*Table A.5. Upper tail probabilities for the null distribution of Wilcoxon's rank sum W statistic:* $m = 3(1)10, n = 1(1)m$; $m = 11(1)20, n = 1(1)4$

For given $m$ and $n$, the table entry for the point $x$ is $P_0\{W \geq x\}$. Under these conditions, if $x$ is such that $P_0\{W \geq x\} = \alpha$, then $w(\alpha, m, n) = x$.

$n = 1$

| x | $m = 3$ | $m = 4$ | $m = 5$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ | $m = 11$ |
|---|---|---|---|---|---|---|---|---|---|
| 3 | .500 | .600 | | | | | | | |
| 4 | .250 | .400 | .500 | .571 | | | | | |
| 5 | | .200 | .333 | .429 | .500 | .556 | | | |
| 6 | | | .167 | .286 | .375 | .444 | .500 | .545 | |
| 7 | | | | .143 | .250 | .333 | .400 | .455 | .500 |
| 8 | | | | | .125 | .222 | .300 | .364 | .417 |
| 9 | | | | | | .111 | .200 | .273 | .333 |
| 10 | | | | | | | .100 | .182 | .250 |
| 11 | | | | | | | | .091 | .167 |
| 12 | | | | | | | | | .083 |

$n = 1$

| x | $m = 12$ | $m = 13$ | $m = 14$ | $m = 15$ | $m = 16$ | $m = 17$ | $m = 18$ | $m = 19$ | $m = 20$ |
|---|---|---|---|---|---|---|---|---|---|
| 7 | .538 | | | | | | | | |
| 8 | .462 | .500 | .533 | | | | | | |
| 9 | .385 | .429 | .467 | .500 | .529 | | | | |
| 10 | .308 | .357 | .400 | .438 | .471 | .500 | .526 | | |
| 11 | .231 | .286 | .333 | .375 | .412 | .444 | .474 | .500 | .524 |
| 12 | .154 | .214 | .267 | .312 | .353 | .389 | .421 | .450 | .476 |
| 13 | .077 | .143 | .200 | .250 | .294 | .333 | .368 | .400 | .429 |
| 14 | | .071 | .133 | .188 | .235 | .278 | .316 | .350 | .381 |
| 15 | | | .067 | .125 | .176 | .222 | .263 | .300 | .333 |
| 16 | | | | .062 | .118 | .167 | .211 | .250 | .286 |
| 17 | | | | | .059 | .111 | .158 | .200 | .238 |
| 18 | | | | | | .056 | .105 | .150 | .190 |
| 19 | | | | | | | .053 | .100 | .143 |
| 20 | | | | | | | | .050 | .095 |
| 21 | | | | | | | | | .048 |



*Table A.5 (continued)*

$n = 2$

| x | $m = 3$ | $m = 4$ | $m = 5$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ | $m = 11$ |
|---|---|---|---|---|---|---|---|---|---|
| 6 | .600 | | | | | | | | |
| 7 | .400 | .600 | | | | | | | |
| 8 | .200 | .400 | .571 | | | | | | |
| 9 | .100 | .267 | .429 | .571 | | | | | |
| 10 | | .133 | .286 | .429 | .556 | | | | |
| 11 | | .067 | .190 | .321 | .444 | .556 | | | |
| 12 | | | .095 | .214 | .333 | .444 | .545 | | |
| 13 | | | .048 | .143 | .250 | .356 | .455 | .545 | |
| 14 | | | | .071 | .167 | .267 | .364 | .455 | .538 |
| 15 | | | | .036 | .111 | .200 | .291 | .379 | .462 |
| 16 | | | | | .056 | .133 | .218 | .303 | .385 |
| 17 | | | | | .028 | .089 | .164 | .242 | .321 |
| 18 | | | | | | .044 | .109 | .182 | .256 |
| 19 | | | | | | .022 | .073 | .136 | .205 |
| 20 | | | | | | | .036 | .091 | .154 |
| 21 | | | | | | | .018 | .061 | .115 |
| 22 | | | | | | | | .030 | .077 |
| 23 | | | | | | | | .015 | .051 |
| 24 | | | | | | | | | .026 |
| 25 | | | | | | | | | .013 |

$n = 2$

| x | $m = 12$ | $m = 13$ | $m = 14$ | $m = 15$ | $m = 16$ | $m = 17$ | $m = 18$ | $m = 19$ | $m = 20$ |
|---|---|---|---|---|---|---|---|---|---|
| 15 | .538 | | | | | | | | |
| 16 | .462 | .533 | | | | | | | |
| 17 | .396 | .467 | .533 | | | | | | |
| 18 | .330 | .400 | .467 | .529 | | | | | |
| 19 | .275 | .343 | .408 | .471 | .529 | | | | |
| 20 | .220 | .286 | .350 | .412 | .471 | .526 | | | |
| 21 | .176 | .238 | .300 | .360 | .418 | .474 | .526 | | |
| 22 | .132 | .190 | .250 | .309 | .366 | .421 | .474 | .524 | |
| 23 | .099 | .152 | .208 | .265 | .320 | .374 | .426 | .476 | .524 |
| 24 | .066 | .114 | .167 | .221 | .275 | .327 | .379 | .429 | .476 |
| 25 | .044 | .086 | .133 | .184 | .235 | .287 | .337 | .386 | .433 |
| 26 | .022 | .057 | .100 | .147 | .196 | .246 | .295 | .343 | .390 |
| 27 | .011 | .038 | .075 | .118 | .163 | .211 | .258 | .305 | .351 |
| 28 | | .019 | .050 | .088 | .131 | .175 | .221 | .267 | .312 |
| 29 | | .010 | .033 | .066 | .105 | .146 | .189 | .233 | .277 |
| 30 | | | .017 | .044 | .078 | .117 | .158 | .200 | .242 |
| 31 | | | .008 | .029 | .059 | .094 | .132 | .171 | .212 |
| 32 | | | | .015 | .039 | .070 | .105 | .143 | .182 |

*Table A.5 (continued)*

$n = 2$

| $x$ | $m = 12$ | $m = 13$ | $m = 14$ | $m = 15$ | $m = 16$ | $m = 17$ | $m = 18$ | $m = 19$ | $m = 20$ |
|---|---|---|---|---|---|---|---|---|---|
| 33 | | | | .007 | .026 | .053 | .084 | .119 | .156 |
| 34 | | | | | .013 | .035 | .063 | .095 | .130 |
| 35 | | | | | .007 | .023 | .047 | .076 | .108 |
| 36 | | | | | | .012 | .032 | .057 | .087 |
| 37 | | | | | | .006 | .021 | .043 | .069 |
| 38 | | | | | | | .011 | .029 | .052 |
| 39 | | | | | | | .005 | .019 | .039 |
| 40 | | | | | | | | .010 | .026 |
| 41 | | | | | | | | .005 | .017 |
| 42 | | | | | | | | | .009 |
| 43 | | | | | | | | | .004 |

$n = 3$

| $x$ | $m = 3$ | $m = 4$ | $m = 5$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ | $m = 11$ |
|---|---|---|---|---|---|---|---|---|---|
| 11 | .500 | | | | | | | | |
| 12 | .350 | .571 | | | | | | | |
| 13 | .200 | .429 | | | | | | | |
| 14 | .100 | .314 | .500 | | | | | | |
| 15 | .050 | .200 | .393 | .548 | | | | | |
| 16 | | .114 | .286 | .452 | | | | | |
| 17 | | .057 | .196 | .357 | .500 | | | | |
| 18 | | .029 | .125 | .274 | .417 | .539 | | | |
| 19 | | | .071 | .190 | .333 | .461 | | | |
| 20 | | | .036 | .131 | .258 | .388 | .500 | | |
| 21 | | | .018 | .083 | .192 | .315 | .432 | .531 | |
| 22 | | | | .048 | .133 | .248 | .364 | .469 | |
| 23 | | | | .024 | .092 | .188 | .300 | .406 | .500 |
| 24 | | | | .012 | .058 | .139 | .241 | .346 | .442 |
| 25 | | | | | .033 | .097 | .186 | .287 | .385 |
| 26 | | | | | .017 | .067 | .141 | .234 | .330 |
| 27 | | | | | .008 | .042 | .105 | .185 | .277 |
| 28 | | | | | | .024 | .073 | .143 | .228 |
| 29 | | | | | | .012 | .050 | .108 | .184 |
| 30 | | | | | | .006 | .032 | .080 | .146 |
| 31 | | | | | | | .018 | .056 | .113 |
| 32 | | | | | | | .009 | .038 | .085 |
| 33 | | | | | | | .005 | .024 | .063 |
| 34 | | | | | | | | .014 | .044 |
| 35 | | | | | | | | .007 | .030 |
| 36 | | | | | | | | .003 | .019 |
| 37 | | | | | | | | | .011 |
| 38 | | | | | | | | | .005 |
| 39 | | | | | | | | | .003 |



*Table A.5 (continued)*

$n = 3$

| $x$ | $m = 12$ | $m = 13$ | $m = 14$ | $m = 15$ | $m = 16$ | $m = 17$ | $m = 18$ | $m = 19$ | $m = 20$ |
|---|---|---|---|---|---|---|---|---|---|
| 24 | .527 | | | | | | | | |
| 25 | .473 | | | | | | | | |
| 26 | .420 | .500 | | | | | | | |
| 27 | .367 | .450 | .524 | | | | | | |
| 28 | .316 | .400 | .476 | | | | | | |
| 29 | .268 | .352 | .429 | .500 | | | | | |
| 30 | .224 | .305 | .384 | .456 | .521 | | | | |
| 31 | .182 | .261 | .338 | .412 | .479 | | | | |
| 32 | .147 | .220 | .296 | .369 | .438 | .500 | | | |
| 33 | .116 | .182 | .254 | .327 | .396 | .461 | .519 | | |
| 34 | .090 | .148 | .216 | .287 | .356 | .421 | .481 | | |
| 35 | .068 | .120 | .181 | .249 | .317 | .382 | .444 | .500 | |
| 36 | .051 | .095 | .150 | .213 | .280 | .345 | .407 | .464 | .517 |
| 37 | .035 | .073 | .122 | .180 | .244 | .308 | .370 | .429 | .483 |
| 38 | .024 | .055 | .099 | .151 | .211 | .273 | .335 | .394 | .449 |
| 39 | .015 | .041 | .078 | .125 | .180 | .239 | .300 | .359 | .415 |
| 40 | .009 | .029 | .060 | .102 | .152 | .208 | .267 | .325 | .382 |
| 41 | .004 | .020 | .046 | .082 | .127 | .179 | .235 | .293 | .349 |
| 42 | .002 | .012 | .034 | .065 | .105 | .153 | .206 | .262 | .317 |
| 43 | | .007 | .024 | .050 | .086 | .129 | .178 | .232 | .286 |
| 44 | | .004 | .016 | .038 | .069 | .108 | .153 | .204 | .257 |
| 45 | | .002 | .010 | .028 | .055 | .089 | .131 | .178 | .229 |
| 46 | | | .006 | .020 | .042 | .073 | .111 | .154 | .202 |
| 47 | | | .003 | .013 | .032 | .059 | .092 | .132 | .177 |
| 48 | | | .001 | .009 | .024 | .046 | .077 | .113 | .155 |
| 49 | | | | .005 | .017 | .036 | .062 | .095 | .134 |
| 50 | | | | .002 | .011 | .027 | .050 | .080 | .115 |
| 51 | | | | .001 | .007 | .020 | .040 | .066 | .098 |
| 52 | | | | | .004 | .014 | .031 | .054 | .083 |
| 53 | | | | | .002 | .010 | .023 | .044 | .069 |
| 54 | | | | | .001 | .006 | .017 | .034 | .058 |
| 55 | | | | | | .004 | .012 | .027 | .047 |
| 56 | | | | | | .002 | .008 | .020 | .038 |
| 57 | | | | | | .001 | .005 | .015 | .030 |
| 58 | | | | | | | .003 | .010 | .023 |
| 59 | | | | | | | .002 | .007 | .018 |
| 60 | | | | | | | .001 | .005 | .013 |
| 61 | | | | | | | | .003 | .009 |
| 62 | | | | | | | | .001 | .006 |
| 63 | | | | | | | | .001 | .004 |
| 64 | | | | | | | | | .002 |
| 65 | | | | | | | | | .001 |
| 66 | | | | | | | | | .001 |

*Table A.5 (continued)*

$n = 4$

| $x$ | $m = 4$ | $m = 5$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ | $m = 11$ |
|---|---|---|---|---|---|---|---|---|
| 18 | .557 | | | | | | | |
| 19 | .443 | | | | | | | |
| 20 | .343 | .548 | | | | | | |
| 21 | .243 | .452 | | | | | | |
| 22 | .171 | .365 | .543 | | | | | |
| 23 | .100 | .278 | .457 | | | | | |
| 24 | .057 | .206 | .381 | .536 | | | | |
| 25 | .029 | .143 | .305 | .464 | | | | |
| 26 | .014 | .095 | .238 | .394 | .533 | | | |
| 27 | | .056 | .176 | .324 | .467 | | | |
| 28 | | .032 | .129 | .264 | .404 | .530 | | |
| 29 | | .016 | .086 | .206 | .341 | .470 | | |
| 30 | | .008 | .057 | .158 | .285 | .413 | .527 | |
| 31 | | | .033 | .115 | .230 | .355 | .473 | |
| 32 | | | .019 | .082 | .184 | .302 | .420 | .525 |
| 33 | | | .010 | .055 | .141 | .252 | .367 | .475 |
| 34 | | | .005 | .036 | .107 | .207 | .318 | .426 |
| 35 | | | | .021 | .077 | .165 | .270 | .377 |
| 36 | | | | .012 | .055 | .130 | .227 | .330 |
| 37 | | | | .006 | .036 | .099 | .187 | .286 |
| 38 | | | | .003 | .024 | .074 | .152 | .245 |
| 39 | | | | | .014 | .053 | .120 | .206 |
| 40 | | | | | .008 | .038 | .094 | .171 |
| 41 | | | | | .004 | .025 | .071 | .140 |
| 42 | | | | | .002 | .017 | .053 | .113 |
| 43 | | | | | | .010 | .038 | .089 |
| 44 | | | | | | .006 | .027 | .069 |
| 45 | | | | | | .003 | .018 | .052 |
| 46 | | | | | | .001 | .012 | .039 |
| 47 | | | | | | | .007 | .028 |
| 48 | | | | | | | .004 | .020 |
| 49 | | | | | | | .002 | .013 |
| 50 | | | | | | | .001 | .009 |
| 51 | | | | | | | | .005 |
| 52 | | | | | | | | .003 |
| 53 | | | | | | | | .001 |
| 54 | | | | | | | | .001 |



*Table A.5 (continued)*

$n = 4$

| $x$ | $m = 12$ | $m = 13$ | $m = 14$ | $m = 15$ | $m = 16$ | $m = 17$ | $m = 18$ | $m = 19$ | $m = 20$ |
|---|---|---|---|---|---|---|---|---|---|
| 34 | .524 | | | | | | | | |
| 35 | .476 | | | | | | | | |
| 36 | .431 | .522 | | | | | | | |
| 37 | .385 | .478 | | | | | | | |
| 38 | .342 | .435 | .521 | | | | | | |
| 39 | .299 | .392 | .479 | | | | | | |
| 40 | .260 | .352 | .439 | .519 | | | | | |
| 41 | .223 | .312 | .399 | .481 | | | | | |
| 42 | .190 | .274 | .360 | .443 | .518 | | | | |
| 43 | .158 | .239 | .323 | .405 | .482 | | | | |
| 44 | .131 | .206 | .287 | .368 | .446 | .517 | | | |
| 45 | .106 | .175 | .253 | .332 | .410 | .483 | | | |
| 46 | .085 | .148 | .221 | .298 | .375 | .449 | .516 | | |
| 47 | .066 | .123 | .191 | .265 | .341 | .415 | .484 | | |
| 48 | .052 | .101 | .164 | .235 | .308 | .381 | .451 | .516 | |
| 49 | .039 | .082 | .139 | .205 | .277 | .349 | .419 | .484 | |
| 50 | .029 | .065 | .116 | .179 | .247 | .318 | .387 | .453 | .515 |
| 51 | .021 | .051 | .096 | .154 | .219 | .287 | .356 | .422 | .485 |
| 52 | .015 | .039 | .079 | .131 | .192 | .258 | .326 | .392 | .455 |
| 53 | .010 | .030 | .063 | .110 | .168 | .231 | .297 | .363 | .426 |
| 54 | .007 | .022 | .051 | .092 | .145 | .205 | .269 | .334 | .397 |
| 55 | .004 | .016 | .040 | .076 | .124 | .181 | .242 | .306 | .368 |
| 56 | .002 | .011 | .031 | .062 | .106 | .158 | .217 | .279 | .341 |
| 57 | .001 | .008 | .023 | .050 | .089 | .138 | .193 | .253 | .314 |
| 58 | .001 | .005 | .017 | .040 | .074 | .119 | .171 | .228 | .288 |
| 59 | | .003 | .012 | .031 | .061 | .101 | .150 | .205 | .262 |
| 60 | | .002 | .009 | .024 | .050 | .086 | .131 | .183 | .239 |
| 61 | | .001 | .006 | .018 | .040 | .072 | .113 | .162 | .216 |
| 62 | | .000 | .004 | .014 | .032 | .060 | .098 | .143 | .194 |
| 63 | | | .002 | .010 | .025 | .049 | .083 | .125 | .174 |
| 64 | | | .001 | .007 | .019 | .040 | .070 | .109 | .155 |
| 65 | | | .001 | .005 | .015 | .032 | .059 | .094 | .137 |
| 66 | | | .000 | .003 | .011 | .026 | .049 | .081 | .120 |
| 67 | | | | .002 | .008 | .020 | .040 | .069 | .105 |
| 68 | | | | .001 | .006 | .016 | .033 | .058 | .091 |
| 69 | | | | .001 | .004 | .012 | .027 | .049 | .079 |
| 70 | | | | .000 | .002 | .009 | .021 | .041 | .067 |
| 71 | | | | | .001 | .006 | .017 | .033 | .057 |
| 72 | | | | | .001 | .005 | .013 | .027 | .048 |
| 73 | | | | | .000 | .003 | .010 | .022 | .041 |
| 74 | | | | | .000 | .002 | .007 | .018 | .034 |
| 75 | | | | | | .001 | .005 | .014 | .028 |
| 76 | | | | | | .001 | .004 | .011 | .023 |
| 77 | | | | | | .000 | .002 | .008 | .018 |

*Table A.5 (continued)*

$n = 4$

| $x$ | $m = 12$ | $m = 13$ | $m = 14$ | $m = 15$ | $m = 16$ | $m = 17$ | $m = 18$ | $m = 19$ | $m = 20$ |
|---|---|---|---|---|---|---|---|---|---|
| 78 | | | | | | .000 | .002 | .006 | .015 |
| 79 | | | | | | | .001 | .004 | .011 |
| 80 | | | | | | | .001 | .003 | .009 |
| 81 | | | | | | | .000 | .002 | .007 |
| 82 | | | | | | | .000 | .001 | .005 |
| 83 | | | | | | | | .001 | .004 |
| 84 | | | | | | | | .000 | .003 |
| 85 | | | | | | | | .000 | .002 |
| 86 | | | | | | | | .000 | .001 |
| 87 | | | | | | | | | .001 |
| 88 | | | | | | | | | .000 |
| 89 | | | | | | | | | .000 |
| 90 | | | | | | | | | .000 |

$n = 5$

| $x$ | $m = 5$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|---|---|---|
| 28 | .500 | | | | | |
| 29 | .421 | | | | | |
| 30 | .345 | .535 | | | | |
| 31 | .274 | .465 | | | | |
| 32 | .210 | .396 | | | | |
| 33 | .155 | .331 | .500 | | | |
| 34 | .111 | .268 | .438 | | | |
| 35 | .075 | .214 | .378 | .528 | | |
| 36 | .048 | .165 | .319 | .472 | | |
| 37 | .028 | .123 | .265 | .416 | | |
| 38 | .016 | .089 | .216 | .362 | .500 | |
| 39 | .008 | .063 | .172 | .311 | .449 | |
| 40 | .004 | .041 | .134 | .262 | .399 | .523 |
| 41 | | .026 | .101 | .218 | .350 | .477 |
| 42 | | .015 | .074 | .177 | .303 | .430 |
| 43 | | .009 | .053 | .142 | .259 | .384 |
| 44 | | .004 | .037 | .111 | .219 | .339 |
| 45 | | .002 | .024 | .085 | .182 | .297 |
| 46 | | | .015 | .064 | .149 | .257 |
| 47 | | | .009 | .047 | .120 | .220 |
| 48 | | | .005 | .033 | .095 | .185 |
| 49 | | | .003 | .023 | .073 | .155 |
| 50 | | | .001 | .015 | .056 | .127 |
| 51 | | | | .009 | .041 | .103 |
| 52 | | | | .005 | .030 | .082 |



*Table A.5 (continued)*

$n = 5$

| $x$ | $m = 5$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|---|---|---|
| 53 | | | | .003 | .021 | .065 |
| 54 | | | | .002 | .014 | .050 |
| 55 | | | | .001 | .009 | .038 |
| 56 | | | | | .006 | .028 |
| 57 | | | | | .003 | .020 |
| 58 | | | | | .002 | .014 |
| 59 | | | | | .001 | .010 |
| 60 | | | | | .000 | .006 |
| 61 | | | | | | .004 |
| 62 | | | | | | .002 |
| 63 | | | | | | .001 |
| 64 | | | | | | .001 |
| 65 | | | | | | .000 |

$n = 6$

| $x$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|---|---|
| 39 | .531 | | | | |
| 40 | .469 | | | | |
| 41 | .409 | | | | |
| 42 | .350 | .527 | | | |
| 43 | .294 | .473 | | | |
| 44 | .242 | .418 | | | |
| 45 | .197 | .365 | .525 | | |
| 46 | .155 | .314 | .475 | | |
| 47 | .120 | .267 | .426 | | |
| 48 | .090 | .223 | .377 | .523 | |
| 49 | .066 | .183 | .331 | .477 | |
| 50 | .047 | .147 | .286 | .432 | |
| 51 | .032 | .117 | .245 | .388 | .521 |
| 52 | .021 | .090 | .207 | .344 | .479 |
| 53 | .013 | .069 | .172 | .303 | .437 |
| 54 | .008 | .051 | .141 | .264 | .396 |
| 55 | .004 | .037 | .114 | .228 | .356 |
| 56 | .002 | .026 | .091 | .194 | .318 |
| 57 | .001 | .017 | .071 | .164 | .281 |
| 58 | | .011 | .054 | .136 | .246 |
| 59 | | .007 | .041 | .112 | .214 |
| 60 | | .004 | .030 | .091 | .184 |
| 61 | | .002 | .021 | .072 | .157 |
| 62 | | .001 | .015 | .057 | .132 |
| 63 | | .001 | .010 | .044 | .110 |

*Table A.5 (continued)*

$n = 6$

| $x$ | $m = 6$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|---|---|
| 64 | | | .006 | .033 | .090 |
| 65 | | | .004 | .025 | .074 |
| 66 | | | .002 | .018 | .059 |
| 67 | | | .001 | .013 | .047 |
| 68 | | | .001 | .009 | .036 |
| 69 | | | .000 | .006 | .028 |
| 70 | | | | .004 | .021 |
| 71 | | | | .002 | .016 |
| 72 | | | | .001 | .011 |
| 73 | | | | .001 | .008 |
| 74 | | | | .000 | .005 |
| 75 | | | | .000 | .004 |
| 76 | | | | | .002 |
| 77 | | | | | .001 |
| 78 | | | | | .001 |
| 79 | | | | | .000 |
| 80 | | | | | .000 |
| 81 | | | | | .000 |

$n = 7$

| $x$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|---|
| 53 | .500 | | | |
| 54 | .451 | | | |
| 55 | .402 | | | |
| 56 | .355 | .522 | | |
| 57 | .310 | .478 | | |
| 58 | .267 | .433 | | |
| 59 | .228 | .389 | | |
| 60 | .191 | .347 | .500 | |
| 61 | .159 | .306 | .459 | |
| 62 | .130 | .268 | .419 | |
| 63 | .104 | .232 | .379 | .519 |
| 64 | .082 | .198 | .340 | .481 |
| 65 | .064 | .168 | .303 | .443 |
| 66 | .049 | .140 | .268 | .406 |
| 67 | .036 | .116 | .235 | .370 |
| 68 | .027 | .095 | .204 | .335 |
| 69 | .019 | .076 | .176 | .300 |
| 70 | .013 | .060 | .150 | .268 |
| 71 | .009 | .047 | .126 | .237 |
| 72 | .006 | .036 | .105 | .209 |



*Table A.5 (continued)*

$n = 7$

| $x$ | $m = 7$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|---|
| 73 | .003 | .027 | .087 | .182 |
| 74 | .002 | .020 | .071 | .157 |
| 75 | .001 | .014 | .057 | .135 |
| 76 | .001 | .010 | .045 | .115 |
| 77 | .000 | .007 | .036 | .097 |
| 78 | | .005 | .027 | .081 |
| 79 | | .003 | .021 | .067 |
| 80 | | .002 | .016 | .054 |
| 81 | | .001 | .011 | .044 |
| 82 | | .001 | .008 | .035 |
| 83 | | .000 | .006 | .028 |
| 84 | | .000 | .004 | .022 |
| 85 | | | .003 | .017 |
| 86 | | | .002 | .012 |
| 87 | | | .001 | .009 |
| 88 | | | .001 | .007 |
| 89 | | | .000 | .005 |
| 90 | | | .000 | .003 |
| 91 | | | .000 | .002 |
| 92 | | | | .002 |
| 93 | | | | .001 |
| 94 | | | | .001 |
| 95 | | | | .000 |
| 96 | | | | .000 |
| 97 | | | | .000 |
| 98 | | | | .000 |

$n = 8$

| $x$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|
| 68 | .520 | | |
| 69 | .480 | | |
| 70 | .439 | | |
| 71 | .399 | | |
| 72 | .360 | .519 | |
| 73 | .323 | .481 | |
| 74 | .287 | .444 | |
| 75 | .253 | .407 | |
| 76 | .221 | .371 | .517 |
| 77 | .191 | .336 | .483 |
| 78 | .164 | .303 | .448 |
| 79 | .139 | .271 | .414 |

$n = 8$

| $x$ | $m = 8$ | $m = 9$ | $m = 10$ |
|---|---|---|---|
| 80 | .117 | .240 | .381 |
| 81 | .097 | .212 | .348 |
| 82 | .080 | .185 | .317 |
| 83 | .065 | .161 | .286 |
| 84 | .052 | .138 | .257 |
| 85 | .041 | .118 | .230 |
| 86 | .032 | .100 | .204 |
| 87 | .025 | .084 | .180 |
| 88 | .019 | .069 | .158 |
| 89 | .014 | .057 | .137 |
| 90 | .010 | .046 | .118 |
| 91 | .007 | .037 | .102 |
| 92 | .005 | .030 | .086 |
| 93 | .003 | .023 | .073 |
| 94 | .002 | .018 | .061 |
| 95 | .001 | .014 | .051 |
| 96 | .001 | .010 | .042 |
| 97 | .001 | .008 | .034 |
| 98 | .000 | .006 | .027 |
| 99 | .000 | .004 | .022 |
| 100 | .000 | .003 | .017 |
| 101 | | .002 | .013 |
| 102 | | .001 | .010 |
| 103 | | .001 | .008 |
| 104 | | .000 | .006 |
| 105 | | .000 | .004 |
| 106 | | .000 | .003 |
| 107 | | .000 | .002 |
| 108 | | .000 | .002 |
| 109 | | | .001 |
| 110 | | | .001 |
| 111 | | | .000 |
| 112 | | | .000 |
| 113 | | | .000 |
| 114 | | | .000 |
| 115 | | | .000 |
| 116 | | | .000 |

*Table A.5 (continued)*

| | $n = 9$ | |
|---|---|---|
| $x$ | $m = 9$ | $m = 10$ |
| 86 | .500 | |
| 87 | .466 | |
| 88 | .432 | |
| 89 | .398 | |
| 90 | .365 | .516 |
| 91 | .333 | .484 |
| 92 | .302 | .452 |
| 93 | .273 | .421 |
| 94 | .245 | .390 |
| 95 | .218 | .360 |
| 96 | .193 | .330 |
| 97 | .170 | .302 |
| 98 | .149 | .274 |
| 99 | .129 | .248 |
| 100 | .111 | .223 |
| 101 | .095 | .200 |
| 102 | .081 | .178 |
| 103 | .068 | .158 |
| 104 | .057 | .139 |
| 105 | .047 | .121 |
| 106 | .039 | .106 |
| 107 | .031 | .091 |
| 108 | .025 | .078 |
| 109 | .020 | .067 |
| 110 | .016 | .056 |
| 111 | .012 | .047 |
| 112 | .009 | .039 |
| 113 | .007 | .033 |
| 114 | .005 | .027 |
| 115 | .004 | .022 |
| 116 | .003 | .017 |
| 117 | .002 | .014 |
| 118 | .001 | .011 |
| 119 | .001 | .009 |
| 120 | .001 | .007 |
| 121 | .000 | .005 |

| | $n = 9$ | |
|---|---|---|
| $x$ | $m = 9$ | $m = 10$ |
| 122 | .000 | .004 |
| 123 | .000 | .003 |
| 124 | .000 | .002 |
| 125 | .000 | .001 |
| 126 | .000 | .001 |
| 127 | | .001 |
| 128 | | .000 |
| 129 | | .000 |
| 130 | | .000 |
| 131 | | .000 |
| 132 | | .000 |
| 133 | | .000 |
| 134 | | .000 |
| 135 | | .000 |

| | $n = 10$ |
|---|---|
| $x$ | $m = 10$ |
| 105 | .515 |
| 106 | .485 |
| 107 | .456 |
| 108 | .427 |
| 109 | .398 |
| 110 | .370 |
| 111 | .342 |
| 112 | .315 |
| 113 | .289 |
| 114 | .264 |
| 115 | .241 |
| 116 | .218 |
| 117 | .197 |
| 118 | .176 |
| 119 | .157 |
| 120 | .140 |

| | $n = 10$ |
|---|---|
| $x$ | $m = 10$ |
| 121 | .124 |
| 122 | .109 |
| 123 | .095 |
| 124 | .083 |
| 125 | .072 |
| 126 | .062 |
| 127 | .053 |
| 128 | .045 |
| 129 | .038 |
| 130 | .032 |
| 131 | .026 |
| 132 | .022 |
| 133 | .018 |
| 134 | .014 |
| 135 | .012 |
| 136 | .009 |
| 137 | .007 |
| 138 | .006 |
| 139 | .004 |
| 140 | .003 |
| 141 | .003 |
| 142 | .002 |
| 143 | .001 |
| 144 | .001 |
| 145 | .001 |
| 146 | .001 |
| 147 | .000 |
| 148 | .000 |
| 149 | .000 |
| 150 | .000 |
| 151 | .000 |
| 152 | .000 |
| 153 | .000 |
| 154 | .000 |
| 155 | .000 |





*Table A.6. Upper tail probabilities for the null distribution of the Ansari-Bradley $\mathscr{W}$ statistic: $2 \leq m \leq n, (m+n) \leq 20$*

For given $m$ and $n$, the table entry for the point $x$ is $P_0\{\mathscr{W} \geq x\}$. Under these conditions, if $x$ is such that $P_0\{\mathscr{W} \geq x\} = \alpha$, then $\omega_2\ (\alpha, m, n) = x$. On the other hand, if $x$ is such that $P_0\{\mathscr{W} \geq x\} = 1 - \alpha$, then $P_0\{\mathscr{W} \leq (x-1)\} = P_0\{\mathscr{W} < x\} = \left[1 - P_0\{\mathscr{W} \geq x\}\right] = [1 - (1-\alpha)] = \alpha$, and $\omega_1\ (\alpha, m, n) = (x-1)$.

$m = 2$

| $x$ | $n = 2$ | $n = 3$ | $n = 4$ | $n = 5$ | $n = 6$ | $n = 7$ | $n = 8$ | $n = 9$ | $n = 10$ |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 3 | .8333 | .9000 | .9333 | .9524 | .9643 | .9722 | .9778 | .9818 | .9848 |
| 4 | .1667 | .5000 | .6667 | .7619 | .8214 | .8611 | .8889 | .9091 | .9242 |
| 5 | | .2000 | .3333 | .5238 | .6429 | .7222 | .7778 | .8182 | .8485 |
| 6 | | | .0667 | .2381 | .3571 | .5000 | .6000 | .6727 | .7273 |
| 7 | | | | .0952 | .1786 | .3056 | .4000 | .5091 | .5909 |
| 8 | | | | | .0357 | .1389 | .2222 | .3273 | .4091 |
| 9 | | | | | | .0556 | .1111 | .2000 | .2727 |
| 10 | | | | | | | .0222 | .0909 | .1515 |
| 11 | | | | | | | | .0364 | .0758 |
| 12 | | | | | | | | | .0152 |

$m = 2$

| $x$ | $n = 11$ | $n = 12$ | $n = 13$ | $n = 14$ | $n = 15$ | $n = 16$ | $n = 17$ | $n = 18$ |
|---|---|---|---|---|---|---|---|---|
| 2 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 3 | .9872 | .9890 | .9905 | .9917 | .9926 | .9935 | .9942 | .9947 |
| 4 | .9359 | .9451 | .9524 | .9583 | .9632 | .9673 | .9708 | .9737 |
| 5 | .8718 | .8901 | .9048 | .9167 | .9265 | .9346 | .9415 | .9474 |
| 6 | .7692 | .8022 | .8286 | .8500 | .8676 | .8824 | .8947 | .9053 |
| 7 | .6538 | .7033 | .7429 | .7750 | .8015 | .8235 | .8421 | .8579 |
| 8 | .5000 | .5714 | .6286 | .6750 | .7132 | .7451 | .7719 | .7947 |
| 9 | .3590 | .4286 | .5048 | .5667 | .6176 | .6601 | .6959 | .7263 |
| 10 | .2308 | .2967 | .3714 | .4333 | .5000 | .5556 | .6023 | .6421 |
| 11 | .1410 | .1978 | .2667 | .3250 | .3897 | .4444 | .5029 | .5526 |
| 12 | .0641 | .1099 | .1714 | .2250 | .2868 | .3399 | .3977 | .4474 |
| 13 | .0256 | .0549 | .1048 | .1500 | .2059 | .2549 | .3099 | .3579 |
| 14 | | .0110 | .0476 | .0833 | .1324 | .1765 | .2281 | .2737 |
| 15 | | | .0190 | .0417 | .0809 | .1176 | .1637 | .2053 |
| 16 | | | | .0083 | .0368 | .0654 | .1053 | .1421 |
| 17 | | | | | .0147 | .0327 | .0643 | .0947 |
| 18 | | | | | | .0065 | .0292 | .0526 |
| 19 | | | | | | | .0117 | .0263 |
| 20 | | | | | | | | .0053 |