

Rule of Quarters Lesson Plan

Concept/principle to be demonstrated:

Converting decimal foot measurements to inches and fractions can be accomplished using tables, math computations and/or memorization. This lesson provides a tool to memorize four key decimal values for quick and accurate conversion. Understanding is demonstrated by applying the rule of quarters to a variety of construction-related problems.

Lesson objectives/Evidence of Learning:

- Recognizes and justifies the need for an exact answer in a given situation
- Selects and justifies appropriate strategies and tools to compute the answer in a problem
- Uses estimation to predict or verify the reasonableness of calculated results
- Comprehends concept of decimal conversions
- Uses data table to convert decimal foot measurements
- Converts decimal foot by memory

How this math connects to construction jobs:

The Rule of Quarters is field conversion that provides answers that are accurate to within 1/16." Construction workers can easily determine if answers are reasonable. This lesson will help students comprehend how multi-step conversions can be done quickly and accurately by using four basic values.

- **Operating Engineers** may convert elevations when excavating for foundations.
- **Carpenters** use conversions to establish finish floor elevations.
- **Plumbers** set their rough-in pipes based on foundation heights.

Teacher used training aids:

- Engineer's rod
- Tape measure
- Plot plan from building project or print reading
- Printed flash cards

Materials needed per student:

- Calculator with $\sqrt{\quad}$ key & memory +/- functions
- *Conversion Chart and Rule of Quarters* handout

Terms:

- **Bench mark:** (also called a job datum) are often placed on the corner of the plot plan, which is either the number of feet above sea level or the number 100.0'.
- **Contour lines:** shown on a plot plan to show the surface shape of the lot.
- **Datum point:** reference from which other elevations in the area are measured.
- **Elevation:** height established for different levels
- **Grading:** reshaping the surface of the lot by adding or removing soil.
- **Plot plan:** shows the size and shape of the lot and the location of the building.

Lesson Introduction:

Boundaries of building lots are mapped and recorded by local authorities. The plot plan (or site plan) provides the building location and land contour elevations. High and low points of the property are identified so the lot can be graded to provide proper water drainage. This information is used by the operating engineer who clears the property. Finish grades and elevations shown on the plot plan are based on data provided by a professional surveyor or engineer. These are written on a plot plan in feet and tenths of a foot rather than in feet and inches.

Lesson Components:

1. The elevations shown on the plot plan are used by the operating engineers who run the excavation equipment to grade the lot. Computing the amount of change is easier to complete when the figures are left in feet and tenths.
2. The plot plan usually shows the finish floor elevation of the building in reference to the bench mark. This is also in feet and tenths.
3. However, it becomes necessary to convert the elevation into feet and inch measurements used by carpenters to determine correct height of the building foundation and footings.
4. There are conversion charts available to be used to convert decimal foot measurements to their inch and fraction inch equivalents. (see Conversion Chart)
5. To read the table, locate the desired decimal foot measurement. Determine the inches by reading the heading of the column. The row identifies the number of eighths (reduce if needed).

Example: Convert .25' to inches

.25 is 3" with no eighths.

Example: Convert .35' to inches

.35' is $4 \frac{2}{8}" = 4 \frac{1}{4}"$

Use the conversion chart to solve the following problems: (Write on the board).

.03'

.31'

.52'

.79'

.87'

What are your answers?

$\frac{3}{8}"$

$3 \frac{3}{4}"$

$6 \frac{1}{4}"$

$9 \frac{1}{2}"$

$10 \frac{7}{16}"$

6. What happened when converting .87? .87 is mid-way between $10 \frac{3}{8}$ " and $10 \frac{1}{2}$ "
7. Notice the pattern made by the inch values 8-9-8. There are $100/100'$ and $96/8"$ in a foot. Therefore, an eighth of an inch is almost equal to $1/100$ of a foot.
8. Carpenters should be able to make the conversions without the table.
9. Decimal foot values are converted to inch values by multiplying by 12 (the number in inches in a foot).

Example: Convert .75' to inches

Step 1 $.75' \times 12 = 9"$

10. If there is a decimal value remainder after multiplying, convert the decimal value to a fraction of an inch. Multiply by 8 and reduce the resulting fraction if needed.

Example: Convert .7' to inches

Step 1: $.7' \times 12 = 8.4"$

Step 2: $.4" \times 8 = 3.2"$

Step 3: Round to the nearest 8th 3.2 is rounded to 3

Step 4: Combine results of steps $.7' = 8 \frac{3}{8}"$

11. The **Rule of Quarters** is a very quick way to complete conversions without using a chart or calculator. This technique provides $1/8"$ and is accurate to within a $1/16"$.
12. The +8 and -8 on either side of the quarters (3", 6", 9" and 12") indicate the math action to take from these anchors. Remember that $1/100'$ is about $1/8"$.

Example: Convert .7' to inches

Step 1: Locate the closest quarter. In this case it is $9" = .75$

Step 2: .7 is 5 less than .75

Step 3: The value is $5/8$ less than $9" = 8 \frac{3}{8}"$

13. Use flash cards to practice with students.

Conversion Chart

8ths	0"	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"
0	.00	.08	.17	.25	.33	.42	.50	.58	.67	.75	.83	.92
1	.01	.09	.18	.26	.34	.43	.51	.59	.68	.76	.84	.93
2	.02	.10	.19	.27	.35	.44	.52	.60	.69	.77	.85	.94
3	.03	.11	.20	.28	.36	.45	.53	.61	.70	.78	.86	.95
4	.04	.13	.21	.29	.38	.46	.54	.63	.71	.79	.88	.96
5	.05	.14	.22	.30	.39	.47	.55	.64	.72	.80	.89	.97
6	.06	.15	.23	.31	.40	.48	.56	.65	.73	.81	.90	.98
7	.07	.16	.24	.32	.41	.49	.57	.66	.74	.82	.91	.99

Rule of Quarters

Inch	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	12"
Fraction	1/12'	2/12'	3/12'	4/12'	5/12'	6/12'	7/12'	8/12'	9/12'	10/12'	11/12'	12/12'
Quarter			0.25			0.50			0.75			1.00
Function		-0.08		+0.08	-0.08		+0.08	-0.08		+0.08	-0.08	
Decimal	0.08	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.83	0.92	1.00

.83

.36

.15

.95

.52

.47

.30

.77

.13

.68

.28

.06

