

March, 1971

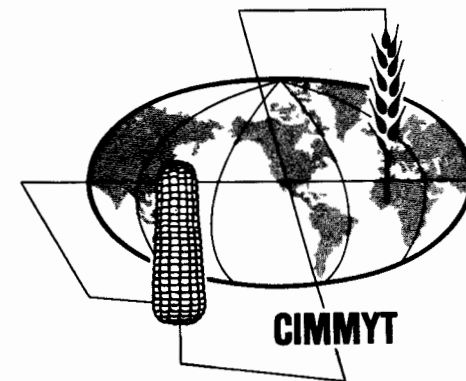
Instructions for the management of the

## INTERNATIONAL YIELD NURSERIES

SPRING WHEAT (ISWYN)

DURUM (IDYN)

TRITICALE (ITYN)



CENTRO INTERNACIONAL DE MEJORAMIENTO DE MAIZ Y TRIGO  
INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER

Apartment Postal 6-641 México 6, D. F., México

PLEASE RETURN THE RESULTS OF YOUR YIELD

NURSERY AS SOON AS POSSIBLE AFTER HARVEST

Late returns lead to serious delays in publication of the results and reduce their value to wheat workers throughout the world.

### INTERNATIONAL SPRING WHEAT YIELD NURSERY (ISWYN)

The International Spring Wheat Yield Nursery is designed to test the adaptation of groups of spring wheat varieties under a wide range of latitudes, climates, day lengths, fertility conditions, water management and disease complexes. While it has been known for years that certain varieties are much more broadly adapted than others, little systematic information has been collected in this important phase of plant breeding. These experiments are designed to study the performance of some of the most important varieties and experimental material from the major wheat growing areas of the world under the environmental conditions of many countries.

Results of previous nurseries have shown that it is possible to produce varieties of nearly universal adaptation as well as varieties adapted to only a narrow geographic range.

### INTERNATIONAL DURUM YIELD NURSERY (IDYN)

The International Durum Yield Nursery is designed to measure the performance and adaptation of current and new Durum varieties and lines in a wide variety of latitudes, climates, fertility conditions, water management and disease complexes. Experience gained from the spring wheat yield nurseries has been useful as a basis for designing the present durum nurseries.

### INTERNATIONAL TRITICALE YIELD NURSERY (ITYN)

Worldwide interest has been shown in the man-made crop plant called Triticale, a plant produced by crossing wheat and rye. Initially a biological oddity, Triticale has now reached the stage of having potential commercial capabilities.

Due primarily to the work of members of the Plant Science Department of the University of Manitoba, and more recently to CIMMYT working in collaboration with the Canadian group, many of the basic deficiencies of Triticale are being overcome. By improving the growth habit, plant type, disease resistance and fertility, the productivity of Triticale now warrants testing over a much wider range of environments.

The first yield nurseries have been designed to assess the performance of advanced breeding lines and to compare them to other cereals. The performance of the Triticale lines may be disappointing in some environments at first, but rapid progress is being made and the information gained from the yield nurseries will be invaluable to guide the breeders in their search for improved germ plasm.

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The objectives of these nurseries are to 1) provide research workers developing new varieties an opportunity to assess the performance of their advanced breeding lines over a wide range of climatic, cultural and disease conditions, 2) serve as a source of fundamental information on adaptation, 3) allow local research and extension workers to compare the performance of new varieties from other countries and 4) provide a source of new, valuable genetic variability which the cooperator may use directly or in crosses within his breeding program.

The results of the International Yield Nurseries are statistically analyzed and published for general distribution. It is important that cooperators study carefully the following pages which provide the directions for the conduct of the nursery and the note-taking techniques. The value of these nurseries will depend to a large degree on the quality of the data which is returned for analysis.

It is understood that any country collaborating in these tests will be free to use any of the material included in the nursery, either as parental material or as commercial varieties. In this latter case, the country of origin of the variety or line under multiplication should be recognized.

We sincerely request the cooperation of all persons or institutions interested in these tests. They are a collective endeavor and success depends upon what is collectively contributed. We realize that they may have faults and limitations and would appreciate any suggestion for improvement.

### Plan of the Experiment

The nurseries are made up of a set number of varieties which are replicated 3 times. Six-row plots are used and the seed is packaged individually for each row of the six-row plot. The last entry in each replication is reserved for your own local check variety (see "Local Check Variety" below). The variety number and the plot number are identical in the first replication, but the varieties have been assigned at random. The varieties are randomized in replicates 2 and 3 with the exception of the local check variety, which is always last. The varieties are arranged according to a randomized complete block design. In the shipment of seed that you receive the seed packets have been prearranged according to the above design to facilitate planting.

The seed contained in each envelope should be sown in a 2.5 meter row (8.3 feet) with the distance between rows left to the discretion of the cooperator. However, plot dimensions must be recorded on the general information sheet so that we will be able to compute variables in terms of unit area. The quantity of seed in each envelope varies with the nursery, variety and from year to year. This adjustment is made by us to allow for a uniform and optimum seeding rate. The precise information on seeding rates for any nursery is available from the coordinator.

Should any other type or size of plot be used, please notify the coordinator when returning pertinent data.

### Selection of Varieties

An effort has been made to include in each nursery a balance of representative commercial wheat varieties from the important wheat regions of the world and new material. Some of these entries may be too early or late, too tall or dwarfed, too light sensitive or susceptible to disease. This will mean that the nursery will be difficult to handle in certain locations, but the data thus obtained will be extremely valuable to the success of the project.

### Local Check Variety

Empty envelopes for packaging a local variety are provided at the end of each replication. Each year the number of seeds required in each packet of "Local Check" will vary. The required number of seeds will be computed and listed in the field books thusly - Local Check (180 seeds) which will refer to the number of seeds per packet. These sets will become the last entry in each of the 3 replications and should be placed in this order before planting. The name of this local variety should be entered in both the collaborator's field book and the copy to be returned to the coordinator. Please do not substitute other varieties in the experiment as this considerably complicates the statistical analyses. If one wishes to compare additional local varieties, he may simply place them at the end of each replication where they will be part of the experiment, but will not hinder statistical analyses.

### Planting Date

There is considerable variation in the maturity of the varieties which are included in this nursery. It is therefore difficult to suggest a specific date of planting for each location. As a guide, however, it can be said that many of the varieties included are of the same general maturity as the variety Mentana, which is known to many of the collaborators. A few varieties will be from 7 to 21 days later than Mentana, particularly in locations with short day lengths, whereas some others may be 15 days or so earlier at each location.

### Fertilizer and Management

It is strongly urged that the nursery receive fertilizer and good management. In wheat as well as other crops, new advances in production are generally made by selecting varieties that will respond to fertilizer and better management. These varieties can only be selected under optimum conditions.

### Protection from Birds and Animals

Differential varietal damage by birds or animals will nullify the value of any experiment. Therefore, each cooperator is urged to make certain that his experiment is protected from such pests. The method employed to minimize the effect of these factors is left entirely to the discretion of the collaborator.

### Submitting Varieties for Test

A number of the varieties will remain constant in this nursery over a period of years, and the remainder will be replaced by materials submitted from the collaborating countries. Any scientists wishing to submit lines or varieties for inclusion in the forthcoming years' tests should have approximately 300 grams of seed of any such line shipped to the coordinator:

Dr. Keith W. Finlay  
Centro Internacional de Mejoramiento  
de Maiz y Trigo  
Apartado Postal 6-641  
Mexico 6, D. F., Mexico

The package or envelope must be labeled "Experimental Wheat Seed - No Commercial Value". In all cases the shipment of seed should be made via Air Express or Air Mail, and should reach Mexico City no later than the 15th of September to be increased during the winter in Sonora, Mexico. It is not always possible to include all varieties submitted for trial. The final composition of a yield nursery will be made by CIMMYT.

## NOTES TO BE TAKEN

### General Instructions

The seed box that is shipped to each collaborator includes duplicate sets of forms for recording the characteristics set out in the following pages. These should both be completed as soon as the experiment is harvested. The collaborator may keep one set for his own personal use and the other should be returned by Air Mail to the coordinator (address on page 5).

Your copy and the copy to be returned are clearly marked. The one to be returned is of lighter weight paper to save on air mail postage.

A form requesting general information about the experiment is attached to the front of the first data sheet. This provides space for listing latitude, longitude, elevation, planting date, rainfall, irrigation applied, fertilizer used, etc. Please fill this out as completely as possible as the information is extremely useful in interpreting the results of the trial.

All notes should be taken for all replications of each variety if possible, as this will allow a more adequate statistical treatment of the data. Additional unlabeled columns are left in the data sheets for any other type of data that can be taken. Collaborators are urged to include all additional data in which differential reactions are observed.

The metric system or percentage is preferred for recording data except rust data, which should be taken in the usual manner (described on page 10). CLEARLY INDICATE THE UNITS IN WHICH DATA ARE TAKEN.

### Yield of Grain

Yield of grain is to be determined on the 4 central rows of each 6-row plot in all replicates. In order to reduce error from bird damage and shattering, each variety should be cut no later than a week after its physiologic maturity (when the peduncles have turned yellow).



The grain may either be dried to a uniform moisture content in the bundles before threshing or if samples are threshed with high moisture content, all grain samples should be dried to a uniform constant moisture content before grain weights are taken and recorded. If moist grain samples are weighed, the moisture content should be determined by a reputable electric conductivity moisture meter for each sample and weights corrected to a uniform 12% moisture basis. Regardless of methods used, an outline of method employed should be returned with the report to the coordinator. Grain weights in all cases will be determined on samples which have been previously cleaned of chaff. Grain weights from the 4 center rows of each 6-row plot after being cleaned and corrected for moisture as described above, are to be recorded in grams. Please clearly indicate on the data sheets if any modification is made in plot size or shape, area harvested, etc.

#### Test Weight

The test weight of the cleaned grain samples used to determine yields, as mentioned above, should be used to determine test weight. Either pounds per bushel or kilograms per hectoliter can be employed depending on the equipment available for making the determinations. PLEASE CLEARLY INDICATE THE UNITS USED.

#### 1000 Grain Weight

Because some cooperators may not have equipment to determine test weight, or if there is insufficient seed to do so, a measure of the 1000 grain weight can be used. 1000 grain weight is usually expressed in grams. Should any other units be used, please indicate clearly in the record sheets.

#### Maturity

Two measurements on varietal maturity are requested. These are:

1) The number of days from germination to flowering; and 2) The number of days from germination to physiological maturity.

A variety shall be considered to be flowering as soon as 50 percent of the culms are fully headed (spikes fully exerted). The physiological maturity is considered to be the date when 50 percent of the peduncles are ripe (yellow).

Tables 1 and 1A are provided to assist in recording elapsed days. We suggest entering the planting day (or effective planting day) on the general information sheet to be returned to CIMMYT. All other dates can then be entered as the accumulated days from January 1st. This, it is hoped, will simplify field data recording.

### Straw

Two notes on straw characteristics should be recorded; they are:

1) Height. The average height of the plants in a row in centimeters (or inches) should be determined when the grain is beginning to form. The distance from ground line to the tip of the terminal spikelets of the spike is considered plant height. INDICATE CLEARLY THE UNITS USED.

2) Lodging. The percentage of lodging estimated when the plants are physiologically mature will be used as an indication of straw strength.

### Shattering

Since yields will be determined on the 4 center rows of each plot, and these rows will be harvested soon after physiologic maturity is reached, it will be necessary to make observations of shattering on the two border rows of each plot. These notes should be made approximately two weeks after the yield rows have been harvested. Notes on the percent of shattering of the grain from the individual spikelets and the percentage of plants showing this defect should be recorded as follows:

- 1) Average percentage of spikelets per head that shattered, and
- 2) Percentage of plants showing shattering.

### Neck Break

In some varieties there may be a weakness of the rachis at the "neck" or near the base of the spikelet. In such cases the entire spike, or entire spikelet (base of spike) is frequently broken and falls to the ground. Notes should be taken on the percentage of plants showing this flaw.

### Damage Due to Frost

The differential damage to the seedlings caused by frost, should these occur, should be noted in one of the additional columns, using the following suggested scale:

0	}	No damage due to frost
1		
2	}	Slight damage
3		
4	}	Moderate damage
5		
6	}	Severe damage
7		
8	}	Very severe damage
9		

The damage caused by frost during the time of flowering or after, should also be indicated in order to show the percentage of sterility or grains severely frozen. The dates on which the frosts occurred should also be recorded.

## Cereal Rusts

The method outlined below for taking notes on stem, leaf and stripe rust infection was recommended by Dr. W. Q. Loegering, (USDA International Spring Wheat Rust Nursery, 1959) for use with the International Rust Nursery. This recommendation has been adopted for the sake of uniformity in compiled data. If another method is used, an explanation should accompany the data.

Field notes on the rusts of cereals describe severity (percentage of rust infection on the plants) and response (kind of infection).

### Severity

Severity is recorded as percent of infection according to the modified Cobb scale. As severity is determined by observation, readings cannot be absolutely accurate. Therefore, below 5 percent severity, the intervals used are trace (tr) to 2. Usually, 5 percent intervals are used from 5 to 20 percent severity and 10 percent intervals for higher readings.

The diagram shows six degrees of rustiness, which may be used in estimating the percentage of rust infection on leaf or stem. The shaded spots represent rust, and the figures represent approximately the rust percentage computed on the basis of the maximum amount of surface covered by rust as shown in the 100 percent figure. This figure represents 37 percent of actual surface and is arbitrarily selected as 100 percent infection.

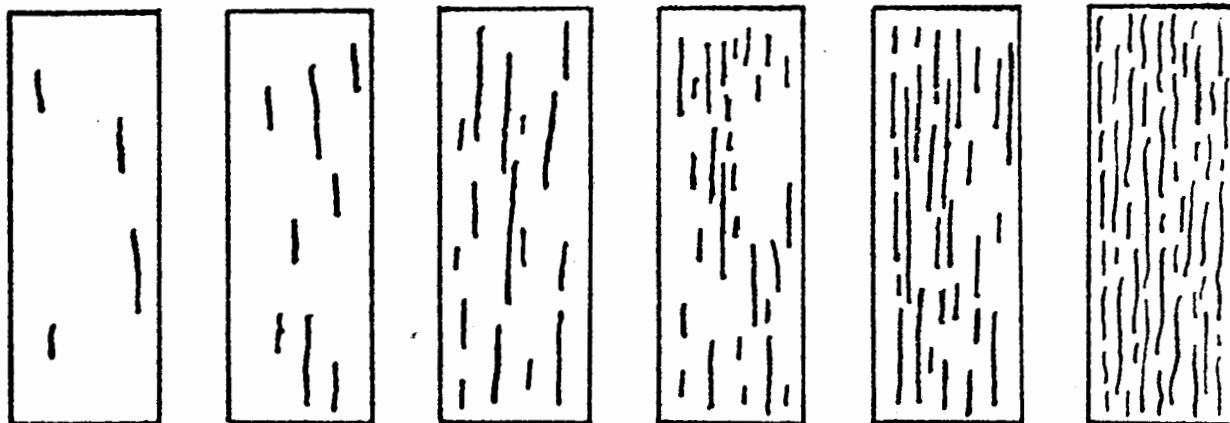
### Response

The response of a variety refers to the type of infection and is recorded by the following capital letters:

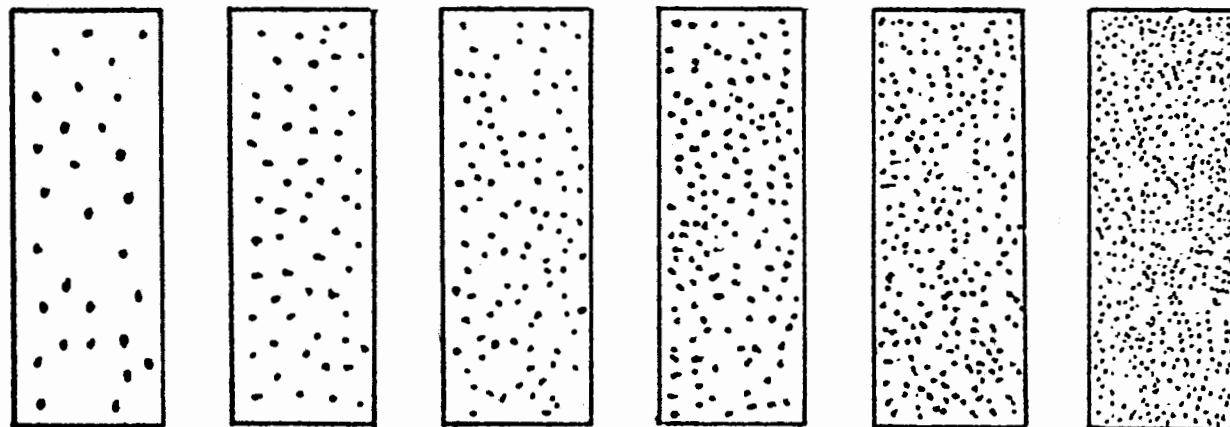
- 0 - no visible infection of plants.
- R - resistant. Necrotic areas with or without minute uredia present.

THE RUST SEVERITY SCALE  
FOR

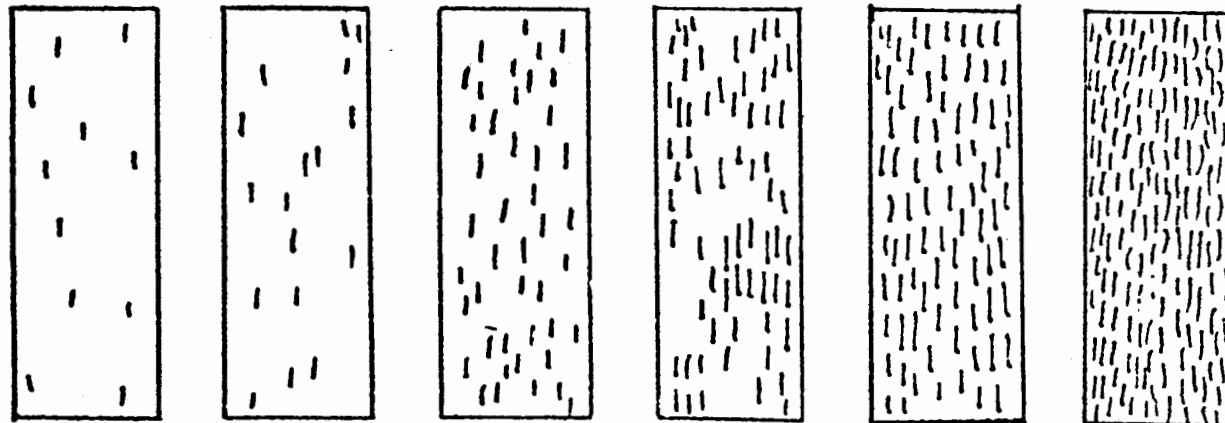
STRIPE RUST



LEAF RUST



STEM RUST



5%      10%      25%      40%      65%      100%

11

- MR - moderately resistant. Small uredia present surrounded by necrotic areas.
- MS - moderately susceptible. Medium uredia with necrosis, but possibly some distinct chlorosis.
- S - susceptible. Large uredia with necrosis and little or no chlorosis present.
- X - intermediate. Variable sized uredia, some with necrosis and/or chlorosis (under special circumstances it may be desirable to use VR-very resistant or VS-very susceptible).

Usually, distinctions between VR and R, or VS and S are difficult to make and therefore are of little value).

### Combining Severity and Response Readings

Readings of severity and response are recorded together with severity first. For example:

- TrR - trace severity of a resistant type infection.
- 5MR - 5 percent severity of a moderately resistant type infection.
- 60S - 60 percent severity of a susceptible type infection.

### Variability in Reaction

Usually, a single severity and response gives an adequate picture of the reaction of a line or variety; occasionally there is obvious variability in reaction within a line. This variability may appear in several forms:

- 1) Clear-cut separation of plants into 2 or even 3 classes.
- 2) A range of reaction from plants without clear-cut separation into classes.
- 3) A range of reaction on each plant.

1) and 2) may result from either segregation or seed mixture, while 3) may result from either race mixtures in the field or an X-response of the variety.

It is usually impractical to try to determine what causes the variability. However, it is quite simple to record whether the variability is represented by a clear-cut separation of plants into classes or by a range in the reaction as follows:

" , " Segregation or seed mixture. A comma separating two severity and response readings indicates that the plants fall into clear-cut classes with readings as given. For example, 5R, 40S, means that there were two classes of plants in the row with respect to reaction to rust; one group 5R and the other 40S.

" - " Range in reaction. A dash separating two readings indicates a range in severity and response of the plants in the row. For example, 15R-5S means that there was a range of severity and response to rust from 15R to 5S.

When using these combinations the first reading is understood to represent the predominating class. If it seems desirable to give information on the number in each group it may be done in the following manner: 30p5R, 4p50S meaning that 30 plants had a severity and response reading of 5R and 4 plants were 50S.

#### Readings Difficult to Make

" e " Escape. Often a variety or line will have little or no rust, but there is a doubt that it is truly resistant because it matured early or for other reasons. Thus "0e" indicates that there was no rust on the variety, but there is a doubt that the variety was as resistant as "0" would indicate.

- " n " Very often one disease such as stripe rust or a leaf spot is so severe that the taking of notes on certain other diseases is impossible. When this is the case, the letter "n" should be used to indicate that this was the case. For example, if stripe rust kills the leaves before leaf rust can develop, then the note for leaf rust will be "n".
- " - " When data cannot be recorded on an entry for any other reason, the space for the note should be marked with a dash.

#### Recording Disease Data Other Than Rust Reaction

Sometimes diseases other than rusts develop in the nursery and it is possible to obtain good data. If data are recorded on diseases other than rusts, a key to the symbols used in recordings of such data should accompany the records.



Table 1. Dates and accumulative days from January 1 in a non-leap year.

DAYS FROM JANUARY 1											
Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1-1	1-32	1-60	1-91	1-121	1-152	1-182	1-213	1-244	1-274	1-305	1-335
2-2	2-33	2-61	2-92	2-122	2-153	2-183	2-214	2-245	2-275	2-306	2-336
3-3	3-34	3-62	3-93	3-123	3-154	3-184	3-215	3-246	3-276	3-307	3-337
4-4	4-35	4-63	4-94	4-124	4-155	4-185	4-216	4-247	4-277	4-308	4-338
5-5	5-36	5-64	5-95	5-125	5-156	5-186	5-217	5-248	5-278	5-309	5-339
6-6	6-37	6-65	6-96	6-126	6-157	6-187	6-218	6-249	6-279	6-310	6-340
7-7	7-38	7-66	7-97	7-127	7-158	7-188	7-219	7-250	7-280	7-311	7-341
8-8	8-39	8-67	8-98	8-128	8-159	8-189	8-220	8-251	8-281	8-312	8-342
9-9	9-40	9-68	9-99	9-129	9-160	9-190	9-221	9-252	9-282	9-313	9-343
10-10	10-41	10-69	10-100	10-130	10-161	10-191	10-222	10-253	10-283	10-314	10-344
11-11	11-42	11-70	11-101	11-131	11-162	11-192	11-223	11-254	11-284	11-315	11-345
12-12	12-43	12-71	12-102	12-132	12-163	12-193	12-224	12-255	12-285	12-316	12-346
13-13	13-44	13-72	13-103	13-133	13-164	13-194	13-225	13-256	13-286	13-317	13-347
14-14	14-45	14-73	14-104	14-134	14-165	14-195	14-226	14-257	14-287	14-318	14-348
15-15	15-46	15-74	15-105	15-135	15-166	15-196	15-227	15-258	15-288	15-319	15-349
16-16	16-47	16-75	16-106	16-136	16-167	16-197	16-228	16-259	16-289	16-320	16-350
17-17	17-48	17-76	17-107	17-137	17-168	17-198	17-229	17-260	17-290	17-321	17-351
18-18	18-49	18-77	18-108	18-138	18-169	18-199	18-230	18-261	18-291	18-322	18-352
19-19	19-50	19-78	19-109	19-139	19-170	19-200	19-231	19-262	19-292	19-323	19-353
20-20	20-51	20-79	20-110	20-140	20-171	20-201	20-232	20-263	20-293	20-324	20-354
21-21	21-52	21-80	21-111	21-141	21-172	21-202	21-233	21-264	21-294	21-325	21-355
22-22	22-53	22-81	22-112	22-142	22-173	22-203	22-234	22-265	22-295	22-326	22-356
23-23	23-54	23-82	23-113	23-143	23-174	23-204	23-235	23-266	23-296	23-327	23-357
24-24	24-55	24-83	24-114	24-144	24-175	24-205	24-236	24-267	24-297	24-328	24-358
25-25	25-56	25-84	25-115	25-145	25-176	25-206	25-237	25-268	25-298	25-329	25-359
26-26	26-57	26-85	26-116	26-146	26-177	26-207	26-238	26-269	26-299	26-330	26-360
27-27	27-58	27-86	27-117	27-147	27-178	27-208	27-239	27-270	27-300	27-331	27-361
28-28	28-59	28-87	28-118	28-148	28-179	28-209	28-240	28-271	28-301	28-332	28-362
29-29		29-88	29-119	29-149	29-180	29-210	29-241	29-272	29-302	29-333	29-363
30-30		30-89	30-120	30-150	30-181	30-211	30-242	30-273	30-303	30-334	30-364
31-31		31-90		31-151		31-212	31-243		31-304		31-365

Table 1A. Dates and accumulative days from January 1 in a leap year.

DAYS FROM JANUARY 1											
Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1-1	1-32	1-61	1-92	1-122	1-153	1-183	1-214	1-245	1-275	1-306	1-336
2-2	2-33	2-62	2-93	2-123	2-154	2-184	2-215	2-246	2-276	2-307	2-337
3-3	3-34	3-63	3-94	3-124	3-155	3-185	3-216	3-247	3-277	3-308	3-338
4-4	4-35	4-64	4-95	4-125	4-156	4-186	4-217	4-248	4-278	4-309	4-339
5-5	5-36	5-65	5-96	5-126	5-157	5-187	5-218	5-249	5-279	5-310	5-340
6-6	6-37	6-66	6-97	6-127	6-158	6-188	6-219	6-250	6-280	6-311	6-341
7-7	7-38	7-67	7-98	7-128	7-159	7-189	7-220	7-251	7-281	7-312	7-342
8-8	8-39	8-68	8-99	8-129	8-160	8-190	8-221	8-252	8-282	8-313	8-343
9-9	9-40	9-69	9-100	9-130	9-161	9-191	9-222	9-253	9-283	9-314	9-344
10-10	10-41	10-70	10-101	10-131	10-162	10-192	10-223	10-254	10-284	10-315	10-345
11-11	11-42	11-71	11-102	11-132	11-163	11-193	11-224	11-255	11-285	11-316	11-346
12-12	12-43	12-72	12-103	12-133	12-164	12-194	12-225	12-256	12-286	12-317	12-347
13-13	13-44	13-73	13-104	13-134	13-165	13-195	13-226	13-257	13-287	13-318	13-348
14-14	14-45	14-74	14-105	14-135	14-166	14-196	14-227	14-258	14-288	14-319	14-349
15-15	15-46	15-75	15-106	15-136	15-167	15-197	15-228	15-259	15-289	15-320	15-350
16-16	16-47	16-76	16-107	16-137	16-168	16-198	16-229	16-260	16-290	16-321	16-351
17-17	17-48	17-77	17-108	17-138	17-169	17-199	17-230	17-261	17-291	17-322	17-352
18-18	18-49	18-78	18-109	18-139	18-170	18-200	18-231	18-262	18-292	18-323	18-353
19-19	19-50	19-79	19-110	19-140	19-171	19-201	19-232	19-263	19-293	19-324	19-354
20-20	20-51	20-80	20-111	20-141	20-172	20-202	20-233	20-264	20-294	20-325	20-355
21-21	21-52	21-81	21-112	21-142	21-173	21-203	21-234	21-265	21-295	21-326	21-356
22-22	22-53	22-82	22-113	22-143	22-174	22-204	22-235	22-266	22-296	22-327	22-357
23-23	23-54	23-83	23-114	23-144	23-175	23-205	23-236	23-267	23-297	23-328	23-358
24-24	24-55	24-84	24-115	24-145	24-176	24-206	24-237	24-268	24-298	24-329	24-359
25-25	25-56	25-85	25-116	25-146	25-177	25-207	25-238	25-269	25-299	25-330	25-360
26-26	26-57	26-86	26-117	26-147	26-178	26-208	26-239	26-270	26-300	26-331	26-361
27-27	27-58	27-87	27-118	27-148	27-179	27-209	27-240	27-271	27-301	27-332	27-362
28-28	28-59	28-88	28-119	28-149	28-180	28-210	28-241	28-272	28-302	28-333	28-363
29-29	29-60	29-89	29-120	29-150	29-181	29-211	29-242	29-273	29-303	29-334	29-364
30-30		30-90	30-121	30-151	30-182	30-212	30-243	30-274	30-304	30-335	30-365
31-31		31-91		31-152		31-213	31-244		31-305		31-366

