PLUMBING MATHEMATICS

A review of basic fundamentals of mathematics is essential to successful applications of plumbing principals. An acceptable reference that may be used during your examination is **Mathematics for Plumbers and Pipefitters**. The first six units contained in this reference will summarize these basic principals. If, after review of these six units, you still have difficulty in understanding the terms, formulas and principals used, further study must be considered.

In solving all mathematical problems you should follow the pattern of steps listed below:

STEP 1: Write the applicable formula.

STEP 2: Substitute the numerical value for each symbol in the formula.

STEP 3: Change values to like units, for example: all to feet or all to inches, with the exception of grade and drop formulas.

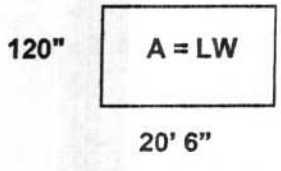
STEP 4: Solve the problem and label your answers, that is: feet, inches, gallons, etc.

A practical example using the preceding pattern of steps is as follows:

EXAMPLE: What is the area of a roof 120 inches wide and 20 feet 6 inches long?

(A) 200 square feet (C) 210 square feet
(B) 205 square feet (D) 215 square feet

STEP 1: Rectangle formula: Area = Length x Width (A = L X W)



STEP 2: Area = 2' 6" X [120" / 12"] or 10'

STEP 3: Area = 20.5' x 10'

Note: Since you will be using a calculator, your answer will often be in the form of a decimal. The answers on the examination may be given as a decimal or a fraction so you must change your decimal to a fraction in some cases.

STEP 4: 20.5' x 10' = 205 square feet. Area = 205 square feet.
Answer (B) 205 square feet.

When solving problems that involve decimals (fractional parts of a whole) carry the answer to three (3) decimal places to the right of the decimal point. Some problems may have an infinite number of decimal places, therefore rounding off is necessary. When you round off a number the rule is:

(A) Numbers Less than five (5) are dropped.
(B) Numbers More than five (5) are carried over to the preceding number, in other words, the preceding number is increased by **1.**

EXAMPLE: Round off the following numbers to three (3) decimal places:
4.87231 becomes 4.872 (3 is less than 5)
16.10782 becomes 16.108 (8 is more than 5)
7.0032 becomes 7.003 - 62.6666 becomes 62.667

Note: Do not round off numbers until you have finished the problem.

Since you will be using a calculator, your answer will often be in the form of a decimal. The answers on the examination may be given as a decimal or a fraction. In some cases you will have to convert your decimal to its fractional equivalent. In order to convert a decimal part of a whole foot or a whole inch to a fraction or a whole foot or a whole inch to a fraction, you will multiply the decimal times (x) the whole unit represented by the decimal point.

EXAMPLE: 0.75 inches is equal to $\frac{0.75}{1} \times \frac{64}{64} = \frac{48}{64} = \frac{24}{32} = \frac{3"}{4}$

0.5 feet is equal to $\frac{0.5}{1} \times \frac{12}{12} \times \frac{6.0}{12} \times \frac{1}{2} = 6"$

Note: A whole inch may be represented as $\frac{64}{64}$ so 64 is the whole.
A whole foot may be represented as $\frac{12}{12}$ so 12 is the whole.

In some cases you may get a whole number and a decimal part of a whole number as your final answer.

EXAMPLE: 2.64 feet is equal to what ruler measurement?

STEP 1: 2 whole feet.

STEP 2: $\frac{0.64}{1} \times \frac{12}{12} = \frac{7.68"}{12}$ or 7 and $\frac{68}{100}$ of an inch.

STEP 3: $\frac{0.68}{1} \times \frac{64}{64} = \frac{43.52"}{64}$

STEP 4: $\frac{43.52"}{64}$ rounds off to $\frac{44}{64} = \frac{11}{16}$

ANSWER: 2.64' equals 21 - 7 - 11/16"

NOTE: Conversion tables have been added elsewhere in this manual. These tables are self-explanatory.

FORMULAS

NOTE: Tab this section for quick review. These formulas and constants should be memorized.

1. Area of squares and rectangles: area = length x width
2. Area of circles: area = π x radius^2
3. Circumference of a circle: circumference = π x diameter
4. Volume of a rectangle and square tanks: volume = length x width x height
5. Volume of a cylinder: volume = π x radius^2 x height
6. Gallons from cubic inches: $\text{gallons} = \frac{\text{cubic inches}}{231}$
7. Gallons from cubic feet: gallons = cubic feet x 7.5
8. Pounds per square inch (P.S.I.): P.S.I. = 0.434 x height
9. Height when pressure is known: height = 2.304 x pressure
10. Drop of a pipe: drop = pitch x run
11. Pitch of a pipe: $\text{pitch} = \frac{\text{drop}}{\text{run}}$
12. Run of a pipe: $\text{run} = \frac{\text{drop}}{\text{pitch}}$
13. Drop from %of fall: drop = % of fall x run
14. Length of a diagonal for 45° angles and offsets: diagonal = 1.414 x offset
15. Length of all other diagonals: diagonal = $\sqrt{a^2 + b^2}$
16. Actual length from scale: $\text{actual length} = \frac{\text{plan measurement}}{\text{scale}}$
17. Ratio of larger to smaller pipe: $\text{ratio} = \frac{(\text{large diameter})^2}{(\text{small diameter})^2}$

18. Man hours per joint: man hours = $\frac{\text{(number of hours x number of men)}}{\text{number of joints}}$

19. Lead needed for given number of joints:
lead need = pipe diameter x lead weight x number of joints

20. Total lead need plus waste allowance: total need = $\frac{\text{lead need}}{\text{(100\% - \% of waste)}}$

21. Degree of offset of a pipe fitting: degree of angle = fitting x 360°

CONSTANTS

NOTE: Tab This Section On Formulas And Constants

22.	1 cubic foot of water	=	7.5 gallons
23.	1 gallon of water	=	8.34 pounds
24.	1 foot of head	=	0.434 P.S.I.
25.	1 P.S.I.	=	2.304 feet of head
26.	1 gallon of water	=	231 cubic inches
27.	1 cubic foot	=	1728 cubic inches
28.	π	=	3.14

APPLICATION OF FORMULAS

The following are applications of the proceeding formulas identified with corresponding numbers:

Formula Number 1: Area of squares and rectangles:
What is the area of a rectangle measuring 51/2 feet by 14 feet?

Step 1: Area = length x width

Step 2: Area = 14' x 51/2'

Step 3: Area = 14' x 5.5'

Step 4: Area = 77 square feet.

Formula Number 2: Area of circles:
What is the area of a circle 6 inches in diameter?

Step 1: Area = π x radius^2

Step 2: Area = 3.14 x (3" x 3")

Step 3: Area = 3.14 x 9"

Step 4: Area = 28.26 square inches.

Formula Number 3: Circumference of circles:
What is the circumference of a circle with a 6-inch diameter?

Step 1: Circumference = π x diameter

Step 2: Circumference = 3.14 x 6"

Step 3: Circumference = 18.84 inches

Formula Number 4: Volume of rectangular and square tanks:
What is the volume of a tank 4 feet wide, 36 inches high and 81/2 feet long?

Step 1: Volume = length x width x height

Step 2: Volume = 81/2' x 4' x 36"

Step 3: Volume = 8.5' x 4' x 3'

Step 4: Volume = 102 cubic feet

Formula Number 5: Volume of a cylinder:
What is the volume of a cylinder 8 inches in diameter and 12 inches high?

Step 1: Volume = w x radius² x height

Step 2: Volume = 3.14 x [4" x 4"] x 12"

Step 3: Volume = 3.14 x 16" x 12"

Step 4: Volume = 602.88 cubic inches

Formula Number 6: Gallons from cubic Inches:
How many gallons will a tank hold if the tank contains 8,850 cubic inches?

Step 1: $\text{Gallons} = \frac{\text{Cubic Inches}}{231}$

Step 2: $\text{Gallons} = \frac{8{,}850}{231}$

Step 3: Gallons = 38.312

Formula Number 7: Gallons from cubic feet:
A tank contains 5,650 cubic feet of water. How many gallons are there?

Step 1: Gallons = cubic feet X 7.5

Step 2: Gallons = 5,650 x 7.5

Step 3: Gallons = 42,375

Formula Number 8: Pounds per square inch (P.S.I.):
What P.S.I. would be produced at the base of a stack with 50 feet head pressure (height)?

Step 1: P.S.I. = 0.434 x height

Step 2: P.S.I. = 0.434 x 50

Step 3: P.S.1 = 21.7

Formula Number 9: Height (or head) when pressure is known:
What head may be obtained if there is 33 P.S.I. applied?

Step 1: Height = 2.304 x P.S.I.

Step 2: Height = 2.304 x 33

Step 3: Height = 76.032 Feet

Formula Number 10: Drop of a pipe:

What is the amount of fall (or drop) if you have 1/8" fall per foot and a 92-foot run?

Step 1: Drop = pitch x run

Step 2: Drop = 1/8" x 92'

Step 3: Drop = 0.125" x 92'

Step 4: Drop = 11.5" or 11-1 /2"

Note: Drop must be in inches - Run remains in feet.

Formula Number 11: Pitch of pipe:

What is the pitch of a pipe with a run of 96 feet and a 1-foot drop?

Step 1: $\text{Pitch} = \frac{\text{drop}}{\text{run}}$

Step 2: $\text{Pitch} = \frac{1 \text{ foot}}{96 \text{ feet}}$

Step 3: $\text{Pitch} = \frac{12 \text{ inches}}{96 \text{ feet}}$

Step 4: Pitch = 0.125 inches or 1/8"

Formula Number 12: Run of a pipe:

From the building wall to the sewer tap there is 1 foot of drop on a sewer line with 1/4 inch pitch. How long is the Run?

Step 1: $\text{Run} = \frac{\text{drop}}{\text{pitch}}$

Step 2: $\text{Run} = \frac{1 \text{ foot}}{¼ \text{ inch}}$

Step 3: $\text{Run} = \frac{12}{.25}$

Step 4: Run = 48 feet

Formula Number 13: Drop from percent of fall:

A sewer installed with a 2% fall per foot has a run of 100 feet. How much drop will there be?

Step 1: Drop = % of fall x run

Step 2: Drop = 2% x 100 feet

Step 3: Drop = 0.0 2 x 100

Step 4: Drop = 2 feet

Formula Number 14: Length of a diagonal for 45° angles and offsets:

A sewer line has an offset of 8 feet. What is the length of the diagonal, (including fitting allowances)? Note: 1/8 bends are used to make the offset.

Step 1: Diagonal = 1.414 x offset

Step 2: Diagonal = 1.414 x 8 feet

Step 3: Diagonal = 11.312 feet

Formula Number 15: Length of all other diagonals:

What is the diagonal of a triangle with a height of 8 inches and a base of 10 inches?

Step 1: Diagonal = $\sqrt{A^2 + B^2}$

Step 2: Diagonal = $\sqrt{8^2 + 10^2}$

Step 3: Diagonal = $\sqrt{64 + 100}$

Step 4: Diagonal = 12.81 Inches

Formula Number 16: Actual length from scale:

If your ruler shows a length of a wall on a blueprint to measure 6-1/2 inches and the scale indicates 1/4 inch per foot, what is the actual length of the wall?

Step 1: Actual Length = $\frac{\text{plan measurement}}{\text{scale}}$

Step 2: Actual Length = $\frac{\text{6-1/2 inches}}{\text{1/4 inch}}$

Step 3: Actual Length = $\frac{6.5}{.25}$

Step 4: Actual Length = 26 feet

Formula Number 17: Ratio of larger to smaller pipe:
(Diameter not length and not allowing for friction)

How many 2-inch pipes will it take to replace one 4 inch pipe?

Step 1: $\text{Ratio} = \frac{(\text{Large Diameter})^2}{(\text{Small Diameter})^2}$

Step 2: $\text{Ratio} = \frac{(4)^2}{(2)^2}$

Step 3: $\text{Ratio} = \frac{16}{4}$

Step 4: Ratio = 4 Pipes Of 2 Inch Diameter.

Formula Number 18: Man hours per joint:
A Journeyman and an apprentice complete 200 five-inch joints in eight hours. What is the unit cost, in man-hours, per joint?

Step 1: $\text{Man Hours} = \frac{(\text{hours x number of men})}{\text{number of joints}}$

Step 2: $\text{Man Hours} = \frac{(8 \times 2)}{200}$

Step 3: $\text{Man Hours} = \frac{16}{200}$

Step 4: Man Hours = 0.08 hours per joint

Formula Number 19: Lead needed for given number of joints:
What is the amount of lead needed to calk 140 three-inch joints if each joint requires ¾ pounds of lead for each inch of diameter?

Step 1: Lead Need = diameter x weight x number of joints

Step 2: Lead Need = 3" x 3/4 lbs. x 140

Step 3: Lead Need = 311 x 0.75 Lb. x 140

Step 4: Lead Need = 315 Pounds (Lbs.)

Formula Number 20: Total lead need plus waste allowance:
A rough-in requires 300 pounds of lead. How much lead will be needed if there is a 7% waste?

Step 1: Total Need = $\frac{\text{Lead Need}}{(100\% - \%\text{ of waste})}$

Step 2: Total Need = $\frac{300}{(100\% - 7\%)}$

Step 3: Total Need = $\frac{300}{.93}$

Step 4: Total Need = 322.58 Pounds (Lbs.)

Formula Number 21: Degree of offset of a pipe:
What angle is made when you offset a sewer with a 1/5 bend?

Step 1: Degree of angle = Fitting x 360°

Step 2: Degree of angle = 1/5 x 360°

Step 3: Degree of angle = 0.20 x 360°

Step 4: Degree of angle = 72° (Degrees)

Note: You must change the fraction (1/5) to a decimal dividing the bottom number into the top number does this:

1/5 = 1.00/5 = 0.20

FIGURING PROFITS

There are two ways of showing a profit:

1. Profit on **COST** method.
2. Profit on **SALES** method.

Selling a job with your profit based on the profit on SALES method will make a greater net dollar. Both examples are shown below:

1. PROFIT ON COST:

EXAMPLE: What is the selling price of a job that costs $550.00 if you want a 10% profit on cost?

Selling Price (SP) = (Cost x 10%) + Cost
SP = ($550. x .10) + $550.00
SP = $55.00 + $550.00
SP = $605.00

2. PROFIT ON SALES:

EXAMPLE: What is the selling price of a job that costs $550.00 if you want a 10% profit on sales?

$$\text{Selling Price (SP)} = \frac{\text{Cost}}{(100\% - \%\text{ of Profit})}$$

$$SP = \frac{550.00}{(100\% - 10\%)}$$

$$SP = \frac{\$550.00}{90\%} \text{ or } \frac{\$550.00}{.90}$$

SP = $611.11

FIGURING DISCOUNTS

There are three types of discount problems likely to be asked on the examination. Practical examples of these methods is as follows:

1. SIMPLE DISCOUNT:

EXAMPLE: Your materials cost $300.00 subject to a 15% cash discount. What is your actual supply bill (ASB)?

STEP 1: ASB = 100% - Discount x Cost
STEP 2: ASB = (100% - 15%) x $300.00
STEP 3: ASB = 85% x $300.00 or 0.85 x 300.00
STEP 4: ASB = $255.00

MULTIPLE DISCOUNTS

Multiple discounts are indicated by a series of simple discounts such as: -15%, -10%, and -5%. To find the actual discount you must compute the series of simple discounts, which is equal to the multiple discounts.

EXAMPLE: The list price of type "L" copper pipe is $552.00 per 100 feet. Your discount is given -15%, -10% and -5% from list. What is your cost for this material?

STEP 1: Subtract each discount from 100%:

100%	100%	100%
-15%	-10%	-5%
85%	90%	95%

STEP 2: Change each percentage to a decimal:

.85 .90 .95

STEP 3: Multiply each decimal times (x) each other:

.85 x .90 x .95 = .727 Simple Discount

STEP 4: Multiply your simple discount by the list price to find your actual cost of materials:

.727 X $552. = $401.30 per 100' (actual cost after discount)

EARLY PAYMENT DISCOUNT

Early payment discounts are indicated by a simple discount in the space provided for **TERMS** on material invoices. This discount primarily applies to accounts on a monthly billing.

EXAMPLE: Your invoice for materials indicates your total cost is $600.00. Your terms are 2/10 net 30. If the bill is paid within 10 days what is the early payment discounted amount (EPD)?

Note: The number to the left of the slash (/) mark indicates the percentage discount if paid within the number of days indicated to the right of the slash mark.

STEP 1: EPD = 100% - Discount x Cost

STEP 2: EPD = (100% - 2%) x $600.00

STEP 3: EPD = 98% x $600.00 or .98 x 600.00

STEP 4: EPD = $588.00

CONVERSION TABLE

MULTIPLY	BY	TO OBTAIN
ACRES	43,560	SQUARE FEET
ACRE – FEET	43,560	CUBIC FEET
ACRE – FEET	325,851	GALLONS
ATMOSPHERES	76.0	CMS. OF MERCURY
ATMOSPHERES	29.92	INCHES OF MERCURY
ATMOSPHERES	33.90	FEET OF WATER
ATMOSPHERES	14.70	LBS./SQ. INCH
BTU /MINUTE	12.96	FEET-LBS./SECOND
BTU/ MINUTE	0.02356	HORSE-POWER
CENTIMETERS	0.3937	INCHES
CENTIMETERS OF MERCURY	0.01316	ATMOSPHERES
CENTIMETERS OF MERCURY	0.4461	FEET OF WATER
CENTIMETERS OF MERCURY	27.85	LBS./SQ. FOOT
CENTIMETERS OF MERCURY	0.1934	LBS./SQ. INCH
CUBIC FEET	1728	CUBIC INCHES
CUBIC FEET	0.03704	CUBIC YARDS
CUBIC FEET	7.48052	GALLONS
CUBIC FEET	29.92	QUARTS (LIQUID)
CUBIC FEET/ MINUTE	472.0	CUBIC CENTIMETERS /SECOND
CUBIC FEET /MINUTE	0.1247	GALLONS/ SECOND
CUBIC FEET/ MINUTE	62.43	POUNDS OF WATER/ MINUTE
CUBIC FEET /SECOND	0.646317	MILLION GALLONS/ DAY
CUBIC FEET/ SECOND	448.831	GALLONS/ MINUTE
CUBIC YARDS	27	CUBIC FEET
CUBIC YARDS	202.0	GALLONS
FEET OF WATER	0.02950	ATMOSPHERES
FEET OF WATER	0.8826	INCHES OF MERCURY
FEET OF WATER	62.43	LBS./ SQ. FOOT
FEET OF WATER	0.4335	LBS./ SQ. INCH
FEET/ MINUTE	0.01667	FEET/ SECOND
FEET/ MINUTE	0.01136	MILES/ HOUR

CONVERSION TABLE

MULTIPLY	BY	TO OBTAIN
FEET /SECOND	0.6818	MILES /HOUR
FEET/ SECOND	0.01136	MILES/ MINUTE
GALLONS	3785	CUBIC CENTIMETERS
GALLONS	0.1337	CUBIC FEET
GALLONS	231	CUBIC INCHES
GALLONS	4	QUARTS (LIQUID)
GALLONS WATER	8.3453	POUNDS OF WATER
GALLONS /MINUTE	0.002228	CUBIC FEET /SECOND
GALLONS /MINUTE	8.0208	CUBIC FEET /HOUR
GALLONS WATER/MINUTE	6.0086	TONS WATER /24 HOURS
INCHES	2.540	CENTIMETERS
INCHES OF MERCURY	0.03342	ATMOSPHERES
INCHES OF MERCURY	1.133	FEET OF WATER
INCHES OF MERCURY	0.4912	LBS./ SQ. FOOT
INCHES OF WATER	0.002458	ATMOSPHERES
INCHES OF WATER	0.07355	INCHES OF MERCURY
INCHES OF WATER	5.202	LBS. /SQ. FOOT
INCHES OF WATER	0.03613	LBS./ SQ. INCH
LITERS	1000	CUBIC CENTIMETERS
LITERS	61.02	CUBIC INCHES
LITERS	0.2642	GALLONS
MILES	5280	FEET
MILES/ HOUR	88	FEET /MINUTE
MILES/ HOUR	1.467	FEET /SECOND
MILLIMETERS	0.1	CENTIMETERS
MILLIMETERS	0.03937	INCHES
MILLION GALLONS/ DAY	1.54723	CUBIC FEET /SECOND

CONVERSION TABLE

MULTIPLY	BY	TO OBTAIN
POUNDS OF WATER	0.01602	CUBIC FEET
POUNDS OF WATER	27.68	CUBIC INCHES
POUNDS OF WATER	0.1198	GALLONS
POUNDS /CUBIC INCH	1728	POUNDS /CUBIC FOOT
POUNDS/ SQUARE FOOT	0.01602	FEET OF WATER
POUNDS /SQUARE INCH	0.06804	ATMOSPHERES
POUNDS /SQUARE INCH	2.307	FEET OF WATER
POUNDS /SQUARE INCH	2.036	INCHES OF MERCURY
QUART (DRY)	67.20	CUBIC INCHES
QUART (LIQUID)	57.75	CUBIC INCHES
SQUARE FEET	144	SQUARE INCHES
SQUARE MILES	640	ACRES
SQUARE YARDS	9	SQUARE FEET
TEMPERATURE (C°) + 273	1	ABSOLUTE TEMP. (C°)
TEMPERATURE (C°) + 17.78	1.8	TEMPERATURE (°F)
TEMPERATURE (°F) + 460	1	ABSOLUTE TEMP. (°F)
TEMPERATURE (°F) - 32	5/9	TEMPERATURE (C°)
TONS (SHORT)	2000	POUNDS
TONS OF WATER/ 24 HOURS	83,333	POUNDS WATER /HOUR
TONS OF WATER/ 24 HOURS	0.16643	GALLONS /MINUTE
TONS OF WATER/ 24 HOURS	1.3349	CUBIC FEET /HOUR

DECIMAL EQUIVALENTS OF A FOOT

INCHES	DECIMAL OF A FOOT	INCHES	DECIMAL OF A FOOT	INCHES	DECIMAL OF A FOOT
1/16	0.0052	4 - 1/16	0.3385	8 - 1/16	0.6719
1/8	0.0104	4 - 1/8	0.3438	8 - 1/8	0.6771
3/16	0.0156	4 - 3/16	0.3490	8 - 3/16	0.6823
1/4	0.0208	4 - 1/4	0.3542	8 - 1/4	0.6875
5/16	0.0260	4 - 5/16	0.3594	8 - 5/16	0.6927
3/8	0.0313	4 - 3/8	0.3646	8 - 3/8	0.6979
7/16	0.0365	4 - 7/16	0.3698	8 - 7/16	0.7031
1/2	0.0417	4 - 1/2	0.3750	8 - 1/2	0.7083
9/16	0.0469	4 - 9/16	0.3802	8 - 9/16	0.7135
5/8	0.0521	4 - 5/8	0.3854	8 - 5/8	0.7188
11/16	0.0573	4 - 11/16	0.3906	8 - 11/16	0.7240
3/4	0.0625	4 - 3/4	0.3958	8 - 3/4	0.7292
13/16	0.0677	4 - 13/16	0.4010	8 - 13/16	0.7344
7/8	0.0729	4 - 7/8	0.4063	8 - 7/8	0.7396
15/16	0.0781	4 - 15/16	0.4115	8 - 15/16	0.7448
1	0.0833	5	0.4167	9	0.7500
1 - 1/16	0.0885	5 - 1/16	0.4219	9 - 1/16	0.7552
1- 1/8	0.0938	5 - 1/8	0.4271	9 - 1/8	0.7604
1 - 3/16	0.0990	5 - 3/16	0.4323	9 - 3/16	0.7656
1 - 1/4	0.1042	5 – 1/4	0.4375	9 - 1/4	0.7708
1 - 5/16	0.1094	5 - 5/16	0.4427	9 - 5/16	0.7760
1 - 3/8	0.1146	5 - 3/8	0.4479	9 - 3/8	0.7813
1 - 7/16	0.1198	5 - 7/16	0.4531	9 - 7/16	0.7865
1 - 1/2	0.1250	5 - 1/2	0.4583	9 – 1/2	0.7917
1 - 9/16	0.1302	5 - 9/16	0.4635	9 - 9/16	0.7969
1 - 5/8	0.1354	5 - 5/8	0.4688	9 - 5/8	0.8021
1 - 11/16	0.1406	5 - 11/16	0.4740	9 - 11/16	0.8073
1 - 3/4	0.1458	5 - 3/4	0.4792	9 - 3/4	0.8125
1 - 13/16	0.1510	5 - 13/16	0.4844	9 - 13/16	0.8177
1 - 7/8	0.1563	5 - 7/8	0.4896	9 - 7/8	0.8229
1 - 15/16	0.1615	5 - 15/16	0.4948	9 - 15/16	0.8281
2	0.1667	6	0.5000	10	0.8333
2 - 1/16	0.1719	6 - 1/16	0.5052	10 - 1/16	0.8385
2 - 1/8	0.1771	6 - 1/8	0.5104	10 - 1/8	0.8438
2 - 3/16	0.1823	6 - 3/16	0.5156	10 - 3/16	0.8490
2 - 1/4	0.1875	6 - 1/4	0.5208	10 - 1/4	0.8542

DECIMAL EQUIVALENTS OF A FOOT

INCHES	DECIMAL OF A FOOT	INCHES	DECIMAL OF A FOOT	INCHES	DECIMAL OF A FOOT
2 - 5/16	0.1927	6 - 5/16	0.5260	10 - 5/16	0.8594
2 - 3/8	0.1979	6 - 3/8	0.5313	10 - 3/8	0.8646
2 - 7/16	0.2031	6 - 7/16	0.5365	10 - 7/16	0.8698
2 - 1/2	0.2383	6 - 1/2	0.5417	10 - 1/2	0.8750
2 - 9/16	0.2135	6 - 9/16	0.5469	10 - 9/16	0.8802
2 - 5/8	0.2188	6 - 5/8	0.5521	10 - 5/8	0.8854
2 - 11/16	0.2240	6 - 11/16	0.5573	10 - 11/16	0.8906
2 - 3/4	0.2292	6 - 3/4	0.5625	10 - 3/4	0.8958
2 - 13/16	0.2344	6 - 13/16	0.5677	10 - 13/16	0.9010
2 - 7/8	0.2396	6 - 7/8	0.5729	10 - 7/8	0.9063
2 - 15/16	0.2448	6 - 15/16	0.5781	10 - 15/16	0.9115
3	0.2500	7	0.5833	11	0.9167
3 - 1/16	0.2552	7 - 1/16	0.5885	11 - 1/16	0.9219
3 - 1/8	0.2604	7 - 1/8	0.5938	11 - 1/8	0.9271
3 - 3/16	0.2656	7 - 3/16	0.5990	11 - 3/16	0.9323
3 - 1/4	0.2708	7 - 1/4	0.6042	11 - 1/4	0.9375
3 - 5/16	0.2760	7 - 5/16	0.6094	11 - 5/16	0.9427
3 - 3/8	0.2813	7 - 3/8	0.6146	11 - 3/8	0.9479
3 - 7/16	0.2865	7 - 7/16	0.6198	11 - 7/16	0.9531
3 - 1/2	0.2917	7 - 1/2	0.6250	11 - 1/2	0.9583
3 - 9/16	0.2969	7 - 9/16	0.6302	11 - 9/16	0.9635
3 - 5/8	0.3021	7 - 5/8	0.6354	11 - 5/8	0.9688
3 - 11/16	0.3073	7 - 11/16	0.6406	11 - 11/16	0.9740
3 - 3/4	0.3125	7 - 3/4	0.6458	11 - 3/4	0.9792
3 - 13/16	0.3177	7 - 13/16	0.6510	11 - 13/16	0.9844
3 - 7/8	0.3229	7 - 7/8	0.6563	11 - 7/8	0.9896
3 - 15/16	0.3281	7 - 15/16	0.6615	11 - 15/16	0.9948
4	0.3333	8	0.6667	12	1.0000

INCHESAREAS- CIRCUMFERENCE OF CIRCLES

DECIMAL	FRACTION	LIMITS
0.000	0	0.000 - 0.031
0.062	1/16	0.032 - 0.093
0.125	1/8	0.094 - 0.156
0.187	3/16	0.157 - 0.218
0.25	1/4	0.219 - 0.281
0.312	5/16	0.282 - 0.343
0.375	3/8	0.344 - 0.406
0.437	7/16	0.407 - 0.468
0.05	1/2	0.469 - 0.531
0.562	9/16	0.532 - 0.593
0.625	5/8	0.594 - 0.656
0.687	11/16	0.657 - 0.718
0.75	3/4	0.719 - 0.781
0.812	13/16	0.782 - 0.843
0.875	7/8	0.844 - 0.906
0.937	15/16	0.907 - 0.968
1.000	16/16	0.969 - 1.031

DIAMETER	CIRCUMFERENCE	AREA
1/8	0.39270	0.01227
1/4	0.78540	0.04909
3/8	1.1781	0.11045
1/2	1.5708	0.19635
3/4	2.3562	0.44179
1	3.1416	0.7854
1-1/4	3.9270	1.2272
1-1/2	4.7124	1.7671
2	6.2832	3.1416
2-1/2	7.8540	4.9087
3	9.4248	7.0686
4	12.566	12.566
5	15.708	19.635
6	18.850	28.274
7	21.991	38.485
8	25.133	50.265
9	28.274	63.617
10	31.416	78.540

INCHES TO DECIMAL FEET

	0	1	2	3	4	5	6	7	8	9	10	11
INCHES		.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167
1/16	.0052	.0885	.1719	.2552	.3385	.4219	.5052	.5885	.6719	.7552	.8385	.9219
1/8	.0104	.0937	.1771	.2604	.3437	.4271	.5104	.5937	.6771	.7604	.8437	.9271
3/16	.0156	.0989	.1823	.2656	.3489	.4323	.5156	.5989	.6823	.7656	.8489	.9323
1/4	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375
5/16	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427
3/8	.0312	.1146	.1979	.2812	.3646	.4479	.5312	.6146	.6979	.7812	.8646	.9479
7/16	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531
1/2	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583
9/16	.0469	.1302	.2135	.2969	.3802	.4635	.5469	.6302	.7135	.7969	.8802	.9635
5/8	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	.9688
11/16	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740
3/4	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792
13/16	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8127	.9010	.9844
7/8	.0729	.1562	.2396	.3229	.4062	.4896	.5729	.6562	.7396	.8229	.9062	.9896
15/16	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948