

Paper Sizes and Paper Weight: Metric and US Standards

Introduction

Paper sizes are all related to letter size, because this is a convenient size for handling. In most of the world, letter size is 'A4' size or 210 by 297 millimeters (mm). In the United States, letter size is 'A' size or 8 1/2 by 11 inches. (The United States is a metric country. Measures in the United States have been hard metric since 1866 when the inch was defined as exactly 25.4 mm.) Paper sizes are organized into series based on folding a standard, large sheet of paper into a smaller letter size or book page size. Originally, there were many standard sizes. In reprographics there is now one standard series in the metric world, and one standard series in the United States.

Sheets of Paper

Originally paper was hand made, one sheet at a time. It was also hand printed, one sheet at a time. Now paper is made in a continuous web or ribbon up to 6 Meters (20 feet) wide. Paper is also printed on a continuous web in newspapers and other high speed printing processes in which the paper may move at up to 100 kilometers per hour (60 miles per hour). Because each paper roll must end, the paper handling equipment can automatically splice the end of one roll to the beginning of the next roll while the paper is moving through the press at 100 kilometers per hour (60 miles per hour). Laser printers that print at up to 1,300 pages per minute also uses paper rolls, but currently the printers must be stopped to load a new roll.

Efficiency

The speed at which hand fed presses can be operated is limited. Historically, once the maximum feeding speed was reached, the only way to increase efficiency was to increase the size of the sheet being printed with each

printing impression. To accommodate the need for a manageable book size, the printed sheet was folded. An unfolded sheet has two sides; a sheet folded once has four sides and is called a folio.

Books

The folded sheets are called signatures which are gathered and sewn together into a book. A book of folio signatures is called a folio edition.

Book Production

As described above, books are printed on large sheets of paper, called broadsheets or broadsides, reducing the number of printing impressions required. Each of the large sheets is then folded. Each folded sheet forms a signature. The signatures are gathered and sewn together to form a book. After binding the bolts are trimmed (cut) on three sides. The bolts are the uncut edges of the book, called the head, the fore-edge, and tail or foot. This trimming leaves the bound spine and forms the bound leaves of the book. (Uncut broadsheet sheet sizes are given as untrimmed sizes; cut letter and page sizes are given as trimmed sizes.) After trimming the book is free to be opened. In a book opening the verso or back side of a cut page or leaf appears on the left and the recto or front side of a cut leaf appears on the right.

Book Size

Two things affect the size of the pages of a book, the size of the original sheet of paper, and the number of times the sheet of paper is folded before trimming. Books bound from once folded signatures are called folio editions. Quarto editions are bound from twice folded signatures. Octavo editions are bound from thrice folded signatures. Sextodecimo or sixteenmo editions are bound from signatures

folded four times, and thirty-twomos from 5 folds and sixty-fourmos from 6 folds. Interestingly, it is not possible to fold a piece of paper more than 7 times.

In England, there were dozens of traditional standard sheet sizes. In the metric world, for reprographics, there is one standard sheet size. In the United States, for reprographics, there is one standard sheet size (trimmed), and one old standard sheet size (untrimmed). In England, in the metric world, and in the United States, there are still a variety of sheet sizes used in commercial printing.

Aspect Ratio

An aspect ratio is the ration of one side of a sheet to the other side. A sheet that is 100 mm by 50 mm (4 inches by 2 inches) has an aspect ratio of 2. A sheet of paper that is 200 by 100 mm (8 by 4 inches) has an aspect ration of 2 as well. A television screen has an aspect ratio of 4 to 3 which is often referred to as the golden ratio, and is the same aspect ratio as the 300 by 225 mm (12 by 9 inch) 'A' size sheet that is the basis for the old (untrimmed) United States paper size series. HDTV (High Definition TV) has an aspect ratio of 16 to 9. When giving an aspect ratio as two numbers, the horizontal dimension or width is always given first, and the vertical dimension, or height is given second.

An aspect ratio greater than 1 is called a landscape aspect ratio because most landscape paintings are wider than they are tall. An aspect ratio less than 1 is called a portrait aspect ratio because most portrait paintings are narrower than they are tall.

Traditional English Paper Sizes in Inches

As can be seen, traditional English paper sheets come in a wide variety of sizes. Traditional English paper sheets also come in a wide variety of aspect ratios.

Traditional English Paper Sizes

Name	Untrimmed Sheet Size	Folded Quarto Size	Name	Untrimmed Sheet Size	Folded Quarto Size
Pot	12 3/4 x 15 1/2	6 3/8 x 7 3/4	Imperial	22 x 30	11 x 15
Crown	15 x 20	7 1/2 x 10	Medium	18 x 23	9 x 11 1/2
Double Crown	20 x 30	10 x 15	Double Medium	23 x 36	11 1/2 x 18
Quad Crown	30 x 40	15 x 20			
Double Quad Crown	40 x 60	20 x 30	Post	15 1/2 x 19 1/4	7 3/4 x 9 5/8
			Large Post	16 1/2 x 21	8 1/4 x 10 1/2
Demy	17 1/2 x 22 1/2	8 3/4 x 11 1/4	Sheet and 1/2 Post	19 1/2 x 23 1/2	9 3/4 x 11 3/4
Small Demy	15 1/2 x 20	7 3/4 x 10	Double Post	19 1/2 x 31 1/2	9 3/4 x 15 3/4
Double Demy (Music Demy)	22 1/2 x 35	11 1/4 x 17 1/2	Double Large Post	21 x 33	10 1/2 x 16 1/2
Quad Demy	35 x 45	17 1/2 x 22 1/2			
			Royal	20 x 25	10 x 12 1/2
Small Foolscap	13 1/4 x 16 1/2	6 5/8 x 8 1/4	Super Royal	20 x 27 1/2	10 x 13 3/4
Double Foolscap	17 x 27	8 1/2 x 13 1/2	Double Royal	25 x 40	12 1/2 x 20
Foolscap	13 1/2 x 17	6 3/4 x 8 1/2			
Quad Foolscap	27 x 34	13 1/2 x 17	Elephant	23 x 28	11 1/2 x 14

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The Old (Untrimmed) United States Paper Size

As described, the old United States paper size was based on a 9 by 12 inch piece of paper. This was trimmed to 8 1/2 by 11 which became the new

basis for the standard paper size. In reprographics and records management, as well as digital imaging, the older paper sizes must be accommodated because the older records are still on the older size sheets.

Folded Sizes

As can be seen, an E size sheet once folded is D size, twice folded is C size, thrice folded is B size, and folded 4 times, is A size.

Varying Aspect Ratio

In the United States System, when enlarging page size from 'A' Size to 'B' Size, the aspect ratio changes. That is, when one enlarges an 8 1/2 x 11 inch image to 11 x 17 inches, it does not fit exactly. The Europeans who established the metric paper sizes engineered a paper size series in which the aspect ratio is the same for all paper sizes. The only aspect ratio for which this is possible is the square root of two. In the metric world, when an image is enlarged from one paper size to another, the image fits exactly.

Metric Paper Sizes

The basic size of metric paper is one square meter, which is the area of an A0 sheet of metric paper. This size, taken along with the aspect ratio, the square root of two, fully determines the size and shape of metric reprographics paper.

For a given sheet size, United States paper is a little wider than metric paper in the short dimension, and a little shorter than metric paper in the long dimension.

As can be seen, A0 size folded once is A1 size, folded twice is A2 size, folded thrice is A3 size, and folded 4 times is A4 size.

Metric paper also has a 'B' series of sizes for posters and wall-charts and a 'C' series of sizes for envelopes.

Weights of Paper

The weight of metric paper is given in grams per square meter (gsm). As written above, by definition, one square meter is one A0 size sheet or 16 A4 size sheets. The weight of United States letter size paper is given in pounds per 500 sheet ream of uncut C size paper. For the letter size paper, a sheet is cut into 4 pages so that a cut ream of letter size paper, 500 letter size sheets, weighs 5 pounds if the paper is nominally 20 pound paper.

Summary

Paper sizes are based on what is convenient to handle. Reprographics paper sizes come in series that are related by folding from or to a base size. In the metric world, the base size is A0, which produces a letter size of 210 x 297 mm (millimeters). In the United States the equivalent letter size and base size is 8 1/2 by 11 inches. [006v24]

Sidebar

FUD is a computer acronym that stands for Fear, Uncertainty, and Doubt.

In mid-1998 Microsoft released a listing of the Y2K (Year 2000 millennium bug) dependencies of its products at www.microsoft.com. While Office 97 and Windows 95 are said to have no serious problems, it seems prudent to use the 98 versions (or later) of the Microsoft products which have been checked to ensure that they provide a smooth transition to the new millennium.

United States Paper Sizes in Inches, New (Trimmed) and Old (Untrimmed)

Name	New Size	Old Size	Name	New Size	Old Size
A	8 1/2 x 11	9 x 12	F	28 x 40	varies
B	11 x 17	12 x 18	G	11 x (22 1/2 to 90)	varies
C	17 x 22	18 x 24	H	28 x (44 to 143)	varies
D	22 x 34	24 x 36	J	34 x (55 to 176)	varies
E	34 x 44	36 x 48	K	40 x (55 to 143)	varies

Metric Trimmed Paper Sizes

Metric Name	Metric Size in mm	Size in Inches	United States Size	Size in Inches
A8	53 x 74	2.07 x 2.91	Business card	2 x 3 1/2
A7	74 x 105	2.91 x 4.13	3 x 5	3 x 5
A6	105 x 148	4.13 x 5.83	Microfiche	4.13 x 5.83
A5	148 x 210	5.83 x 8.27	5 x 8	5 x 8
A4	210 x 297	8.27 x 11.69	A	8 1/2 x 11
A3	297 x 420	11.69 x 16.54	B	11 x 17
A2	420 x 594	16.54 x 23.39	C	17 x 22
A1	594 x 841	23.39 x 33.11	D	22 x 34
A0	841 x 1189	33.11 x 46.81	E	34 x 44
2A	1189 x 1681	46.81 x 66.22		

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Note to Editors

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Steve Gilheany is a Sr. Systems Engineer at Archive Builders. He has worked in digital document management and document imaging for eighteen years.

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In addition, he has nine years of experience in data center operations and database and computer communications systems design, programming, testing, and software configuration management. He has an MLS Specialization in Information Science and an MBA with a concentration in Computer and Information Systems from UCLA, a California Adult Education teaching credential, and a BA in Computer Science from the University of Wisconsin at Madison. His industry certifications include: the CDIA (Certified Document Imaging System Architect) and the AIIM Master, and AIIM Laureate, of Information Technologies (from AIIM International, the Association of Information and Image Management, www.AIIM.org), and the CRM (Certified Records Manager) (from the ICRM, the Institute of Certified Records Managers, an affiliate of ARMA International, the Association of Records Managers and Administrators, www.ARMA.org).

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Paper Weights		Name of Standard Sheet Sizes					
		Sorted by Round Number Weight Within Basis Size Name					
Basis Size	Book	Bond	Bristol	Index	Tag	Metric*	
inches	25	17	22.5	25.5	24	39.37	
by	by	by	by	by	by	by	
inches	38	22	28.5	30.5	36	39.37	
area in sq. in.	950	374	641.25	777.75	864	1550.00	
mm	635	431.8	571.5	647.7	609.6	1000	
by	by	by	by	by	by	by	
mm	965.2	558.8	723.9	774.7	914.4	1000	
area in sq. M	0.612902	0.241290	0.413709	0.501773	0.557418	1.000000	
	pounds**	pounds**	pounds**	pounds**	pounds**	gsm***	
	30	11.81	20.25	24.56	27.28	44.40	
	40	15.75	27.00	32.75	36.38	59.21	
	45	17.72	30.38	36.84	40.93	66.61	
	50	19.68	33.75	40.93	45.47	74.01	
	60	23.62	40.50	49.12	54.57	88.81	
	70	27.56	47.25	57.31	63.66	103.61	
	80	31.49	54.00	65.49	72.76	118.41	
	90	35.43	60.75	73.68	81.85	133.21	
	100	39.37	67.50	81.87	90.95	148.01	
	120	47.24	81.00	98.24	109.14	177.62	
	33.02	13	22.29	27.03	30.03	48.88	
	40.64	16	27.43	33.27	36.96	60.16	
	50.80	20	34.29	41.59	46.20	75.19	
	60.96	24	41.15	49.91	55.44	90.23	
	71.12	28	48.01	58.23	64.68	105.27	
	81.28	32	54.87	66.55	73.93	120.31	
	91.44	36	61.72	74.86	83.17	135.35	
	101.60	40	68.58	83.18	92.41	150.39	
	99.26	39.08	67	81.26	90.27	146.92	
	118.52	46.66	80	97.03	107.79	175.42	
	148.15	58.32	100	121.29	134.74	219.28	
	177.78	69.99	120	145.54	161.68	263.14	
	207.41	81.65	140	169.80	188.63	306.99	
	237.04	93.32	160	194.06	215.58	350.85	
	109.93	43.28	74.20	90	99.98	162.72	
	134.36	52.90	90.69	110	122.20	198.88	
	171.01	67.32	115.43	140	155.53	253.11	
	207.65	81.75	140.16	170	188.85	307.35	
	109.95	43.29	74.22	90.02	100	162.75	
	137.44	54.11	92.77	112.52	125	203.43	
	164.93	64.93	111.33	135.03	150	244.12	
	192.42	75.75	129.88	157.53	175	284.81	
	219.91	86.57	148.44	180.03	200	325.50	
	274.88	108.22	185.55	225.04	250	406.87	
	6.76	2.66	4.56	5.53	6.14	10	
	13.51	5.32	9.12	11.06	12.29	20	
	20.27	7.98	13.68	16.59	18.43	30	
	27.02	10.64	18.24	22.12	24.58	40	
	33.78	13.30	22.80	27.66	30.72	50	
	40.54	15.96	27.36	33.19	36.87	60	
	47.29	18.62	31.92	38.72	43.01	70	
	54.05	21.28	36.48	44.25	49.16	80	
	60.80	23.94	41.04	49.78	55.30	90	
	67.56	26.60	45.60	55.31	61.44	100	
	74.32	29.26	50.16	60.84	67.59	110	
	81.07	31.92	54.72	66.37	73.73	120	
	87.83	34.58	59.28	71.90	79.88	130	
	94.59	37.24	63.85	77.44	86.02	140	
	101.34	39.90	68.41	82.97	92.17	150	
	108.10	42.56	72.97	88.50	98.31	160	
	114.85	45.22	77.53	94.03	104.46	170	
	121.61	47.88	82.09	99.56	110.60	180	
	128.37	50.54	86.65	105.09	116.75	190	
	135.12	53.20	91.21	110.62	122.89	200	
	141.88	55.86	95.77	116.15	129.03	210	
	148.63	58.51	100.33	121.68	135.18	220	
	155.39	61.17	104.89	127.22	141.32	230	
	162.15	63.83	109.45	132.75	147.47	240	
	168.90	66.49	114.01	138.28	153.61	250	
	175.66	69.15	118.57	143.81	159.76	260	
	182.41	71.81	123.13	149.34	165.90	270	
	189.17	74.47	127.69	154.87	172.05	280	
	195.93	77.13	132.25	160.40	178.19	290	
	202.68	79.79	136.81	165.93	184.33	300	
	209.44	82.45	141.37	171.46	190.48	310	
	216.19	85.11	145.93	177.00	196.62	320	
	222.95	87.77	150.49	182.53	202.77	330	
	229.71	90.43	155.05	188.06	208.91	340	
	236.46	93.09	159.61	193.59	215.06	350	
	243.22	95.75	164.17	199.12	221.20	360	
	249.98	98.41	168.73	204.65	227.35	370	
	256.73	101.07	173.29	210.18	233.49	380	
	263.49	103.73	177.85	215.71	239.63	390	
	270.24	106.39	182.41	221.24	245.78	400	
	277.00	109.05	186.97	226.78	251.92	410	
	283.76	111.71	191.54	232.31	258.07	420	
	290.51	114.37	196.10	237.84	264.21	430	
	297.27	117.03	200.66	243.37	270.36	440	
	304.02	119.69	205.22	248.90	276.50	450	

pounds per gram 0.002204623
 Grams per pound 453.59237
 mm per inch 25.40000000
 sheets per ream 500.0000000
 *While the aspect ratio of an A0 size sheet is the square root of two (2 ** (1/2)), and the size of an A0 size sheet is 841 mm x 1189 mm (.999949 sq. M.), the weight of paper is given as grams per exactly 1.000000 square meter.
 pounds** (pounds per 500 sheet ream of the specified basis size)
 gsm*** (grams per square meter)

Paper Weights		Name of Standard Sheet Sizes					
		Sorted by Weight					
Basis Size	Book	Bond	Bristol	Index	Tag	Metric*	
inches	25	17	22.5	25.5	24	39.37	
by	by	by	by	by	by	by	
inches	38	22	28.5	30.5	36	39.37	
area in sq. in.	950	374	641.25	777.75	864	1550.00	
mm	635	431.8	571.5	647.7	609.6	1000	
by	by	by	by	by	by	by	
mm	965.2	558.8	723.9	774.7	914.4	1000	
area in sq. M	0.612902	0.241290	0.413709	0.501773	0.557418	1.000000	
	pounds**	pounds**	pounds**	pounds**	pounds**	gsm***	
	6.76	2.66	4.56	5.53	6.14	10	
	13.51	5.32	9.12	11.06	12.29	20	
	20.27	7.98	13.68	16.59	18.43	30	
	27.02	10.64	18.24	22.12	24.58	40	
	33.78	13.30	22.80	27.66	30.72	50	
	40.54	15.96	27.36	33.19	36.87	60	
	47.29	18.62	31.92	38.72	43.01	70	
	54.05	21.28	36.48	44.25	49.16	80	
	60.80	23.94	41.04	49.78	55.30	90	
	67.56	26.60	45.60	55.31	61.44	100	
	74.32	29.26	50.16	60.84	67.59	110	
	81.07	31.92	54.72	66.37	73.73	120	
	87.83	34.58	59.28	71.90	79.88	130	
	94.59	37.24	63.85	77.44	86.02	140	
	101.34	39.90	68.41	82.97	92.17	150	
	108.10	42.56	72.97	88.50	98.31	160	
	114.85	45.22	77.53	94.03	104.46	170	
	121.61	47.88	82.09	99.56	110.60	180	
	128.37	50.54	86.65	105.09	116.75	190	
	135.12	53.20	91.21	110.62	122.89	200	
	141.88	55.86	95.77	116.15	129.03	210	
	148.63	58.51	100.33	121.68	135.18	220	
	155.39	61.17	104.89	127.22	141.32	230	
	162.15	63.83	109.45	132.75	147.47	240	
	168.90	66.49	114.01	138.28	153.61	250	
	175.66	69.15	118.57	143.81	159.76	260	
	182.41	71.81	123.13	149.34	165.90	270	
	189.17	74.47	127.69	154.87	172.05	280	
	195.93	77.13	132.25	160.40	178.19	290	
	202.68	79.79	136.81	165.93	184.33	300	
	209.44	82.45	141.37	171.46	190.48	310	
	216.19	85.11	145.93	177.00	196.62	320	
	222.95	87.77	150.49	182.53	202.77	330	
	229.71	90.43	155.05	188.06	208.91	340	
	236.46	93.09	159.61	193.59	215.06	350	
	243.22	95.75	164.17	199.12	221.20	360	
	249.98	98.41	168.73	204.65	227.35	370	
	256.73	101.07	173.29	210.18	233.49	380	
	263.49	103.73	177.85	215.71	239.63	390	
	270.24	106.39	182.41	221.24	245.78	400	
	277.00	109.05	186.97	226.78	251.92	410	
	283.76	111.71	191.54	232.31	258.07	420	
	290.51	114.37	196.10	237.84	264.21	430	
	297.27	117.03	200.66	243.37	270.36	440	
	304.02	119.69	205.22	248.90	276.50	450	
	6.76	2.66	4.56	5.53	6.14	10	
	13.51	5.32	9.12	11.06	12.29	20	
	20.27	7.98	13.68	16.59	18.43	30	
	27.02	10.64	18.24	22.12			