# State Tax Commission

# Math for Assessors
# Self-Study Course

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# Introduction

This document is designed to provide a review of basic math concepts necessary for assessment administration professionals. While most assessors will use calculators and computers, basic concepts must be understood in order to complete more complicated formulas.

We will begin with the most basic concepts. This review of multiplication is designed to remind you to look at the answer on your calculator for logic. For example, if you are calculating 44 x 82 and the answer is 352, you need to know that the answer should be four digits (3,608) and that some input error was probably made.

BLANK MULTIPLICATION TABLE

Please fill in completely. If you're not too sure of yourself, do it in pencil first.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | | | | | | | | |
| 2 | 2 | 4 | | | | | | | | |
| 3 | | | 9 | 12 | | | | | | |
| 4 | | | | | | | | | | |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | | | | | | | | |

## COMPLETED MULTIPLICATION TABLE

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 |
| 4 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 |
| 7 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 |
| 8 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 |
| 9 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

**Multiplication**

Lines are to make sure that ones, tens, hundreds, etc. are in the correct column.

| | | | |
|---|---|---|---|
| | | 8 | 9 |
| | x | 5 | 7 |
| | 6 | 2 | 3 |
| 4 | 4 | 5 | |
| 5 | 0 | 7 | 3 |

Indenting on the second line places the tens, hundreds, etc. in the correct column.

| | | | |
|---|---|---|---|
| | | 6 | 4 |
| | x | 9 | 4 |
| | 2 | 5 | 6 |
| 5 | 7 | 6 | |
| 6 | 0 | 1 | 6 |

Zero times any number is always zero (0), so the first line is all zeros (0).

| | | | |
|---|---|---|---|
| | x | 5<br>3 | 9<br>0 |
| 1 | 0<br>7 | 0<br>7 | 0 |
| 1 | 7 | 7 | 0 |

There are 5,280 feet in a mile. If you walked 18 miles, how many feet did you walk?

The multiplication problem is right there in the numbers: 5,280 x 18, or 95,040 feet. Do not let the words distract you from the multiplication problem.

**Division**

Division is the reverse of multiplication. For example, 2 x 5 = 10, and 10 ÷ 2 = 5. If you can multiply, you can divide. "Short" division is dividing by a single digit. "Long" division is everything else. When you are dividing and the answer is not a whole number, rounding the answer is a common practice.

Examples:

```
   18.750
8)150.000
  08
  070
  064
  0060
  0056
  00040
  00040
  00000
```

```
   63.666
3)191.000
  18
  011
  009
  0020
  0018
  00020
  00018
  000020
  000018
  000002
```

$$150 \div 8 = 18.75$$

$$191 \div 3 = 63.\overline{666}$$

Common accepted practice is to round up if the number is 5 or higher and round down if the number is less than 5. In the examples above, rounding 18.75 to one decimal place, would give 18.8. Rounding 63.666 to two places would give 63.67 or 63.7 if you round to one place.

Story Problem:

> On a playground there are 264 children. How many soccer teams with 11 members each can be formed?
>
> 264 ÷ 11 = 24 teams

**Fast Multiplication and Division**

Multiplying by 1 is the same number (3 x 1 = 3) and multiplying by 0 is zero (3 x 0 = 0). Multiplying by 10 is done be adding one zero (3 x 10 = 30) and multiplying by 100 is done by adding two zeros (3 x 100 = 300).

If the number being multiplied by 10 is a decimal, just move the decimal one place to the <u>right</u>. If the number being multiplied by 100 is a decimal, just move the decimal two places to the <u>right</u>.

Examples:

| | |
|---|---|
| .7 x 10 = 7 | .7 x 100 = 70 |
| 6.85 x 10 = 68.5 | 6.85 x 100 = 685 |

Dividing is the reverse of multiplying, so dividing by 10 is accomplished by moving the decimal one place to the <u>left</u>, and dividing by 100 is accomplished by moving the decimal two places to the <u>left</u>.

Story Problem: A city has 425 workers all earning the same wages and the total payroll for the year is $6,500,000. How much does each worker earn?

$6,500,000 ÷ 425 = $15,294.118 or $15,294.12 each

**Multiplying and Dividing Decimals**

The rule for multiplying decimals is to count the places to the right of the decimal point in the numbers being multiplied and place the decimal point that number of places to the left in the answer.

Examples:

.5 x .5 = .25 or .5 x 5 = 2.5

```
   67.2①          6.83②
x   8.9①        x   .08②
  6048            .5464④
 5376
598.08②
```

The rule for dividing by decimals is even easier than multiplying. The divisor must be a whole number and however many places the decimal is moved to the right in the division, the decimal must be moved the same amount in the dividend.

Examples:

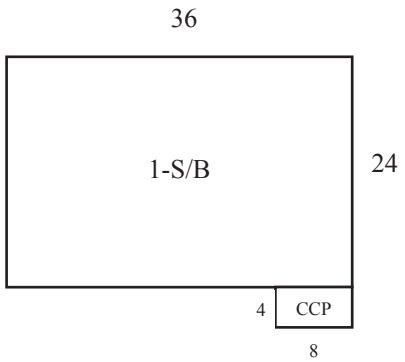
$8.6\overline{)32.5000}$ or $\begin{array}{r} 3.779 \\ 86\overline{)325.000} \end{array}$

$.035\overline{)5.20000}$ or $\begin{array}{r} 148.57 \\ 35\overline{)5{,}200.00} \end{array}$

**Calculating Square Footage**

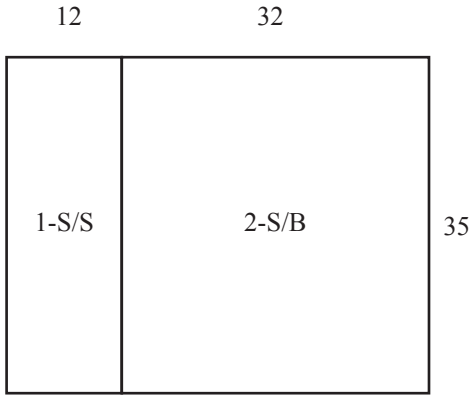
Examples:

1-story over basement (36 x 24 = 864)
Concrete covered porch (4 x 8 = 32)




Using a cost per square foot of $43.52 multiply the square footage by cost: 864 x $43.52 = $37,601.28 (round to nearest dollar $37,601)

1-story over slab (12 x 35 = 420)
2-story over basement (32 x 35 = 1,120)
(420 + 1,120 = 1,540)




Using cost per square foot of $39.43 for the 1-story and $68.31 for the 2-story over the basement, multiply for 1-story and 2-story and add the answers: 420 x 39.43 = 16,560.6; 1,120 x 68.31 = 76,507.2 or 76,507; 16, 561 + 76,507 = $93,068

## Calculating an Economic Condition Factor

ECFs are developed by comparing the cost less depreciation of properties that have sold to the portion of the sale price attributed to the building. The first step in calculating an ECF is to deduct the land value from the selling price to determine the value attributed to the building.

Calculate building value for the following sales:

| Sale Date | Sale Price | Land Value | Building Value | RCN Less Depreciation | Result |
|---|---|---|---|---|---|
| 9-02 | $198,000 | $40,000 | | | |
| 8-02 | $194,000 | $40,000 | | | |
| 6-02 | $180,000 | $40,000 | | | |
| 7-02 | $188,900 | $40,000 | | | |
| 5-02 | $182,000 | $40,000 | | | |
| 8-02 | $188,000 | $40,000 | | | |
| | | | | | |

Answer: Building Value

| Sale Date | Sale Price | Land Value | Building Value | RCN Less Depreciation | Result |
|---|---|---|---|---|---|
| 9-02 | $198,000 | $40,000 | **$158,000** | | |
| 8-02 | $194,000 | $40,000 | **$154,000** | | |
| 6-02 | $180,000 | $40,000 | **$140,000** | | |
| 7-02 | $188,900 | $40,000 | **$148,900** | | |
| 5-02 | $182,000 | $40,000 | **$142,000** | | |
| 8-02 | $188,000 | $40,000 | **$148,000** | | |
| | | | | | |

The next step is to look up the replacement cost new less depreciation from your records.

| Sale Date | Sale Price | Land Value | Building Value | RCN Less Depreciation | Result |
|---|---|---|---|---|---|
| 9-02 | $198,000 | $40,000 | $158,000 | **$157,500** | |
| 8-02 | $194,000 | $40,000 | $154,000 | **$152,000** | |
| 6-02 | $180,000 | $40,000 | $140,000 | **$138,500** | |
| 7-02 | $188,900 | $40,000 | $148,900 | **$146,900** | |
| 5-02 | $182,000 | $40,000 | $142,000 | **$140,500** | |
| 8-02 | $188,000 | $40,000 | $148,000 | **$146,000** | |
| | | | | | |

The final step is to calculate the ECF from the information you have gathered. The formula is sale price minus the land and land improvements equals building value. The building values of a group of sales divided by the replacement cost new less depreciation (RCNLD) of the same group of sales, equals the ECF.

| Sale Date | Sale Price | Land Value | Building Value | RCN Less Depreciation | Result |
|---|---|---|---|---|---|
| 9-02 | $198,000 | $40,000 | $158,000 | $157,500 | **1.003** |
| 8-02 | $194,000 | $40,000 | $154,000 | $152,000 | **1.013** |
| 6-02 | $180,000 | $40,000 | $140,000 | $138,500 | **1.011** |
| 7-02 | $188,900 | $40,000 | $148,900 | $146,900 | **1.014** |
| 5-02 | $182,000 | $40,000 | $142,000 | $140,500 | **1.011** |
| 8-02 | $188,000 | $40,000 | $148,000 | $146,000 | **1.014** |
| **Total** | | | $890,900 | $881,400 | **1.011** |

The ECF for this neighborhood would be 1.011.

Calculate the ECF for this neighborhood based on the following information:

| Sale Date | Sale Price | Land Value | Building Value | RCNLD | Result |
|---|---|---|---|---|---|
| 4-02 | $150,000 | $35,000 | | $113,000 | |
| 3-02 | $145,000 | $40,000 | | $103,000 | |
| 5-02 | $154,000 | $42,000 | | $110,000 | |
| 3-02 | $147,000 | $38,000 | | $107,000 | |
| 6-02 | $151,000 | $37,000 | | $111,900 | |

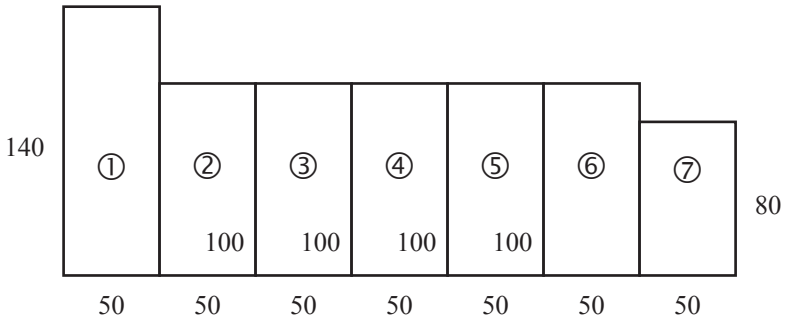
ECF Calculation answer:

| Sale Date | Sale Price | Land Value | Building Value | RCNLD | Result |
|---|---|---|---|---|---|
| 4-02 | $150,000 | $35,000 | **$115,000** | $113,000 | **1.018** |
| 3-02 | $145,000 | $40,000 | **$105,000** | $103,000 | **1.019** |
| 5-02 | $154,000 | $42,000 | **$112,000** | $110,000 | **1.018** |
| 3-02 | $147,000 | $38,000 | **$109,000** | $107,000 | **1.019** |
| 6-02 | $151,000 | $37,000 | **$114,000** | $111,900 | **1.019** |
| Total | | | **$555,000** | $544,900 | **1.019** |

The ECF in the neighborhood would be 1.019.

## Depth Factors

When calculating the value of a subdivision lot by value per front foot, there must be a method to determine equivalent front footage if the lot depth is not standard for the subdivision.




Lots 2, 3, 4, 5, and 6 are all the same depth, 100 feet, and so that is the standard depth for this area. On the chart on the following page, there is a 1 in the space where 100 and 100 meet in the chart. The next example is the 140 foot actual depth in the 100 foot standard depth column is 1.18. To determine equivalent front footage on lot 1, multiply 50 (actual) by the depth factor (1.18) for an answer of 59 feet. The equivalent frontage on lot 7 is 50 x .89 or 44.5 feet. If the value of each equivalent front foot were $300, the standard depth lots, 2-6, would be $15,000 ($300 x 50 ft.). The value of lot 1 would be $300 x 59 or $17,700. The value of lot 7 would be $300 x 44.5 or $13,350.

DEPTH FACTOR TABLE

Depth Factor = Square Root of (Actual Depth / Standard Depth)

| STANDARD DEPTH | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 180 | 200 | 225 | 250 | 300 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACTUAL DEPTH | | | | | | | | | | | | | |
| 40 | 0.63 | 0.6 | 0.58 | 0.55 | 0.53 | 0.52 | 0.5 | 0.47 | 0.45 | 0.42 | 0.4 | 0.37 | 0.32 |
| 60 | 0.77 | 0.74 | 0.71 | 0.68 | 0.65 | 0.63 | 0.61 | 0.58 | 0.55 | 0.52 | 0.49 | 0.45 | 0.39 |
| 65 | 0.81 | 0.77 | 0.74 | 0.71 | 0.68 | 0.66 | 0.64 | 0.6 | 0.57 | 0.54 | 0.51 | 0.47 | 0.4 |
| 70 | 0.84 | 0.8 | 0.76 | 0.73 | 0.71 | 0.68 | 0.66 | 0.62 | 0.59 | 0.56 | 0.53 | 0.48 | 0.42 |
| 75 | 0.87 | 0.83 | 0.79 | 0.76 | 0.73 | 0.71 | 0.68 | 0.65 | 0.61 | 0.58 | 0.55 | 0.5 | 0.43 |
| 80 | 0.89 | 0.85 | 0.82 | 0.78 | 0.76 | 0.73 | 0.71 | 0.67 | 0.63 | 0.6 | 0.57 | 0.52 | 0.45 |
| 85 | 0.92 | 0.88 | 0.84 | 0.81 | 0.77 | 0.75 | 0.73 | 0.69 | 0.65 | 0.61 | 0.58 | 0.53 | 0.46 |
| 90 | 0.95 | 0.9 | 0.87 | 0.83 | 0.8 | 0.77 | 0.75 | 0.71 | 0.67 | 0.63 | 0.6 | 0.55 | 0.47 |
| 95 | 0.97 | 0.93 | 0.89 | 0.85 | 0.82 | 0.79 | 0.77 | 0.72 | 0.69 | 0.65 | 0.62 | 0.56 | 0.48 |
| 100 | 1 | 0.95 | 0.91 | 0.87 | 0.85 | 0.82 | 0.79 | 0.75 | 0.71 | 0.67 | 63 | 58 | 0.5 |
| 110 | 1.05 | 1 | 0.96 | 0.91 | 0.89 | 0.86 | 0.83 | 0.78 | 0.74 | 0.7 | 0.66 | 0.61 | 0.52 |
| 120 | 1.1 | 1.04 | 1 | 0.95 | 0.93 | 0.89 | 0.87 | 0.82 | 0.77 | 0.73 | 0.69 | 0.63 | 0.55 |
| 130 | 1.14 | 1.09 | 1.04 | 1 | 0.96 | 0.93 | 0.9 | 0.85 | 0.81 | 0.75 | 0.72 | 0.66 | 0.57 |
| 140 | 1.18 | 1.13 | 1.08 | 1.03 | 1 | 0.97 | 0.94 | 0.88 | 0.84 | 0.79 | 0.75 | 0.68 | 0.59 |
| 150 | 1.23 | 1.17 | 1.12 | 1.07 | 1.04 | 1 | 0.97 | 0.91 | 0.87 | 0.82 | 0.77 | 0.71 | 0.61 |
| 160 | 1.27 | 1.21 | 1.16 | 1.1 | 1.07 | 1.03 | 1 | 0.94 | 0.89 | 0.84 | 0.8 | 0.73 | 0.63 |
| 170 | 1.3 | 1.24 | 1.19 | 1.13 | 1.1 | 1.06 | 1.03 | 0.97 | 0.92 | 0.87 | 0.82 | 0.75 | 0.65 |
| 180 | 1.34 | 1.28 | 1.23 | 1.17 | 1.13 | 1.1 | 1.06 | 1 | 0.95 | 0.89 | 0.85 | 0.77 | 0.67 |
| 200 | 1.41 | 1.35 | 1.29 | 1.23 | 1.2 | 1.15 | 1.12 | 1.05 | 1 | 0.94 | 0.89 | 0.82 | 0.71 |
| 225 | 1.5 | 1.43 | 1.37 | 1.31 | 1.27 | 1.22 | 1.19 | 1.12 | 1.06 | 1 | 0.95 | 0.87 | 0.75 |
| 250 | 1.58 | 1.51 | 1.44 | 1.38 | 1.34 | 1.29 | 1.25 | 1.18 | 1.12 | 1.05 | 1 | 0.91 | 0.79 |
| 300 | 1.73 | 1.65 | 1.58 | 1.51 | 1.46 | 1.41 | 1.37 | 1.29 | 1.22 | 1.15 | 1.1 | 1 | 0.87 |
| 350 | 1.87 | 1.78 | 1.71 | 1.63 | 1.58 | 1.53 | 1.48 | 1.39 | 1.32 | 1.25 | 1.18 | 1.08 | 0.94 |
| 400 | 2 | 1.91 | 1.82 | 1.74 | 1.69 | 1.63 | 1.58 | 1.49 | 1.41 | 1.33 | 1.26 | 1.15 | 1 |
| 450 | 2.12 | 2.02 | 1.94 | 1.85 | 1.79 | 1.73 | 1.68 | 1.58 | 1.5 | 1.41 | 1.34 | 1.22 | 1.06 |
| 500 | 2.24 | 2.13 | 2.04 | 1.95 | 1.89 | 1.83 | 1.77 | 1.67 | 1.58 | 1.49 | 1.41 | 1.29 | 1.12 |
| 600 | 2.45 | 2.33 | 2.24 | 2.13 | 2.07 | 2 | 1.94 | 1.83 | 1.73 | 1.63 | 1.55 | 1.41 | 1.22 |
| 700 | 2.65 | 2.52 | 2.41 | 2.3 | 2.24 | 2.16 | 2.09 | 1.97 | 1.87 | 1.76 | 1.67 | 1.53 | 1.32 |

## Converting a Millage Rate into a Multiplier

Millage rates are expressed as dollars per thousand. For each mill levied, a taxpayer pays one dollar in taxes for every thousand dollars of taxable value.

For example, if the city charter authorizes 5 mills for operating purposes, 3 mills for garbage pick-up and 1.5 mills for police and fire pension, the total millage levied would be 9.5 mills.

Most taxpayers want to know how much that will cost them not how many mills will be levied. To convert the millage into a multiplier to calculate taxes, you simply move the decimal point 3 places to the left.

The 5 mills for operating purposes would be expressed as .005.

The 3 mills for garbage pick-up would be expressed as .003.

The 1.5 mills for police and fire would be expressed as .0015.

If your taxable value were $50,000, the individual taxes would be calculated as follows:

| | |
|---|---|
| $50,000 x .005 = | $250.00 |
| $50,000 x .003 = | $150.00 |
| $50,000 x .0015 = | $ 75.00 |
| Taxes = | $475.00 |

Total taxes can also be calculated by multiplying the total millage rate times the taxable value.

$50,000 x .0095 (9.5 mills converted to a multiplier) = $475.00

Calculate the taxes from the following information:

Taxable value $60,000.00; charter millage for operating 9.5 mills; library millage 1 mill; refuse and recycling 3.63 mills; recreation .80 mill.

Taxable Value:

Charter:

Library:

Refuse/Recycling:

Recreation:

Total Taxes:

Answer:

| | |
|---|---|
| Taxable Value: | **$60,000** |
| Charter: | **.0095** |
| Library: | **.001** |
| Refuse/Recycling: | **.00363** |
| Recreation: | **.0008** |
| Total Taxes: | $**895.80** |

**Millage Rates**

If the total budget for a city or township is $8,500,000 and the taxable value of the unit is $200,000,000, what millage is necessary to generate the income?

$8,500,000 ÷ $200,000,000 = .0425

To convert .0425 to a millage, the decimal needs to be moved three (3) places to the right: 42.5 mills. To double-check your answer, multiply .0425 by $200,000,000.

If the city or township wants to pass a millage to purchase a parcel of land on which to build a fire station and the purchase price is $300,000, how many mills would they need if the taxable value is $400,000,000?

$300,000 ÷ $400,000,000 = .00075 or .75 mills by moving the decimal 3 places to the right.

Example (to calculate taxes):

$100,000 taxable value; 41.67 mills
(1) 100.000 x 41.67 mills = $4,167 in taxes
(2) $100,000 x .04167 = $4,167 in taxes

**Mean, Median, and Mode**

Definitions:

Mean: The average of all of the numbers used.
Median: The middle number.
Mode: The number that appears most often.

Example 1:

2, 5, 7, 8, 8
Mean: 2 + 5 + 7 + 8 + 8 = 30; 30 ÷ 5 (amount of numbers) = 6
Median: 2, 5, 7, 8, 8 = middle number is 7
Mode: 2, 5, 7, 8, 8 = most often number is 8

Example 2:

6, 9, 5, 8, 9, 5, 9
Step 1: Arrange or array in order (5, 5, 6, 8, 9, 9, 9)
Mean: 5 + 5 + 6 + 8 + 9 + 9 + 9 = 51; 51 ÷ 7 = 7.29 or 7.3
(A mean is not necessarily a whole number as in the above example.)
Median: 5, 5, 6, 8, 9, 9, 9 = middle number is 8
Mode: 5, 5, 6, 8, 9, 9, 9 = most often number is 9

Example with an even amount of numbers:

7, 5, 4, 2, 8, 3 (2, 3, 4, 5, 7, 8)
Mean: 2 + 3 + 4 + 5 + 7 + 8 = 29; 29 ÷ 6 = 4.833 or 4.8
Median: If there are an even number of numbers in the array, you take the middle two values, in this case 4 and 5, and find the average (4 + 5 = 9; 9 ÷ 2 = 4.5) and that is the median.
Mode: In this array, no number appears more than once so there is no mode.

## Paired Sales Analysis

Paired sales analysis is a technique used to measure adjustments to the sale price of a comparable property. Sales data on nearly identical properties is analyzed to isolate a single characteristic effect on value. Before any other adjustments can be made, the sale must be adjusted for the time of the sale. The formula for paired sales adjustments is:

**Sales Price of Property With Item – Sales Price of Like Property Without Item = Value of Item**

## Sample of Paired Sales Analysis

A 3-bedroom, 1-story ranch, single-family, residential property with a 2-car, attached garage recently sold for $250,000. A similar 3-bedroom, 1-story ranch, single-family, residential home across the street without a garage recently sold for $225,000. Using the paired sales analysis technique value the 2-car, attached garage.

$250,000
–225,000
$ 25,000 ÷ $250,000 = .10 or 10%

**Paired Sales Analysis Problem**

Given the following sales data, value:

A. Percentage of value increase per year
B. 4th bedroom
C. Basement
D. Fireplace
D. Air conditioning
F. 2nd bathroom

Sale 1 Sold 1 year ago for $205,000, has a full basement, air conditioning, a fireplace, 4 bedrooms, and 2 bathrooms

Sale 2 Sold recently for $225,500, has a full basement, air conditioning, a fireplace, 4 bedrooms, and 2 bathrooms

Sale 3 Sold 1 year ago for $184,000, has a full basement, air conditioning, a fireplace, 3 bedrooms, and 2 bathrooms

Sale 4 Sold 1 year ago for $177,000, has a full basement, air conditioning, no fireplace, 3 bedrooms, and 2 bathrooms

Sale 5 Sold recently for $174,500, has no basement, air conditioning, a fireplace, 3 bedrooms, and 2 bathrooms

Sale 6 Sold recently for $189,500, has a full basement, no air conditioning, a fireplace, 3 bedrooms, and 1 bathroom

Sale 7 Sold recently for $220,500, has a full basement, no air conditioning, a fireplace, 4 bedrooms, and 2 bathrooms

**Paired Sales Analysis Problem Answers**

**A: % Increase**

| | |
|---|---|
| Sale 2 sold recently | $225,500 |
| Sale 1 sold 1 year ago | $205,000 |
| Value of 1 year of time | $ 20,500 |

$20,500 ÷ $205,000 = **.10 or 10% increase in value for 1 year**

**B: 4th Bedroom**

| | |
|---|---|
| Sale 1 with 4th bedroom | $205,000 |
| Sale 3 w/o 4th bedroom | –184,000 |
| Value of 4th bedroom | **$ 21,000** |

**C: Value of Basement**

| | |
|---|---|
| Sale 2 with basement and 4th bedroom | $225,500 |
| Sale 5 No basement, no 4th bedroom | $174,500 |
| Add value of 4th bedroom ($21,000) to Sale 5 | $195,500 |
| Value of basement (Sale 2 – Sale 5) | **$ 30,000** |

**D: Value of Fireplace**

| | |
|---|---|
| Sale 1 with fireplace and 4th bedroom | $205,000 |
| Sale 4 No fireplace, no 4th bedroom | $177,000 |
| Add Value of 4th bedroom ($21,000) to Sale 4 | $198,000 |
| Value of fireplace (Sale 1 – Sale 4) | **$ 7,000** |

**E: Value of Air Conditioning**

| | |
|---|---|
| Sale 2 with air conditioning | $225,500 |
| Sale 7 without air conditioning | –220,500 |
| Value of air conditioning | **$ 5,000** |

**F: Value of 2nd Bathroom**

| | |
|---|---|
| Sale 2 with 2nd bathroom and 4th bedroom | $225,500 |
| Sale 6 no 2nd bathroom, no 4th bedroom | $189,500 |
| Add Value of 4th bedroom ($21,000) to Sale 6 | $210,500 |
| Value of 2nd bathroom | **$ 10,000** |

**Making Sales Comparison Approach Adjustments**

Market data is information about property prices. When doing an appraisal, sales of similar properties are used. When doing a sales comparison approach, you are determining the value of the subject property by using information about properties that have sold. These properties are called comparables or comps. The best comp is the one that is most like the subject.

For example, you are appraising a 3-bedroom ranch with an attached garage. You have verified the following sales:

1. A 3-bedroom ranch without a garage sold for $125,000.
2. A 4-bedroom tri-level sold for $135,000.
3. A 3-bedroom ranch with a detached garage sold for $145,000.
4. A 4-bedroom ranch without a garage sold for $140,000.

Which one is most like the subject? Number 3 is most similar to the subject and would be the best comparable. Based on this information, the value of the subject property is approximately $145,000.

There are four basic steps in the sales comparison approach:

1. Select sales of comparable property.
2. List the sales.
3. Adjust and tabulate the sales.
4. Correlate and justify the value of the subject property.

The best comp will be the one that is most like the subject property. Don't forget adjustments are made to bring the comps to "like" the subject.

**Appraisal Problem 1**

For example, you are appraising a property with the following features: the house was built 10 years ago. It has 3 bedrooms, 2 baths, a full basement, and a 2-car detached garage. The lot is 80 x 120 sq. ft., which is standard for this neighborhood. You have reviewed your sales file and there are 6 homes in that neighborhood that have sold in the past year.

House number 1 was built 20 years ago and has 3 bedrooms, 1½ baths, a full basement, and a 1-car detached garage. It sold last August for $145,000.

House number 2 was built 9½ years ago. It has 3 bedrooms (1 has been converted into a den), 1½ baths, a full basement, and a 2-car detached garage. It sold for $150,000 last July.

House number 3 was built 12 years ago. It has 3 bedrooms, 2 baths, a full basement, and a 2-car detached garage. It sold last November for $155,000.

House number 4 was built 5 years ago. It has 3 bedrooms, 2½ baths, no basement, and a 2-car detached garage. It sold last January for $153,000.

House number 5 was built 10 years ago. It has 3 bedrooms, 2 baths, and a full basement. It sold last September for $152,000.

House number 6 was built 9 years ago. It has 4 bedrooms 2½ baths, a full basement, and a 2-car attached garage. It sold last December for $160,000.

If you had to pick four comps to use based on the information given, what four would you use?

Houses 2, 3, 5, and 6 would probably be the best choices. House number 1 is twice as old as your subject is and house number 4 is ½ the age of your subject.

**Appraisal Problem 2**

In this problem, no adjustment is needed for age or lot size because the lots are very similar in size and the same builder built the homes within a 3-year period. In some neighborhoods, you may need to make adjustments because the lot sizes are very dissimilar and several different builders built the homes over a longer period of time.

Subject: The house was built 10 years ago. It has 3 bedrooms, 2 baths, a full basement, and a 2-car detached garage. The lot is 80 x 120 sq. ft., which is standard for this neighborhood. The house has 1,200 square feet, wood siding, central air conditioning, and a 4x 8 front porch.

Comp number 1 was built 9½ years ago. It has 3 bedrooms (1 converted into a den), 1½ baths, a full basement, and a 2-car detached garage. It has 1,180 square feet, vinyl siding, a 4 x 8 front porch, and an 80 x 120 sq. ft. lot. It sold for $150,000 in July of last year.

Comp number 2 was built 12 years ago. It has 3 bedrooms, 2 baths, a full basement, and a 2-car detached garage. It has 1,250 square feet, aluminum siding, a 4 x 4 front porch, and a 75 x 125 sq. ft. lot. It sold for $155,000 in November of last year.

Comp number 3 was built 10 years ago. It has 3 bedrooms, 2 baths, central air, and a full basement. It has 1,200 square feet, wood siding, a 4 x 4 front porch, and an 80 x 120 sq. ft. lot. It sold in September of last year for $152,000.

Comp number 4 was built 9 years ago. It has 4 bedrooms, 2½ baths, a fireplace, full basement, and 2-car attached garage. It has 1,300 square feet, a brick exterior, a 4 x 8 front porch, and an 85 x 120 sq. ft. lot. It sold in December of last year for $160,000.

Use the following information complete the grid on the following page and estimate value for our subject. Remember you always adjust your comps to the subject. If the comp has a feature not found in the subject, the comp would receive a negative adjustment. If the subject has a feature not found in the comp, the comp would receive a positive adjustment.

In this problem, wood siding is standard, vinyl siding is superior to wood siding, and aluminum siding is less desirable. Brick is more desirable than vinyl, wood, and aluminum. The porch adjustment given is a plus adjustment for size in this example.

| | | | |
|---|---|---|---|
| Fireplace | $1,000 | Exterior - | |
| ½ bath | $ 750 | Vinyl | $ 500 |
| Full bath | $1,500 | Aluminum | $ 500 |
| Porch | $ 500 | Brick | $3,000 |
| Central air | $1,200 | | |
| Garage | $4,000 if detached | | |
| | $5,000 if attached | | |

| | Subject | Comp 1 | Comp 2 | Comp 3 | Comp 4 |
|---|---|---|---|---|---|
| Date of Sale | | | | | |
| Sale Price | | | | | |
| Lot Size | | | | | |
| Square feet | | | | | |
| Fireplace | | | | | |
| Bath | | | | | |
| Basement | | | | | |
| Porches | | | | | |
| Central air | | | | | |
| Garage | | | | | |
| Exterior finish | | | | | |
| Year built | | | | | |
| Total adjustment | | | | | |
| Estimated value | | | | | |

**Appraisal Problem Solution**

| | Subject | Comp 1 | Comp 2 | Comp 3 | Comp 4 |
|---|---|---|---|---|---|
| Date of Sale | **-------** | **7-01** | **11-01** | **9-01** | **12-01** |
| Sale Price | **-------** | **$150,000** | **$155,000** | **$152,000** | **$160,000** |
| Lot Size | **80 x 120** | **80 x 120** | **75 x 125** | **80 x 120** | **85 x 120** |
| Square feet | **1,200** | **1,180** | **1,250** | **1,200** | **1,300** |
| Fireplace | **No** | **No** | **No** | **No** | **Yes –1,000** |
| Bath | **2** | **1½ +750** | **2** | **2** | **2½ –750** |
| Basement | **Full** | **Full** | **Full** | **Full** | **Full** |
| Porches | **4 x 8** | **4 x 8** | **4 x 4 +500** | **4 x 4 +500** | **4 x 8** |
| Central air | **Yes** | **No +1,200** | **No +1,200** | **Yes** | **No +1,200** |
| Garage | **Yes-D** | **Yes-D** | **Yes-D** | **No +4,000** | **Yes-A –1,000** |
| Exterior finish | **Wood** | **Vinyl –500** | **Alum. +500** | **Wood** | **Brick –3000** |
| Year built | **1992** | **1993** | **1990** | **1992** | **1993** |
| Total adjustment | **-------** | **+1,450** | **+2,200** | **+4,500** | **–4,550** |
| Estimated value | **$156,500** | **$151,450** | **$157,200** | **$156,500** | **$155,450** |

Comp 3 required the fewest adjustments (2) and would be the best choice for estimating the value of the subject. Because comp 1's estimated value is several thousand dollars lower than the other comps, you might want to review that sale to determine why the value is so low. It may be a sale between relatives or a forced sale or the house may have been neglected and need substantial work due to the deferred maintenance that is reflected in the market.