Table 1: U.S. Customary and Metric Equivalents

In the following tables, the equivalents are rounded.

U.S. to Metric		Metric to U.S.	
Length Equivalents			
1 in.	= 2.54 cm (exact)	1 cm	= 0.394 in.
1 ft	= 0.305 m	1 m	= 3.28 ft
1 yd	= 0.914 m	1 m	= 1.09 yd
1 mi	= 1.61 km	1 km	= 0.62 mi
Area Equivalents			
1 $in.^2$	= 6.45 cm^2	1 cm^2	= 0.155 $in.^2$
1 ft^2	= 0.093 m^2	1 m^2	= 10.764 ft^2
1 yd^2	= 0.836 m^2	1 m^2	= 1.196 yd^2
1 acre	= 0.405 ha	1 ha	= 2.47 acres
Volume Equivalents			
1 $in.^3$	= 16.387 cm^3	1 cm^3	= 0.06 $in.^3$
1 ft^3	= 0.028 m^3	1 m^3	= 35.315 ft^3
1 qt	= 0.946 L	1 L	= 1.06 qt
1 gal	= 3.785 L	1 L	= 0.264 gal
Mass Equivalents			
1 oz	= 28.35 g	1 g	= 0.035 oz
1 lb	= 0.454 kg	1 kg	= 2.205 lb

Table 2: Celsius and Fahrenheit Equivalents

$$C = \frac{5(F-32)}{9} \qquad F = \frac{9 \cdot C}{5} + 32$$

Celsius		Fahrenheit
100°	← water boils at sea level →	212°
95°		203°
90°		194°
85°		185°
80°		176°
75°		167°
70°		158°
65°		149°
60°		140°
55°		131°
50°		122°
45°		113°
40°		104°
35°		95°
30°	comfort range	86°
25°		77°
20°		68°
15°		59°
10°		50°
5°		41°
0°	← water freezes at sea level →	32°

Table 3: Powers, Roots, and Prime Factorizations

Number	Square	Square Root	Cube	Cube Root	Prime Factorization
1	1	1.0000	1	1.0000	—
2	4	1.4142	8	1.2599	prime
3	9	1.7321	27	1.4422	prime
4	16	2.0000	64	1.5874	$2 \cdot 2$
5	25	2.2361	125	1.7100	prime
6	36	2.4495	216	1.8171	$2 \cdot 3$
7	49	2.6458	343	1.9129	prime
8	64	2.8284	512	2.0000	$2 \cdot 2 \cdot 2$
9	81	3.0000	729	2.0801	$3 \cdot 3$
10	100	3.1623	1000	2.1544	$2 \cdot 5$
11	121	3.3166	1331	2.2240	prime
12	144	3.4641	1728	2.2894	$2 \cdot 2 \cdot 3$
13	169	3.6056	2197	2.3513	prime
14	196	3.7417	2744	2.4101	$2 \cdot 7$
15	225	3.8730	3375	2.4662	$3 \cdot 5$
16	256	4.0000	4096	2.5198	$2 \cdot 2 \cdot 2 \cdot 2$
17	289	4.1231	4913	2.5713	prime
18	324	4.2426	5832	2.6207	$2 \cdot 3 \cdot 3$
19	361	4.3589	6859	2.6684	prime
20	400	4.4721	8000	2.7144	$2 \cdot 2 \cdot 5$
21	441	4.5826	9261	2.7589	$3 \cdot 7$
22	484	4.6904	10,648	2.8020	$2 \cdot 11$
23	529	4.7958	12,167	2.8439	prime
24	576	4.8990	13,824	2.8845	$2 \cdot 2 \cdot 2 \cdot 3$
25	625	5.0000	15,625	2.9240	$5 \cdot 5$
26	676	5.0990	17,576	2.9625	$2 \cdot 13$
27	729	5.1962	19,683	3.0000	$3 \cdot 3 \cdot 3$
28	784	5.2915	21,952	3.0366	$2 \cdot 2 \cdot 7$
29	841	5.3852	24,389	3.0723	prime
30	900	5.4772	27,000	3.1072	$2 \cdot 3 \cdot 5$
31	961	5.5678	29,791	3.1414	prime
32	1024	5.6569	32,768	3.1748	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
33	1089	5.7446	35,937	3.2075	$3 \cdot 11$
34	1156	5.8310	39,304	3.2396	$2 \cdot 17$
35	1225	5.9161	42,875	3.2711	$5 \cdot 7$
36	1296	6.0000	46,656	3.3019	$2 \cdot 2 \cdot 3 \cdot 3$
37	1369	6.0828	50,653	3.3322	prime
38	1444	6.1644	54,872	3.3620	$2 \cdot 19$
39	1521	6.2450	59,319	3.3912	$3 \cdot 13$
40	1600	6.3246	64,000	3.4200	$2 \cdot 2 \cdot 2 \cdot 5$
41	1681	6.4031	68,921	3.4482	prime
42	1764	6.4807	74,088	3.4760	$2 \cdot 3 \cdot 7$
43	1849	6.5574	79,507	3.5034	prime
44	1936	6.6332	85,184	3.5303	$2 \cdot 2 \cdot 11$
45	2025	6.7082	91,125	3.5569	$3 \cdot 3 \cdot 5$
46	2116	6.7823	97,336	3.5830	$2 \cdot 23$
47	2209	6.8557	103,823	3.6088	prime
48	2304	6.9282	110,592	3.6342	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$
49	2401	7.0000	117,649	3.6593	$7 \cdot 7$
50	2500	7.0711	125,000	3.6840	$2 \cdot 5 \cdot 5$

Table 3: Powers, Roots, and Prime Factorizations (continued)

Number	Square	Square Root	Cube	Cube Root	Prime Factorization
51	2601	7.1414	132,651	3.7084	$3 \cdot 17$
52	2704	7.2111	140,608	3.7325	$2 \cdot 2 \cdot 13$
53	2809	7.2801	148,877	3.7563	prime
54	2916	7.3485	157,464	3.7798	$2 \cdot 3 \cdot 3 \cdot 3$
55	3025	7.4162	166,375	3.8030	$5 \cdot 11$
56	3136	7.4833	175,616	3.8259	$2 \cdot 2 \cdot 2 \cdot 7$
57	3249	7.5498	185,193	3.8485	$3 \cdot 19$
58	3364	7.6158	195,112	3.8709	$2 \cdot 29$
59	3481	7.6811	205,379	3.8930	prime
60	3600	7.7460	216,000	3.9149	$2 \cdot 2 \cdot 3 \cdot 5$
61	3721	7.8102	226,981	3.9365	prime
62	3844	7.8740	238,328	3.9579	$2 \cdot 31$
63	3969	7.9373	250,047	3.9791	$3 \cdot 3 \cdot 7$
64	4096	8.0000	262,144	4.0000	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
65	4225	8.0623	274,625	4.0207	$5 \cdot 13$
66	4356	8.1240	287,496	4.0412	$2 \cdot 3 \cdot 11$
67	4489	8.1854	300,763	4.0615	prime
68	4624	8.2462	314,432	4.0817	$2 \cdot 2 \cdot 17$
69	4761	8.3066	328,509	4.1016	$3 \cdot 23$
70	4900	8.3666	343,000	4.1213	$2 \cdot 5 \cdot 7$
71	5041	8.4261	357,911	4.1408	prime
72	5184	8.4853	373,248	4.1602	$2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$
73	5329	8.5440	389,017	4.1793	prime
74	5476	8.6023	405,224	4.1983	$2 \cdot 37$
75	5625	8.6603	421,875	4.2172	$3 \cdot 5 \cdot 5$
76	5776	8.7178	438,976	4.2358	$2 \cdot 2 \cdot 19$
77	5929	8.7750	456,533	4.2543	$7 \cdot 11$
78	6084	8.8318	474,552	4.2727	$2 \cdot 3 \cdot 13$
79	6241	8.8882	493,039	4.2908	prime
80	6400	8.9443	512,000	4.3089	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 5$
81	6561	9.0000	531,441	4.3267	$3 \cdot 3 \cdot 3 \cdot 3$
82	6724	9.0554	551,368	4.3445	$2 \cdot 41$
83	6889	9.1104	571,787	4.3621	prime
84	7056	9.1652	592,704	4.3795	$2 \cdot 2 \cdot 3 \cdot 7$
85	7225	9.2195	614,125	4.3968	$5 \cdot 17$
86	7396	9.2736	636,056	4.4140	$2 \cdot 43$
87	7569	9.3274	658,503	4.4310	$3 \cdot 29$
88	7744	9.3808	681,472	4.4480	$2 \cdot 2 \cdot 2 \cdot 11$
89	7921	9.4340	704,969	4.4647	prime
90	8100	9.4868	729,000	4.4814	$2 \cdot 3 \cdot 3 \cdot 5$
91	8281	9.5394	753,571	4.4979	$7 \cdot 13$
92	8464	9.5917	778,688	4.5144	$2 \cdot 2 \cdot 23$
93	8649	9.6437	804,357	4.5307	$3 \cdot 31$
94	8836	9.6954	830,584	4.5468	$2 \cdot 47$
95	9025	9.7468	857,375	4.5629	$5 \cdot 19$
96	9216	9.7980	884,736	4.5789	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$
97	9409	9.8489	912,673	4.5947	prime
98	9604	9.8995	941,192	4.6104	$2 \cdot 7 \cdot 7$
99	9801	9.9499	970,299	4.6261	$3 \cdot 3 \cdot 11$
100	10,000	10.0000	1,000,000	4.6416	$2 \cdot 2 \cdot 5 \cdot 5$

About Table 4 and the Value of π

As discussed in the text in Section 5.6, π is an irrational number, and so the decimal form of π is an infinite non-repeating decimal. Mathematicians even in ancient times realized that π is a constant value obtained from the ratio of a circle's circumference to its diameter, but they had no sense that it might be an irrational number. As early as about 1800 B.C., the Babylonians gave π a value of 3, and around 1600 B.C. the ancient Egyptians were using the approximation of 256/81, that would be a decimal value of about 3.1605. In the third century B.C., the Greek mathematician Archimedes used polygons approximating a circle to determine that the value of π must lie between 223/71 (=3.1408) and 22/7 (=3.1429). He was accurate to two decimal places. About seven hundred years later, in the fourth century A.D., Chinese mathematician Tsu Chung-Chi refined Archimedes' method and expressed the constant as 355/113, which was correct to six decimal places. By 1610, Ludolph van Ceulen of Germany had also used a polygon method to find π accurate to 35 decimal places.

Knowing that the decimal expression of π would not terminate, mathematicians still sought a repeating pattern in its digits. Such a pattern would mean that π was a rational number and that there would be some ratio of two whole numbers that would produce the correct decimal representations. Finally, in 1767, Johann Heinrich Lambert provided a proof to show that π is indeed irrational and thus is non repeating as well as non terminating.

Since Lambert's proof, mathematicians have still made an exercise of calculating π to more and more decimal places. The advent of the computer age in this century has made that work immeasurably easier, and on occasion you will still see newspaper articles pronouncing that mathematics researchers have reached a new high in the number of decimal places in their approximations. In 1988, that number was 201,326,000 decimal places. Within 1 year, that record was more than doubled, and most recent approximations of π now reach beyond one billion decimal places! For your understanding, appreciation, and interest, the value of π is given in table 4 to a mere 4000 decimal places as calculated by a computer program. To show π calculated to one billion decimal places would take every page of nearly 400 copies of this text!

Table 4: The Value of π

$\pi =$

3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706798214808651328230664709384460955058223172535940812848111745028410270193852110555964462294895493038196442881097566593344612847564823378678316527120190914564856692346034861045432664821339360726024914127372458700660631558817488152092096282925409171536436789259036001133053054882046652138414695194151160943305727036575959195309218611738193261179310511854807446237996274956735188575272489122793818301194912983367336244065664308602139494639522473719070217986094370277053921717629317675238467481846766940513200056812714526356082778577134275778960917363717872146844090122495343014654958537105079227968925892354201995611212902196086403441815981362977477130996051870721134999999837297804995105973173281609631859502445945534690830264252230825334468503526193118817101000313783875288658753320838142061717669147303598253490428755468731159562863882353787593751957781857780532171226806613001927876611195909216420198938095257201065485863278865936153381827968230301952035301852968995773622599413891249721775283479131515574857242454150695950829533116861727855889075098381754637464939319255060400927701671139009848824012858361603563707660104710181942955596198946767837449448255379774726847104047534646208046684259069491293313677028989152104752162056966024058038150193511253382430035587640247496473263914199272604269922796782354781636009341721641219924586315030286182974555706749838505494588586926995690927210797509302955321165344987202755960236480665499119881834797753566369807426542527862551818417574672890977727938000816470600161452491921732172147723501414419735685481613611573525521334757418494684385233239073941433345477624168625189835694855620992192221842725502542568876717904946016534668049886272327917860857843838279679766814541009538837863609506800642251252051173929848960841284886269456042419652850222106611863067442786220391949450471237137869609563643719172874677646575739624138908658326459958133904780275900994657640789512694683983525957098258226205224894077267194782684826014769909026401363944374553050682034962524517493996514314298091906592509372216964615157098583874105978859597729754989301617539284681382686838689427741559918559252459539594310499725246808459872736446958486538367362226260991246080512438843904512441365497627807977156914359977001296160894416948685558484063534220722258284886481584560285060168427394522674676788952521385225499546667278239864565961163548862305774564980355936345681743241125150760694794510965960940252288797108931456691368672287489405601015033086179286809208747609178249385890097149096759852613655497818931297848216829989487226588048575640142704775551323796414515237462343645428584447952658678210511413547357395231134271661021359695362314429524849371871101457654035902799344037420073105785390621983874478084784896833214457138687519435064302184531910484810053706146806749192781911979399520614196634287544406437451237181921799983910159195618146751426912397489409071864942319615679452080951465502252316038819301420937621378559566389377870830390697920773467221825625996615014215030680384477345492026054146659252014974428507325186660021324340881907104863317346496514539057962685610055081066587969981635747363840525714591028970641401109712062804390397595156771577004203378699360072305587631763594218731251471205329281918261861258673215791984148488291644706095752706957220917567116722910981690915280173506712748583222871835209353965725121083579151369882091444210067510334671103141267111369908658516398315019701651511685171437657618351556508849099898599823873455283316355076479185358932261854896321329330898570642046752590709154814165498594616371802709819943099244889575712828905923233260972997120844335732654893823911932597463667305836041428138830320382490375898524374417029132765618093773444030707469211201913020330380197621101100449293215160842444859637669838952286847831235526582131449576857262433441893039686426243410773226978028073189154411010446823252716201052652272111660396