.033781	5.067113	0.197351	0.967323	4.901535	0.204018	5
6	1.040673	6.100893	0.163910	0.960917	5.862452	0.170577	6
7	1.047610	7.141566	0.140025	0.954553	6.817005	0.146692	7
8	1.054595	8.189176	0.122112	0.948232	7.765237	0.128779	8
9	1.061625	9.243771	0.108181	0.941952	8.707189	0.114848	9
10	1.068703	10.305396	0.097037	0.935714	9.642903	0.103703	10
11	1.075827	11.374099	0.087919	0.929517	10.572420	0.094586	11
Years							
1	1.083000	12.449926	0.080322	0.923361	11.495782	0.086988	12
2	1.172888	25.933190	0.038561	0.852596	22.110544	0.045227	24
3	1.270237	40.535558	0.024670	0.787255	31.911805	0.031336	36
4	1.375666	56.349915	0.017746	0.726921	40.961913	0.024413	48
5	1.489846	73.476856	0.013610	0.671210	49.318433	0.020276	60
6	1.613502	92.025325	0.010867	0.619770	57.034522	0.017533	72
7	1.747422	112.113308	0.008920	0.572272	64.159261	0.015586	84
8	1.892457	133.868583	0.007470	0.528414	70.737970	0.014137	96
9	2.049530	157.429536	0.006352	0.487917	76.812497	0.013019	108
10	2.219640	182.946036	0.005466	0.450523	82.421481	0.012133	120
11	2.403869	210.580392	0.004749	0.415996	87.600600	0.011415	132
12	2.603389	240.508387	0.004158	0.384115	92.382799	0.010825	144
13	2.8194693	272.920391	0.003664	0.354677	96.798498	0.010331	156
14	.053484	308.022575	0.003247	0.327495	100.875783	0.009913	168
15	3.306922	346.038223	0.002890	0.302396	104.640591	0.009557	180
16	3.581394	387.209151	0.002583	0.279221	108.116870	0.009249	192
17	3.878648	431.797246	0.002316	0.257822	111.326732	0.008983	204
18	4.200574	480.086130	0.002083	0.238063	114.290595	0.008750	216
19	4.549220	532.382968	0.001878	0.219818	117.027312	0.008545	228
20	4.926803	589.020419	0.001698	0.202971	119.554291	0.008364	240
21	5.335725	650.358749	0.001538	0.187416	121.887606	0.008204	252
22	5.778588	716.788131	0.001395	0.173053	124.042099	0.008062	264
23	6.258207	788.731118	0.001268	0.159790	126.031474	0.007935	276
24	6.777636	866.645339	0.001154	0.147544	127.868387	0.007821	288
25	7.340176	951.026401	0.001051	0.136237	129.564522	0.007718	300
26	7.949407	1042.411049	0.000959	0.125796	131.130667	0.007626	312
27	8.609204	1141.380579	0.000876	0.116155	132.576785	0.007543	324
28	9.323764	1248.564531	0.000801	0.107253	133.912075	0.007468	336
29	10.097631	1364.644697	0.000733	0.099033	135.145030	0.007399	348
30	10.935730	1490.359461	0.000671	0.091443	136.283493	0.007338	360

Compound Interest Tables

Monthly Payments
Interest Rate - 9.00%

	1	2	3	4	5	6	
Period	Amt of $1 at Interest	Accumulation of one per Period	Sinking Fund Factor	Present Value of Reversion	P.V. of Ord. Annuity 1 per Period	Installment to Amortize	Period
Interest = Rate Months	0.090 (Decimal)		Base =	0.007500			N Periods
1	1.007500	1.000000	1.000000	0.992555	0.992555	1.007500	1
2	1.015056	2.007500	0.498132	0.985167	1.977722	0.505632	2
3	1.022669	3.022556	0.330845	0.977833	2.955556	0.338345	3
4	1.030339	4.045225	0.247205	0.970554	3.926110	0.254705	4
5	1.038066	5.075564	0.197022	0.963329	4.889439	0.204522	5
6	1.045852	6.113631	0.163568	0.956158	5.845597	0.171068	6
7	1.053696	7.159483	0.139674	0.949040	6.794637	0.147174	7
8	1.061598	8.213179	0.121755	0.941975	7.736613	0.129255	8
9	1.069560	9.274778	0.107819	0.934963	8.671576	0.115319	9
10	1.077582	10.344339	0.096671	0.928003	9.599579	0.104171	10
11	1.085664	11.421921	0.087550	0.921094	10.520674	0.095050	11
Years							
1	1.093806	12.507586	0.079951	0.914238	11.434912	0.087451	12
2	1.196413	26.188470	0.038184	0.835831	21.889146	0.045684	24
3	1.308645	41.152716	0.024299	0.764148	31.446805	0.031799	36
4	1.431405	57.520711	0.017385	0.698614	40.184781	0.024885	48
5	1.565681	75.424136	0.013258	0.638699	48.173373	0.020758	60
6	1.712552	95.007027	0.010525	0.583923	55.476848	0.018025	72
7	1.873202	16.426928	0.008589	0.533845	62.153964	0.016089	84
8	2.048921	139.856163	0.007150	0.488061	68.258438	0.014650	96
9	2.241124	165.483222	0.006042	0.446204	73.839381	0.013542	108
10	2.451357	193.514277	0.005167	0.407937	78.941692	0.012667	120
11	2.681311	224.174837	0.004460	0.372951	83.606420	0.011960	132
12	2.932836	257.711569	0.003880	0.340966	87.871091	0.011380	144
13	3.207957	294.394279	0.003396	0.311724	91.770017	0.010896	156
14	3.508885	334.518079	0.002989	0.284990	95.334564	0.010489	168
15	3.838043	378.405768	0.002642	0.260549	98.593408	0.010142	180
16	4.198078	426.410426	0.002345	0.238204	101.572760	0.009845	192
17	4.591886	478.918252	0.002088	0.217775	104.296610	0.009588	204
18	5.022637	536.351674	0.001864	0.199098	106.786856	0.009364	216
19	5.493795	599.172747	0.001668	0.182023	109.063531	0.009168	228
20	6.009151	667.886869	0.001497	0.166412	111.144954	0.008997	240
21	6.572851	743.046851	0.001345	0.152140	113.047870	0.008845	252
22	7.189430	825.257357	0.001211	0.139093	114.787589	0.008711	264
23	7.863848	915.179777	0.001092	0.127164	116.378106	0.008592	276
24	8.601532	1013.537538	0.000986	0.116258	117.832217	0.008486	288
25	9.408415	1121.121937	0.000891	0.106287	119.161622	0.008391	300
26	10.290988	1238.798494	0.000807	0.097172	120.377014	0.008307	312
27	11.256354	1367.513924	0.000731	0.088838	121.488172	0.008231	324
28	12.312278	1508.303749	0.000662	0.081219	122.504034	0.008162	336
29	13.467254	1662.300631	0.000601	0.074254	123.432775	0.008101	348
30	14.730576	1830.743483	0.000546	0.067886	124.281865	0.008046	360

Compound Interest Tables

Monthly Payments
Interest Rate - 10.00%

	1	2	3	4	5	6	
Period	Amt of $1 at Interest	Accumulation of one per Period	Sinking Fund Factor	Present Value of Reversion	P.V. of Ord. Annuity 1 per Period	Installment to Amortize	Period
Interest = Rate Months	0.100 (Decimal)		Base =	0.008333			n Periods
1	1.008333	1.000000	1.000000	0.991735	0.991735	1.008333	1
2	1.016736	2.008333	0.497925	0.983539	1.975274	0.506258	2
3	1.025208	3.025069	0.330570	0.975410	2.950685	0.338904	3
4	1.033752	4.050278	0.246896	0.967349	3.918035	0.255229	4
5	1.042366	5.084030	0.196694	0.959355	4.877390	0.205027	5
6	1.051053	6.126397	0.163228	0.951426	5.828817	0.171561	6
7	1.059812	7.177450	0.139325	0.943563	6.772380	0.147658	7
8	1.068643	8.237263	0.121399	0.935765	7.708146	0.129732	8
9	1.077549	9.305906	0.107458	0.928031	8.636177	0.115791	9
10	1.086528	10.383456	0.096307	0.920362	9.556540	0.104640	10
11	1.095583	11.469984	0.087184	0.912755	0.469295	0.095517	11
Years							
1	1.104713	12.565568	0.079582	0.905212	11.374508	0.087915	12
2	1.220391	26.446915	0.037811	0.819409	21.670854	0.046144	24
3	1.348181	41.781821	0.023933	0.741739	30.991235	0.032267	36
4	1.489354	58.722491	0.017029	0.671432	39.428160	0.025362	48
5	1.645308	77.437072	0.012913	0.607788	47.065369	0.021247	60
6	1.817594	98.111313	0.010192	0.550177	53.978665	0.018525	72
7	2.007920	120.950418	0.008267	0.498027	60.236667	0.016601	84
8	2.218175	146.181075	0.006840	0.450820	65.901488	0.015174	96
9	2.450447	174.053712	0.005745	0.408088	71.029355	0.014078	108
10	2.707041	204.844978	0.004881	0.369406	75.671163	0.013215	120
11	2.990504	238.860492	0.004186	0.334391	79.872986	0.012519	132
12	3.303649	276.437875	0.003617	0.302695	83.676528	0.011950	144
13	3.649584	317.950101	0.003145	0.274003	87.119542	0.011478	156
14	4.031743	363.809199	0.002748	0.248031	90.236200	0.011082	168
15	4.453919	414.470344	0.002412	0.224521	93.057439	0.010746	180
16	4.920303	470.436373	0.002125	0.203239	95.611258	0.010459	192
17	5.435523	532.262777	0.001878	0.183974	97.923008	0.010212	204
18	6.004693	600.563213	0.001665	0.166536	100.015632	0.009998	216
19	6.633463	676.015597	0.001479	0.150750	101.909902	0.009812	228
20	7.328073	759.368832	0.001316	0.136461	103.624619	0.009650	240
21	8.095418	851.450239	0.001174	0.123526	105.176801	0.009507	252
22	8.943114	953.173773	0.001049	0.111817	106.581856	0.009382	264
23	9.879575	1065.549090	0.000938	0.101218	107.853729	0.009271	276
24	10.914096	1189.691572	0.000840	0.091624	109.005045	0.009173	288
25	12.056945	1326.833393	0.000753	0.082939	110.047230	0.009087	300
26	13.319464	1478.335755	0.000676	0.075078	110.990629	0.009009	312
27	14.714186	1645.702395	0.000607	0.067961	111.844605	0.008940	324
28	16.254954	1830.594508	0.000546	0.061519	112.617635	0.008879	336
29	17.957060	2034.847241	0.000491	0.055688	113.317392	0.008824	348
30	19.837399	2260.487905	0.000442	0.050409	113.950820	0.008775	360

Tables of Weights and Measures

Some of the cost commonly used tables of weights and measures, together with other useful information follow:

Linear Measure

1 foot ..... 12 inches
1 yard ..... 3 feet or 36 inches
1 rod ..... 5 ½ yards or 16 ½ feet or 198 inches
1 furlong ..... 40 rods or 220 yards or 660 feet or 7,920 inches
1 mile ..... 8 furlongs or 320 rods or 1,760 yards or 5,280 feet or 63,360 inches

Surveyor's Linear Measure

1 link ..... 7.92 inches
1 rod ..... 25 links
1 chain ..... 4 rods or 100 links or 66 feet
1 furlong ..... 10 chains
1 mile ..... 8 furlongs or 80 chains or 320 rods

Square Measure

1 square foot ..... 144 square inches
1 square yard ..... 9 square feet or 1,296 square inches
1 square rod ..... 30 1/4 square yards or 272 1/4 square feet or 625 square links
1 square chain ..... 16 square rods
1 acre ..... 10 square chains or 160 square rods or 4,840 square yards or 43,560 square feet
1 square mile ..... 640 acres

Cubic Measure

1 cubic foot ..... 1,728 cubic inches
1 cubic yard ..... 27 cubic feet
1 cord foot ..... 16 cubic feet
1 cord of wood ..... 8 cord feet or 128 cubic feet
1 perch of stone or masonry ..... 24 3/4 cubic feet

Angles and Arcs

1 minute ..... 60 seconds
1 degree ..... 60 minutes
1 right angle ..... 90 degrees
1 quadrant ..... 90 degrees
1 circumference ..... 360 degrees

Other Measurements

1 span ..... 9 inches
1 hand ..... 4 inches
1 knot ..... 6,086 feet
1 fathom ..... 6 feet
1 stone ..... 14 pounds

Hay Measure

About 500 cubic feet of well settled hay is considered a ton. Hay at the bottom of a large mow, other than clover hay, would probably weigh a ton for about 450 cubic feet. It may take 600 to 700 cubic feet of dry, unsettled hay to make a ton.

Grain Measure

To find the capacity in bushels of a bin or wagon-bed, multiply the cubic feet by 8/10. For greater accuracy, add 1/3 of a bushel for every 100 cubic feet.

To find the cubic feet, multiply the length, width, and depth in feet together.

To Find Capacity of Cylindrical Tanks Standing on End

To find the capacity in cubic feet of a round cistern or tank: multiply the square of the average diameter by the depth, and multiply the product by .785.

To Convert Cubic Measure Into Gallons and Bushels

To convert cubic inches into gallons, divide by 231. To convert cubic feet to gallons, multiply by 7.48.

To convert cubic inches into level bushels, divide by 2,150.42. To convert cubic feet into bushels, multiply by .8. For greater accuracy, add 1/3 of a bushel for every 100 cubic feet.

To Find Contents of Corn in Crib

To find the contents in bushels of a corn crib multiply the cubic feet by 4 and divide the product by 9. This allows 2 1/4 cubic feet for a bushel. It is the rule most generally used, and will hold out in ordinary good corn, even if measured at the time it is cribbed.

Example: Find the contents of a corn crib 18 feet long, 7 feet wide, and 8 feet high.

Answer: 7 x 8 x 18 = 1,008 cubic feet x 4 = 4,032 ÷ 9 = 448 bushels.

Approximate Capacity of Round Silos

(The diameter is shown at the top of the columns and depth at the left.)

Height of Silo	Inside Diameter of Silo in Feet and Capacity in Tons (2,000 lbs.)					
	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
Feet	Tons	Tons	Tons	Tons	Tons	Tons
20	26	- - - - - -	- - - - - -	- - - - - -	- - - - - -	- - - - - -
22	30	- - - - - -	- - - - - -	- - - - - -	- - - - - -	- - - - - -
24	34	49	- - - - - -	- - - - - -	- - - - - -	- - - - - -
26	38	55	- - - - - -	- - - - - -	- - - - - -	- - - - - -
28	42	61	83	- - - - - -	- - - - - -	- - - - - -
30	47	67	91	- - - - - -	- - - - - -	- - - - - -
32	51	74	100	131	- - - - - -	- - - - - -
34	56	80	109	143	- - - - - -	- - - - - -
36	61	87	118	155	196	- - - - - -
38	66	94	128	167	212	- - - - - -
40	70	101	138	180	229	280

Legal Weight of Various Commodities Per Bushel

(Minimum Weights by Wisconsin Statute)

	Pounds per Bushel
Alfalfa Seed	60
Alsike Seed	60
Apples	44
Barley	48
Beans, white	60
Blue Grass Seed	14
Bran	20
Buckwheat	5
Clover Seed	60
Coal	80
Corn, shelled	56
Corn in the ear	70
Flaxseed	56
Hungarian Grass Seed	48
Malt, Barley	34
Millet Seed	50
Oats	32
Onions	57
Onion Sets	32
Peaches	48
Peaches, dried	33

Pears 48
Peas 60
Peas, wrinkled 56
Potatoes, Irish 60
Potatoes, Sweet 54
Rye 56
Timothy Seed 45
Wheat 60

Equalization District Offices

District Supervisor	Counties
MADISON DISTRICT OFFICE (76) VACANT P O BOX 8909 MS 6-301 MADISON WI 53708-8909 **Phone Number**: 608-266-8184| **Fax Number**: 608-267-1355 E-mail	Columbia, Crawford, Dane, Dodge, Grant, Green, Green Lake, Iowa, Jefferson, Lafayette, Marquette, Richland, Rock, Sauk, Vernon
MILWAUKEE DISTRICT OFFICE (77) PAT CHANESKE 819 NORTH 6 TH ST ROOM 530 MILWAUKEE WI 53203-1606 **Phone Number**: 414-227-4455 **Fax Number**: 414-227-4071 E-mail	Fond du Lac, Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington, Waukesha
EAU CLAIRE DISTRICT (79) DIANE FORREST 610 GIBSON ST STE 7 EAU CLAIRE WI 54701 **Phone Number:** 715-836-2866 | **Fax Number:** 715-836-6690 E-mail	Barron, Bayfield, Buffalo, Burnett, Chippewa, Douglas, Dunn, Eau Claire, Jackson, La Crosse, Monroe, Pepin, Pierce, Polk, Rusk, St. Croix, Sawyer, Trempealeau, Washburn
WAUSAU DISTRICT OFFICE(80) ALBERT ROMPORTL 730 THIRD ST WAUSAU WI 54403-4700 **Phone Number:** 715-842-5885 | **Fax Number:** 715-848-1033 E-mail	Adams, Ashland, Clark, Iron, Juneau, Langlade, Lincoln, Marathon, Oneida, Portage, Price, Taylor, Vilas, Wood
GREEN BAY DISTRICT OFFICE (81) MARY GAWRYLESKI 200 N JEFFERSON ST STE 126 GREEN BAY WI 54301-5100 **Phone Number:** 920-448-5195 | **Fax Number:** 920-448-5207 E-mail	Brown, Calumet, Door, Florence, Forest, Kewaunee, Manitowoc, Marinette, Menominee, Oconto, Outagamie, Shawano, Waupaca, Waushara, Winnebago

Manufacturing District Offices

District Supervisor	Counties
EAU CLAIRE DISTRICT OFFICE MANUFACTURING & UTILITY BUREAU 610 GIBSON ST STE 7 EAU CLAIRE WI 54701-2650 **Phone Number:** 715-836-4925 **Fax Number:** 715-836-6690 **E-mail:** mailto:mfgtel79@revenue.wi.gov	Adams, Ashland, Barron, Bayfield, Buffalo, Burnett, Chippewa, Clark, Douglas, Dunn, Eau Claire, Iron, Jackson, Juneau, La Crosse, Lincoln, Marathon, Monroe, Oneida, Pepin, Pierce, Polk, Price, Rusk, St Croix, Sawyer, Taylor, Trempealeau, Vernon, Vilas, Washburn, Wood
GREEN BAY DISTRICT OFFICE MANUFACTURING & UTILITY BUREAU 200 N JEFFERSON ST STE 126 GREEN BAY WI 54301-5100 **Phone Number:** 920-448-5191 **Fax Number:** 920-448-5210 **E-mail**: mailto:mfgtel81@revenue.wi.gov	Brown, Calumet, Door, Florence, Fond Du Lac, Forest, Green Lake, Kewaunee, Langlade, Manitowoc, Marinette, Marquette, Menominee, Oconto, Outagamie, Portage, Shawano, Sheboygan, Waupaca, Waushara, Winnebago
MADISON DISTRICT OFFICE MANUFACTURING & UTILITY BUREAU P O BOX 8909 MS 6-301 MADISON WI 53708-8909 **Phone Number:** 608-267-8992 **Fax Number:** 608-267-1355 **E-mail:** mailto:mfgtel76@revenue.wi.gov	Columbia, Crawford, Dane, Dodge, Grant, Green, Iowa, Jefferson, Lafayette, Richland, Rock, Sauk, Walworth, **Waukesha*** ***Towns of**: Delafield, Eagle, Genesee, Lisbon, Merton, Mukwonago, Oconomowoc, Ottawa, Summit, Vernon, Waukesha **Villages of**: Big Bend, Chenequa, Dousman, Eagle, Hartland, Lac La Belle, Merton, Mukwonago, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex, Wales. **Cities of**: Delafield, Oconomowoc, Pewaukee, Waukesha
MILWAUKEE DISTRICT OFFICE MANUFACTURING & UTILITY BUREAU STATE OFFICE BUILDING 819 N 6 TH ST RM 530 MILWAUKEE WI 53203-1606 **Phone Number:** 41-227-4456 **Fax Number:** 414-227-4095 **E-mail:** mailto:mfgtel77@revenue.wi.gov	Kenosha, Milwaukee, Ozaukee, Racine, Washington, **Waukesha*** ***Town of** Brookfield **Villages of**: Butler, Elm Grove, Lannon, Menomonee Falls **Cities of**: Brookfield, Milwaukee, Muskego, New Berlin

Sources of Information Within the Department of Revenue

Department of Revenue
2135 Rimrock Road
P.O. Box 8971
Madison, Wisconsin53708-8971
http://www.revenue.wi.gov

For Information on:	Contact:
Appeals from the Board of Review	Supervisor of Equalization for your district http://www.revenue.wi.gov/faqs/slf/sups.html or Office of Technical and Assessment Services
Approval of Forms	Office of Technical and Assessment Services
Assessment Process Assessment of special type properties Board of Review Completion of various forms submitted to the Supervisor of Equalization Equalized Values Exempt properties Revaluation	Supervisor of Equalization for your district
Assessor Certification Continuing Education for Assessors Recertification Requirements Temporary Certification	Office of Technical and Assessment Services
Assessor Complaints	Office of Technical and Assessment Services
Certification of full values Indebtedness Levy Limits School Loans Shared Taxes Statement of Assessments Statement of Taxes	Local Government Services
Composite Conversion Factors Local Modifiers Unindexed Depreciation Tables Assessment Manuals Use of assessment manuals	Office of Technical and Assessment Services

Manufacturing and Telco Assessment	Supervisor of Manufacturing/Utilities for your district (for address refer to the chart of manufacturing districts)
Tax Incremental Finance	Equalization

Other Sources of Information

For Information on:	Contact:
Farmland Preservation Program	Department of Agriculture, Trade, and Consumer Protection P.O. Box 8911 Madison, WI 53708 (608) 224-4634
Forest Crop Law Managed Forest Law Woodland Tax Law	Department of Natural Resources Forest Tax Section Madison, WI 53707 (608) 266-8019
Homestead Credit	Homestead Credit Information P.O. Box 8906 Madison, WI 53708-8906 (608) 266-8641
Property Tax Deferral Program	WHEDA P.O. Box 1728 Madison, WI53708-1728 (608) 266-7884 (800) 755-7835

Vocational Schools

Blackhawk Technical College
6004 Prairie Road, P.O. Box 5009
Janesville, WI 53547
Phone: (608) 758-6900, 1 (800) 498-1282 (Area Code 608 only)

Chippewa Valley Technical College
620 West Clairmont Avenue
Eau Claire, WI 54701
Phone: (715) 833-6200, 1 (800) 547-2882

Fox Valley Technical College
1825 North Bluemound Drive
Appleton, WI 54912
Phone: (920) 735-5600, 1 (800) 735-3882

Gateway Technical College
1001 South Main Street
Racine, WI 53403
Phone: (262) 619-6200, 1 (800) 247-8170

Lakeshore Technical College
1290 North Avenue
Cleveland, WI 53015-1414
Phone: 1 (888) 468-6582

Madison Area Technical College
3550 Anderson Street
Madison, WI 53704
Phone: (608) 246-6100, 1 (800) 322-6282

Mid-State Technical College
500 - 32nd Street, North
Wisconsin Rapids, WI 54494
Phone: (715) 422-5300, 1 (888) 575-6782

Milwaukee Area Technical College
700 West State Street
Milwaukee, WI 53233
Phone: (414) 297-6600

Moraine Park Technical College
235 North National Avenue, P.O. Box 1940
Fond du Lac, WI 54936
Phone: (920) 922-8611, 1 (800) 472-4554

Nicolet Technical College
Highway G South
Box 518
Rhinelander, WI 54501
Phone: (715) 365-4410, 1 (800) 544-3039

North Central Technical College
1000 West Campus Drive
Wausau, WI 54401
Phone: (715) 675-3331, 1 (888) 682-7144

Northeast Technical College
2740 West Mason Street
P.O. Box 19042
Green Bay, WI 54307
Phone: (920) 498-5400, 1 (800) 422-6982

Southwest Wisconsin Technical College
1800 Bronson Boulevard
Fennimore, WI 53809
Phone: (608) 822-3262, 1 (800) 362-3322

Waukesha County Technical College
800 Main Street
Pewaukee, WI 53072
Phone: (262) 691-5566, 1 (877) 463-9282

Western Wisconsin Technical College
304 North 6th Street
La Crosse, WI 54601
Phone: (608) 785-9200, 1 (800) 322-9982), 1 (800) 248-9982 (Outside of Wisconsin)

Wisconsin Indianhead Technical College
505 Pine Ridge Drive
Shell Lake, WI 54871
Phone: (715) 468-2815, 1 (800) 243-9482

Wisconsin Technical College System Board
310 Price Place
P.O. Box 7874
Madison, WI 53707-7874
Phone: (608) 266-1207

Note: Links to individual technical college websites are available at the following address: http://www.witechcolleges.com/

Sources of Publications

Appraisal Institute
550 W. Van Buren Street
Suite 1000
Chicago, IL 60607

Tel.: 312-335-4100 FAX: 312-335-4200

- *The Appraisal Journal* (quarterly)
- *Valuation Insights & Perspectives* (quarterly)
- *Appraiser News Online*
- *Real Estate Outlook* (semi-annually)

International Association of Assessing Officers (IAAO)
314 West 10th Street
Kansas City MO 64105-1616

Tel.: 312-819-6100 FAX: 312-819-6149
E-mail: webmaster@iaao.org

- *Property Assessment Valuation, 3rd ed.*
- *Fair and Equitable*
- *Issues in Appraisal and Assessment*
- *Assessment Journal (bimonthly)*
- *Assessment Practices Self-Evaluation Guide*
- *GIS Guidelines for Assessors*
- *Guide to Real Property Demonstration Appraisal Report Writing*
- *Legal Issues in Property Valuation and Taxation: Cases and Materials*
- *Property Appraisal and Assessment Administration*
- Other publications available

League of Wisconsin Municipalities
202 State St., Suite 300
Madison, WI 53702-2215

Tel.: 608-267-2380 FAX: 608-267-0645 In Wisconsin 1-800-331-5502

- Proceedings, Institute for Municipal Assessors
- Special Assessments in Wisconsin

Wisconsin Agriculture Statistics Service
P.O. Box 8934
Madison, WI 53708-8934

Tel.: 608-224-4848 FAX: 608-224-4855 1-800-789-9277

- Agricultural Land Sales
- *Wisconsin Farm Reporter* (24 times per year)
- Agricultural Statistics (annually)
- Other publications, price list available

Wisconsin Department of Administration
Document Sales Unit
P.O. Box 7840
202 South Thornton Avenue
Madison, WI 53707-7840

Tel.: 608-266-3358 FAX: 608-261-8150
Credit Card Orders Only: 1-800-362-7253
Email: docsales@doa.state.wi.us

- *Wisconsin Property Assessment Manual*
- *Wisconsin Blue Book*
- *Wisconsin Statutes (*reprints of chapter laws*)*
- Various publications, catalog available

Wisconsin Department of Revenue
Office of Technical and Assessment Services
P.O. Box 8971
Madison, WI 53708-8971

Tel.: 608-266-7750 FAX: 608-264-6897
E-mail: bapdor@revenue.wi.gov
Internet: http://www.revenue.wi.gov/

- *Chapter 70* (Wisconsin Statutes)
- *Guide for Property Owners*
- *Guide for Board of Review Members*
- *Property Assessment Appeal Guide*
- *Mobile Home Guide*
- *Guide to the Property Assessment Process for Wisconsin Municipal Officials*
- *Wisconsin Property Assessment Manual*
- Study Information for Assessor Certification Exams

Wisconsin Farm Bureau Federation
Box 5550
Madison, WI 53705-0550

Tel.: 608-836-5575 FAX: 608-828-5769 1-800-261-FARM

Wisconsin Government Finance Officers Assn.
c/o Kathy Kasza
Village of Brown Deer
4800 W Green Brook Drive
Brown Deer, WI 53223

Tel.: 414-371-3040 FAX: 414-371-3045

Wisconsin Municipal Clerks Assn.
W136 S8415 Holz Drive
Muskego, WI 53150-4307

Tel.: 414-422-1864 FAX: 414-422-0288

The Quill (quarterly)

Wisconsin Register of Deeds Assn. (WRDA)
Attn: Jane Light
P.O. Box 1438
Madison, WI 53701

Tel.: 608-266-4141 FAX: 608-267-3110
E-mail: light@co.dane.wi.us

Wisconsin Taxpayers Alliance
335 W. Wilson Street
Madison, WI 53703-3694

Tel.: 608-255-4581 FAX: 608-255-0642

- Notice of Legislative Hearings
- Wisconsin Government in Focus
- other publications

Wisconsin Towns Association
W7686 County Road MMM
Shawano, WI 54166

Tel.: 715-526-3157 FAX: 715-524-3917

Madison Office
44 East Mifflin Street
Madison, WI 53703
Tel.: 608-256-0543 FAX: 608-256-3986

Wisconsin Association of Assessing Officers (WAAO)
c/o Joan Spencer
630 South Central Ave.
P.O. Box 727
Mansfield, WI 54449-0727

Tel.: 715-384-3856 FAX: 715-384-7831
E-mail: webmaster@waao.org

- *Assessor's Voice of Wisconsin* (AVOW) (newsletter)
- Exemption Video
- other publications available

Cost Manuals and Services

Marshall & Swift / Boeckh
P.O. Box 26307
Los Angeles, CA 90017-0307
Phone: (800) 544-2678

R.S. Means Company, Inc.
100 Construction Plaza
P.O. Box 800
Kingston, MA 02364-0800
Phone: (800) 448-8182

Mobile Home/Recreational Vehicle
Blue Books and Marine Blue Books
Intertec Publishing Corp.
Dept. TIG, P.O. Box 12901
Overland Park, KS 66282
Phone: (800) 262-1954

Other Suggested Publications

Appraisal Institute, *The Dictionary of Real Estate Appraisal*, third edition (Chicago: Appraisal Institute, 1993).

Bloom, George F., and Harrison, Henry S., *Appraising the Single Family Residence* (Chicago: American Institute of Real Estate Appraisers, 1978).

Dasso, Jerome, *Computerized Assessment Administration* (Chicago: International Association of Assessing Officers, 1974).

Dilmore, G., *The New Approach to Real Estate Appraising* (Englewood Cliffs, New Jersey: Prentice-Hall, 1971).

Draper, N.R. and Smith, H., *Applied Regression Analysis* (New York: John Wiley & Sons, Inc., 1966).

Ellwood, L.W., *Ellwood Tables for Real Estate Appraising and Financing*, third edition (Chicago: American Institute of Real Estate Appraisers, 1970).

Hoag, John S., *Fundamentals of Land Measurement* (Chicago: Chicago Title Insurance Company, 1977).

International Association of Assessing Officers, *Property Assessment Valuation*, second edition (Chicago: IAAO, 1996).

Johnson, Irvin E., *Selling Real Estate by Mortgage-Equity Analysis* (Lexington: Lexington Books, 1976).

Kinnard, William N., Jr., *Income Property Valuation* (Lexington: Lexington Books, 1971).

Murray, William G., *Farm Appraisal and Valuation*, fifth edition (Ames, Iowa: Iowa State University Press, 1969).

Ring, A.A., *The Valuation of Real Estate*, second edition (Englewood Cliffs, New Jersey: Prentice-Hall, 1970).

Robinson, Peter C., *How to Appraise Commercial Properties* (Englewood Cliffs, New Jersey: Prentice-Hall, 1970).

Youngman, Joan, *Legal Issues in Property Valuation and Taxation* (Chicago: IAAO, 1994).

A Standard System of Identifying and Coding Local

Assessment Classification - Three Digit Level

Category	Code
Residential Sites	160
Residential River Frontage Value	181
Residential Lake Frontage Value	182
Residential Road Frontage Value	183
Residential Unmeandered Land	184
Total Residential Frontage Value	180
Residential Parcel Size Adjustment	190
Total Residential Lands	100
Commercial Sites	260
Commercial River Frontage Value	281
Commercial Lake Frontage Value	282
Commercial Road Frontage Value	283
Commercial Unmeandered Land	284
Total Commercial Frontage Value	280
Commercial Parcel Size Adjustment	290
Total Commercial Lands	200
Manufacturing Sites	360
Manufacturing River Frontage Value	381
Manufacturing Lake Frontage Value	382
Manufacturing Road Frontage Value	383
Manufacturing Unmeandered Land	384
Total Manufacturing Frontage Value	380
Manufacturing Parcel Size Adjustment	390
Total Manufacturing Lands	300
1st Grade Tillable Land	411
2nd Grade Tillable Land	412
3rd Grade Tillable Land	413
Irrigated Land	414
Total Tillable Land	410
Orchards	420
Prime Pasture	441
Secondary Pasture	442
Residual Pasture	443
Total Pasture	440
Cranberry Bogs	451
Tobacco	452
Ginseng	453
Muck	454
Ponds	455

All Other Agricultural Land Not Elsewhere Coded	456
Category	**Code**
Total Specialty Lands	450
Agricultural River Frontage Value	481
Agricultural Lake Frontage Value	482
Agricultural Road Frontage Value	483
Agricultural Unmeandered Land	484
Total Agricultural Frontage Value	480
Agricultural Parcel Size Adjustment	490
Total Agricultural Lands	400
Fallow 1st Grade Tillable Land	501
Fallow 2nd Grade Tillable Land	502
Fallow 3rd Grade Tillable Land	503
Fallow Pasture Land	504
Total Fallow Lands	505
Swamp	511
Waste	512
Conservation Easements	513
Total Swamp and Waste	510
Quarries, Pits and Mines	531
Privately Owned Dumps, Sanitary Land Fills, Etc.	532
Total Quarries Pits, Mines & Privately Owned Sanitary Land Fills, Dumps, Etc.	530
Unmeandered Waters (Privately owned non-navigable)	540
Residual River Frontage Value	581
Residual Lake Frontage Value	582
Residual Road Frontage Value	583
Residual Unmeandered Land	584
Total Residual Frontage Value	580
Residual Parcel Size Adjustment	590
Total Residual Lands	500
Primary Forest	611
Secondary Forest	612
Residual Forest	613
Cutover	614
Total Forest and Cutover	610
Seedlings	651
Pine Plantation	652
Christmas Tree Plantation	653
Total Seedling Pine and Christmas Tree Plantations	650
Forest River Frontage Value	681
Forest Lake Frontage Value	682
Forest Road Frontage Value	683
Forest Unmeandered Land	684
Total Forest Frontage Value	680
Forest Parcel Size Adjustment	690

Total Forest Lands	600
Category	**Code**
Other Homesites	700
Regular Forest Crop, Special Forest Crop, Managed Forest Land and Woodland Tax	811
Utilities	812
Total Specially Taxed Lands	810
County Forest Crop	820
Federally Owned	830
State Owned Meandered Waters	841
State Owned Navigable Waters (not on government survey)	842
All Other State Owned	843
Total State Owned	840
County Owned	850
School Owned	860
Municipal Owned	870
Other Exempt	881
Exempt Unmeandered Land	884
Total Other Exempt and Exempt Unmeandered Land	880
Total Specially Taxes Lands and Exempt Lands	800
Total Parcel	900

A Standard System for Identifying and Coding Local

Assessment Classification - Three Digit Level

160 Residential Sites - include all of the land under the buildings and area immediately surrounding them; land that is used for wells, septic systems, etc.

181 Residential River Frontage Value.

182 Residential Lake Frontage Value.

183 Residential Road Frontage Value.

184 Residential Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is “high and dry.” This land may be residential.

180 Total Residential Frontage Value.

190 Residential Parcel Size Adjustment.

100 Total Residential Lands - is the total of all the residential land within a specified area.

260 Commercial Sites - include all of the land under buildings, parking lots, etc., and area immediately surrounding them. Also includes the land used for wells, septic systems, etc.

281 Commercial River Frontage Value.

282 Commercial Lake Frontage Value.

283 Commercial Road Frontage Value.

284 Commercial Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is "high and dry." This land may be commercial.

280 Total Commercial Frontage Value.

290 Commercial Parcel Size Adjustment.

200 Total Commercial Lands - is a total of all the commercial land.

360 Manufacturing Sites - the acreages of manufacturing sites are taken directly from the SAM rolls.

381 Manufacturing River Frontage Value.

382 Manufacturing Lake Frontage Value.

383 Manufacturing Road Frontage Value.

384 Manufacturing Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is "high and dry." This land may be manufacturing.

380 Total Manufacturing Frontage Value.

390 Manufacturing Parcel Size Adjustment.

300 Total Manufacturing Lands - is a total of all the manufacturing land within a specified area.

411 1st Grade Tillable Land - land being used for farm purposes and made up of all those soil series and types shown on the County or Regional Soil Survey as possessing the best production capabilities with suitable slope and erosion ratings.

412 2nd Grade Tillable Land - land being used for farm purposes which is plowed or capable of being plowed and made up of soil series and types shown on the County Soil Survey as having a lesser production capability than 1st grade soils through of good slope and erosion ratings. It also includes lands comprised of those soil types with the best production capability but whose poorer slopes and erosion ratings exclude them from being classed as 1st grade.

413 3rd Grade Tillable Land - land being used for farm purposes which is plowed or capable of being plowed and made up of soil series and types on the Soil Survey with the poorest productivity rating or those soils of higher productivity with the poorest slope and erosion ratings which prevent them from being classed in a higher grade. Sometimes the poorest lands in this grade have been cultivated for a period of years and then cultivation has been abandoned. Such land is not included in this grade but in pasture.

414 Irrigated Land - tillable land that is being irrigated.

410 Total Tillable Land - is the total of all tillable land which constitutes the 1st grade, 2nd grade, 3rd grade and irrigated sub-classes.

420 Orchards - is an acre or more of land that has any type of orchard planted on it - i.e., apples, cherries, etc.

441 Prime Pasture - pasture adjacent to a road; with water; well drained; near buildings; good forage grasses; relatively open.

442 Secondary Pasture - pasture lacking 3 or more of the above elements of prime pasture.

443 Residual Pasture - transitional; not E or F; marginal usefulness among tillable acreage, e.g., drainage ditches, rocky knobs, frost pockets, sink holes or waterswamp.

440 Total Pasture - all pasture land.

451 Cranberry Bogs - include producing bogs and any surrounding land used directly in production such as ditches, dams, dykes, etc. It does not include, reservoirs; they should be classed as swamp. NOTE: Producing bogs are limited by the Federal Market Order and all producers are members of the Wisconsin Cranberry Growers Association. A list of growers can be obtained from the association. Nonproducing bogs should be classed as swamp.

452 Tobacco - land used to produce tobacco.

453 Ginseng - land used to produce ginseng.

454 Muck - land composed of very poorly drained, organic soils. Typically muck is black or dark gray in color. Some of this land is cleared of natural vegetation, drained and used for producing mint, horseradish and potatoes. Some of the land has remained in natural vegetation.

455 Pond - a small body of water not surrounded by swampland.

456 All Other Agricultural Land Not Elsewhere Coded - all other specialty agricultural lands not included in the other 450 series will be included in this category.

450 Total Specialty Lands - total of specialty lands and other agricultural land not elsewhere coded in the 450 series of codes.

481 Agricultural River Frontage Value.

482 Agricultural Lake Frontage Value.

483 Agricultural Road Frontage Value.

484 Agricultural Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is "high and dry." This land may be agricultural.

480 Total Agricultural Frontage Value.

490 Agricultural Parcel Size Adjustment.

400 Total Agricultural Lands - this is a total of all tillable land plus total pasture and transitional land, orchards, cranberry bogs and agricultural homesites. The total for this code represents all land used for agricultural purposes.

501 Fallow 1st Grade Tillable Land - Code 411 lands left fallow.

502 Fallow 2nd Grade Tillable Land - Code 412 lands left fallow.

503 Fallow 3rd Grade Tillable Land - Code 413 lands left fallow.

504 Fallow Pasture Land - pasture land left fallow.

505 Total Fallow Lands - all fallow land.

511 Swamp - is water saturated land. The land is always low and usually displays small bodies or winding channels of open water. Organic soil texture and very high water tables are also characteristic of swamp.

512 Waste - can refer to many land features such as bedrock outcrops, extremely steep slopes (over 30%), slag piles, and other non-productive land.

513 Conservation Easements - these are normally lands in which a permanent easement either restricting farm use or for hunting and fishing rights are held either by the DNR or the Federal Fish and Wildlife Service. These lands would normally be classified as pasture or swamp and waste.

510 Total Swamp and Waste - is the total of 511, 512 and 513.

531 Quarries, Pits and Mines - these are quarries, pits and mines not listed on the SAM roll. If they are producing they may be listed on the SAM roll and carried as manufacturing. If they are not, they are classed as 531 whether they be non-producing or abandoned.

532 Privately Owned Sanitary Land Fills, Dumps, etc.

530 Total Quarries, Pits and Mines and Privately Owned Sanitary Land Fills, Dumps, etc. - is the total of 531 and 532.

540 Unmeandered Waters - Privately Owned Non-navigable - those that do not have their bounds established on the government survey. An example would be a non-navigable stream that has changed its course. The government survey would indicate land where the water now flows. This section would be unmeandered privately owned water. By the same token, the former river bed would be classed as unmeandered land.

581 Residual River Frontage Value.

582 Residual Lake Frontage value.

583 Residual Road Frontage Value.

584 Residual Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is "high and dry." This land may be residual.

580 Total Residual Frontage Value.

590 Residual Parcel Size Adjustment.

500 Total Residual Lands - the total of all residual land.

611 Primary Forest - land covered with productive timber; has excellent access; has utilities available; is high and dry.

612 Secondary Forest - small wooded pockets interspersed among tillable land; has poor access; is marginal in production.

613 Residual Forest - low and wet; nearly inaccessible.

614 Cutover - land in a transitional stage between forest and its next use; trees have been removed by logging.

610 Total Forest and Cutover - total of all forest lands coded in the 610 series of codes.

651 Seedlings - land planted in pines 0-3 feet tall where you cannot determine if ultimate use is logging or cutting Christmas trees.

652 Pine Plantation - land planted with unsheared pines for the purpose of logging.

653 Christmas Tree Plantation - land planted with sheared pines to be cut for Christmas trees. Shearing usually begins when trees are approximately 4 feet tall. Cutting usually occurs at 8-10 years maturity.

650 Total Seedling, Pine and Christmas Tree Plantations - total land planted in seedlings, pine or Christmas trees.

681 Forest River Frontage Value.

682 Forest Lake Frontage Value

683 Forest Road Frontage Value.

684 Forest Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is "high and dry." This land may be forest land.

Total Forest Frontage Value.

690 Forest Parcel Size Adjustment.

600 Total Forest Lands - is the total of all forest lands.

700 Other Homesites - includes all of the land under the buildings and area immediately surrounding them; land that is used for wells, septic systems, etc

811 Regular Forest Crop, Special Forest Crop, Managed Forest Land and Woodland Tax.

812 Utilities - this classification includes all utilities such as electric companies, gas companies, railroads, etc., subject to taxation under Chapter 76.

810 Total Specially Taxed Lands - reflects the total of specially taxed lands.

820 County Forest Crop - forest lands which have been entered by action of county boards under Sec. 28.10 into the forest crop program under Sec. 77. This land is listed in the assessment roll under County Forest Crop Acres.

830 Federally Owned - all of federally owned lands. If it is federally owned, it may be exempt from assessments. Examples are U.S. highways, federally owned forest, etc.

841 State Owned Meandered Waters - all navigable bodies of water are property of the state. Their bounds have been established on the government survey.

842 State Owned Navigable Waters - again, all navigable waters are property of the state. State owned navigable waters are those that have not had their bounds established on the government surveys. For example, new river channels or elevated lake levels may have occurred since the original government survey.

843 All Other State Owned - as the category implies. Examples are: state highways, state owned forests, conservation lands, etc.

840 Total State Owned - is the total of the 840 series.

850 County Owned - all county owned lands.

860 School Owned - all school owned lands.

870 Municipal Owned - includes such things as dumps and sanitary landfills if not privately owned. All municipal owned lands fall into this category.

881 Other Exempt - includes lands used for Lions Foundations, scouts, Bible camps, etc. (Sec. 70.11).

884 Exempt Unmeandered Land - land which, because of a change in the course of a river or a drop in the water level, now is "high and dry," this land may be exempt property belonging to a unit of government or may be part of a parcel qualifying for an exemption under Sec. 70.11.

880 Total Other Exempt and Exempt Unmeandered Land - is the total of 881 and 884.

880 Total, Other Lands - the total of all exempt lands.

900 Total Parcel - is the total acreage summation. For example, the 100, 200, 300, 400, 500, 600, 700, and 800 categories when added together, will equal the total parcel.

Percent Change

A parcel of land that was valued at $17,500 has been reassessed to a value of $21,400. What is the percent change in the valuation of the parcel? To calculate the percent change in any number, multiply the quotient of the difference between the two values of the number, divided by the base (previous) value of the number, by 100: percent change = 100 [(new value - base value)/base value].

The percent change in the value of the parcel above is 22.3%.

100[21,400 - 17,500)/17,500] = 100 [3,900/17,500] = 100 (.22285) = 22.3%.

Interpolation

Interpolation is a process whereby an unknown number between two given data points is determined. Interpolation assumes a linear relationship between data points. The process of interpolation will be illustrated in the calculations below.

The cost of a factory weighing scale is dependent on its weight capacity and surface area. The X-axis of this cost table shows the tonnage capabilities of the scale; while the Y-axis shows the square footage of the scale's surface. The tabular values are the cost of the scales associated with those pairs of criteria.

Factory Scales

X →		1	5	10	25	Tons
Y ↓						
Square	15	4,236	5,748	7,638	13,308	
Footage	30	5,147	6,510	8,214	13,326	
	48	6,516	7,578	8,906	12,889	
	63	7,275	8,256	9,482	13,160	
	75	8,130	8,936	9,942	12,962	

From the table, the cost of a 30 square foot, 5 ton capacity scale is $6,510. However, how is the cost of a 60 square foot scale with a one ton capacity determined? Although a cost for that scale is not shown on the table, it can be calculated by interpolation. The estimated cost for the 60 foot/1 ton scale will be between $6,516 and $7,275, the costs for the 48 and 63 square foot, one ton scales, respectively. Furthermore, the estimated cost will be closer to $7,275 than $6,516 since the desired scale's size is closer to 63 square feet than it is to 48 square feet. This cost will be the same proportionate distance between the two tabular limits for cost ($6,516 and $7,275) as the desired area of 60 is between the two tabular areas (48 and 63).

The difference between the desired area and the smallest area (60-48 = 12) and, total difference between the two tabular areas (63-48 = 15), are the first calculated. The difference between the two known costs is determined ($7,275-$6,516 = $759); and, that remainder is multiplied by the ratio of the area's differences: $759 x 12/15 = $607.20. This product is the proportionate amount that the estimated cost is above the cost associated with the lower area. Adding this amount to that cost ($6,516 + $607.20) results in an interpolated value for the 60 square foot/1 ton scale of $7,123.20.

This process is illustrated as follows:

Step:	Comment:
1. (60-48)/(63-48) = 12/15	ratio between areas
2. 7275 - 6516 = 759	difference between known costs
3. 759 x 12/15 = 607.20	difference times ratio
4. 607.20 + 6516 = 7123.20	product added to the lower cost = interpolated value

The interpolation in the above example occurred in the vertical axis of the table. Interpolation can also occur along the horizontal axis. For example, the cost of a 15 square foot scale with 4 ton capability is interpolated as follows:

1. (4-1)/(5-1) = 3/4 ratio between indices
2. 5748 - 4236 = 1512 difference between known costs
3. 1512 x 3/4 = 1134 difference times ratio
4. 1134 + 4236 = 5370 product added to the lower cost = interpolated value

What is the cost of a 35 square foot scale with a 7 ton capacity? Neither of the stated criteria for this scale are shown on the table. A double interpolation (both horizontal and vertical) must be performed in order to calculate the cost. The computations below, show that the sequence of the interpolation does not make a difference in the final estimate.

Horizontal:

1. 7-5)/(10-5) = 2/5
2. 8214 - 6510 = 1704
3. 1704 x 2/5 = 681.60
4. 681.60 + 6510 = 7191.60 [30 square foot/7 ton scale]
5. 8906 - 7578 = 1328
6. 1328 x 2/5 = 531.20
7. 531.20 + 7578 = 8109.20 [48 square foot/7 ton scale]
8. (35-30)/(48-30) = 5/18
9. 8109.20 - 7191.60 = 917.60
10. 917.60 x 5/18 = 254.89
11. 254.89 + 7191.60 = 7446.49 [35 square foot/7 ton scale]

Vertical:

1. (35-30)/(48-30) = 5/18
2. 7578 - 6510 = 1068
3. 1068 x 5/18 = 296.67
4. 296.67 + 6510 = 6806.67 [35 square foot/5 ton scale]
5. 8906 - 8214 = 692
6. 692 x 5/18 = 192.22
7. 192.22 + 8214 = 8406.22 [35 square foot/10 ton scale]
8. (7-5)/(10-5) = 2/5
9. 8406.22 - 6806.67 = 1599.55
10. 1599.55 x 2/5 = 639.82
11. 639.82 + 6806.67 = 7446.49 [35 square foot/7 ton scale]

Many statistical and financial calculators are able to estimate this linear function and interpolate a cost using simple linear regression. The X and Y values for the data pairs are entered into the calculator which is then used to estimate any other X or Y value. The calculator's handbook is the best source to determine if this process is possible on that machine.

Interpolation assumes a linear relationship exists throughout the table. The values in the table should be examined to see whether they vary at some constant rate, or with constant differences, or according to some other algebraic law. If the variation is not uniform, the reasonableness of the interpolation will be in question.

Extrapolation

Extrapolation is a process of estimating a value lying outside the range of data pairs given in a table.

What would be the cost of a 100 square foot scale of 5 ton capacity? The desired square footage is beyond the indices of the table. The use of a linear estimation process on a calculator mentioned above, is the easiest way to calculate this extrapolated cost.

Manually, extrapolation involves solving the linear equation for the estimated value of Y where: Y = A + Bx. For this equation, n = number of data pairs; A = mean (Y) - B[mean(X)]; and, B = [sum(XY) - (sum (X) sum(Y))/n]/[sum(X^2) - ((sum $(X)^2$)/n)]. Using the five costs from the five ton column as the Y values and their associated square footages as the X values, the following values can be calculated for A and B: B = 53.13; A = 4950.99.

Therefore, for an X of 100 square feet, the extrapolated cost for Y will be $10,263.99: [4950.99 + 53.13(100) = 10263.99].

The inherent danger in extrapolation, is the same as for interpolation. A linear relationship is assumed to exist throughout (and beyond) the table's data pairs. The extrapolated value of $10,264 for the 100 square foot/5 ton scale is accurate for the values and relationships assumed for the data pairs on the cost table. However, those assumptions may be wrong for data pairs outside the lower and upper limits of the table. Therefore, extrapolation, if done at all, should be performed with extreme caution; and, with the understanding that the reliability of extrapolated value will be subject to question.

Cash Equivalent Financing

The definition of market value is the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

1. Buyer and seller are typically motivated;
2. Both parties are well informed or well advised, and acting in what they consider their own best interests;
3. A reasonable time is allowed for exposure in the open market;
4. Payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and
5. The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

The best indication of market value would be an arm's-length sale of the property paid for totally in cash if, according to professionally accepted appraisal practices, the sale conforms to recent arm's-length sales of reasonably comparable property. However, because of the large dollar amounts involved in real estate transactions, strictly cash sales are rare. In most transactions, the buyer pays a portion of the sales price in cash and borrows the

remainder. The seller rarely keeps all of the purchase price. The seller usually has a mortgage and a real estate commission to pay. In addition, both the buyer and seller may have to pay closing costs.

The process of cash equivalency is to analyze the transaction, to determine whether or not any of the financing conditions had an effect on the sales price, and to determine the amount that the sales price was affected. Cash equivalency assumes that through this process the transaction can be adjusted to a cash amount that is indicative of market value. The cash equivalency process is designed to adjust only financial items. This process is not designed to adjust those items that make the transaction a non-arm's-length transaction. For example, this process does not attempt to make adjustments for the length of time that the property was on the open market, that the buyer or seller was not knowledgeable, or that the buyer or seller was compelled to act.

The purpose of this section is to explain the basis for the adjustments for cash equivalency, what elements of a transaction do and do not need adjustment, and how to make the various adjustments. Note: When using the comparable sales approach, the cash equivalent adjustment must be made before making any other adjustments.

Basis for Cash Equivalency

There are several reasons for making cash equivalent adjustments. Cash equivalent adjustments are required by statute, by court case, and by appraisal theory. In *State ex. rel. Flint v. Kenosha County Rev. Bd.*, 126 Wis. 2d 152, 376 NW 2d 364, (1985), the court held that the law requires the use of the cash equivalency adjustment in assessing real property based upon the sale of comparable properties.

Section 70.32, Wis. Stats., directs the assessor to use professionally acceptable appraisal practices. Appraisal theory states that there may be a difference between sales price and market value. The arm's-length sale of a property is the best evidence of market value. However, not all sales are arm's-length. For example, the sale between a parent and child, is usually not an arm's-length sale. Even a sale that is arm's-length may not be market value. For example, a sale that is not recent will not represent market value; but, may be adjusted to show the effect of time on the sales price and, thus, become an indication of market value. Similarly, a property may sell for a price that is influenced by the financing terms. By making the adjustment as outlined in this section, the assessor can adjust this sale so that it becomes an indication of market value.

Sales Not Needing Adjustment

Not every sale needs adjustment. Nor does every condition of a sale need adjustment. It is important that the assessor realizes what elements or conditions of a sale are "typical" of the market place and for which no adjustments need be made. It may be helpful to describe what a typical, or usual, transaction involves. A property owner lists the property with a real estate broker for a specific price. Either that broker or another broker produces a buyer who makes an offer at a price that is acceptable to the seller. This process may involve offers from several different buyers or offers and counter-offers between the buyer and the seller. The buyer agrees to pay a certain percentage of the sales price in cash and obtains

the balance as a loan from a bank, savings and loan, credit union, or other third-party that is in the business of making real estate loans. At the closing, the seller receives the money, pays a commission to the real estate broker, pays off any outstanding mortgages on the property, and keeps the balance. Unless there is some unusual circumstance connected with this transaction, the sales price should need no adjustment to be an indication of market value. The sales price may need adjustment for such items as number of bedrooms, size, location, etc. in order to be used as an indication of market value for other properties.

Typical Financing

The buyer in this transaction obtains a loan from a bank, savings and loan, credit union, or other third party that is in the business of making real estate loans. Because few transactions are strictly cash, most purchasers obtain a loan to cover part of the purchase price. This is typical of the real estate market and the assessor need make no adjustment for this.

Closing Costs

Closing costs are fees usually expressed as a percentage of the loan amount charged to the buyer by the financial institution to cover the costs of processing the loan. These costs include an appraisal of the property, legal fees, survey, credit checks, and other costs associated with the processing of the loan. Since these costs are based on the loan and do not affect the sales price, no adjustment need be made for them. Closing costs should not be confused with seller's points which do affect the sales price and will be discussed later.

Real Estate Commissions

Real estate commissions are the fees paid to the broker by the seller for bringing about the sale of the property. The commission is usually expressed as a percentage of the sales price and varies depending on the type of property involved and can vary from broker to broker. The real estate commission is considered an economic cost of acquiring the property and no adjustment need be made for it.

Properties sold by the owner will require a more thorough analysis. An owner who is knowledgeable and willing to devote a sufficient amount of time and energy should be able to receive a price close to or the same as if sold through a broker. If the seller could only obtain the same price as the broker less the commission, a prudent seller would not waste the time and effort necessary to sell the property without a broker. A prudent buyer should be willing to purchase a property for the same or nearly the same amount whether it is sold by the owner or through the broker. However, not all buyers and sellers are prudent. Therefore, the assessor will have to analyze each transaction not involving a broker to determine whether this affected the sales price. Any adjustment made for this situation should be made after the cash equivalency adjustment.

Income Tax Considerations

Income tax considerations can influence the structuring of the real estate transaction. One party may wish to structure the transaction so that some taxes are deferred, some taxes are treated as capital gains, or some of the price can be classified as a deductible expense. Although income tax considerations can and do play a role in the structuring of the transaction, they rarely influence the sales price of the property and, therefore, have no influence on the cash equivalency adjustment.

Title Insurance

Title insurance is often required by lending institutions to protect against any loss because of a defect in the title. This is not a part of the real estate transaction and has no affect on the sales price.

Transfer Fee

The sale of real estate usually requires the filing of a new deed with the County Register of Deeds. A transfer fee of 30¢ per $100 is required for all recordings except those exempted by statute. Although the transfer fee is based on the sales price or estimate of value, the fee has no affect on the sales price and no adjustment need be made for it.

Sales Needing Adjustment

The conditions of the sale that need adjustment are those noncash items that either have an affect on the sales price or are not expressed in cash. Remember, the purpose of the cash equivalency adjustment is to convert noncash items into their worth as cash in order to arrive at a market value estimate of the worth of the property. The noncash items can be divided into either tangible or intangible items.

Tangible Items

Some real estate transactions will include such items as real estate, automobiles, boats, jewelry, furniture, and other items of tangible property as part of the purchase price. In many cases a recent appraisal of the real estate will have been made. The assessor should review the appraisal to be sure that it represents market value. If there is no appraisal or the appraisal does not represent market value, the assessor will have to make a market value estimate of the property. Similarly, for the other tangible items, appraisals may exist for these items or, the assessor should consult “blue books” or experts in these fields for estimates of the worth of the property.

Intangible Items

Intangible items are items that have little worth in and of themselves but are representative of greater worth. Money is an intangible item in that the worth of $100 does not represent the value of the paper or metal coins involved. This section gives a brief explanation of different intangible items that may be involved in a cash equivalency transaction.

Seller's Points

Seller's points are additional percentages of the loan amount paid by the seller to enable the purchaser to obtain a loan through guaranteed loan programs such as the Veteran's Administration (VA) or Federal Home Administration (FHA). These programs restrict the maximum interest rate that a lending institution can charge the borrower. This rate is usually less than the current rate being charged by the institution. For the institution to achieve the desired rate, it charges points (a point is one percent of the loan amount). The points increase the yield that the lending institution receives to an amount equivalent to a loan at the market interest rate. Federal law prohibits the buyer from paying points. Therefore, the seller has to pay them. The seller usually either raises the selling price or does not reduce the asking price as much as the seller would for a "cash" sale. Either way the sales price is higher than it would be for a normal transaction and, thus, requires a cash equivalent adjustment.

Stocks and Bonds

Stocks and bonds represent ownership or liens on businesses and other property. Stocks and bonds have a par or face value on the certificates. However, this is not necessarily market value and thus, requires a cash equivalent adjustment.

Assumed Mortgages

The seller usually must pay off any existing mortgage at the time of the sale. In some cases, the buyer may be allowed to continue the payments as if nothing had happened. This is called an assumed mortgage and can be advantageous to the buyer provided that the interest rate is below the current market rate. Because the assumed interest rate is less than the market interest rate, a cash equivalent adjustment is necessary. The purchaser still has to make a down payment to the seller and often obtain additional financing. Most mortgages written currently do not allow for loan assumption. Those that do usually require a fee from the purchaser that provides the lender with the same return as a current mortgage.

Blended Mortgages

A blended mortgage takes the outstanding mortgage loan balance and interest rate and the new loan amount and interest rate and blends them into one mortgage. This is usually done by weighing the loan balances by the interest rate of each loan to come up with a new interest rate. Since the existing interest rate is below the current market rate, a cash equivalent adjustment is necessary.

Wrap-Around Mortgage

A wrap-around mortgage is subordinate to but inclusive of an existing mortgage(s) on a property. In general, a third-party lender refinances the property by assuming the existing mortgage (and its debt service) and "wraps around" a new junior mortgage. The wrap-

around lender extends to the borrower an amount equal to the difference between the balance outstanding on the existing mortgage(s) and the face amount of the new loan.

An alternative "wrap-around" is when the seller continues to pay off the existing institutional loan while the buyer makes payments on a seller financed loan. This allows the buyer the advantage of continuing the payments on an existing mortgage at a lower interest rate. In either case, since part of the mortgage is at a below market interest rate, a cash equivalent adjustment is necessary.

Land Contracts

Land contracts are seller carried loans at a less than market interest rate. They are usually for a short-term (usually 3-4 years) at which time the buyer obtains a loan from an institutional lender. The sales price is usually raised to compensate the seller for the below market interest rate. The buyer gets to pay the below market interest rate for several years in anticipation of interest rates being lower when the time comes to obtain an institutional loan. The use of the land contract also enables the buyer to purchase a property with a smaller down payment than an institutional lender would require. The balance of the purchase price due at the end of the land contract is often referred to as a "balloon" payment. Since the loan is made at a below market interest and the sales price raised because of it, a cash equivalent adjustment is necessary.

Subsidized Down Payment

Many of today's mortgages require the buyer to make a substantial down payment. In order to allow the buyer to purchase the property, the seller will provide the down payment at a below market interest rate. The balance of the purchase price is financed through an institutional lender. Because the seller makes the loan at a below market interest rate, a cash equivalent adjustment is necessary.

Interest Only Payments, Then Equal Amortization

In this type of financing, the buyer makes only the interest payment on the mortgage for several years. No principal payments are made. At the end of this period, the buyer makes amortization payments to cover both the principal and interest. This is done by a buyer who hopes that either interest rates will come down in several years or that the buyer's income will rise enough over several years to cover the interest and principal payments. Because the buyer is making lower payments than normal, a cash equivalent adjustment is necessary.

Steps in the Cash Equivalent Adjustment

Determining the Date of Adjustment

It is important that the assessor make sure that all data regarding the cash equivalent adjustment reflect the actual conditions on the date of sale. Interest rates, the availability of mortgage money, mortgage terms and conditions, and the value of noncash items will change over time. Therefore, the assessor must make sure that the cash equivalent

adjustment reflects the conditions on the date of the sale. This date is established from the date of conveyance entered on the real estate transfer return. The closing date and transfer date could be several months after the sales terms were agreed upon and conditions may have changed since then.

Identify the Noncash Components

In this step, the assessor determines what noncash items (both tangible and intangible) are involved in the transaction. This would be all elements except cash and include real property, personal property, assumed loans, new loans, seller's points, stocks and bonds, and other items.

Ascertain the Face Value and Market Value of the Noncash Components as of the Date of Sale

In this step, the assessor determines the face value of any new mortgages and the outstanding balance of any assumed loans. The face value of new loans will be stated in the note and the outstanding balance of an existing loan can be readily calculated. The market value of stocks and bonds can be looked up in various financial papers. The market value of automobiles can be looked up in various "blue books." The market value of real estate, paintings, jewelry, etc. should have been established by appraisals done near the date of sale. If no appraisals were made, the assessor will either have to make an appraisal or consult an expert in that field to determine the market value of the item.

Determine the Terms and Conditions of the Financing

In this step, the assessor determines the interest rate, down payment, amortization period, number of payments, timing of payments, seller points, and balloon for the loan, land contract, or other financing instrument.

Determine the Terms and Conditions of Typical Financing

In this step, the assessor determines the same items as in the previous step that are typical or normal for the marketplace. The assessor should talk to real estate brokers, lenders, and appraisers to determine what is typical for the municipality for that type of property. The Department recommends using the Federal Land Bank interest rate for most preferred borrowers adjusted to reflect the required cost of stock purchase as the typical interest rate for agricultural property.

Make the Adjustment as Needed

In this step, the assessor makes the calculations necessary to determine the value of the cash equivalent financing. Specific examples are given in the next section. The assessor must have access to Compound Interest Tables to make the adjustment.

Determine the Cash Equivalent Value of the Property

In this step, the assessor adds the cash equivalent value of all noncash items to any cash payments to arrive at the cash equivalent value of the property.

Examples of Cash Equivalent Adjustments

This section gives examples of how to apply the steps listed in the previous section to the various financing conditions of the sale that need adjustment. Some of the examples will be applicable to more than one situation and will be so identified.

Seller Points

Seller points are charged when the lending institution has to make a below market loan (VA or FHA) and charges the seller points (one point equals one percent) to give the lender the equivalent of the market interest rate. The points are charged on the loan amount and should be subtracted from the purchase price to yield the cash equivalent value. In this example, the purchase price is $100,000, the buyer obtains a 95 percent loan, and the seller must pay 4 points.

Purchase Price	$ 100,000
Less: Down Payment	– 5,000
Loan Amount	95,000
	X .04
Seller Points	$ 3,800
Purchase Price	$ 100,000
Less: Seller Points	– 3,800
Cash Equivalent Value	$ 96,200

Discounting Payments

This adjustment is made when the buyer obtains a below market interest rate. The assessor calculates the payment at the below market interest rate. This is done by multiplying the loan amount times the periodic payment factor at the below market interest rate (from column 6 of the Compound Interest Tables). The payment is then divided by the periodic payment factor at the market interest rate. In this step, the assessor determines what loan amount at the market interest rate would require the same monthly payment as the below market loan. This result is the cash equivalent value of the financing. This amount is added to the down payment to yield the cash equivalent value of the transaction

NOTE: For information on the use of Compound Interest Tables, please refer to the Appendix in this Manual. In the following examples CEV stands for Cash Equivalent Value. PPF stands for Periodic Payment Factor.

Assume that a buyer purchases a property for $100,000 with a 25 percent down payment, a 20 year term, at an 8 percent rate of interest. All conditions are normal except that the market interest rate is 10 percent. All payments are assumed to be monthly.

Purchase Pr	$	100,000		
Less: Down Payment	–	25,000		
Loan Amount		75,000		
PPF (20 years @ 8%)	x	.008364		
Monthly Payment	$	627.30		
PPF (20 years @ 10%)	÷	.009650		
CEV of Financing	$	65,005.18		
Down Payment	$	25,000.00		
CEV of Financing		65,005.18		
CEV of Transaction	$	90,005.18	Rounded	$ 90,000

An alternative method to determine the cash equivalent value is to calculate the monthly payment as above and then to determine the present value of this income stream at the market interest rate by multiplying the monthly payment by the factor from column 5 of the Compound Interest Tables at the market interest rate.

Purchase Price	$	100,000		
Less: Down Payment	–	25,000		
Loan Amount		75,000		
PPF (20 years @ 8%)	x	.008364		
Monthly Payment	$	627.30		
PV Coefficient (20 years @ 10%)	x	103.624619		
CEV of Financing	$	65,003.72		
Down Payment	$	25,000.00		
CEV of Financing		65,003.72		
CEV of Transaction	$	90,003.72	Rounded	$ 90,000

Both methods produce the same result and can be used in valuing assumed mortgages, land contracts, or any financing at below market interest rates. This procedure will be used as part of the process of determining the cash equivalent value in several of the following procedures.

Mortgage With Balloon

This type of financing involves payments at a below market interest rate with final payment of the balance at some time in the future. This is usually done in hopes that in several years the interest rate will drop enough for the buyer to finance the loan with a typical lending institution. This is done by discounting the payments (as done in the previous example) for the length of the below market interest rate loan. The next step is to determine the present worth of the payments to be made to the lending institution. This is done by multiplying the monthly payment times the Present Value of an Annuity (from column 5 of the Compound Interest Tables). Since these payments will not begin for several years, the present value of this income stream must be calculated by multiplying the present value, determined in the previous step by the Present Value of a Reversion factor

(from column 4 of the Compound Interest Tables) at the market interest rate at the time of sale. Then add the down payment, the discounted payments, and the present value of the reversion to determine the cash equivalent value of the transaction.

Assume: The purchase price of the property is $100,000. The seller will carry the loan for 5 years based on an 8 percent loan for 20 years. At the end of 5 years, the buyer anticipates getting a loan from a lending institution at 8 percent for the remaining 15 years. The current market interest rate is 10 percent. The buyer also makes a 10 percent down payment.

Purchase Price	$	100,000
Less: Down Payment (10%)	–	10,000
Loan Amount	$	90,000
PPF (20 years @ 8%)	x	.008364
Monthly Payment}	$	752.76
PPF (5 Years @ 10%)	÷	.021247
CEV of Discounted Payments	$	35,429

Value of the Balloon:

Monthly Payment (as calculated above)	$	752.76
PV Coefficient (15 yrs @ 8%)	x	104.640591
PV of Income Stream	$	78,769.25
PV of Reversion (5 yrs @ 10%)	x	.607788
CEV of Balloon	$	47,875.01
Down Payment	$	10,000.00
CEV of Discounted Payments		35,429.00
CEV of Balloon		47,875.01
CEV of Transaction	$	93,304.01

Rounded $ 93,300

Assumed Mortgage and Conventional Mortgage

When a mortgage is assumed it rarely provides the total amount that the buyer needs to borrow. The buyer will need to obtain an additional loan for the balance of the purchase price. The cash equivalent value is calculated by determining the present worth of the remaining income stream for the assumed mortgage and adding it to the value of the new loan, assuming it is at the market interest rate, and the down payment.

Assume: The purchase price is $100,000. The buyer makes a down payment of 10%, or $10,000. The buyer assumes a mortgage which was written 5 years ago for $50,000 for 20 years at 8% and has a remaining balance of $43,750. The buyer also obtained a mortgage from a lending institution for the remainder of the purchase price, $46,250, for 20 years at the market interest rate of 10%.

Assumed Mortgage Original Amount	$	50,000.00	
PPF (20 years @ 8%)	x	.008364	
Monthly Payment		418.20	
PPF (15 years @ 10%)	÷	.010746	
CEV of Assumed Mortgage	$	38,916.81	
Down Payment		10,000.00	
Face Value of New Mortgage		46,250.00	
CEV of Assumed Mortgage		38,916.81	
CEV of Transaction	$	95,166.81	Rounded $ 95,200

If the buyer obtained the new mortgage at a below market interest rate, the assessor would use the Discounting Payments procedure as previously explained to determine the cash equivalent value of the new mortgage. The assessor would add this value to the cash equivalent value of the assumed mortgage and the down payment to determine the cash equivalent value of the transaction.

Blended Mortgage

A blended mortgage has the same principle as the previous example except that the two separate mortgages are weighted or "blended" into one new mortgage at a below market interest rate. The assessor discounts the payments for this new mortgage and adds it to the down payment to determine the cash equivalent value of the transaction. For this example we will assume the same conditions as the previous example. Determining the blended rate:

Assumed Mortgage	$ 43,750	÷	$ 90,000	=	48.6%
New Mortgage	$ 46,250	÷	$ 90,000	=	51.4%
	$ 90,000				100.0%

Assumed Mortgage Rate	8%	x	48.6%	=	3.9%
New Mortgage Rate	10%	x	51.4%	=	5.1%
Blended Rate					9.0%

Purchase Price	$ 100,000	
Less: Down Payment	– 10,000	
Loan Amount	90,000	
PPF (20 years @ 9%)	x .008997	
Monthly Payment	809.73	
PPF (20 years @ 10%)	÷ .009650	
CEV of Financing	$ 83,909.84	
CEV of Financing	$ 83,909.84	
Down Payment	– 10,000.00	
CEV of Transaction	$ 93,909.84	Rounded $ 93,900

The cash equivalent value obtained by this method is slightly different from the results obtained in the previous example because the buyer assumed a mortgage with a 15 year term in the previous example. The blending of that mortgage into a 20 year mortgage in this example lowers the present value of the financing because the assumed loan in the previous example is recovered over a shorter period of time and thus has a higher value than the blended loan.

Interest Only Payments, Then Equal Amortization

In this financing arrangement, the buyer makes only the interest payments on the mortgage for a certain period of time. At that time, the buyer pays equal amortization payments over a period of time to pay off the mortgage. The assessor discounts the interest payments as done in previous examples. The assessor also discounts the amortization payments and, since they do not start for several years, the assessor must determine the present worth of the income stream deferred for several years. The assessor adds the cash equivalent value of the two income streams to the down payment to determine the cash equivalent value of the transaction.

Assume: The purchase price is $100,000 and the buyer makes a 20 percent down payment. The buyer makes interest only payments for three years, then amortization payments for 15 years, both at 8 percent interest. The market rate of interest is 10 percent.

Purchase Price	$ 100,000		
Less: Down Payment	– 20,000		
Loan Amount	$ 80,000		
Interest Rate	x .08		
Annual Interest Payment	$ 6,400		
	÷ 12		
Monthly Payments	533.33		
PV Annuity Factor (3 yrs @ .10)	x 30.991235		
CEV of Interest Payments	16,528.56		
Loan Amount	$ 80,000		
PPF (15 years @ 8%)	x .009557		
Monthly Payment	764.56		
PPF (15 years @ 10%)	÷ .010746		
Deferred Value Income Stream	$ 71,148.33		
PV of Reversion (3 yrs @ 10%)	x .741739		
CEV of Amortization Payments	$ 52,773.49		
Down Payment	$ 20,000.00		
CEV of Interest Payments	16,528.56		
CEV of Amortization Payments	$ 52,773.49		
CEV of Transaction	$ 89,302.05	Rounded	$ 89,300

Subsidized Down Payment

Many of today's mortgages require the buyer to make a substantial down payment. In order to allow the buyer to purchase the property, the seller may provide part or all of the down payment at a below market interest rate. The balance of the purchase price is financed through a lending institution. The assessor discounts the payments on the seller financed down payment and adds it to the buyer's down payment and the loan amount.

Assume: The purchase price is $100,000. The buyer makes a $5,000 down payment. The seller finances an additional $15,000 down payment at 8 percent for 10 years. The balance of the purchase price is covered by a loan with a lending institution at the market interest rate of 10 percent.

Purchase Price		$ 100,000		
Less: Buyer's Down Payment	5,000			
Seller Subsidized Payment	15,000			
		- 20,000		
Mortgage Amount		$ 80,000		
Seller Subsidized Down Payment		15,000		
PPF (10 years @ 8%)		x .012133		
Monthly Payment		$ 182.00		
PPF (10 years @ 10%)		÷ .013215		
CEV of Subsidized Down Payment		$13,772.23		
CEV of Subsidized Down Payment		$13,772.23		
Buyer's Down Payment		5,000.00		
Mortgage Amount		80,000.00		
CEV of Transaction		$98,772.23	Rounded	$ 98,800

Note: In some cases, part or all of the buyer's down payment will be financed by the buyer's parents, other relatives, or some other source. Unless this financing has some effect on the purchase price, no adjustments need to be made.

Summary

Cash Equivalent Financing adjustments are made to recognize the effect of below market interest rates and other forms of "creative financing" on the purchase price of a property. This adjustment has been recognized in various statutes and court cases. This adjustment must be made before any other adjustments are made when using the comparable sales approach.

This section has differentiated between those items of a transaction that do not need adjustment and those items that do need adjustment. This section also describes the steps necessary in the cash equivalent adjustment process and gives examples of various types of adjustments. This section is not meant to cover all possible cash equivalent transactions. Buyers, sellers, investors, and brokers are constantly developing new methods of structuring the real estate transaction. This section is intended to provide the assessor with

a basic understanding of the cash equivalent process and how to apply it to the more common situations.

Summary

The actual listing of property consists of making the following entries on the property record cards and assessment roll:

- Name of owner
- School district in which each tract lies
- Statutory classification of each tract according to its use
- Legal description of tract and number of acres

Statutory Provisions are Directory

Section 70.555, Wis. Stats., states that "directions herein given for the assessing of lands and personal property and levying and collecting taxes shall be deemed directory only, and no error or informality in the proceedings of any of the officers entrusted with the same, not affecting the substantial justice of the tax, shall vitiate or in anywise affect the validity of such tax or assessment." In 38 Opinion of Attorney General 600 (1949) it was held that errors in descriptions in the tax roll were considered as not affecting the substantial justice of the tax and were subject to correction under sec. 74.61, Wis. Stats., or cancellation action by the county board with charge back of tax under sec. 75.25, Wis. Stats.

Sources

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Hoag, John S. *Fundamentals of Land Measurement*. Chicago Title Insurance Company. Chicago, Illinois, 1977.

Illinois Property Tax Mapping Manual. Department of Local Government Affairs. Springfield, Illinois.

International Association of Assessing Officers. *Improving Real Property Assessment, A Reference Manual*. Chicago, Illinois, 1978.

International Association of Assessing Officers. *Property Assessment Valuation*. Chicago, Illinois, 1977.

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Moyer, David D. and Fisher, Kenneth Paul. *Land Parcel Identifiers for Information Systems*. American Bar Foundation, 1973.

North American Institute for Modernization of Land Data Systems. *Land Data Systems Now: Proceedings of the Second MOLDS Conference*. American Congress on Surveying and Mapping, 1979.

Schenkel, William M. *Modern Real Estate Principles*. Dallas, Texas: Business Publications, Inc. 1977.

Sources of Maps Useful to the Assessor

Aerial Photographs: United States Department of Agriculture Agricultural Stabilization and Conservation Service (There is an ASCS office in each county in the state) Special Services Wisconsin Department of Transportation Room 5B P.O. Box 7916 Madison, Wisconsin 53707-7916 (608) 266-7809 Regional and/or County Planning or Zoning Office	**Contour Maps:** University of Wisconsin Geological and Natural History Survey 3817 Mineral Point Road Madison, WI 53705 (608) 263-7389 **Government Surveys:** Board of Commissioner of Public Lands 125 South Webster Street P.O. Box 8943 Room 200 Madison, WI 53708-8943 (608) 266-1370 University of Wisconsin Geological and Natural History Survey Madison, Wisconsin 53706
Base or Section Maps: County Clerk's Office County Real Property Lister County Surveyor's Office Regional and/or County Planning or Zoning Office State Cartographer's Office (See Computerized Mapping listing below)	**Highway Maps:** Department of Transportation Division of Highways Document Map Sales 3617 Pierstorff Street Madison, WI 53707 (608) 246-3265
Certified Surveys: County Register of Deeds Office County Surveyor's Office	**Lake Maps:** The Clarkson Map Company P.O. Box 218 Kaukauna, WI 54130 (920) 766-3000
Computerized Mapping Information: State Cartographer's Office 160 Science Hall 550 N. Park Street University of Wisconsin Madison, WI 53706-1491 (608) 262-3065 E-mail: sco@facstaff.wisc.e	**Planimetric Maps:** University of Wisconsin Geological and Natural History Survey See Above Listing

Plat Books: Commercial Mapping Companies County Clerk's Office County Real Property Lister Rockford Map Publishers, Inc. P.O. Box 6126 Rockford, IL 61125-6126 (815) 399-4614	**Soil Survey Maps:** United States Department of Agriculture Farm Service Agency Natural Resources Conservation Service (There are ASCS and NRCS offices in each county in the state.) USDA-Natural Resources Conservation Service 6515 Watts Road, Suite 200 Madison, WI 53719 (608) 264-5341 University of Wisconsin Extension Services County Office
Recorded Subdivisions: County Surveyor's Office County Register of Deeds Office	**Topographic Maps:** University of Wisconsin Geological and Natural History Survey 3817 Mineral Point Road Madison, WI 53705 (608) 263-7389 (Madison-area maps only)
Soil Association Maps: United States Department of Agriculture Natural Resources Conservation Service (There is an NRCS office in each county in the state.) University of Wisconsin Geological and Natural History Survey 3817 Mineral Point Road Madison, WI 53705 (608) 263-7389	**Wetland Maps:** United States Department of Agriculture Natural Resources Conservation Service/Soil Conservation Service (There is an NRCS/SCS office in each county in the state.)

Definition of Terms Used in Surveys and Descriptions

A **magnetic meridian** is the direction in the horizontal plane taken by a magnetized needle when it comes to rest in the earth's magnetic field.

A **true meridian** is that meridian through a given point joining the north and south poles of the earth's axis.

An **assumed meridian** is the direction chosen by consideration of convenience for any particular survey, locality, or purpose.

The **declination** of the needle is the angle, which that line makes with its reference meridian, whether the meridian be a true, magnetic or assumed meridian.

The **bearing** of a line is the angle, which that line makes with its reference meridian, whether the meridian be a true, magnetic, or assumed meridian.

The **magnetic bearing** of a line is the acute angle that it makes with the magnetic meridian.

The **true bearing** of a line is the acute angle that it makes with the true meridian.

The **azimuth** of a line is the clockwise angle that it makes with the north end of a true or assumed meridian.

The sum of the interior angles of any closed figure is always 360 degrees.

Each **degree** consists of 60 minutes.

Each **minute** consists of 60 seconds.

A **circle** is that set of all points a given distance from a given point.

The given point of a circle is called the **center** of the circle.

The **radius** of a circle is a straight line drawn from the center of the circle to any given point on the circle.

The **circumference** of a circle is the length of the circle, or the distance around the circle.

A **chord** of a circle is a straight line whose end points lie on the circle. (If the line also passes through the center of the circle, the common reference is then diameter.)

An **arc** is that part of a circle measured between two given points on the circle.

A **central angle** of a circle is an angle whose vertex is the center of the circle and whose sides contain two radii.

A **secant** is a straight line that extends beyond the circle but intersects the circle at two points.

A **tangent** is a straight line that intersects a circle at only one point.

The **point of tangency** is that point at which a tangent intersects a circle.

An **interior angle** is an angle formed by two lines which angle is enclosed by the other sides of a closed figure.

An **exterior angle** is an angle formed by two lines which angle is not enclosed by the other sides of a closed figure.

A **deflection angle** is that angle which any line makes with the proceeding line, if the proceeding line were extended. A deflection angle may be to the right or to the left and any reference to the deflection of an angle must indicate whether it is to the right or left. This is indicated by use of the letter R or L.

An **angle to the right** is the clockwise angle at any vertex between the back line and the forward line.

A line that is drawn **perpendicular** to another line is one which forms an exact angle of 90 degrees with its reference line.

Two lines that are **parallel** to each other remain the same distance apart for their entire length.

On the drawing of a circle,

Point O is the center of the circle.

Point T is the point of tangency of the tangent line ATG.

Line DOT is the diameter of the circle.

Line RO is a radius of the circle.

Line SROE is a secant of the circle.

Line ATG is a tangent of the circle.

Line RT is a chord of the circle.

The distance from R to point T measured on the circle is an arc of the circle.

The angle formed by the intersection of the lines
RO and OD is a central angle of the circle.

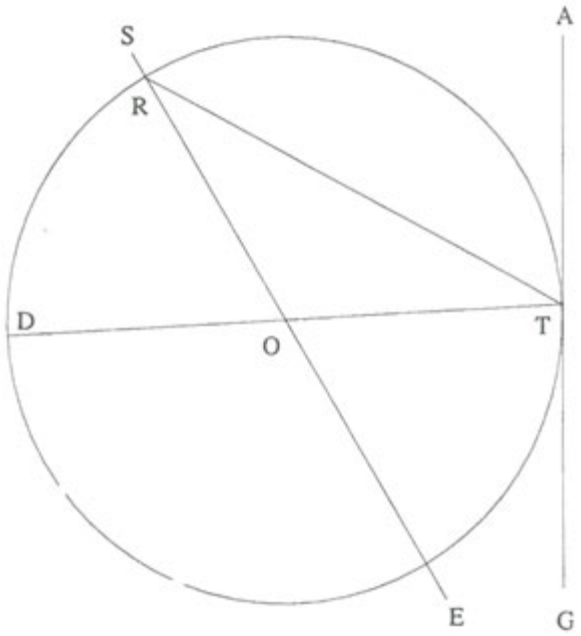


Table of Measures

Linear Measure

1 foot ..... 12 inches
1 yard ..... 3 feet or 36 inches
1 rod ..... 5 1/2 yards or 16 1/2 feet or 198 inches
1 furlong ..... 40 rods or 220 yards or 660 feet or 7,920 inches
1 mile ..... 5,280 feet or 63,360 inches

Surveyor's Linear Measure

1 link ..... 7.92 inches
1 rod ..... 25 links
1 chain ..... 4 rods or 100 links or 66 feet
1 furlong ..... 10 chains
1 mile ..... 8 furlongs or 80 chains or 320 rods

Square Measure

1 square foot ..... 144 square inches
1 square yards ..... 9 square feet or 1,296 square inches
1 square rod ..... 30 1/4 square yards or 272 1/4 square feet or 625 square links
1 square chain..... 16 square rods
1 acre..... 10 square chains or 160 square rods or 4,840 square yards or 43,560 square feet
1 square mile ..... 640 acres

Cubic Measure

1 cubic foot ..... 1,728 inches
1 cubic yard..... 27 cubic feet
1 cord foot..... 16 cubic feet
1 cord of wood ..... 8 cord feet or 128 cubic feet
1 perch of stone or masonry ..... 24 3/4 cubic feet

Angles and Arcs

1 minute..... 60 seconds
1 degree..... 60 minutes
1 right angle..... 90 degrees
1 quadrant ..... 90 degrees
1 circumference..... 360 degrees

Other Measurements

1 span..... 9 inches
1 hand ..... 4 inches
1 knot ..... 6,086 feet
1 fathom ..... 6 feet
1 stone..... 14 pounds

Scale Conversions

Scales	Foot/Inch	Miles/Inch	Acres/Sq. inch
1:20,000	1,666.667	0.316	63.769
1:24,000	2,000.00	0.379	91.827
1:31,680	2,640.00	0.500	160.00
1:48,000	4,000.00	0.758	367.309
1:62,500	5,208.33	0.986	622.744
1:125,000	10,416.667	1.973	2,490.980
1:250,000	20,833.333	3.946	9,963.907
1:500,000	41,666.667	7.891	39,855.627
1:1,000,000	83,333.333	15.783	159,422.507

Scale Conversion Formulas

Foot/Inch =	Scale	Mile/Inch	Scale		
	12	=	63,360		
Inch/Mile =	63,360	Ac/Sq.in.	$(Scale)^2$		
	Scale	=	43,560	x	144

Meters/In. = Ft./In. x 0.3408

Computing acreage

In computing acreage there are several formulas that can be used.

1. Multiply the length by width and divide the answer by 43,560 (square feet in one acre). That gives the number of acres in a parcel.

2. If a legal description is in acreage and one dimension of the property is known: multiply the number of acres by 43,560; divide by the known dimension to get the second dimension of the parcel.

2. If dimensions of a parcel are both in chains, multiply length by width and divide by 10 for number of acres.

3. If dimensions of a parcel are both in rods; multiply length by width and divide by 160 for number of acres.

Subdivision Possibilities of an Acre of Land Into Lots

Size of lot in feet	Width of street in feet	Width of alley in feet	Length of block in feet	Number of lot per acres	Percent of area saleable
25 x 100	40	12	350	12.37	71
25 x 100	60	20	300	10.64	61
25 x 125	66	16	594	9.44	68
30 x 110	45	12	360	9.30	70
33 x 132	50	12	330	7.00	70
37 ½ x 125	50	12	375	6.57	70
40 x 140	50	12	320	5.50	70
40 x 140	60	12	320	5.12	66
50 x 150	50	12	400	4.18	72
50 x 150	60	12	400	4.07	70
55 x 165	55	12	385	3.49	72
66 x 198	50	No	462	2.67	80

Areas of Plane Surfaces

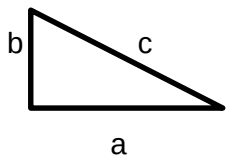
Nomenclature

a, b, c, d	–	Length of sides
A	–	Area
d, d_1, d_2	–	Diameters
e, f	–	Length of diagonals
h	–	Vertical height or altitude
n	–	Number of sides
p	–	Perimeter
r_1, r_2, R	–	Radii

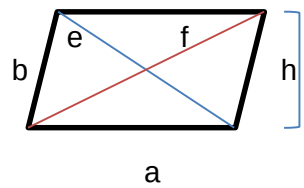
General Parallelogram or Rhomboid
And Rhombus
Rhomboid – opposite sides parallel
p = 2 (a + b)
$e^2 + f^2 = 2(a^2 + b^2)$
A = ah

Rhombus – opposites sides parallel and all sides equal

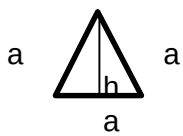
Right Triangle
p = a + b + c
$c^2 = a^2 + b^2$
$b = \sqrt{c^2 - a^2}$
$A = \frac{ab}{2}$



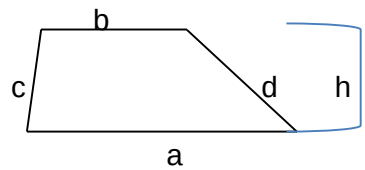
a = b
p = 4a = 4b
$e^2 + f^2 = ab$
$A = ah = \frac{ef}{2}$



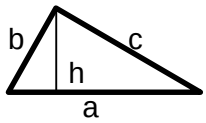
Equilateral Triangle
p = 3a
$h = \frac{a}{2}\sqrt{3} = .866a$
$A = a^3 \frac{\sqrt{3}}{4} = .433a^3$



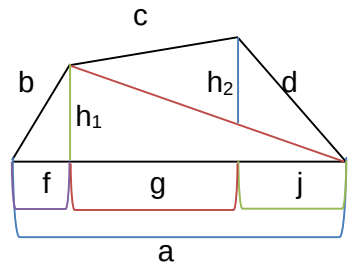
Trapezoid
p = a + b + c + d
$A = \frac{(a+b)}{2}$ h



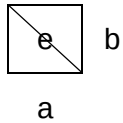
General Triangle
Let $a = \frac{a+b+c}{2}$
p = a + b + c
$h = \frac{2}{a}\sqrt{s(s-a)(s-b)(s-c)}$b
$A = \frac{ah}{2}$
$A = \sqrt{s(s-a)(s-b)(s-c)}$



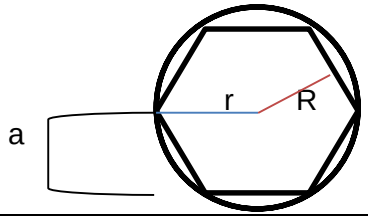
Trapezium
p = a + b + c + d
A = sum of areas of two major triangles
A = $\frac{(h_1 + h_2)g + fh_1 + jh_2}{2}$



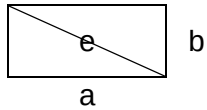
Square
a = b
p = 4a
$A = a^2 = .5e^2$
$e = a\sqrt{2} = 1.414a$



Regular Polygon
p = na
$a = 2\sqrt{R^2 - r^2}$
$A = \frac{nar}{2} = \frac{na}{2}\sqrt{R^2 - \frac{a2}{4}}$
A = n X Area of each triangle

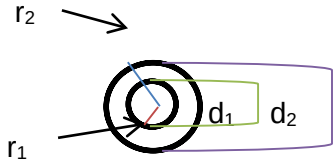


Rectangle
p = 2(a + b)
$e = \sqrt{a^2 + b^2}$
$b = \sqrt{e^2 - a^2}$
A = ab



Circle
$p = 2\pi r = \pi d = 3.1416d$
$A = \pi r^2 = \frac{\pi r2}{4} = .7854d^2$
$A = \frac{p^2}{4\pi} = .07958p^2$

Hollow Circle or Annulus
$A = \frac{\pi}{4}(d_2^2 - d_1^2) = .7854(d_2^2 - d_1^2)$
$A = \pi(r_2^2 - r_1^2)$
$A = \pi\frac{d1 + d2}{2}(r_2 - r_1)$
$A = \pi(r_1 + r_2)(r_2 - r_1)$



Abbreviations and Terms Used in Condensing Descriptions

Abandon ..... ABND
About.....ABT
Above described ..... ABV DESC
Abstract .....ABS
According to the recorded plat ... ACRP
Acre ..... A, AC
Addition .....ADD
Additional .....ADDL
Adjacent .....ADJAC
Adjoining.....ADJ. ADJN
Administrator .....ADMR
Administrator's Deed..... ADMR D
Agreement .....AGMT
Ahead .....AH
Along ..... ALG
Amount .....AMT
And others ..... ET AL
And wife..... ET UX OR & W
Angle .....ANG
Angle point..... A/P
Annexed ..... ANXD
Approved..... APPVD OR APVD
Arbitrary ..... ARB
Assessor's plat .....ASR PLT
Assignment of land contract.....ALC
Assume..... (A)
At..... @
Auxiliary reference line .....AR
Avenue .....AV
Azimuth ..... AZ

Ban.....BK
Base line ..... B/L
Bearing long chord .....BLC
Bearing tree .....BO
Before.....BEF
Begin or beginning ..... BEG
Beginning at a point .....BAP
Beginning of curve..... BC
Being .....BNG
Between ..... BET OR BETW
Block ..... BLK
Board..... BRD
Book .....BK
Boulevard .....BLVD
Bound .....BND
Boundary..... BDY
Boundaries .....BDRS
Bounded .....BDD
Brook .....BRK
Buildings ..... BLDGS

Cemetery ..... CEM
Cemetery deed .....CEM D
Cemetery plat ..... CEM PLT
Center.....CEN
Center angle.....C/A
Center line ..... C/L, CL
Center of section .....CEN/S
Certain .....CERT
Certificate .....CTF
Certificate of descent ..... CTF DES
Certified .....CTFD
Certified survey ..... CTFD SUR
Chain..... CH
Chains ..... CHS
Chord..... CH
City..... C
Commence..... COM
Commencing ..... COMG
Commencing at a point..... CAP
Commercial .....COMM
Common .....COMM
Company .....CO
Computed .....COMP
Concave ..... CONC
Concrete ..... CONC
Condition.....COND
Consideration.....CONSIDE
Construction..... CONST
Contain or contained .....CONTD
Contains ..... CONTS
Containing ..... CONT
Continue..... CONT
Continuing ..... CONT
Convey..... CONV
Corner .....COR
Corners.....CORS

Corporation ..... CORP
Correction ..... CORR
Correction deed ..... CORR D
County ..... CO
County and city ..... C & C
County surveyor ..... CO SUR
County trunk highway ..... CTH
Court ..... CT
Cover or covering ..... COV
Creek ..... CR
Curve ..... CUR

Decree ..... DEC
Dedicated or dedication ..... DED
Deed ..... D OR DD
Deeds ..... DDS
Degree ..... DEG or °
Degree of curve ..... D
Describe, description, described . DESC
Described as follows ..... DAF
Distant ..... DIST
District ..... DIST
Ditch ..... DIT
Division ..... DIV
Document ..... DOC
Drive ..... DR
Driveway ..... DWY

Each ..... EA
Easement ..... ESMT
East ..... E
Easterly ..... ELY
Egress ..... EGR
Elevation ..... ELV
Entitled ..... ENTLD
Escrow ..... ESC
Establish ..... ESTB
Estate ..... EST
Except, excepting, exception ..... EX
Executor ..... EXCTR
Executrix ..... EXCTRX
Existing ..... EXST
Extended ..... EXTD
Extension ..... EXTN

Federal Aid Project ..... FAP
Feet, foot ..... FT
Filed ..... FLD

Final degree ..... FD
Following ..... FOL
Forest crop land ..... FCL
Foundation ..... FDN
Fourth 1/4
Fraction ..... FR
Fractional ..... FRL
From ..... FR

General land office survey ..... GLO
Government ..... GVT
Government lot ..... GVT L
Grant deed ..... GT DD
Granted ..... GTD
Grantee ..... GTEE
Grantor ..... GTR
Guarantee ..... GUAR
Guide meridian ..... GM

Half 1/2
Having ..... HAV
Herein described ..... HD
Heretofore ..... HTOFOR
Hereunto ..... HUNTO
Highway ..... HWY
Highway conveyance ..... HWY CONV
Horizontal ..... HOR

Improvement ..... IMP
Inch ..... IN or "
Inches ..... INS
Include, included, or including .... INCL
Inclusive ..... INCL
Incorporated ..... INC
Information ..... INFO
Ingress ..... INCR
Instruction ..... INSTR
Instrument ..... INSTR
Interest ..... IN
Intersection ..... INTER
Intersection angel I
Intersection with interstate highway ..... INTER/W
Interstate highway ..... IH
Iron pin, iron pipe ..... IP

Joint ..... JT
Jointly ..... JTLY
Joint tenancy ..... JT

Judgment ..... JGD
Junction ..... JCT
Juncture ..... JCR

Known ..... KN
Known as ..... KN AS

Land ..... LD
Land contract LC
Latitude ..... LAT
Lease ..... LSE
Left ..... LT
Length of curve L
Lessee ..... LSEE
Licensed surveyor ..... LS
Limited highway easement ..... LHE
Line ..... LI OR LN
Link ..... LK
Lis Pendes ..... LP
Location monument ..... LM
Long chord LC
Longitude ..... LONG
Lot L
Lying ..... LYG
Lying and being ..... LYD & BNG

Magnetic ..... MAG
Man hole ..... MH
Manufactured ..... MFG
Maximum ..... MAX
Marked ..... MKD
Meander corner ..... MC
Measured ..... (M) MEAS
Memorandum ..... MEMO
Mentioned ..... MEN
Meridian ..... MER
Metes and bounds ..... M & B
Mile ..... MI
Mile corner ..... MC
Minimum ..... MS
Mineral survey ..... MS
Minutes ..... ' or M
Miscellaneous ..... MISC
Month ..... MO
Monument ..... MON
More or less ..... M OR L
More particularly ..... MP
Mortgage ..... MTG
Motel ..... MO

Municipal ..... MCPL

Necessary ..... NEC
North ..... N
Northeast ..... NE
Northeasterly ..... NELY
Northerly ..... NLY
Northwest ..... NW
Northwesterly ..... NWLY
Number ..... NO

Official ..... OFCL
Official records ..... OR
Office of Register of Deeds ..... ORD
Original ..... ORIG
Other ..... OTH
Other property ..... OP
Outlot ..... OL

Page ..... P
Paid ..... PD
Parallel ..... PRL
Parallel to ..... =
Parallel with ..... P/W
Parcel ..... PCL
Part ..... PT
Partial ..... PTL
Particularly ..... PART
Parties ..... PTIES
Partition ..... PRTN
Party ..... PTY
Pavement ..... PVMT
Permanent ..... PERM
Personal estate ..... P EST
Place ..... PL
Plat ..... PLT
Point ..... PT
Point of beginning ..... POB
Point of commencement ..... POC
Point of curvature ..... PC
Point of tangency ..... PT
Point of intersection ..... PI
Point of compound curve ..... PCC
Point of reverse curve ..... PRC
Point of curve ..... POC
Portion ..... POR
Possession ..... POSN
Preliminary ..... PRELIM
Premises ..... PREM

Principal ..... PRIN
Principal meridian..... PRIN MER
Private ..... PVT
Private drive ..... PD
Project ..... PROJ
Prolong ..... PROL
Prolongation ..... PR OL
Property ..... PROP
Property line ..... PL
Public ..... PUB
Public land ..... PL

Quarter 1/4
Quarter quarter 1/4 1/4
Quarter quarter line 1/4L
Quarterly 1/4ly
Quiet title ..... QT
Quit claim ..... QC
Quit claim deed ..... QCD

Radius ..... R or RAD
Railroad ..... RR
Railway ..... RY or RWY
Range ..... R
Range line ..... R/L
Ranges ..... RS
Real estate ..... REST
Record ..... REC
Record of survey ..... R OF S
Reference line ..... REF/L
Reference monument ..... RM
Regarding ..... RE
Regular ..... REG
Relocated ..... REL
Replat ..... REP
Report ..... REEP
Required ..... RQD
Reserve ..... RES
Reservation ..... RESVN
Residential ..... RES
Resolution ..... RESOL
Restaurant ..... REST
Restrict ..... RESTR
Resubdivision ..... RESUB
Reversion ..... REV
Right ..... RT
Right of way ..... ROW or R/W
Right angles ..... RA
Right angles to ..... R/A

River ..... RIV
Road ..... RD
Roadway ..... RDWY
Rods ..... RDS
Running ..... RUN or RUNG

Said ..... SD
Sanitary ..... SAN
Scaled ..... (S)
School ..... SCH
Second ..... " or S or 2ND
Section ..... S or SEC
Section corner ..... S/C
Section line ..... S/L
Series ..... SER
Sheriff's deed ..... SD
Signature ..... SIG
Sixteenth section 1/16
South ..... S
Southeast ..... SE
Southeasterly ..... SELY
Southerly ..... SLY
Southwesterly ..... SWLY
Special meander corner ..... SMC
Square ..... SQ
Stake ..... STK
Stamps ..... STPS
Standard ..... STD
Standard parallel ..... STAN PAR
Starting ..... STG
State trunk highway ..... STH
Station ..... STA
Street ..... ST
Subdivision ..... SUB
Subject ..... SUBJ
Supervisor ..... SUPER

Tangent ..... TAN
Tangent length of curve ..... T
Tax deed ..... TD
Tax exempt ..... TX
Tax sale ..... TXS
Temporary ..... TEMP
Terminate ..... TERM
Termination of joint tenancy ... T JTEN
Termination of life estate ..... T LEST
Thence ..... TH
Thereof ..... THRF
Thereon ..... THON

Therefore..... THFRE
Through ..... THRU
Together..... TOG
Together with ..... TOG/WI
Town ..... T or TN
Township..... T or TP or TWP
Tract..... TR
Triangulation.....TRI
Trust deed..... TD

Under .....UND
Undivided .....UND
Unincorporated..... UNINC
United States Coast and
Geodetic Survey .....USC & GS
United States Geological Survey USGS
United States highway ..... US HWY

Vacated ..... VAC
Variation..... VAR
Vendee ..... VDE
Vendor..... VDR
Village VIL
Volume ..... VOL

Warranty deed.....WD
West .....W
Westerly.....WLY
Which or whence.....WH
With ..... WI
Witness corner ..... WC
Witness point..... WP

Yard .....YD
Year..... YR

N 1/4 corner N1/4C
S 1/4 corner..... S1/4C
E 1/4 corner..... E1/4C
W 1/4 corner..... W1/4C

NOTE: Website links are not guaranteed as archival links.

Topic	Website
Act 11 - Manufactured & Mobile Homes	http://www.legis.state.wi.us/2007/data/acts/07act11.pdf
Act 86 - Clarification	http://www.legis.state.wi.us/2007/data/acts/07Act86.pdf
Act 86 - History	http://www.legis.state.wi.us/2007/data/AB580hst.html
Appraisal Foundation	http://www.appraisalfoundation.org
Appraisal Institute	http://www.appraisalinstitute.org
Assessor List	http://www.revenue.wi.gov/training/assess/assrlist.pdf
Benevolent Retirement Home 130% Test Chart	http://www.revenue.wi.gov/equ/130_calc.pdf
Cable TV Personal Property Form (PA-016)	http://www.dor.state.wi.us/forms/govtvc/pa-016.pdf
Computer Exemption Guidelines	http://www.revenue.wi.gov/pubs/slf/compexgd.pdf
Real Estate Transfer Return	https://ww2.revenue.wi.gov/RETRWebApp/application
Exempt Computer Equipment - Appeal	http://www.revenue.wi.gov/forms/manuf/pa-137.pdf
Frequently Asked Questions	http://www.revenue.wi.gov/faqs/index-pt.html
Housing and Urban Development (HUD)	http://www.hud.gov
Internal Revenue Service (IRS)	http://www.irs.gov
International Association of Assessing Officers (IAAO)	http://www.iaao.org
League of Wisconsin Municipalities	http://www.lwm-info.org
Marshall & Swift / Boeckh	http://marshallswift.com
NAICS Manual	http://www.naics.com/manuals.htm
National Cable and Telecommunications Association	http://www.ncta.com
PAD System Instructions	http://www.revenue.wi.gov/eretr/training/viewpad.pdf
Property Assessment Appeal Guide	http://www.revenue.wi.gov/html/govpub.html#property
R. S. Means Company, Inc.	http://www.rsmeans.com
Rural Housing Service (RHS)	http://www.rurdev.usda.gov/rhs
SIC Manual	http://www.naics.com/manuals.htm
State Cartographer's Office	www.sco.wisc.edu/
TID Criteria Matrix	http://www.revenue.wi.gov/pubs/slf/tif/tif-trix.pdf
Unindexed Depreciation Tables	http://www.revenue.wi.gov/slf/decbal.pdf
Utility Taxation Information	http://www.revenue.wi.gov/html/govpub.html#utility
USDA Economic Research Service (corn cost of production)	http://www.ers.usda.gov

Topic	Website
USDA Economics and Statistics System at Mann Library, Cornell University	http://usda.mannlib.cornell.edu/MannUsda/homepage.do
USDA Natural Resources Conservation Service Map	http://www.wi.nrcs.usda.gov/images/maps/mapping_status_web.jpg
USDA National Agricultural Statistics Service (Corn prices, corn yield)	http://www.nass.usda.gov/About_NASS/index.asp
Use Value Conversion Charge FAQs	http://www.revenue.wi.gov/faqs/slf/usevalue.html
Use Value - Eligible Programs	http://www.dor.state.wi.us/pubs/slf/usprgm.pdf
Use Value Conversion Charge	http://www.revenue.wi.gov/report/a.html#ag
WHEDA	http://www.wheda.com
Wind Energy Systems	http://www.renewwisconsin.org
Wind Energy Additional Information	http://www.eere.energy.gov/
Wisconsin Agricultural Statistics Service (corn price, corn yield)	http://www.nass.usda.gov/wi/
Wisconsin Association of Assessing Officers (WAAO)	http://www.waao.org/
Wisconsin Department of Revenue	http://www.revenue.wi.gov
Wisconsin Department of Revenue - State prescribed forms	http://www.revenue.wi.gov/forms/govasr/spflist.html
Wisconsin Department of Revenue Assessor Certification	http://www.revenue.wi.gov/training/assess/index.html
Wisconsin Department of Revenue Equalization District Offices	http://www.revenue.wi.gov/faqs/slf/sups.html
Wisconsin Department of Revenue Property Tax FAQs	http://www.revenue.wi.gov/faqs/index-pt.html
Wisconsin Farm Bureau Federation	http://www.wfbf.com/
Wisconsin Government Finance Officers Association	http://www.wgfoa.org/
Wisconsin Municipal Clerks Association	http://www.wisclerks.org/2/home.asp
Wisconsin Register of Deeds Association (WRDA)	http://www.wrdaonline.org
Wisconsin State Statutes	http://www.legis.state.wi.us/rsb/stats.html
Wisconsin Taxpayers Alliance	http://www.wistax.org
Wisconsin Technical Colleges	http://www.witechcolleges.com/
Blackhawk Technical College	www.blackhawk.edu
Chippewa Valley Technical College	www.cvtc.edu

Topic	**Website**
Fox Valley Technical College	www.fvtc.edu
Gateway Technical College	www.gtc.edu
Lakeshore Technical College	www.gotoltc.com
Madison Area Technical College	www.matcmadison.edu
Mid-State Technical College	www.mstc.edu
Milwaukee Area Technical College	www.matc.edu
Moraine Park Technical College	http://www.moraine.tec.wi.us/
Nicolet Technical College	www.nicoletcollege.edu
North Central Technical College	www.ntc.edu
Northeast Technical College	www.nwtc.edu
Southwest Wisconsin Technical College	www.swtc.edu
Waukesha County Technical College	www.wctc.edu
Western Wisconsin Technical College	www.wwtc.edu
Wisconsin Indianhead Technical College	www.witc.edu
Wisconsin Technical College System Board	http://www.witechcolleges.com/
Wisconsin Towns Association	http://www.wisctowns.com

Acronym	Stands For
AAR	Annual Assessment Report
AFR	Assessor Final Report (Replaced by MAR)
ANSI	American National Standards Institute
ASCS	Agricultural Stabilization and Conservation Service
BMIR	Below Market Interest Rate
BOR	Board of Review
BPT	Bureau of Property Tax
CAD	Computer-Aided Design
CAMA	Computer Assisted Mass Appraisal
CARS	Cable Television Relay Service
CATV	Cable TV or Community Antenna Television
CBD	Central Business District
CEU	Continuing Education Requirements
DNR	Department of Natural Resources
DOA	Department of Administration
DOR	Department of Revenue
ECR	Exempt Computer Value Report
EGI	Effective Gross Income
EPA	Environmental Protection Agency
e-RETR	Electronic Real Estate Transfer Return
ERTID	Environmental Remediation Tax Incremental District
ERTIF	Environmental Remediation Tax Incremental Finance
ETRA	Economic Tax Recovery Act
FAQ	Frequently Asked Questions
FCC	Federal Communications Commission
GI	Gross Income
GIS	Geographic Information System
GRM	Gross Rent Multiplier
HAP	Housing Assistance Payment
HUD	Housing and Urban Development
IAAO	International Association of Assessing Officers
IRR	Internal Rate of Return
IRS	Internal Revenue Service
LAN	Local Area Network
LDS	Local Distribution Service
LGS	Local Government Services
LURA	Land Use Restriction Agreement
MAR	Municipal Assessment Report

Acronym	Stands For
MDS	Multi-point Distribution Service
ME	Management Expense
MFL	Managed Forest Law
MLS	Multiple Listing Service
MSO	Multiple System Operator
NAICS	North American Industry Classification System
NCTA	National Cable and Telecommunications Association
NOI	Net Operating Income
OCR	Overall Capitalization Rate
OE	Operating Expense
PAD	Provide Assessment Data
PAS	Property Assessment Specialist
PILOT	Payment in Lieu of Taxes
PRC	Property Record Card
REA	Rural Electric Association
RETR	Real Estate Transfer Return
RFP	Request for Proposal
RHS	Rural Housing Service
SCS	Soil Conservation Service
SIC	Standard Industrial Classification
SOA	Statement of Assessment
SOT	Statement of Taxes
TAR	Tax Incremental District Assessment Report
TID	Tax Incremental District
TIF	Tax Incremental Finance
USC	United States Code
USCGS	United States Coast and Geodetic Survey
USDA	United States Department of Agriculture
USPAP	Uniform Standards of Professional Appraisal Practices
WAAO	Wisconsin Association of Assessing Officers
WAN	Wide Area Network
WHEDA	Wisconsin Housing and Economic Development Authority
WPAM	*Wisconsin Property Assessment Manual*
WRDA	Wisconsin Register of Deeds Association