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A REVISED DIRECTIONS TEST

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The directions tests of Woodworth and Wells* have proved themselves so valuable and are being used so extensively by various psychologists that it is surprising that no norms have yet appeared. The writers offer the data they have collected up to the present time in the hope that they may prove serviceable to other workers.

The Easy Directions Test B and the Hard Directions Test have been used. These tests are reproduced in Figures 1 and 2 respectively. The numbering of the directions does not appear on the test sheets. We have inserted the numbers on the figures for purposes of reference. The Easy Directions Test was given to 429 children ranging in age from 6 to 16. The Hard Directions Test was given to 1327 children ranging in age from 7 to 17, and to a heterogeneous group of adults.

The instructions in each case were very simple: "I want to see if you can fill these out according to directions. Do exactly what each line tells you to do. Try to fill them out correctly." No definite time limit was adhered to because we wished the children to try all the directions. As a matter of fact the majority of pupils finished in much less than ten minutes. The test was given as a class test.

A score of *one* was given for each direction correctly answered in the Easy Directions. The total possible score in this test is therefore 20. A direction had to be literally correct before a score was allowed. Direction 1 was given credit only when some sort of a mark crossed out the g and the g only. Direction 2 received credit only for the figure "2" placed between the two dots, the word "two" not receiving credit. Direction 3 received credit for the answer, "three," "3", or "III," "three feet," etc., or any answer conveying

*WOODWORTH, R. S. AND WELLS, F. L. *Association Tests*, Psychol. Monog., Vol. XII, No. 57, 1911. (123)

1. Cross out the *g* in *tiger*
2. Write 2 between the two dots: . . —
3. How many feet make a yard?
4. Write + over the longest word. It rained yesterday.
5. Put a dot below this line: _____
6. Write the sum of these numbers: $\frac{3}{4}$
7. Make a boy's name by adding one letter to Joh
8. Make a cross in the circle:
9. What comes next after D in the alphabet?
10. Write 7 in the largest square:
11. Cross out the blackest letter in TEXAS
12. Write g on the egg-shaped figure:
13. Make two dots between these lines:
14. Put the sign = where it belongs: 3 + 2 5.
15. Write here.....the middle letter of get.
16. Put a nose on this face:
17. Add a cross and make these rows equal: $\begin{array}{ccccc} & & & \times & \times & \times \\ \times & \times & \times & \times & \times \end{array}$
18. Put a dot in the circle, below the center:
19. Draw a line around the three dots:
20. Cross out the last word in this sentence.

Figure 1. Easy Directions. Test B.

1. With your pencil make a dot over any one of these letters F G H I J, and a comma after the longest of these three words: boy mother girl. 2. Then, if Christmas come, in March, make a cross right here. . . . but if not, pass along to the next question, and tell where the sun rises 3. If you believe that Edison discovered America, cross out what you just wrote, but if it was some one else, put in a number to complete this sentence: "A horse has . . . feet." 4. Write *yes*, no matter whether China is in Africa or not . . . ; and then give a wrong answer to this question: "How many days are there in the week?" 5. Write any letter except *g* just after this comma, . . . and then write *no* if 2 times 5 are 10 . . . 6. Now, if Tuesday comes after Monday, make two crosses here. . . , but if not, make a circle here . . . or else a square here . . . 7. Be sure to make three crosses between these two names of boys: George . . . Henry. 8. Notice these two numbers: 3, 5. If iron is heavier than water, write the larger number here . . . , but if iron is lighter write the smaller number here . . . 9. Show by a cross when the nights are longer: in summer? . . . in winter? 10. Give the correct answer to this question: "Does water run uphill?" . . . and repeat your answer here. . . . 11. Do nothing here ($5+7=$. . .), unless you skipped the preceding question; but write the first letter of your first name and the last letter of your last name at the ends of this line:

FIGURE 2

the idea, three. No. 4 received credit only for the sign + written *above* "yesterday," no credit for "X" or for any other sign or in any other position than *above* "yesterday." No. 5 had to have the dot fairly below the black line. Credited responses to directions 6 are "7" or "seven" *with* or *without* drawing the addition bar, and the answer placed in any position with respect to the two figures to be added. In direction 7, credit was given when "n" or "N" was added to the end of "Joh," but no credit was given for writing out the word "John" and neglecting to complete the partial "Joh." No. 8, credit for either "X" or "+" in the circle. No. 9, credit for "e" or "E". No. 10, credit only for the figure, "7," not for the word, "seven," in the largest square. No. 11, credit for any mark through "X" only. No. 12, credit for "G" or "g" (perhaps a slight deviation from our principle of literal exactness). No. 13, credit for two dots placed anywhere between the two lines. No. 14, credit only for "-" placed in the proper place, no credit for "-" or "+," etc. No. 15, credit for "e" or "E." No. 16, credit for any mark filling up

the greater portion of the blank left in the outline. No. 17, credit for "X" in the proper place. No. 18, credit for a dot anywhere in the lower one-third area of the circle below the dot in the centre. No. 19, credit for any shaped line enclosing the three dots only. No. 20, credit for a horizontal line through "sentence" or for any mark crossing out *at least two* of the letters, no credit for any line crossing out only one letter, as in "sentence," because this is a response to a misinterpretation of the direction whereby "letter" is understood instead of "word."

The Hard Directions Test was scored in the manner suggested by Woolley.* A credit of one point was given to each simple direction and a credit of two points for each compound or conditional direction answered correctly. If the conditional direction was only partially correct then a credit of one point was allowed. The conditional directions are numbers 2, 3, 6, 8, and 11. *No credit was given either part of the condition unless one or the other of the parts was attempted as shown by some mark or other on the paper.* This procedure was necessary because credit is sometimes given for doing nothing in one part of the condition. First direction, one credit for a dot *above any one* of the five letters and one credit for a comma after "mother," thus making two credits if both are correctly done. Second, one credit for *not* making a cross, and one for "east," no credit for "west," etc.; if a cross is made in the first part of the direction and nothing done to the second part, then one credit was given (an intelligent response based on wrong information); if both parts are answered, one credit was given for answer to the second half. Third, credit for *not* crossing out anything in the *preceding* sentence and then if nothing is crossed out an additional credit for "four" or "4" placed in proper space; one credit is given if the second half is answered correctly and the first part incorrectly. This direction is unsatisfactory, since the subject may have already crossed out the word written in the preceding sentence before coming to this direction because the word was wrong. Fourth, one credit for "yes" and one credit for *any* number or figure other than "7" or "seven." Fifth, one credit for *any* letter other than "g," and one credit for "no." Sixth, credit for "XX" or "+ +" and an additional one for *not* doing anything in the other two spaces; a single credit of one is given for filling in the second part of this direction

*The writers wish to thank Mrs. H. T. Woolley for sending them detailed directions as to her method of scoring.

without filling in the first (an intelligent response based on wrong information). Seventh, one credit for "XXX" or "+++" or "***." Eighth, credit of one for "5" in first blank and an additional credit if nothing is done in the second, one credit if the second part *alone* is filled with "3;" a credit of one if "5" is placed in the first blank and "3" also in the second. Ninth, one credit for "+" or "X" after "winter," no credit for a mark after "summer" or for a mark after both "summer" and "winter." Tenth, one credit for "no" or "it does not," etc., and one additional credit for repeating *exactly* the first answer; in case the first answer were "yes" or anything else, and this is correctly repeated, one credit is given for the correct repetition. Eleventh, one credit for doing nothing to the first part *if* the preceding direction was attempted (one credit for "12," if the preceding direction was not attempted) and one credit for "J. e." or "J. E.," if the subject's name is John Doe, placed after the word, "line." In accordance with the principle first laid down, no credit at all is given for this direction (if the preceding direction was attempted) unless the second part of the direction is attempted.

The results for the individuals tested grouped according to age are given in Tables I and II. Table I shows the percentiles at each age for the Easy Directions Test. The table is to be read as follows:

TABLE I

Easy Directions Test. Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16
Percentiles											
100	8	16	16	20	20	20	20	20	20	20	20
90	8	13	12	19	20	19	20	20	20		..
80	6	10	12	19	20	19	20	19	20	..	..
70	2	8	10	19	19	19	19	19	20	..	..
60	2	6	9	18	19	19	19	19	19		..
50	2	4	7	18	18	18	18	19	19	19	20
40	1	3	7	18	18	18	18	18	18		..
30	0	2	5	17	18	17	17	18	18	..	..
20	0	1	3	17	17	17	17	17	18	..	..
10	0	0	1	14	17	15	16	17	17	..	..
0	0	0	0	14	15	5	12	15	14	9	13
No. of Cases	11	81	32	10	38	60	69	58	38	24	8

the highest or 100 percentile score made by six-year-old children is 8; ten per cent. of the children below the highest scored 8 also, and so on down the column. The other columns are to be interpreted in the same way.

Table II shows the percentiles at each age for the Hard Directions Test. The table is to be interpreted in the same manner as Table I.

TABLE II

Hard Directions Test. Percentiles

Age Percentile	7	8	9	10	11	12	13	14	15	16	17	Ad.
100	18	19	20	20	20	20	20	20	20	20	20	20
90	14	16	18	18	18	19	19	20	20	19	19	20
80	13	13	17	17	17	18	19	19	19	19	19	20
70	11	12	16	16	16	17	18	18	18	18	16	20
60	8	10	13	13	15	16	18	18	18	17	16	20
50	8	9	12	12	14	14	17	17	16	16	16	19
40	6	8	11	11	13	13	16	16	15	16	15	19
30	5	7	9	8	10	11	15	15	14	15	13	18
20	3	6	8	7	9	10	13	14	12	13	10	17
10	1	3	6	6	3	6	9	11	9	9	8	15
0	0	0	0	0	0	0	0	0	0	0	8	11
No. of Cases	22	79	115	124	124	154	213	253	144	45	10	44

The table for the Easy Directions Test shows that the test discriminates fairly well between the varying abilities of six, seven and eight-year-olds, in-as-much as all these ages show a gradual increase in the scores from the 0 to the 100 percentile at each age, and, furthermore, each age shows an increase over the preceding age. The number of cases tested at age nine is not sufficient, but from that age on we note very little difference in the percentile scores for each age and scarcely any increase from age to age. The Hard Directions Test shows discriminative capacity from age seven up to age thirteen, or fourteen, in-as-much as the percentile scores show a gradual increase for each age and also from one age to the other.

The fifty percentile at each age gives the median or norm for each age. Figure 3 shows the median scores for both the Easy and the Hard Directions Tests. We note that on Test B the scores increase gradually from age six to age eight, and that at age nine there is a sudden increase in score with but little increase thereafter. This would seem to indicate that the directions are entirely too easy for all ages after age nine. The Hard Directions increase gradually from age seven to thirteen with no increase thereafter except for the adults. This would seem to indicate that this test is too easy after age thirteen. The peculiar overlapping of the curves at ages seven

and eight is due to the fact that the seven and eight-year-olds tested on the Hard Directions Test are mainly the brighter accelerated pupils found in the higher grades. These norms are obviously too high for seven and eight-year-olds in general.

If these tests are to be used, then, they can only be used within the limits already mentioned, Test B from age six to age nine inclusive and the Hard Directions from age seven or eight to age thirteen inclusive. It would be much more desirable to have one test covering all ages from age six to age thirteen, or even better, to adult. The two tests might simply be massed together as one test giving us a test covering ages six to thirteen. This procedure would, however, give us too cumbersome a test because much useless material, due to relative equality of many of the directions, would evidently be included. It, therefore, would seem to be a better procedure to determine the relative difficulty of the different directions and eliminate those found inadequate.

RELATIVE DIFFICULTY OF THE DIRECTIONS

Easy Directions Test. From a mere inspection of the directions in either test, it is obvious that they differ greatly among themselves in difficulty. From the data gathered we are able to estimate the relative difficulty of each direction.

TABLE III

Percentage of Each Age Passing Each Direction. Test B.

Direc. No.	Chronological Age										(a)	(b)	(c)												
	7	8	9	10	11	12	13	14	15	16	Total	Aggregate %	Aggregate % ranking in order of difficulty												
1	22	1	21	9	70	6	92	5	90	0	88	5	93	0	92	0	95	8	100	0	72	2	766	4	13
2	34	6	40	6	76	5	85	0	93	3	90	0	88	0	92	0	87	5	100	0	75	1	787	5	9
3	6	2	9	4	58	8	75	0	80	0	87	0	88	0	94	7	87	5	100	0	63	5	686	6	17
4	3	7	0	0	41	2	65	0	66	7	75	5	63	8	65	0	70	9	71	4	49	6	523	2	20
5	50	5	62	5	88	5	97	5	93	3	94	3	93	0	100	0	95	8	100	0	84	0	875	4	3
6	3	7	3	1	41	2	80	0	85	0	78	3	91	4	86	7	54	2	71	4	59	1	595	0	19
7	16	0	25	0	58	8	92	5	96	7	91	4	82	7	94	7	95	8	85	7	70	8	739	3	15
8	11	1	18	7	98	5	95	0	86	7	91	4	94	9	100	0	95	8	100	0	71	8	782	1	12
9	22	2	31	2	70	6	92	5	96	7	97	1	96	5	91	7	100	0	85	7	76	0	787	2	10
10	60	5	78	3	91	5	97	5	96	7	97	1	98	3	100	0	100	0	100	0	89	2	922	9	2
11	42	0	62	6	82	5	97	5	91	7	97	1	100	0	100	0	100	0	100	0	83	3	873	5	4
12	83	4	53	1	82	6	97	5	93	3	97	1	94	9	97	5	91	6	100	0	80	0	841	0	6
13	29	6	34	4	70	6	90	0	90	0	94	3	89	6	92	0	100	0	100	0	75	1	790	5	8
14	39	6	50	0	70	6	87	5	90	0	92	8	98	3	94	7	87	5	100	0	78	4	811	0	7
15	12	7	18	7	70	6	82	5	95	0	92	8	94	9	97	5	91	6	100	0	71	1	756	3	14
16	64	3	78	3	100	0	97	5	100	0	98	6	100	0	100	0	95	8	100	0	90	8	934	5	1
17	34	6	40	6	82	6	97	5	98	3	98	6	96	5	97	5	100	0	100	0	80	9	846	2	5
18	17	3	28	1	70	6	97	5	96	7	97	1	98	3	100	0	95	8	85	7	75	8	787	1	11
19	27	1	50	0	64	9	85	0	76	7	74	0	82	7	84	0	70	9	100	0	66	6	715	3	16
20	29	7	34	4	47	1	72	5	70	0	72	5	84	5	89	4	83	3	71	4	63	8	654	8	18
No																									
Cases	81	32		17	40		60	69		58		37	24		7						Total Cases 425				

Table III shows the percentage of cases at each age able to respond correctly. The numbers in this and the following tables do not correspond exactly to those given in Tables I and II on account of exclusion of a few cases that could not be classified and to inclusion of extra cases where these had been obtained at the time of making up the different tables. The table is to be read as follows: Of the 81 seven-year-olds tested 22.1 per cent. were able to pass the first direction; 34.6 per cent. the second direction, and so on for each of the other directions and for the other ages. The next to the last vertical column, (b), shows the aggregate percentage passing each of the directions, found by adding the percentages at each age for the direction considered, and from this is derived the last vertical column, (c), which shows the ranking in order of difficulty of the twenty directions. Direction 16 has an aggregate percentage of 934.5, which is the largest value, and therefore this direction is given a rank of 1 because it is the easiest direction as determined by this method of estimating difficulty.

Table IV shows the score made on each direction at each age. The table is to be read as follows: All the seven-year-olds together

TABLE IV

Scores Made on Each Direction by Ages. Test B.

Age	Direction Number—																				No of Cases	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
7	18	28	5	3	41	3	13	9	18	49	33	27	24	32	10	52	28	14	22	24	81	
8	7	13	3	0	20	1	8	6	10	25	20	17	11	16	6	25	13	9	16	11	32	
9	12	13	10	7	15	7	10	15	12	16	14	14	12	12	12	17	14	12	11	8	17	
10	37	34	30	26	39	32	37	38	37	39	39	39	36	35	33	39	39	39	34	29	40	
11	54	56	48	40	56	51	58	52	58	58	55	56	54	54	57	60	59	58	46	42	60	
12	61	62	60	52	65	54	63	63	67	67	67	67	65	64	64	68	68	67	51	50	69	
13	54	51	51	37	54	53	48	55	56	57	58	55	52	57	55	58	56	57	48	49	58	
14	34	34	35	24	37	32	35	37	35	37	37	36	34	35	36	37	36	37	31	33	37	
15	23	21	21	17	23	13	23	23	21	24	24	22	24	21	22	23	24	23	17	20	24	
16	7	7	7	5	7	5	6	7	6	7	7	7	7	7	7	7	7	6	7	5	7	
Total	307	319	270	211	357	251	301	305	323	379	354	340	319	333	302	386	344	322	283	271	425	
Ranking	12	10	5	18	20	3	19	15	13	8	2	4	6	10	5	7	14	1	5	9	16	17

scored 18 on direction 1, 28 on direction 2 and so on. This table may also be regarded as showing the total number passing each direction at each age because a score of one is allowed for each direction. The next to the last horizontal line shows the total score for each direction and from this total score is derived the last line which shows the ranking of the 20 directions in order of difficulty. Column (a), of Table III shows the percentage of the total children passing each direction as calculated from the total number passing each direction in Table IV.

Table V shows the ranking of the 20 directions in order of difficulty for each age. This table is derived from Table III, which showed the percentage passing each direction at each age. Table V is to be read as follows: For the seven-year-olds direction 1 was the thirteenth in order of difficulty, direction 2 the sixth in order of difficulty and so on. The next to the last horizontal row gives the total rank for each direction and from this row is derived the amalgamated ranking in the last row of the table. Table VI shows the ranking of the directions by the three methods.

Correlation of the Three Different Methods of Ranking. The correlations of these three methods are as follows (Spearman's Foot Rule Method):

A with B, $r = .97$
 A with C, $r = .98$
 B with C, $r = .99$

A. Amalgamated Rank
 B. Aggregate Per Cent.
 C. Total Score.

TABLE V.

Ranking of Directions in Order of Difficulty, by ages. Test B.
(Based on the percent scoring on each direction.)

Age	Direction Number—																				Number of Cases
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
7	13	6 5	18	19 5	3	19 5	15	17	12	2	4	8	10	5	16	1	6 5	14	11	9	81
8	15	8 5	18	20	5	19	14	16 5	12	1 5	5	5	10 5	5	16 5	1 5	8 5	13	5	10 5	32
9	11 5	8	16 5	19 5	3 5	19 5	16 5	3 5	11 5	2	6	6	11 5	11 5	11 5	1	6	11 5	15	18	17
10	10	14 5	18	20	4	17	10	8	10	4	4	4	12	13	16	4	4	4	14 5	19	40
11	13	9	17	20	9	16	4 5	15	4 5	4 5	11	9	13	13	7	1	2	4 5	18	19	60
12	15	14	16	18	8 5	17	12 5	12 5	5	5	5	5	8 5	10 5	10 5	1 5	1 5	5	19	20	58
13	11.5	15 5	15 5	20	11 5	13	18 5	9	6 5	4	1 5	9	14	4	9	1 5	6 5	4	18 5	17	69
14	15	15	11 5	20	3 5	18	11 5	3 5	11 5	3 5	3 5	8	15	11 5	8	3 5	8	3 5	19	17	37
15	8 5	15	15	18 5	8 5	20	8 5	8 5	3	3	3	12 5	3	15	12 5	8 5	3	8 5	18 5	17	24
16	7 5	7 5	7 5	19	7 5	19	16	7 5	16	7 5	7 5	7 5	7 5	7 5	7 5	5 7	7 5	17	7 5	19	7
Total	120 0	113 5	153 0	194 5	64 0	178 0	127 0	101 0	92 0	37 0	50 5	74 0	105 0	96 0	114 5	31 0	53 5	85 0	146 0	165 5	425
Ranking	14	12	17	20	5	19	15	10	8	2	3	6	11	9	13	1	4	7	16	18	

TABLE VI.

Ranking of Directions in Order of Difficulty by Three Methods. Easy Directions

Method	Ranking of Sentence Number																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
A. Amal. Ranking	14	12	17	20	5	19	15	10	8	2	3	6	11	9	13	1	4	7	16	18		
B. Aggr. Per Cent.	13	9	17	20	3	19	15	12	10	2	4	6	8	7	14	1	5	11	16	18		
C. Total Score	12	10	5	18	20	3	19	15	13	8	2	4	6	10	5	7	14	1	5	9	16	17

Since C gives a higher average correlation with the two other methods than either of the other two methods, A and B, with the two remaining methods in each case, therefore C was taken as most probably representing the true order of difficulty of the directions. Correlating the ranking of each separate age, Table V, with the total ranking of method C, we obtain the results shown in Table VII.

TABLE VII

Correlation of Each Age with Method C. Easy Directions

	Age											
	7	8	9	10	11	12	13	14	15	16	Av'g.	
Correlation r.....	.89	.84	.91	.85	.70	.82	.76	.72	.69	.51	.769	

The high correlations for the lower ages and the gradual tendency of the correlations to decrease with increase of age is just what we should expect from a test difficult enough for only the lower ages. Pupils of higher ages may be expected to show their ability to better advantage on directions suited to their ability rather than upon directions much too easy for their age. An examination of Table III shows that the test is entirely too easy for all ages above age 9; the hardest direction for the ten-year-olds is passed by 65 per cent. of the group.

Hard Directions. The Hard Directions were subjected to the same kind of analysis as the Easy Directions. It was found that only a very small percentage of those tested made partial scores on any of the directions; and since the inclusion of these partial scores in the determination of the difficulty of these directions complicates the statistical work with little or no advantage, the scores of a perfect performance of both parts of the direction, where such occur, are the only ones included in the tables presented.

Table VIII shows the percent. passing each direction at each age, the total percentages passing each direction and the aggregate per cent. (sum of the per cents. at each age) with the aggregate ranking derived therefrom.

Table IX shows the number of persons passing both parts of each direction. The scores would, of course, be quite different, two credits in the original scoring having been given for directions 1, 2, 3, 4, 5, 6, 8, 10, 11, and one credit each for directions 7 and 9. It is obvious that the difficulty of each direction should be computed upon the number passing each direction, not the scores on each unless weighted properly, when the scores are not the same on every direction.

TABLE VIII

Per Cent Passing Each Direction by Ages. Hard Directions.

Direction	Per Cent Passing at the Age—										Total	Aggregate per cent	Aggregate ranking
	8	9	10	11	12	13	14	15	16				
1	6.9	31.1	31.1	39.6	53.8	66.0	65.0	69.4	62.0	57.3	424.9	9	
2	34.5	55.5	55.5	58.4	59.0	70.5	74.5	77.8	76.3	68.1	562.0	4	
3	58.6	80.7	71.6	62.5	61.7	78.5	74.8	70.8	76.3	72.3	633.7	3	
4	17.3	51.1	33.4	66.6	62.3	75.0	73.1	67.8	71.5	65.8	518.1	6	
5	13.8	40.4	42.2	41.6	66.5	76.3	84.2	71.6	76.3	68.7	512.5	7	
6	27.7	51.1	53.4	60.5	69.5	83.5	74.8	70.1	69.1	70.1	559.7	5	
7	34.5	60.6	62.2	66.6	80.1	83.0	90.3	88.5	90.5	80.9	655.7	1	
8	6.9	26.6	33.4	41.6	50.6	59.2	62.0	60.8	83.1	50.2	379.2	10	
9	10.4	37.8	28.8	56.3	51.7	61.5	69.2	57.7	64.3	57.0	437.7	8	
10	34.5	64.3	73.4	70.9	74.8	86.5	89.3	78.5	81.0	79.9	653.2	2	
11	3.5	15.5	13.4	29.2	47.5	56.8	60.3	55.5	42.8	47.9	324.5	11	
No. of Cases	29	45	45	48	95	176	234	130	42	844			

TABLE IX

Number Passing Each Direction by Ages. Hard Directions

Age	Number Passing Direction—											Number of Cases
	1	2	3	4	5	6	7	8	9	10	11	
8	2	10	17	5	4	8	10	2	3	10	1	29
9	14	25	36	23	18	23	27	12	17	29	7	45
10	14	25	32	15	19	24	28	15	13	33	6	45
11	19	28	30	32	20	29	32	20	27	34	14	48
12	51	56	58	59	63	66	76	48	49	71	45	95
13	116	124	138	132	134	147	146	104	108	152	100	176
14	152	174	175	171	197	175	211	145	162	209	141	234
15	90	101	92	88	93	91	115	79	75	102	72	130
16	26	32	32	30	32	29	38	16	27	34	18	42
Total	484	575	610	555	580	592	683	441	481	674	404	844
Ranking	8	6	3	7	5	4	1	10	9	2	11	

Table X gives the ranking in order of difficulty of all directions by ages, as calculated from the percentage passing each direction at each age.

Table XI shows the ranking of the directions in order of difficulty for all ages by the three methods; A, amalgamated rank, B, aggregate per cent, C, total score.

TABLE X

Ranking of Directions in Order of Difficulty by Ages. Hard Directions

Age	Ranking of Direction Number											Number of Cases
	1	2	3	4	5	6	7	8	9	10	11	
8	9.5	3	1	6	7	5	3	9.5	8	3	11	29
9	9	4	1	5.5	7	5.5	3	10	8	2	11	45
10	9	4	2	7.5	6	5	3	7.5	10	1	11	45
11	10	6	4	2.5	8.5	5	2.5	8.5	7	1	11	48
12	8	7	6	5	4	3	1	10	9	2	11	95
13	8	7	4	6	5	2	3	10	9	1	11	176
14	9	6	4.5	7	3	4.5	1	10	8	2	11	234
15	7	3	5	8	4	6	1	9	10	2	11	130
16	9	4	4	6	4	7	1	11	8	2	10	42
Total	78.5	44	31.5	53.5	48.5	43	18.5	85.5	77	16	98	844
Ranking	9	5	3	7	6	4	2	10	8	1	11	

TABLE XI

Ranking of Each Direction by the Three Methods. Hard Directions

Method	Ranking of Direction Number										
	1	2	3	4	5	6	7	8	9	10	11
A. Amal. Rank....	9	5	3	7	6	4	2	10	8	1	11
B. Aggr. %.....	9	4	3	6	7	5	1	10	8	2	11
C. Total Score.....	8	6	3	7	5	4	1	10	9	2	11

Correlating the three methods we find (Spearman's Foot Rule Method):

A with B, $r = .97$

A with C, $r = .97$

B with C, $r = .95$

On the basis of the reasoning in the case of the Easy Directions, since A gives a higher average correlation with B and C than does B or C with the remaining two, A should be the more reliable measure. The high average correlation of C, however, shows that C is a very reliable measure and we shall use this method throughout. It is obvious that any of the rankings would be reliable enough for our purpose. In this connection it is interesting to note that the inclusion of a group of 166 heterogeneous adults, 11 backward pupils in the public schools, 17 professional people, 44 college students, 94 men seeking employment at a free public employment office, changed the total order of difficulty only in that, where before direction 5 preceded direction 2 in difficulty, after the inclusion of this group direction 5 followed direction 2 in difficulty.

Table XII gives the correlations of the ranking for each age (Table X) correlated with the total ranking in difficulty, method C.

TABLE XII

Correlations of Ranking at Each Age with Method C.

Age...	8	9	10	11	12	13	14	15	16	Av.
Correlation ..	.84	.88	.88	.76	.95	.95	.97	.89	.89	.89

Harder Directions. Now since the two tests separately or in combination test only up to and including the thirteenth year, it seemed desirable to secure some harder directions to be included as a test for fourteen-year-olds and beyond. Accordingly eight directions were secured, five of which were discarded as unsuitable. Of the three retained, numbers 5 and 8 were adaptations from Kelley's Reading Tests.*

The procedure was again the same as in the case of the last two tests. It is not necessary here to go into the details of the several operations as the norms secured from the test as a whole were inadequate, lacking differentiation; all but four of the tests were found too easy for the ages above 13; three of these four are incorporated in the final series and the fourth was excluded because of lack of differentiation from age to age and also because of equal median difficulty with one of the three chosen. The three ultimate-

*KELLEY, F. J., *The Kansas Silent Reading Tests*, Jour. of Educ. Psych. Vol. VII, 2, Feb. 1916., Pp. '3-80.

ly chosen are shown in Figure 4 as incorporated in our New Directions Test. (Their original numbers in the harder Directions Test were 8, 5, and 6, respectively).

The percentages passing each of the three chosen directions at each age are shown under "Harder Directions" in Table XIII. Direction 6, which becomes the last of our new series, *i. e.*, No. 15, proved too difficult for all but college students. Hence it was included as a test for "superior adults."

A SUGGESTED NEW DIRECTIONS TEST

By simply combining Test B and the Hard Directions on one sheet and securing norms for the combined sheet we might thereby get a test for ages 6 to 13 inclusive; similarly, by combining this new test with the Harder Directions Test we might get a test, more or less adequate, for all ages, 6 to "superior adult" inclusive. Such a test would, however, be cumbersome, due to the inclusion of too many directions of relatively equal difficulty. We propose therefore to eliminate the useless and inadequate directions and combine those remaining into one test which shall not be cumbersome and shall differentiate between all ages from 6 to "superior adults."

The directions selected should vary in difficulty from the easiest to the hardest. The directions should so vary in difficulty that each age will show an increase in score above the preceding age. The directions selected should show increasing percentages passing each direction with increasing age. To this end they should not involve more than the simplest kind of knowledge for their carrying out. Each age should be represented in the test with one or more directions passed by the median child, or by a safe margin of that age above 50 per cent., and which is not passed by the median child of the age below, by a safe margin below that age.

With all these points in mind we have chosen 15 directions from the three tests as best fulfilling these conditions. Table XIII gives the selected directions with the percentages passing at each age as taken from Tables III and VIII and the results from the Harder Directions Test. The percentages on the directions from the several tests are based necessarily on different numbers depending on which test they originally came from. The directions for the ages, 6, 7, 8, 9, are based on 425 persons tested by test B; the directions for ages 10, 11, 12, 13, are based on 844 persons tested by the Hard Directions Test; and the directions for ages 14, 15, and Adult are based on 698 persons tested on the Harder Directions Test.

TABLE XIII
Percentage Passing the Selected Sentences at Each Age

Test and Direct'n Number	Revised Test Numb'r	Direction	Per cent passing at age—														Sup Ad	Total	Credits	
			6	7	8	9	10	11	12	13	14	15	16	17						
Easy																				
Direcs.																				
16 E	1	Put a nose on this face	36 2	64 3	78 3	100 0				(Based on 425 tested)								90 8	1	
10 E	2	Write 7 in the largest square.	45 4	60 5	78 3	94 5											89 2	1		
5 E	3	Put a dot below this line		50 5	62 5	88 5	97 5										84 0	1		
11 E	4	Cross out the blackest letter in Texas		42 0	62 6	82 6	97 5										83 3	1		
12 E	5	Write g on the egg-shaped figure		33 4	53 1	82 6	97 5	93 3									80 0	1		
14 E	6	Put the sign = where it belongs.		39 6	50 0	70 6	87 5	90 0									78 4	1		
7 E	7	Make a boy's name by adding one letter to Joh			25 0	58 8	92 5	96 7									70 8	1		
19 E	8	Draw a line around the three dots.			50 0	64 9	85 0	76 7									66 6	1		
Hard																				
Direcs.																				
6 H	9	Now, if Tuesday comes after Monday, here.			27 7	51 1	53 4	60 5	69 5	83 5							70 1	2		
9 H	10	Show by a cross when the nights are longer .				37 8	28 8	56 3	51 7	61 5	69 2						57 0	2		
8 H	11	Notice these two numbers: 3 5. If iron, here.					33 4	41 6	50 6	59 2	62 0						50 2	2		
11 H	12	Do nothing here (5+7= .), unless . line						29 2	47 5	56 8	60 3	55 5					47 9	1+2		
Harder																				
Direcs.																				
8	13	If in the following words											40.6	68 1	59 3	58.7	52 5	76.3	67 0	3
5	14	A list of words is given below. One of them is											46 9	47 4	57 1	58 7	55 7	83.0	66 5	3
6	15	You are looking at a clock face . . . at 3 45.											12 5	26 7	29 7	41 3	34 4	56 1	41 8	4

Name _____ Age _____ Grade _____

PINTNER-TOOPS REVISED DIRECTIONS TEST

Put a nose on this face:

Write 7 in the largest square:

Put a dot below this line: _____

Cross out the blackest letter in TEXAS

Write g on the egg-shaped figure.

Put the sign = where it belongs. $3+2$ 5.

Make a boy's name by adding one letter to Joh

Draw a line around the three dots

Now if Tuesday comes after Monday, make two crosses here . . . , but if not, make a circle here or else a square here

Show by a cross when the nights are longer: in summer? in winter?

Notice these two numbers: 3, 5. If iron is heavier than water, write the larger number here , but if iron is lighter write the smaller number here

Do nothing here ($5+7=$) unless you skipped the preceding question, but write the first letter of your first name and the last letter of your last name at the end of this line

If in the following words e comes right after a more times than e comes just after i, then put a line under each word containing an e and an i, but if e comes just before a more times than right after i, then put a line under each word containing an a and an e:

receive

feather

teacher

believe

A list of words is given below. One of them is needed to complete the thought in the following sentence: The roads became muddy when the snow.

Do not put the missing word in the blank space left in the sentence, but put a cross below the word in the list which is next above the word needed in the sentence.

water

is

melted

snow

You are looking at a clock-face in a mirror. Place the hands of the clock at 3:45.

Figure 4.

Figure 4 shows the Revised Directions Test. The first eight directions are taken from the Easy Directions Test, the next four from the Hard Directions Test, and the last three are the three new harder directions which we have added.

The number of credits allotted to each direction is shown in the last column of Table XIII. This gives one point credit to the first eight directions and leaves the method of scoring these directions precisely as before. The details in regard to scoring have been explained above.

Two points credit are given to directions 9, 10, and 11, but *no partial credits are to be allowed*. These directions must be answered absolutely correctly in order to get a credit of 2; if not absolutely correct, *i. e.*, if partially correct, no credit whatever is allowed; a credit of 1 is never given to these directions. For direction 12 three credits are allowed, and these are divided into 1 and 2 credits, 1 for the first part of the direction and 2 for the second part. Each part must be absolutely correct in order to receive the partial credit of 1 or 2 as the case may be. The second part is always scored 2, for a correct response, or 0, for an incorrect response.

Directions 13 and 14 receive three points credit each, and no partial credits; the score is either 3 or 0. The correct response to direction 13 is the underlining of both "feather" and "teacher." The correct response to direction 14 is the placing of a cross (X or +) underneath the letters of the word, "is." No credit is allowed if the cross is on the word "melted;" it must be above this word. No credit is allowed if the word "melted" has been written in the incomplete sentence above, unless the word has been written in and crossed out again.

Direction 15 receives 4 points credit for an acceptable performance. An acceptable performance is interpreted as meaning that the minute hand on the diagram be drawn within one minute on either side of the figure, "9," and the hour hand shifted to the left anywhere up to the figure, "4;" *i. e.*, the hour hand must be shifted somewhat to the left in order to receive credit. No partial credit is allowed.

A method of procedure in giving the revised form of the directions test has not yet been standardized. In all probability the most feasible method will be to give as instructions to the subjects merely the words, "Fill this blank out according to directions. Do exactly what you are told to do on the paper," and to allow the subjects to

work at the test for a period of eight minutes. Each one is given as much time as he needs to complete the test, provided he does not exceed the time limit of eight minutes.

NORMS FOR THE REVISED DIRECTIONS TEST

The directions, selected and arranged in order of difficulty, are useless without norms. Now, it seems quite possible that the total score made upon any direction depends somewhat upon its position with reference to other directions; so that in the rearranged form we cannot be sure of the sentences receiving the same percentages at each age as in the original. The only adequate thing to do, of course, is to restandardize the new test, and we are at present working upon this standardization.

Realizing the immediate need for norms, we have adopted the following procedure to secure norms which are, we believe fairly accurate and will serve our purposes until more accurate norms are determined: (1), all papers were regraded on the basis of the selected sentences and the revised credits (2), the norms thus obtained from each of the several tests for each age were added to secure the norms for the entire revised test. Since not the same but different groups (in part at least) of children were tested on the three tests, our procedure may here be questioned. Our justification and the assumption underlying this procedure is this: The *median* child, from whatever group, within proper limitations, he may be selected, should make the same score as any *median child of his age* on the combined list. We, therefore, are justified in crediting the median child (who determines our norm) at any age, say 16, with the median score made by the median child of age 16, on the other two tests without testing him on those tests. This is the same principle as is used in the Binet Scale which credits the child with all tests below his basal age. We do not feel justified in establishing percentile scores on this basis. We, therefore, present the norms (medians or 50-percentiles) for the revised test in Table XIV, based on 2366 individual measurements.

TABLE XIV

Tentative Norms for the Revised Directions Test

Test	Median Scores for Age—												Superior Adults
	6	7	8	9	10	11	12	13	14	15	16	17	
Easy													
Directions B	1	3	6	7	8	8	8	8	8	8	(8)	(8)	(8)
Hard													
Directions	(0)	(1)	2	3	3	4	5	7	7	7	6	7	9
Harder													
Directions	...	.	.	..	0	0	(0)	(0)	3	4	6	6	7
Revised Test	1	4	8	10	11	12	13	15	18	19	20	21	24

SUMMARY

1. A standardization of the Woodworth and Wells Easy and Hard Directions Tests has been attempted. This standardization includes method of procedure, method of scoring and percentile norms for many ages.

2. An analysis of the relative difficulty of the directions in the two tests has been made, showing that many directions are of much the same degree of difficulty.

3. To secure one test covering a wider range of difficulty than any one of the original tests, a combination of the two tests as they are at present is not feasible.

4. A revised Directions Test has been constructed by choosing the most suitable directions from the original tests and by adding three other directions.

5. A method of scoring and tentative norms for the Revised Directions Test are offered.