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TWO THOUSAND NORMAL CHILDREN MEASURED BY THE BINET MEASURING SCALE OF INTELLIGENCE

By HENRY HERBERT GODDARD, Ph. D., Vineland, New Jersey

Since the first publication of the measuring scale by Binet and Simon there have been few tests of the scale itself upon groups of children. Prof. Decroly and his associates in Belgium have made the most important contributions. But these have been upon small groups and rather select. Our own testing of four hundred feeble-minded children was the largest use made of it upon defectives.

It seemed very desirable to have the experience of this test upon a homogeneous group of normal children. With this thought in mind, arrangements were made in the fall of 1910, at the beginning of the school year, to test the entire school population of one complete school system. This system includes about five thousand population within a small city and as many more outside, so that we have, city and country, a school population of about two thousand children. The city referred to is, as will be seen, a small one, and not it is true, widely different from the country except that the population is not of course engaged in farming.

The tests were made by five assistants from the Research Laboratory of the Training School at Vineland. These persons were all expert in the use of these tests, having been trained in the laboratory. The method of procedure was for two or more teachers, according to the number of rooms in the school, to go to a school and test out the children there, at one sitting if possible. In a very few cases it was necessary to go back a second time. The examiner was provided with a small table and a couple of chairs in an ante-room or in the hall. When everything was ready the teacher sent out a child, who was tested and returned to the room, when another child came out, and so on with practically no disturbance of the school. The work began always with the lowest grade so that if there were any tendency for the children to tell the others it would be minimized because the younger children

could not tell the older ones anything about their questions. However, experience proved that there was practically no attempt to coach any children in regard to the answers. Indeed such coaching would have been largely useless because no answer was ever criticised and the child was made to feel that his answer was satisfactory, therefore had no reason to look it up or talk about it, and, if he told another child, was as likely to tell a wrong answer as a right one. A few cases where there had been some telling, evidently without any thought of dishonor, the child who had thus been told was found to be unable to retain what had been told him, *if it was something that was beyond his normal mental age.*

In other words, there were obtained in these cases, evidences of two things: first, that the Binet Scale was wonderfully accurate; and second, that a child cannot learn the things that are beyond his grade of intelligence. He may be drilled upon them but can only give rote work and will fall down upon them if carefully questioned. So that the whole matter of the children explaining to each other was practically without any influence upon any of our results.

The examiners, while all more or less trained, differed considerably in experience so that the result was that the number tested in the school day varied from twelve to thirty at the beginning. Those who did twelve rapidly increased in the number they could do, while those who did thirty were practically at their maximum at the start. No children were tested at recesses or outside of school.

In the seventh and eighth grammar grades and the high school, the children were tested in groups, the papers being given out to them at their desks and they turning them right side up at the signal and beginning to answer the question. The results in these grades will be considered later in this paper. All others were done individually.

We were interested to discover to what extent the personal equation of the examiner affected the results and accordingly on each second day for the first week and a half, the work of each examiner was subjected to examination, by drawing the curve of distribution for her cases. With the exception of one case, where the method of crediting one question had been misunderstood, the differences in the different examiners was practically a negligible quantity so that it was entirely safe to put all the results together and compare them as though they had been made by one examiner. This was an important item since it demonstrated that the value of the tests is not noticeably affected by the personal equation—provided of course the examiners have mastered the method and are temperamentally fit for such work with children.

The method of procedure by each examiner was usually to say "Do you want to come and play with me? Let us look at these pictures," and then to begin by showing the child the pictures of test number 4 for three-year-olds and also number 6 for seven-year-olds. The way in which the child received and talked about the pictures would usually enable the teacher to determine about where to begin. If she was uncertain from this she would probably begin with the questions set for the child's age. If the child failed on any of these questions she would go back a year, and if a child answered these questions she would go on with the next year and so on until she was sure the child's limit had been reached. No attempt was made to have every child answer all of the questions for all ages since the purpose of the examination was primarily to determine the mental condition of the child, whether normal, backward, or precocious.

If the child was backward, then the examiner went back until she found that the child could answer at least all but one for the given year.

It may be stated in passing that none of the fears that naturally arise in the mind of one who is new to the method was realized. The children almost without exception were eager for the tests, did their best and were much pleased with the result. That was true whether they were *at age*, *above age*, or *below*. Of course part of this was due to the method because the child was *never scolded*, was never even told that he had failed, but *always encouraged*, told even that he had done well, the examiner considering that whatever he did, was well for him. If the child made a mistake so obvious that he was conscious of it himself, the examiner passed over it as lightly as possible, mentioning something that would be a good excuse for such a slip, and so making the child comfortable. In this way we believe that we got the best from every child that was examined.

The results, so far as the children in the first six grades are concerned, are shown in the following distribution curve, whereon is seen that five hundred and fifty-four children tested exactly *at age*. That is to say, they did the questions for their respective ages. Three hundred and twenty-nine tested one year above, and three hundred and twelve tested one year below. Again forty-nine were two years above the average, fourteen were three years above, and two were four years above, while one hundred and fifty-six were two years below; seventy-nine three years below; thirty-seven four years below; eight, five years; six, six years; and one seven years below; making a total of fifteen hundred and forty-seven in these six grades, who were tested.

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Table I shows the distribution of the entire 1,547 children in *mental* age and physical age. One sees just how many were backward “at age” and precocious for each physical age.

TABLE I

Age	MENTAL AGE *													Totals
	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII		
4 yrs.													8	
5 "	2	I	2	2	3		4						114	
6 "	I	4	8	40	40	16	9	0	I				160	
7 "	0	0	3	29	48	69							197	
8 "		I	2	8	15	114	50	4	3				209	
9 "			2	2	I	87	86	16	12	3			201	
10 "						27	54	56	58	4	2		201	
11 "					3	15	24	19	124	27	8	2	222	
12 "					I		13	25	50	60	12	I	166	
13 "						4	10	13	42	36	39		144	
14 "						I	5	6	30	19	21	7	89	
15 "							I	I	6	5	4	3	20	
								3	0	I	2	0	6	
Totals	3	6	17	81	111	337	256	143	326	155	88	13	1547	

* In these tables Roman numerals stand for *Mental Age* as determined by the Binet tests. Arabic numerals when used for *Age* denote physical or chronological age.

The heavy faced figures show those "at age."

For example, of the four-year-old children, 1 tested to the mental age of III, 2 tested IV, 2 tested V, and 3 tested VI, that is to say, they had the mental development of average children of those respective ages.

To a person familiar with statistical methods the foregoing curve of itself, amounts to practically a mathematical demonstration of the accuracy of the tests. The results could not arrange themselves on this curve, which is recognized at once as practically a normal curve of distribution, if the questions were not carefully graded. Secondly, if they were not right, age for age, but were too hard or too easy, the largest group would not be one *at age*, but would be a year below or a year above according to whether they were too hard or too easy. Consequently, we are forced to the conclusion that the questions that Professors Binet and Simon have selected are well graded, at least from the ages of five to twelve, and that they fit the ages to which they are assigned.

The significance of these figures obtained from the general results is very great. There is every reason to believe, and statisticians confirm this, that any group of two thousand children may be taken as a fair sample of conditions to be found in any number of children in any country. Consequently, whatever proportions or percentage are found here may be taken to be very closely the standard to be found elsewhere.

Bearing this in mind it becomes very significant when we find that we have 78% of the children practically normal and satisfactory—for we allow those children who are one year above and one year below to pass with the central group as satisfactory children. It is probably true that in a school system which is ideally conducted, where the superintendent has sufficient help to do all that he wishes to do, these children a year ahead and a year below would be looked into a little closer to see if there was any reason for this. But in the main, it is not a significant difference. But when we come to those that deviate more than that, we have conditions that are of importance. Of those more than a year above age, we have 4% and this is certainly significant. Four per cent. of the children in the first six grades of our public schools are especially well endowed,—what Whipple has called "gifted" children. They are born with a better brain or better protoplasm so that they have better endowments and greater capacity for doing school work. There seems to be no good reason why we should not recognize this and utilize it in our school work, giving these children the extra advantage which their natural endowment enables them to use, giving them a

broader experience and a broader education as they go through the grade. This probably does not mean that they should go through the grade faster, but that the course should be richer as they go.

On the lower side of the curve, we have first, those who are *two* and *three* years behind age. Experience teaches us that these are probably what we call *merely backward*. That is to say, they are not permanently arrested in their development. They constitute, as will be seen, 15% of the children in the first six grades. They need help and with help they may be advanced to come up to the normal, or if always slow, nevertheless they can learn enough to be useful and respected citizens, but they must have special help. The Special Class for the slow child is needed for these.

Then we come to those that are four years or more behind their "age", and here again experience is conclusive that children who are four years behind are so far back that they can never catch up, or in other words, they are where they are because there is a serious difficulty which can never be overcome—they are feeble-minded. These constitute 3% of the children in these grades. We shall not stop here to discuss the social significance of this and its importance to all students of social problems.

Educationally the conclusion is forced upon us that it is very unfair to the normal child to keep these children in the same class with him. They should be segregated and given a special teacher who understands their case and is allowed to train them as their mental condition will permit. Of course, ultimately they ought all to go to the institutions for the Feeble Minded where they will be cared for and prevented from contaminating society; but until this can be done, the special class for defectives is probably the wisest solution.

As already said, the curve shown, demonstrates the remarkable accuracy of the Binet measuring scale, but we were not quite content with this. We desired to know whether every question in the list was one that was rightly placed, because such is the skill with which the plan has been worked out by Binet that his method of counting enables one to state the results with great accuracy. In other words, the scale is very flexible. Prof. Binet provides that the method of counting shall be that a child is credited first with the mental age at which he has answered all of the questions but one: he is then to be advanced a year for every five questions that he can answer beyond that point, no matter where they are found. This, as we have said, gives a flexibility to the system which overcomes any peculiarities of training that the

child may be subject to, and so he measures up to his proper grade regardless of any accident in his training. But that being the case, it is still possible that some of the individual questions may be too hard or too easy for their age.

With the purpose of determining this, we have gone over every answer that has been given to every question and drawn up tables for this to determine just what percentage of children at the various ages can answer the different questions. The results of this are shown in the next table. (II.)

TABLE II

Physical Age	5	6	7	8	9	10	11	12	13
Mental Age									
III									
1	1	1							
2	1	1							
3	1	1							
4	7	7	1	1					
5	5	3	2						
IV									
1	14	1	5						
2	14	4							
3	13	2	5	1					
4	14	4	1	1					
V									
1	32	2	20	8					
2	23	11	22	3	10				
3	20	12	14	5	7				
4	30	4	18	8					
VI									
1	15	17	35	8	30	4	4		
2		21	5	27	7	20	2	3	
3	14	11	31	9	32	2	4		
4	9	6	35	6	23	2	7		
5	5	5	25	7	32	3	4		
6	13	13	35	8	39	2	7	1	
7	14	11	30	12	43	4	3	1	
VII									
1	3	3	24	14	87	9	34	3	
2		5	15	25	96	5	42		
3		1	4	18	88	10	37	2	
4	2	4	17	22	95	8	36	3	
5		1	7	27	77	26	36	7	
6	6	3	18	19	83	25	41	3	
7	2	1	24	9	94	5	34	1	
8		1	10	20	90	17	39	3	
VIII									
1			1	2	26	33	48	13	5
2		1	4	46	49	79	14	17	
3		2	8	6	97	5	90	1	17
4				1	17	47	74	15	16
5				1	21	34	40	10	4
6				1	52	16	87	2	17

TABLE II—Continued

Physical Age	5	6	7	8	9	10	11	12	13
Mental Age									
IX.									
1			1 20	49 33	48 7	4			
2			13 11	85 45	55 2		1		
3			1 11	38 33	23 3		1		
4		1	1 3	19 27	45 27	3			
5			1 7	22 43	10 2	1 1			
6			1 1	16 24	44 11	3 1	1		
X.									
1			1 11	6 48	6 102	3 14		2	
2				5 4	31 14	104 5	10	2	
3				1 11	27 92	17 13	2	2	
4				21 13	98 8	8		2	
XI.									
1				1 7	10 67	34 48	4 3		
2				1 8	41 51	39 14	3 2		
3					1 8	10 35	3 3	1	
4					8 20	71 37	16 5		
5					2 9	28 35	9 3	1	
XII.									
1					1 8	29 23	28 37	7 2	1
2				1 2	18 7	45 54	4 3	3 1	
3						8 5	30 15	21 2	2
4						1 20	3 40	3 2	1
XIII.									
1						1 4	8 10	29 4	1
2						2 3	7 17	4 1	
3							4 7	17 4	1

EXPLANATION OF TABLE II

The left hand column gives mental age in Roman and the questions under that age in Arabic. For instance, V 1 means five years, first question. In the columns headed by Arabic numerals from 5 to 13, which stand for physical age, the first figure gives the number who answered that question correctly, the second figure, those who failed. For instance, in V 1, 32 succeeded, 2 failed at the physical age of five years, *i. e.*, they test "at age." They are five years old and they do the tests prescribed for five years. The next column to the right shows what six-year-old children do with the same question:—20 succeed, 0 fail. In the same way we may see what proportion of children younger than "at age" have succeeded. For in-

stance, in VII 3, we have "at age" (*i. e.* seven years) 88 to 10. Six-year-old children give 4 to 18, and eight-year-olds, 37 to 2. This shows that the question is rightly placed since it is too hard for six years—only 4 succeeding while 18 fail.

We consider that a question is misplaced in the scale if it is not answered correctly by about 75% or more, of those trying it.

It will be seen now, from looking over this table, that the following questions are misplaced because they are too hard. Question VI 2—the success and failures are "at age" 5 to 27, one year older, 7 to 20, two years older 2 to 3, so that even for children eight years of age, the question does not seem to be answered by even half, although the numbers here are of course too small to be very significant. Question VIII 1 is answered by 33 while 48 failed; one year older, 13 succeed and 5 fail. It is clear that this question is too hard for eight years. Again question VIII 5 is answered by 34 against 40 who failed, but one year older 10 succeeded and 4 failed. It should be transferred to a later age. Question XII 3 is answered by 15 while 21 failed. At one year older, the record is 2 and 2. IX 3 gives 33-23. More succeed than fail but the proportion is not large enough.

These five questions are the only ones that are positively too hard and should be transferred to a later year or else modified to make them easier.

Turning now to examine any questions that may have proved too easy, we find question VIII 3 is answered by 20 while 1 fails. Children one year younger answer this in the proportion of 27 to 5, and even two years younger in the ratio of 8 to 6. It is clear that we may safely transfer this to seven years. IX 2 is answered by 55 while 0 fails. One year younger, it is answered by 85 to 4, and two years younger by 13-11. This should be removed to eight years. Question X 1 is answered by 102 to 3, one year younger, 48 to 6, two years younger, 11 to 6. This, like the last one mentioned, should be put at least one year back. Question X 2 is answered by 104 to 5, one year younger, 31 to 14, two years younger, 5 to 4. XII 2, 44 succeed, 0 fails. One year younger, 45 succeed, 5 fail; two years younger, 18 succeed, 7 fail; three years younger, 3 succeed, 0 fails. This should be removed to one year younger.

The results given in Table II were those obtained by children, all of whom were graded "at age." That is to say, while a child may have failed on one question, he on the whole passed that age.

It seemed worth while to determine whether the same ratio approximately would hold good for those who were *above*

and *below* age. We have consequently worked out the same problem for those who were one, two and three years above and below age. That is to say, if a child is nine years old actually but tests only six, how has he succeeded with the six-year-old questions. Have such children, on the whole, succeeded and failed in about the same ratio as the children who are physically only six years?

An illustration will make the problem clear. Take question VI 1. By the children who are "at age" it is answered correctly by 35 while 8 fail. Of those who are a year above age (*i. e.*, precocious) 34 succeed and 8 fail, practically the same proportion. Those who are two years above, 4 succeed and 0 fails, while those who are one year *below* (*i. e.*, dull), 14 succeed and 3 fail. This is very close to the ratio of 35 to 8.

On the whole the results agree very closely. So whether a child is precocious or backward, he has about the same chance of succeeding with the questions that are *suited to his mental age*. This seems to be a striking confirmation of the accuracy and fairness of the test.

A question of considerable interest is to what extent have our ordinary methods of classification in the schools more or less consciously and accurately recognized the actual mental standing of the child. In other words, to what extent is it true that we somehow by our ordinary methods size up children about right and do not need any such thing as the Binet Scale in order to set us right.

In order to get at this we first found out how many children of those concerned in our study were above or behind school *grade* to the extent of one, two or more years, assuming that a six-year-old child should be in the first grade, seven years in second grade, etc. Table III gives this result. It also gives the number of children who were one, two and three years above or below school grade *according to the Binet Scale*.

TABLE III

Above grade according to school standard	150 = 11.6%
No. in grades ahead of what their mental ability as measured by the Binet scale, would warrant	121 = 9.4%
In right grade according to school standard	393 = 30 %
In right grade according to Binet scale	558 = 43.2%
Below grade according to school standard	659 = 51.1%
No. in grades below what their mental ability warrants	558 = 43.2%

BY YEARS OF RETARDATION

	1 yr.	2 yrs.	3 yrs.	4 yrs.
Retarded according to school system	361	186	90	22
No. children backward according to Binet scale	312	156	79	37
No. children in a school grade below that which their mental age would warrant	449	90	8	

It will be seen from a study of this Table that a somewhat smaller number are behind or above, according to the Binet Scale, than are behind or ahead of school grade. Now, provided these are the same children, we have a justification for the school procedure. For example, we see that 186 children are two years behind grade, that is to say, they are two grades below where their age would presumably put them, and we find also that 156 children are two years behind according to the Binet Scale. In other words, provided they are the same children, the school system is justified in keeping at least 156 of the 186 two years behind their grade. It only remains to account for that 30 which are behind grade but not backward according to the Binet Scale. They might easily be accounted for on the assumption of not having entered school at six years of age. But we shall see.

Analyzing our data so as to show exactly where each individual is, we find that the case is not as favorable as we suggested in the previous paragraph, that many children who are normal mentally are two or three or possibly four years behind their *grade*. We find a great many other children who are mentally dull, not as far behind their grade as their mentality would require. We find still worse conditions among those who are *ahead* of their age mentally. They are *not* correspondingly far ahead in their grade.

In other words, the two systems do not agree at all. Now, having satisfied ourselves that the Binet Scale is the most accurate method that we have of determining intellectual ability in children, the question at once arises, how much injustice is being done these children by the ordinary school routine? We are not now concerned with criticising this particular school system, consequently we do not care what may be the answer to this question in this particular case. We are merely concerned to point out that the conditions found here are probably typical, and that by the use of this method, any superintendent may examine his system of schools, and determine with considerable accuracy whether each and every child is in the grade that his mental ability actually warrants. Of course, it is evident that a child may have the mental ability of eight years, but if he has never been to school he

must be in the first grade for a time at least. But on the other hand, he should not be in the third grade two years later when he is ten years old mentally. As the years go by, he should get through with the mechanics of the learning process in the elements, and be up to what his mentality warrants.

TABLE IV. Section A—at age

Age		Grades						Totals				
Phys- ical	Men- tal	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
4	IV	1						1	1			1
5	V	24	1					25	24		1	25
6	VI	31	2					33	31		2	
7	VII	31	57	6				94	57	31	6	
8	VIII	13	30	33	8	1		85	33	43	9	
9	IX		4	14	26	3		47	26	18	3	
10	X			4	37	41	14	98	41	43	14	
11	XI				2	28	18	48	18	30		
12	XII				2	14	20	36		36		
13	XIII						4	4				
Totals		100	96	57	75	87	56	471	231	205	35	26

TABLE IV. Section B—1 yr. backward

Age		Grades						Totals				
Phys- ical	Men- tal	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
4	III	1						1				1
5	IV	4						4				4
6	V	19						19				19
7	VI	14	2					16	14		2	
8	VII	21	39	6				66	39	21	6	
9	VIII		12	26	3			41	26	12	3	
10	IX			5	13	6		24	13	5	6	
11	X		1	3	8	21	6	39	21	12	6	
12	XI			1	1	10	24	36	24	12		
13	XII					5	13	18		18		
14	XIII						1	1		1		
Totals		59	54	41	25	42	44	265	137	81	23	24

TABLE IV. Section C—2 yrs. backward

Age		Grades						Totals				
Phys- ical	Mental	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
6	IV	2						2				2
7	V	8						8				8
8	VI	4	1					5	4		1	
9	VII	6	8	10	1			25	8	6	11	
10	VIII	1	5	13	9			28	13	6	9	
11	IX		1	4	6	5	1	17	6	5	6	
12	X				15	13	5	33	13	15	5	
13	XI					5	11	16	11	5		
14	XII					1	3	4		4		
Totals		21	15	27	31	24	20	138	55	41	32	10

TABLE IV. Section D—3 yrs. backward

Age		Grades						Totals				
Phys- ical	Mental	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
7	IV	1						1				1
8	V	2						2				2
9	VI	0						0				
10	VII	1	7	4				12	7	1	4	
11	VIII		1	7	4	1	1	14	7	1	6	
12	IX			7	7			14	7	7	11	
13	X				7	11	11	29	11	7		
14	XI					6	6	6	6			
15	XII					1	1	1	1			
Totals		4	8	18	18	12	19	79	38	17	21	3

TABLE IV. Section E—1 yr. advanced

Age		Grades						Totals				
Phys- ical	Mental	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
4	V	1						1	1			1
5	VI	36						36	36			
6	VII	47	23	3				73	23	47	3	
7	VIII	3	23	18	2			46	18	26	2	
8	IX			12	12	3		27	12	12	3	
9	X			7	26	20	3	56	20	33	3	
10	XI				7	19	7	33	7	26		
11	XII					7	6	13		13		
Totals		87	46	40	47	49	16	285	117	157	11	1

TABLE IV. Section F—2 yrs. advanced

Age		Grades						Totals				
Phys- ical	Men- tal	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
4	VI	2						2	2			
5	VII	14	1					15	1	14		
6	VIII	1	4	1				6	1	5		
7	IX			3	0			3	0	3		
8	X			1	6	0		7	0	7		
9	XI				1	3	1	5	1	4		
10	XII					2		2		2		
Totals		17	5	5	7	5	1	40	5	35		

TABLE IV. Section G—3 yrs. advanced

Age		Grades						Totals				
Phys- ical	Men- tal	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	No. tested	No. in normal grade	No. re- tarded	No. ad- vanc'd	Below school age
5	VIII	2	1	0				3	0	3		
6	IX				1			1	1			
7	X			2	1	0		3	0	3		
9	XII				1	1	0	2	0	2		
10	XIII					1	2	3		3		
Totals		2	1	2	3	2	2	12	1	11		

TABLE IV. Section H
Gradation According to Physical Age

Phy. Age	Grades						Totals				
	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	Whole number tested	No. in normal grade	No. re- tarded	No. ad- vanced	No. in school bel. age
4	5						5				5
5	80	3					83				83
6	100	29	4	1			134	100		34	
7	57	82	29	3			171	82	57	32	
8	40	70	52	26	4		192	52	110	30	
9	6	24	57	58	27	4	176	58	87	31	
10	2	14	26	66	69	23	200	69	108	23	
11		3	14	20	62	32	131	32	99		
12			8	25	37	49	119		119		
13				7	21	39	67		67		
14					1	10	11		11		
15						1	1		1		
Totals	290	225	190	206	221	158	1290	393	659	150	88

TABLE IV. Section J
Gradation According to Mental Age

Men. Age	Grades						Totals				
	1st yr.	2d yr.	3rd yr.	4th yr.	5th yr.	6th yr.	Whole number tested	No. in normal grade	No Re- tarded	No. ad- vanced	No in school bel. age
III	1						1				1
IV	8						8				8
V	54	1					55				55
VI	87	5					92	87		5	
VII	120	135	29	1			285	135	120	30	
VIII	20	76	98	26	2	1	222	98	96	29	
IX		5	45	65	17	1	133	65	50	18	
X		3	17	100	106	39	265	106	120	39	
XI			1	11	65	67	144	67	77		
XII				3	30	43	76		76		
XIII					1	7	8		8		
Totals	290	225	190	206	221	158	1290	558 43.2%	547 42.4%	121 9.4%	64 5%

TABLE IV. Section K
Total misplaced by years

According to	Retarded				Advanced		
	1 yr.	2 yr.	3 yr.	4 yr.	1 yr.	2 yr.	3 yr.
Physical Age	361	186	90	22	134	15	1
Mental Age	449	90	8		116	3	1

Table IV gives the foregoing comparisons. Section A. shows the number of children who are the same age *mentally* as *physically* and gives the number for each age in each grade. For example of the children who are eight years old both *mentally and physically*, there are 13 in the first year, 30 in the second year and 33 in the third year, 8 in the fourth year, one in the fifth year. These children, having the mentality of eight years would naturally all be in the third year of school. Consequently the 13 are two years behind what they should be and 30 are one year behind, 33 are in their right place, while 8 are a year ahead of what their mental endowments would probably permit and one is two years ahead.

In the same way we see the condition for each age from four to thirteen. At the right are given the totals. The total number of each age tested, the number that are in their proper grade according to their mental endowments as determined by the Binet tests, the number who are retarded and

the number advanced. The footings show the total number of children in each grade.

Section B. of this table shows the children who are mentally *one year behind* their physical age, the children who are really eight years but test seven, nine and test eight, etc. Reading this as the former section, we can see that of the eight year children, 21 are in the first year of school, 39 are in the second year and 6 are in the third year. Being seven years old mentally, they should of course be in the second school year and 39 of them are found here, but 21 of them are only in the first year, while 6 of them are in the third year, a year ahead of what their mentality warrants. Similarly for the other years.

Section C. shows the same thing again for those children who are *two years behind* their physical age. They are, for instance, eight years old but test only six.

Section D. shows those who are *three years behind* their age. For example, the children who are ten years old, test only seven.

How imperfectly we do justice to these backward children is well seen in the totals on this chart. Of 79 children of this class, 38, almost exactly half, are in their proper place according to their mental ability while the remainder are divided into fairly equal groups, 17 being below what they ought to be and 21 being ahead.

Sections E., F. and G. show the distribution in a similar manner of those who are ahead of their physical age.

The most noticeable thing in these sections is the small number of children who are advanced and the still smaller number who are even up to what their mental ability would warrant. For example, referring to the totals of those who are one year ahead of the average child (Section E.), 117 are properly placed while 157 are held back with the normal child. Of those who are two years ahead of their age (Section F.), 5 are properly placed while 35 are held back, and of those who are three years ahead (Section G.), one is in his proper place and eleven are held back. None in these two latter groups are advanced. Nothing could be clearer than the way in which these figures demonstrate what we all know from experience must be true, that is, that we drag the dull child up, trying to keep him up to his grade and hold the bright child back to keep him to the same grade, thus doing gross injustice to both.

Sections H. and J. of this table give the summaries for the others, Section H. giving all of those of each physical age in each year of school, Section J. giving the same for the mental age.

A few illustrations will make the reading of the chart clear and easy. Referring to Chart J, one sees that under the mental age of eight, there are 20 children in the first school year. It might be thought that these had just entered school and consequently are properly placed. Reference to the other sections will show exactly where they are. For example, we find 13 of them in Section A. (see Sec. A., Mental Age 8, Column "First year"), which shows that these children are eight physically and mentally. One is found on Chart C. He is *ten years old physically, eight years old mentally and still in the first year*. These 14 children are certainly old enough to be in a higher grade. The other 6 are found on Charts E., F. and G. three on Chart E. who are physically seven years old, one on Chart F. is six years old, and 2 on Chart G. are only five years old.

Again in Section J. at ten years of age mentally, we find that there are seventeen children in the third year of school. Let us see how these children are distributed on the other tables. On Table A., we find 4 of them who are ten years old physically as well as mentally. These children should of course be in the fifth year of school and there seems to be no reason why they should not be there. On Chart B. we find three more who are eleven years old physically. These 3 are really one year backward but are held back *two* years, possibly through some technicality or because they are especially weak in some one branch. On Section E., we find 7 more of our children. They are nine years old physically—in other words, they are one year in advance of their age. There is another on Chart F. who is only eight years of age and 2 on Chart G. are only seven. It is probable that these children are kept back to fit into the grade that corresponds most nearly to their age, even though their mental ability would warrant their being two years ahead.

Once again, on Section J. we find at the age of nine, there are 17 children in the fifth school year. On section A. we find at the mental age of nine, there are 3 in the fifth school year. These children are also nine years old physically. They have been put ahead a year, perhaps because of good memory or because of some precocious ways, although they have not anything above the normal mentality and should be in the fourth year of school. In Section B. we find 6 of these children of the mental age of nine in the fifth year—they are ten years old physically, thus showing that they are really one year backward and that they have been pushed ahead, undoubtedly in an effort to keep them up to the grade which their physical age requires. In Section C. we find 5 more of this group of the mental age of nine in the fifth year. They are eleven

years old physically. They again, have been pushed forward a year, although it has not been possible to push them forward two years as their physical age would demand. In Section E. we find 3 more. These children are only eight years old physically, although mentally nine. Here you have the precocious child. He is a year ahead of the average child and consequently is pushed along by his ambitious parents or his ambitious teacher, and although he has not the mentality to be in the fifth year, yet he is found there. This is the child that later breaks down and gives rise to the belief that the precocious child is destined to failure later on. He *is*, if his precocity is made the basis for his being crowded way beyond what his actual mental endowments will warrant.

Let us now analyze the situation from the standpoint of the physical age. Referring to Section H. we find that at age ten, there are 14 children in the second school year. On Section A. we find two of these. These are the children who are ten years mentally as well as physically. They have the right to be in the fifth school year and yet they are held back to the second. On Chart C. we find five more, and their mental age is shown to be eight. They have the ability to be in the third school year but are held back in the second. They are dull and slow as is shown by the fact that while they are ten years old they test only eight and consequently they are not only held back to what their mental age would warrant but a year beyond that. The remaining 7 are found on Section D. They are seven years old mentally and consequently are in their right place. One half of the total number are thus found to be where they ought to be—the rest are unjustly treated.

This is the type of child that makes the truant and incorrigible. He knows that he is duller than some but he knows that he is not as dull as his position would indicate. He takes no interest in the work because it is below him and consequently he plays truant or gets into mischief.

As a final illustration, on Chart H. at age nine, we find that there are 4 children in the sixth school year, two years ahead of what their physical age would warrant, but we find upon reference to Chart E. that three of them are ten years old mentally. In other words, they are one year precocious but they are placed two years ahead. They are thus a year ahead of what even their mental ability would warrant. This is perhaps a case of a bright attractive child who is pushed along because he is above the average. And because he is above the average, he is pushed along at *twice the rate* at which he ought to go. Another case where later the child must break down and become useless.

Referring to Chart F. we find the fourth one who is two years ahead of his physical age and is consequently placed where he should be according to his mental ability.

In other words, out of four children, one is correctly placed.

We are conscious that many a reader will feel that we are leaning too hard upon the supposed accuracy of the Binet tests. We have been all through this. We have had the same misgivings about these tests, but the more we use them the more we feel that they will bear all that is put upon them. Besides the demonstration given in the first part of this paper from the distribution curve, we see the same thing in every line of these tables. Refer again to Section J. of this table and note the distribution of the children of the various mental ages through the different grades. Take age eight as an example. This shows perhaps the first complete range and it will be seen that whereas the eight-year-old children should be in the third year of school life, we have 98 at that age with 76 a year below and 20 two years below, while above we have 26, 2 and 1,—a very good distribution curve. Again, at age nine, it runs 5, 45, 65 (the high point) 17, 1. Even at age ten, 3, 17, 100, 106 and 39. Beyond that we lose the curve because we run into the higher school grades where our tests are supplemented by others and are not so definitely comparable.

Besides this, *it is precisely what we all know does happen in the school.* We know that children are held back because they are too bright; we know that they are pushed forward because they are too large for their grade; we know that they are retarded because of some technicality—they are not up in their arithmetic, or they cannot read quite well enough, while in other things they are abundantly able to go ahead. Besides that, we know that this is true from the experience of these children in after life.

It is almost beyond the bounds of possibility that we could get such figures as are shown in this table unless the tests upon which it is based were amazingly accurate, and if they are accurate, it gives us a wonderfully valuable method of measuring our efficiency and our accuracy in the grading of children, and points out the possibilities of great improvement along this line,—much to the advantage of the children and the comfort of the teacher.

The data used in the foregoing tables have also been tabulated to show the relation of the sexes and the difference between the schools that are in the city and those that are outside in the township. These figures are not especially striking but make a good illustration of the possibilities of such data.

It will be seen from looking at the figures for the boys and girls which, by the way, follow the same normal distribution

TABLE V.

	4 to 7 yrs. below	3 yrs. below	2 yrs. below	1 yr. below	At Age	1 yr. Above	2 yrs. Above	3 yrs. Above	4 yrs. Above	Total
City Boys	19	23	59	112	188	119	12	4	0	536
Country Boys	12	13	28	80	102	49	12	3	0	299
City Girls	13	23	37	65	172	106	20	4	1	441
Country Girls	9	20	31	56	89	57	5	3	1	271
Totals	53	79	155	313	551	331	49	14	2	1547
Total Boys and Girls										
Boys	31	36	87	192	290	168	24	7	0	835
Girls	22	43	68	121	261	163	25	7	2	712
Total City and Country										
City	32	46	96	177	360	225	24	8	1	977
Country	21	33	59	136	191	106	17	6	1	670

curve as is seen in the combination of the two, that there are more backward boys than girls. This is a very neat confirmation of the tests since it agrees with statistics everywhere that there are more defective boys than girls. There are more in institutions for the feeble-minded and although this is usually accounted for by the explanation that girls are more easily taken care of at home, therefore do not get into institutions, yet in view of the facts, there is no doubt that there are more feeble-minded boys than girls. There are more boys in the Special Classes in London and in the Hilfsschulen in Germany and in the Special Classes so far formed in the United States, and everything agrees with this thesis.

Comparing city with country children, there are apparently more children above grade in the city than in the country. This probably has little significance in this case and may only mean that the more ambitious youths of the country go into the city to school and so were tested there.

It will be remembered that the foregoing discussion pertains to the children in the first six grades of the public school system. The seventh, eighth, and ninth grades being practically able to pass the twelve year Binet tests and the thirteen year tests being found too difficult, none of the Binet tests were given to these grades. And inasmuch as the tests that were given were not the Binet tests it does not properly come

into this paper. So we pass over them. They will be considered later and reported if anything valuable is discovered.

Turning to the High School, the thirteen year tests together with three others were given to all of these students. We shall consider only those that belong to the Binet scale. Early in our use of the tests, we felt that the thirteen year tests were altogether too difficult and we have accordingly based nothing upon their value. These experiments in the High School confirm that view.

The complete results are given in Table VI.

TABLE VI

Showing how High School pupils succeed with Binet XIII year tests

PART I. BY YEARS IN HIGH SCHOOL

Year of High School	Question 1. "Cutting out"		Question 2. "Triangle"		Question 3. "Differences"	
	Boys	Girls	Boys	Girls	Boys	Girls
1st	9-27	8-17	17-20	4-21	9-28	7-18
2nd	4-9	10-16	9-4	10-16	8-5	9-17
3rd	4-6	5-12	6-4	5-12	2-8	7-10
4th	4-2	3-4	5-1	5-2	6-0	4-3

TABLE VI

PART 2. BY AGES

Phy. Age.	Year of High Sch.	Cutting out		Triangle		Differences	
		Boys	Girls	Boys	Girls	Boys	Girls
13	1st yr.	0-3	0-3	2-1	1-2	1-2	1-2
14	1st yr.	3-4	3-2	2-5	0-5	2-5	2-3
	2nd "	0-1	2-2	0-1	2-2	1-0	2-2
	Totals	3-5	5-4	2-6	2-7	3-5	4-5
15	1st yr.	2-9	2-6	4-8	0-8	2-10	2-6
	2nd "	1-1	2-2	1-1	1-3	2-0	0-4
	3rd "		0-2		1-1		0-2
	Totals	3-10	4-10	5-9	2-12	4-10	2-12

TABLE VI—*Continued*

16	1st yr.	2-5	2-3	4-5	0-5	2-5	1-4
	2nd "	3-3	3-4	5-1	4-3	1-5	4-3
	3rd "	2-2	0-1	2-2	1-0	0-4	1-0
	4th "	1-0	1-0	1-0	1-0	1-0	0-1
	Totals	8-10	6-8	12-8	6-8	4-14	6-8
17	1st yr.	2-5	1-2	4-3	2-1	2-5	1-2
	2nd "	0-2	0-4	2-0	0-4	2-0	0-4
	3rd "	2-3	3-4	4-1	1-6	2-3	3-4
	4th "	2-1	2-3	3-0	3-2	3-0	3-2
	Totals	6-11	6-13	13-4	6-13	9-8	7-12
18	1st yr.	0-1		1-0		0-1	
	2nd "	0-2	2-3	1-1	2-3	2-0	1-4
	3rd "	0-1	2-5	0-1	2-5	0-1	3-4
	4th "	1-0	0-1	1-0	1-0	1-0	1-0
	Totals	8-4	4-9	3-2	5-8	3-2	5-8
19	1st yr.		0-1		1-0		0-1
	2nd "		0-1		0-1		1-0
	4th "	0-1		0-1		1-0	
	Totals	0-1	0-2	0-1	1-1	1-0	1-1
21	2nd yr.		1-0		1-0		1-0

Examining the Table we see that on question 1 the boys in the first year succeed and fail to the number of 9 and 27 respectively. In the second year 10 succeed while 16 fail, in the third year 4 succeed and 6 fail, in the last year 4 succeed and 2 fail.

The girls' record is as follows. For the first year 8 to 17; second year 10 to 15; third year, 5 to 12; and last year 3 succeed and 4 fail.

Throughout the high school, then, we have for the boys twenty-one successes and forty-four failures; for the girls twenty-six successes and forty-nine failures.

Taken by ages instead of by high school grades the result is no better. This is seen in the second part of the table.

Not only is this question too difficult for high school pupils but even normal highly trained individuals including college professors fail on it to a large extent. One group of about 25 was given the test by the writer and only 6 succeeded. This group was made up of teachers, superintendents of schools, psychologists, mathematicians and biologists. Another group composed entirely of psychologists was tested by the writer

and about twelve succeeded while six failed, giving an average of 66%.

It seems probable that we have here a test, not of what we may call a fundamental and universal human power, but rather a specialized faculty, which may be possessed by some people but not by others although one would not dare say one was of higher intelligence than the other. This perhaps gives us a hint as to what will be necessary in devising tests for higher grades of intelligence. We cannot perhaps hope to find any tests of universal application but rather it will be necessary to test a special gift along different lines.

The second test of the "reversed triangle" fares somewhat better, but not until the senior year does it begin to have the proportion of successes that we have established as necessary in a test. One would expect that the study of geometry had something to do with this result.

As to the third of the Binet tests, it again fares better than the others and shows marked improvement in the results in the senior year. Indeed, like the second one, not until then does it begin to get any reasonable proportion of successes, as will be seen.

There are very few who get all of them correct but if we allow a margin of two and consider the test passed if three differences out of the five are given correctly, then we have in the last year of high school, the boys all succeeding and the girls in the ratio of four to three.

Taking the tests altogether we find that only one boy in the first year of high school gets them all. There are no successful girls. In the second year there are no boys who succeed and but three girls. In the third year we have one boy and no girl. In the fourth year we have four boys and two girls. The last year in the high school ought to mean, according to the usual way of counting, a child eighteen or nineteen years old. It would seem, then, as though we could say that any person who passed these three tests had at least the mentality of an eighteen year old person. But the tests are so special in their application that it would not be safe to say that one who did not pass them did not have the mentality of at least eighteen. This being the case they hardly seem of great value as tests.

Prof. Binet has published in the April, 1911, number of the *Bulletin De La société Libre Pour L'Étude Psychologique de L'Enfant*, his latest comment on his measuring scale. He gives a modified list of questions.

In this list he has done three things. First, he has reduced the number of questions to five in every year except age IV, (there he finds only four questions). This obviates one slight

difficulty which has been met with in scaling the results. Because some years had five questions and some years seven or eight, there was a little difficulty in counting up. However, here at Vineland we have never found that of great importance. It is a decided advantage, however, to have all the years with the same number of questions.

The next thing that he has done has been to omit some of the questions which are strictly dependent upon training and educational opportunity, such as the reading and writing tests. This is good.

Thirdly, he has transposed certain tests from one year to another with the idea of improving the general scale.

With these changes, however, we cannot in every case agree. The results of our experience as given in the preceding tables do not warrant us in making all of the changes that Binet proposes. We give herewith the complete list as we would place it as the result of our experience and following as closely as possible Prof. Binet's desire in the matter.

BINET SCALE					
New	Old	III.		Number of successes and failures	
No change	No change	1.	Nose, eyes, mouth.		
		2.	It rains. I am hungry.		
		3.	Repeat 7 2.		
		4.	Picture (enumerates.)		
		5.	Name.		
		IV.			
		1.	Boy or girl.		
		2.	Key, knife, penny.		
		3.	Repeat 7, 4, 8.		
		4.	Lines.		
		V.			
1.	1.	1.	Compares 3 and 12 grams, 6 and 15.	32- 2	
2.	2.	2.	Copies square.	23-11	
3.	new	3.	Repeats sentence of 10 syllables.	new	
4.	4.	4.	Counts four pennies.	30- 4	
5.	3.	5.	"Patience."	20-12	
		VI.			
1.	7.	1.	Morning or afternoon.	30-12	
2.	4.	2.	Defines fork, table, chair, horse, mama.	35- 6	
VII 3.	5.	3.	Puts key on chair, brings box, shuts door.	25- 7	
VII 1. (30-4)	1.	4.	Shows right hand, left ear.	35- 8	
5.	3.	5.	Chooses prettier.	31- 9	

BINET'S SCALE—Continued

VII.		
VI 4. (24-9)	7.	1. Counts 13 pennies. 94- 5
2.	6.	2. Describes pictures. 83-25
VIII 3. (34-3)	1.	3. Sees picture lacks eyes. 87- 9
VI 3. (17-22)	4.	4. Can copy diamond. 95- 8
5.	from VIII	5. Names colors, red, blue, green, yellow. 97- 5
VIII.		
1.	6.	1. Compares two objects from memory, butterfly, fly; wood, glass; paper, cloth. 87- 2
2.	4.	2. Counts backwards 20 to 1. 90- 1
omitted	from IX	3. Repeats days and week. 85- 4
VII 4. (46-49)	2.	4. Counts stamps 111222. 79-14
5.	from VII	5. Repeats 5 figures. 36- 7
IX.		
1.	3.	1. Makes change 20c—4c. 33-23
2.	4.	2. Definitions better than use. 45-27
VIII 4. (49-33)	1.	3. Knows date. 48- 7
4.	from X	4. Repeats months in order. 48- 6
X I (3-1)	6.	5. Arranges 5 weights. 44-11
X.		
IX 3. (31-14)	2.	1. Knows money, 1c, 5c, 10c, 25c, 50c, \$1, \$2, \$5, \$10. 104- 5
2.	new	2. Copies design. new
—	new	3. Repeats six figures. new
4.	4.	4. Comprehends easy questions. 98- 8
5.	3.	5. Uses 3 words in two sentences. 92-17
XI.		
X 3.	1.	1. Sees absurdity: painter, brothers, locked in room, R. R. accident, suicide. 48- 4
XII 2.	2.	2. Uses 3 words in a single sentence. 39-14
XII 3.	3.	3. Gives 60 words in three minutes. 35-3
XV 3.	XII 2.	4. Gives three rhymes. 45-5
XII 5.	5.	5. Puts dissected sentences together. 35- 9
XII.		
XV 1.	1.	1. Repeats 7 figures. 37- 7
XII 4.	XI 4.	2. Defines charity, justice, goodness. 5- 0
XV 3.	3 (revised)	3. Repeats sentence of 26 syllables. 15-21
1.	new	4. Resists suggestion. new
XV 5.	4.	5. Problems: (a) Hanging from limb. (b) Neighbors visitors. 40-3
XV.		
1.		1. Interprets picture.
		2. Changes hands of clock.
		3. Code.
		4. Opposites.

BINET'S SCALE—*Continued*

		ADULT
1.	XIII 1.	1. Cutting paper.
2.	XIII 2.	2. Reversed triangle.
3.	XIII 3.	3. Gives differences of abstract words.
4.	new	4. Difference between president of a republic and a king.
5.	new	5. Gives sense of a selection read to him.

Binet says that with the new scale *every* question under any given age should be answered, for a child to be credited with that age—instead of *all but one*, as in his earlier plan.

Following each question we give the figures repeated from Table II which show the number of successes and failures on each question by the children of the age at which the question is now placed. In the column before the question is given the number of the question as it was in Binet's older scale, while the first column gives the position that this question has in Binet's new proposed scheme.

Where Binet's new position is different from ours, we give the figures showing the proportion of successes and failures on that question at the age which Binet proposes to place it. This shows in every case that according to our results it is utterly impossible to consider the test in the year in which Binet places it.

In the first four years there are no changes. In age V question 3, "repeating sentence of ten syllables," is entirely new and we take it on Binet's authority. In Age VI there are two which Prof. Binet would place in age VII, but our figures show that they are answered in a goodly proportion at VI.

In question IX, 1. "making change," our use of this was more difficult than the original, which came from the fact that Binet used a 20 sous piece from which the child was to subtract four sous. We, not having a coin of the value of 20c, used the 25c and in order that it might not be too easy to subtract four from five, we made the price 9c; 25—9 is rather a difficult problem for a child of nine, as our results show. We propose now to make it 20—4, exactly as Binet has done and give the child two dimes. This may offer a little confusion but we think on the whole that it will be preferable to the other plan and will probably reduce the difficulty so that the question may properly come in at this age. IX 2. "definitions better than by use," we found rather difficult, it is only succeeded in, as will be noticed, by 45 while 27 fail. However, we feel that we have been a little too exact in our requirements of this question. We have generally required that the child indicate in some way some notion of the *genus*. If we take it simply

"superior to use," and accept as satisfactory all those answers in which the child tells what the article is made of or something about its shape it would make the successes greater, which will probably make it satisfactory.

In X 2 the copying design is new, at least to this system. It is the test that Binet suggested in his 1905 list. We have also put in here the repetition of six figures. Decroly and Degand expressed a desire that the memory for figures should be put in, and our experience shows that a child of ten can generally remember six figures, so it would seem to be a good question to put in here.

The comprehension of questions Binet has proposed to divide up, placing the first three ("easy") in age nine but we had no room for it there and so have kept it as it was before.

Age XI, Binet has thrown out entirely. He has no questions for age XI, but makes all those questions go over to XII with the exception of the first one, which he takes back into X. Now, our experience, as will be shown by the figures does not warrant any such thing, we have accordingly kept them in age XI, with the one exception that we have transferred the question of definition of abstract nouns to age XII and brought back to age XI the giving of rhymes, as our experience is that it is perfectly easy for this age.

In age XII we have the questions that were there before plus the new one that Binet suggests, "resisting suggestion." We proposed four questions for age XV, inasmuch as Binet has proposed questions for this year. We are not very certain that they are satisfactory, but they seem worth trying.

The questions for what Binet calls "ADULTS" (which he explains means only "more than fifteen") we have accepted, and followed him in his new suggestions and put in the old questions for XIII, and added two more, "the difference between a president of a republic and a king" and "to give the sense of a selection that is read to the child."

The tests up to and including twelve years are certainly eminently satisfactory. Our proposed list for XV and Binet's "ADULT" must be further tested out to see if they are of any value.

It would seem that with such a start as Binet has given us, some one ought to be able to work out tests for the higher ages. We need above all things, a test for boys and girls beyond twelve years. As Dr. Huey has expressed in the article in the *Journal of Psycho-Asthenics*, this is the time at which many young people break down and if not arrested in development earlier, become arrested then, and fail to develop those qualities that enable them to become useful and good men and women. Some system of tests which would bring out

these defects would be of inestimable value in the treatment of these people socially, in recognition of how much responsibility they had and were able to bear and what they could be expected to do.

It certainly is time for psychology to attack this problem and we believe that an answer is possible.