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Mechanical Aptitude Tests As A Guide To Enrollment For Industrial Arts In The Sarasota Junior High School

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MECHANICAL APTITUDE TESTS AS A GUIDE TO ENROLLMENT FOR INDUSTRIAL ARTS IN THE SARASOTA JUNIOR HIGH SCHOOL

A Problem Submitted to the Graduate Division in Partial Fulfillment of the Requirements for the Degree of Master of Science

By

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ABSTRACT

This study was undertaken to use the mechanical aptitude test in determining if the proper students are making the best use of the available shop facilities at Sarasota Junior High School, Sarasota, Florida.

Books, magazines, bulletins, questionnaires, mechanical aptitude and other test results were used in compiling this information.

An attempt has been made to point out deficiencies and inconsistencies in the present arrangement and to make recommendations for their correction. The following recommendations were proposed: (1) Aptitude testing should be continued; (2) all those counseling students on enrollment should be helped to become better informed as to the importance of shop work; (3) Industrial Arts Program should be integrated with science and mathematics; (4) more shop training should be offered in Sarasota Senior High; (5) the vocational unit should be continued and broadened; (6) more knowing should be added to shop work and more doing should be added in other courses; (7) Junior High Shop should continue to be varied to allow for exploration; (8) efforts should be made to counter the belief that shop work is for the slow or retarded; (9) the more apt students should be given priority in shop enrollment.

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CHAPTER I

INTRODUCTION

Statement of the Problem

This problem is two fold in nature. First, are students of junior high school age being given the proper help by teachers and guidance personnel in the selection of courses that are in line with their abilities and interests? Secondly, is the field of industrial education getting its rightful share of good students with which to work? Many teachers and administrators in the field of industrial education have complained for some time that the "cream of the crop" has been guided into other channels leaving only the "skimmed milk" for the important work of industrial education. As most everyone knows, this is described as the "dumping grounds" of education.

During recent years, the problem has been worked on at Sarasota Junior High School, Sarasota, Florida. The students have had more than the usual help in guidance. An attempt has been made to furnish the students with reliable information about themselves so that they could make a wise decision as to the courses they should take. The students have also been encouraged to explore and not to close any doors too soon.

Need for the Study

During recent years, there has been a great surge in many fields of education. The function of the junior high school, if it has to be covered in one word, would be exploratory. Programs have been expanded and such measures as the seven day period, have been incorporated to enable students to explore and still enable them to get the basic subjects; namely, the "3Rs". Exploring in the broad sense would be the selection of a wide variety of fields; such as science, arts, and crafts, foreign language, music, etc. This might involve the taking of subjects that were difficult; subjects where there is a definite lack of background, or even subjects that carry a burden of cultural stigma. The taking of French, Spanish, and Italian, could not be considered as exploring, except in a very narrow sense.

It is a rather universally accepted practice for anyone shouldering the responsibility of guidance to bring as much reliable information as possible to the attention of the student.[1] He then should encourage the student to decide where to explore. Many times, however, this is not the case. The student is pressured from many angles. The pressures are applied from parents, teachers, guidance personnel, friends, and other sources. Many of these pressures are based on rather trite assumptions.

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[1]Humphreys, Anthony J., Traxler, Arthur E., Guidance Services. Science Research Associates, Inc., Chicago, Ill. Chapter I, V.

Most everyone is aware of the competition carried on in all levels of education for the so called good student. Competition can be an asset if it is not carried to extremes or if the students' wishes are not lost in the shuffle.

Industrial education has no doubt carried more than its share of the lower students since it is by nature, activity education. On the other hand, industrial education can put the talents of the good students to good purpose and he can go as far as he cares to go.

At Sarasota Junior High School, there has been an attempt to do all of the good things in the way of guidance. Now the time has come to check ourselves. In an attempt to give the student as much information about himself as possible, the Science Research Association Mechanical Aptitude Tests have been administered for three years. This study was, (1) an attempt to ascertain the effectiveness of this testing program, (2) to determine if it is worthwhile as it is and/or, (3) how it can be changed to be bettered.

Purpose of the Study

The purpose of this study was an attempt to, (1) furnish the best possible guidance for students enrolling in junior high school courses, (2) to determine if industrial education is being used as a "dumping ground" and (3) to recommend courses of action to rectify any deficiencies that may exist.

Limitations of the Study

This study was limited to the 25% of the ninth grade students of Sarasota Junior High School who had made the highest scores on the Mechanical Aptitude Test. This test has been administered upon their entrance into seventh grade. It is further limited as to how their test scores have effected their choice of subjects.

CHAPTER II

HISTORICAL BACKGROUND OF THE MECHANICAL APTITUDE TEST AND ITS USES

"Educational aptitude testing has been, still is and doubtless will long continue to be in a stage of expansion and further subdivision."[1]

The conceptions of specialized aptitude tests and tests of behavior which will indicate in advance latent capacity, is very ancient. It appears repeatedly in Plato's Republic. Some of our earliest known contributors to aptitude testing were: Francis Galton's tests in his anthrompometric laboratory established in England in 1884, William Wundt at Leipzig in 1879. The J. McKeen Cattell Tests to freshmen at Columbia's College began in 1894. A. Binet and V. Henri were using aptitude tests in France in 1896. By 1901 the Columbia University Thorndike Tests became quite definite. At this time Clark Wissler's published account of tests and Karl Pearson's coefficients of correlation between tests and scholarship marked the beginning of a new era in testing.[2]

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[1]Albert B. Crawford and Paul S. Burnman, Forecasting College Achievement, (New Haven: Yale University Press, 1946), Preface, p. iii.

[2]Clark L. Hull, Aptitude Testing, (New York and Chicago: World Book Company, Yonkers-on-Hudson), pp. 5-8.

> In 1913, Hugo Munsterberg, a German psychologist imported by Harvard University startled his colleagues by transplanting seedlings from 'pure' laboratory experientation into the garden of useful reality. His pioneer efforts represent, at least in this country, the first trial of scientifically constructed aptitude tests in selection employees for industrial training.[3]

Under the pressure of World War I necessity, the technique of pencil-and-paper group testing developed to a degree which ordinarily would have required many years. The spectacular nature of army testing, the A. S. Otis' "Alpha" and "Beta" tests had at once a profound effect upon the aptitude testing movement.[3]

The University of Minnesota study of Mechanical abilitie originated in a program of research which was formulated and promoted by a committee of the National Research Council in 1922. The great psychological need at this time was the stud of problems of human migration. Dr. Robert Yerkes and Dr. Wissler, successively, were chairmen of the National Research Council Committee on Human Migration.[4]

One of the first assembling tests of mechanical ability to be used widely was the Stenquist's Assembling Tests of General Mechanical Ability. The test was made by John L. Stenquist in 1921.

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[3] Ibid., p. 18.

[4] D. G. Paterson, R. M. Elliott, L. D. Anderson, H. A. To E. Heidbreder. Minnesota Mechanical Ability Tests, (Minneapo The University of Minnesota Press, 1930), Preface, p. iii.

The accounting aptitude testing program which is sponsored by AIA has been in operation since World War II. An analysis of the effectiveness of this program based on a study of 103 individual testees over a period of five years (by Marvin L. Fredrick)[5] can serve as an example of validity tests being given continuously during this time in industry.

In a recent publication by the U. S. Department of Health, Education, and Welfare on the gifted student, the following information was given about Project Talent.

> In order to understand more fully the significance of Project Talent to the study of gifted children (and high school youth in general), it is helpful to look briefly at the background, direction, and objectives of this undertaking.
>
> For more than 25 years, there has been serious discussion of the need for a program of research which would, on a nationwide basis, yield factual information about the nature and distribution of human talents, and how best to assist individuals to identify, develop, and use them. For example, an early proposal in this area suggested the selection of a "standard million" to provide the basis for precise standards and norms representative of the total population of this country. In 1940, a proposal was presented by John C. Flanagan, director of Project Talent, to the Committee on Measurement and Guidance of the American Council on Education to draw a national sample for standardizing aptitude and achievement tests. After World War II a national census of aptitudes was proposed and received some encouragement; however, the groups involved eventually decided they could not

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[5] M. L. Frederick, "Accounting aptitude testing program," Journal of Accounting, (April, 1957), pp. 42-47.

support the study at that time, and these large-scale studes were not carried out.

There have been a number of smaller studies over the years that reveal some of the general pictures of available talent and its utilization. Recently the Educational Testing Service reported the results of a national survey of high school seniors sponsored by the National Science Foundation. The survey included a 20-minute academic aptitude test and a 20-minute questionnaire on college plans and background information. This was typical of much of the activity in this field--the studies which have used tests have used only a single scholastic aptitude test or a few achievement tests. There was an urgent need for a comprehensive survey including aptitude, interest, motivational and background factors, to be accompanied by intermediate and long-range followups of the individuals studied in the survey.

As for the present status of the tools, techniques, and facilities necessary for collecting the type of facts mentioned above, rapid progress in developing suitable procedures has been made during the past few years so that a large-scale study of the type needed became feasible. Much progress was made during and after World War II in the development and use of multifactor testing batteries and other measurement devices. Followup studies were used extensively in the services during World War II, and recent studies by man by investigators have improved the effectiveness of such techniques and increased the general level of knowhow in this area. In addition, recent progress in the development and adaptation of high-speed electronic computers to the problems of scoring, analyzing, and up-dating survey and test data now makes it possible to deal with formerly inconceivable numbers of cases and variables.

From the combination of growing demand, previous studies, and technical progress, Project Talent has emerged. In a sense, it is a scientific census, its initiation planned to coincide with the 1960 Federal census. It will be the first scientifically planned national inventory of human talents.

The goal of the project is to gain information which will help American youth develop their talents, and in so doing strengthen and develop the Nation. Its major objectives can be summarized broadly as:

1. To provide a scientifically planned national inventory of youth.
2. To determine the specific patterns of aptitudes, abilities, and interests which provide the best basis for various college courses and careers.
3. To carry out followsup studies to determine the educational experiences which will contribute to the development of these aptitudes and abilities.
4. To determine the guidance procedures most effective in assisting each student to select the career which will assure him the greatest possible personal satisfaction and success.[6]

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[6] U. S. Office of Education, "Opportunities for Research on the Education of Gifted Students," (Cooperative-Research, Monograph No. 2, 1960. Washington, D. C.) pp. 69-70.

CHAPTER III

INVESTIGATIONAL METHODS AND FINDINGS

The chief instruments used in an attempt to get the students to evaluate their possibilities has been the Science Research Associates Mechanical Aptitude Test and the Differential Aptitude Test on Mechanical Reasoning, Form A.

About three years ago the shop teacher at Sarasota Junior High School requested that a mechanical aptitude test be administered to the students of his shop classes in order to determine which of his students were the most talented. Funds as well as guidance personnel were limited; however, Lucille Montgomery, who was at that time a part time guidance person, took the time to find a test that would serve to answer some of the questions that had previously gone unanswered. That test was the S. R. A. Mechanical Aptitude Test which does not have established norms below the ninth grade level. The S. R. A. Test was administered to the students in the shop classes by the shop teacher and the guidance department as a joint project. The scores were tabulated by the guidance department and since there were no established norms for the seventh and eighth graders, the students were ranked in order and divided into four groups.

During the following year the drafting teacher joined in the program. All the shop and drawing students in the seventh grade were tested using the same test and grouping them into four groups again. Of course, the shortcomings of this method are that it is too limited in those being tested, and has no national norms with which to compare.

The next year a federally subsidized guidance program was granted to Sarasota Junior High School which included four full time guidance personnel and a guidance center. During this year the S. R. A. Test was again administered to all the seventh grade shop and mechanical drawing students while a search went on for a test that would better serve the needs of Junior High School students.

By the time the guidance program started on its second year, a complete testing program was established which included a battery of aptitude tests which was administered to all eighth grades. The guidance department, under the leadership of Mr. Don Self, the principal, recorded all of these aptitude tests results along with others such as I.Q. These were duplicated so that each teacher could be given a copy of all the results. A sample copy can be found in Figure I, page 12.

The group that was selected for this study is the upper twenty five per cent in mechanical reasoning of the 1960-1961 eighth grade class at Sarasota Junior High School.

FIGURE I

SAMPLE TEST TABULATION

	WATSON-GLASER		PINT	HEN-NEL		D		A			T	
	TOTAL	INT	P.	P	TOTAL	VR	NA	VR NA	AR	SR	MR	C SNA	SPELL
Bedwell, Darrell	26	L	92	72	3	1	5	3	5	40	10	15	5
Beery, Janet	11	L		100	40	20	45	30	55	70	55	80	60
Bennett, Diane	45	AV		92	28	3	15	5	30	30	50	60	25
Benscoter, Roberta	56	AV	113	124	88	50	95	80	95	20	50	65	70
Berlin, Danny	42	AV	125	109	57		90		90	80	55	25	5
Berninger, Gary	53	AV		113	73	75	85	85	97	90	85	30	90
Bernstein, Joel	77	H		136	98	95	99	99	85	65	65	80	97
Bingham, Dara	45	AV		115	84	80	45	65	85	65	50	97	95
Bixler, Morgan	11	L	103	93	24	25	5	15	30	5	60	35	30
Black, Art	56	AV		118	77	75	90	90	97	75	80	55	35

This sample is from the Test Results Booklet prepared for each teacher by the Guidance Department of Sarasota Junior High School. Some of the test results are coded i.e. Henman Nelson P. This is done to prevent students from interpreting it if by chance they get possession of it. The use of this chart was thoroughly explained to teachers in a faculty meeting by the Guidance Department.

The results of the mechanical reasoning as shown on the sample are given in percentiles; however, the raw scores were used in the selection of the group for this study because girls are given a ten point advantage over boys before the percentiles are figures. If a girl expresses interest in mechanical or engineering work, her score probably will be more meaningful if compared with the scores of boys in her grade rather than with those of girls.

Using raw scores of the D. A. T. Mechanical Aptitude Test, a group of 128 students was selected for this study. Of this group, 26 were grls and 102 were boys.

A great deal of data were gathered about each member of the selected group over a period of several months. Most of this information came from the guidance center and permanent school records; however, each member of the group was asked to fill out a questionnaire.

Pertinent data collected from all sources include:

1. Grade made during 7th grade in all subjects.
2. Test results from all tests. Figure I, p. 12.
3. I.Q. from at least one test.
4. Future educational plans.
5. Future occupational plans.
6. Forces of influences on No. 4 and 5.

The median I.Q. of the group was 111, which, of course, is high average. The median I.Q. of those members of the group will have shop before they finish junior high school is 108 while the median I.Q. of those who will not have shop by the end of junior high school is 115 or 7 points higher. Table I substantiates the hypothesis that the more intelligent students are being drawn away from shop even though they are the very highest in mechanical resoning and have indicated through their occupational preference that they will need shop work.

The students were well informed about the matter of girls being allowed to take shop courses for 95% said they were aware that girls could take shop courses at Sarasota Junior High School.

TABLE I

AN ANALYSIS OF SHOP ENROLLMENT OF STUDENTS
IN UPPER 25% IN MECHANICAL REASONING
SARASOTA JR. HIGH

Students	Taking Shop	Not Taking Shop
No. in Group (126)	68	58
% of Group	55	45
Median I.Q. (111)	108	115
Boys (101)	68	32
% of Boys	67	33
Girls (26)	2	24
% of Girls	7.7	92.3

This is information gathered from several sources of data in an attempt to show the extent that students with high

Occupational Preferences. The students in this study have shown a very realistic appraisal of their capabilities in their occupational choices. Sometimes there is a very strong tendency for junior high students, especially the ones with lower I.Q.'s, to choose unrealistic occupational goals. When a group of these students was asked to give an occupational choice, a large number chose professional athletics which is beyond their physical and mental capabilities.

The guidance experts consider the junior high school years as too early for a great emphasis to be placed on vocational choices; however, some thought in broad fields of endeavor is not only desirable but necessary in making educational plans.

As noted in Table II, most of the vocational choices are in areas where shop work is a vital part of the endeavor. The use of test results in enrollment. The administration and interpretation of the testing program at Sarasota Junior High School has been a joint effort of administrators, guidance personnel, and teachers. Of course, the classroom teacher has always been the core of the guidance program since he has daily contact with the students. The specific procedure used in dispensing information has varied from year to year but in general, it involves the practice of the guidance expert going into the basic education classroom and discussing the test results in a general way. A short conference is then held with each individual and a profile is drawn to enable a student to know his aptitudes and his achievement. I.Q. scores are not given to students.

TABLE II

AN ANALYSIS OF OCCUPATIONAL PREFERENCES
OF STUDENTS IN THE UPPER 25%
OF THE EIGHTH GRADE CLASS
IN MECHANICAL RESONING
SARASOTA JR. HIGH

Occupation (Broad fields)	Number showing preference	% showing preference
Engineering	25	25
Trades (Skilled Labor)	14	14
Medicine 4 doctors 4 nurses 5 veterinarians	13	13
Armed Services	10	10
Drafting	6	6
Teaching	5	5
Business	5	5
Science	4	4
Farming	4	4
Law	4	4
Technician	3	3
Airline Stewardess	3	3
Athelics	2	2
Art	2	2

This table includes all choices where more than one choice was in the same general field.

All of these above mentioned practices are carried out before enrollment for the following year is conducted. The Basic Education Teacher then helps the student to fill out enrollment cards. This could be construed as the weakest link in the chain for some teachers are still what is called Classical, Formal Disciplinarian, etc. Perhaps there is no intention on the part of these teachers to be unprofessional or to degrade any department, but evidence keeps cropping up that would indicate that some people are very narrow in their beliefs concerning occupational choices as well as what constitutes intelligence and talent. One example of this evidence of a narrow concept is the belief that in order to enter the field of medicine one should have Latin I, II, and III while shop work is considered unnecessary. Recently a practicing registered pharmacist said that he had never had a course in formal Latin. It is also stated in a recent study[1] that Latin is one of the subjects not being offered by an increasing number of schools. Such a renown educator as Dr. Conant said, "The lack of shop training is at present the most serious deterrent to entry into all types of technological work and to college and post-graduate training in science, medicine, and engineering."[2]

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[1]Harl R. Douglass, Modern Administration of Secondary Schools (New York: Ginn and Company, 1954), p. 104.

[2]Kurland (ed) "One Year Ago...On Conant;" The Quarterly Bulletin of the Florida Industrial Arts Association, (Feb. 196[illegible] p. 19.

A student is not born with the knowledge of what has to be known or what activities have to be mastered in order to succeed in a certain field of endeavor. For example: thirteen students have expressed an interest in entering the field of medicine. (See Occupational Preference Table I, p. 14) However, only 8.4 per cent agreed with Dr. Conant's statement as to training for entry into the study of the field of medicine. Table III.

TABLE III

AN ANALYSIS OF STUDENTS' OPINION OF THE DEGREE OF BENEFITS RECEIVED FROM SHOP TRAINING IN REGARD TO VARIOUS OCCUPATIONS

Occupation	No, of Ans.	No. of Yes	No. of No	% of Yes	% of No
Carpenter	114	114	0	100	0
Housewife	111	67	44	60.4	39.6
Scientist	108	61	47	56.5	43.5
Doctor	107	9	98	8.4	91.6
Lawyer	107	8	99	8	92

The information on this table was taken from the questionnaire given to each member of the study group. Out of 126 questionnaires given out to the basic education teachers to administer to the students, 114 came back. This constitutes a 90% return. A few students had either withdrawn from school of had a prolonged illness.

Students' interest in test results. Inquiry is often made as to what degree students of this age are interested in a program which is designed to help them gain some insight of their capabilities. During a recent survey conducted at Sarasota Junior High School, to evaluate the guidance program, a question was included to help determine the degree of interest on the part of eighth and ninth graders. Their responses were tallied in the degrees listed on Table IV. The answers compiled indicated a strong interest by the students. While on the subject concerning the attitude of students, it should be noted that 95 students of a total 114 polled indicated that they were glad they possessed mechanical aptitude.

TABLE IV

AN ANALYSIS OF STUDENT INTEREST
IN TEST SCORES AT SARASOTA
JR. HIGH SCHOOL

Students	Very Much	Yes	Some	Not Much	Not at All
Grade 8	168	158	36	15	4
Grade 9	87	80	13	5	3

This information was gathered from answers given on a questionnaire administered to all eighth and ninth graders during an evaluation of the guidance program at Sarasota Junior High School. The question was one of two asked specifically for this study although it was contributed toward data used on the evaluation.

An observation from numerous conversations with students would indicate that most students have a fairly good idea as to how they stand after their scores have been interpreted and a profile given to each of them.

Educational plans. Out of 115 students of this study answering a question regarding future educational plans, 100 said they hoped to go to college. This high rate is fairly consistent with their occupational choices. Throughout the remainder of this study these 100 students will be considered pursuing a college preparatory course.

Only one student out of 111 knew what was in store for the college preparatory student, interested in industrial arts, in the Sarasota Senior High School. At present, if a student does not take shop in junior high, he has missed his opportunity to take any shop until he reaches college. The vocational students do have opportunities to take shop courses but students planning to go to college had to pursue an academic course. For the sake of comparison, let us consider the fields of foreign language and industrial arts. If a student uses his electives in Sarasota Junior High to take Latin, he has cut out his opportunity to get shop training, whereas, Latin is offered in both the Sarasota Junior and Senior High Schools.

Plans are being made to incorporate a home mechanics type of course for the retarded children at Sarasota Senior High School starting in the fall of 1961. It is understood that this will be incorporated in the so called Industrial Arts Department.

It is not the intention to belittle the benefits of this type of program; however, this does denote the basic philosophy that has been prevalent in Sarasota County in regard to industrial arts training.

Shop space is at a premium in Sarasota Junior High. If the student with superior mechanical aptitude enrolls in shop, as they should have previously, a basic concept as to who should have shop priority will have to be made. A number of students with low mechanical ability have been permitted to take shop for the second and third time. The reason for this repetition is usually not based on success during the first course but instead on the fact that activity education permits freedom of movement etc. Many educators (Dr. Conant included) think that shop should be required for all ninth grade boys, however, such a program would call for a great deal more shop space, teacher time and equipment than is now available. In recent years, Mechanical Drawing has been incorporated as a separate course at Sarasota Junior High. It is required before a student can enter a shop course for the second time. This was done because drafting is very basic in all industrial endeavors and also to alleviate the crowded condition in the shop.

Influences on choices of subjects. The second strongest influence (See Table v p. 22) on subjects taken by the students at Sarasota Junior High School is the parents. Out of a group of 116 ranking highest in mechanical aptitude, 70 declared that their parents would not encourage them to take a shop course.

Of the 70, 54 have indicated an interest in a vocational field that will call for shop work at some level of their training.

One of man's hopes has always been to enable his son to have a better life than he has had. This is a commendable ideal, but the son should decide what a better life would be for himself. "In many instances there appears to be a ganuine need for the protection of young people from the ignorance and indifference of their parents as well as from their own immaturity."[3]

TABLE V

AN ANALYSIS OF INFLUENCES ON CHOICES OF SUBJECTS FOR JUNIOR HIGH SCHOOL

Choices	1's	2's	3's	4's	5's	6's
Grade 7						
Personal	225	79	33	23	13	10
Friends	21	30	96	66	68	9
Parents	127	205	28	13	7	2
Teachers	11	34	105	107	67	21
Guidance	18	20	72	85	92	57
Others	3	13	20	47	96	152
Grade 8						
Personal	225	73	35	23	14	12
Friends	8	37	57	51	116	114
Parents	129	198	62	27	2	1
Teachers	13	59	139	111	41	9
Guidance	15	45	91	93	82	55
Others	5	7	14	29	114	195

[3]Douglass, op. cit., p. 235.

TABLE V (Continued)

AN ANALYSIS OF INFLUENCES ON CHOICES OF SUBJECTS FOR JUNIOR HIGH SCHOOL

Choices	1's	2's	3's	4's	5's	6's
Grade 9						
Personal	113	32	13	13	1	1
Friends	8	14	29	16	47	48
Parents	43	84	27	18	3	0
Teachers	7	22	62	52	19	3
Guidance	6	16	41	45	35	18
Others	0	3	2	18	54	81
Total						
Personal	593	184	81	59	89	23
Friends	37	81	181	133	231	231
Parents	299	487	117	58	12	3
Teachers	43	115	306	270	127	33
Guidance	72	81	285	223	209	130
Others	8	23	36	36	268	581

The factors influencing the choice of subjects show that the parents have considerably more influence than do other teachers or trained guidance personnel. The first law among trained guidance counselors and teachers is to let the students make the choice after all the possibilities have been explored. It can safely be assumed that parents would be more dogmatic than a trained counselor. This points up the need for an intensified program to educate the parents concerni occupational and educational choices. The method of presenting this at Sarasota Junior High School in the past may be considered unique. A film and tape are prepared and presented to the students in an assembly situation. The same

evening their parents are invited to attend a meeting in which the same material is repeated. The parents and students are able to see actual pictures which have been taken in the class and hear the script which has been written by each teacher who teaches the class.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

After careful consideration of the many factors involved, the following conclusions and recommendations for the improvement of the program in Sarasota Junior High and Sarasota County are offered.

1. The testing program, including the mechanical aptitude test, could be considered a success to the extent that it should be continued. Students are anxious to learn what their talents are and do seek help on their enrollment problems.

2. As discussed earlier, a film and script are used as a part of the enrollment procedure at Sarasota Junior High School. The script for shop classes should be rewritten and should include not only the requirements of the course, but the need for shop work in all phases of technological endeavor.

3. The vocational unit which was started this year in the basic education classes should be continued and a definite effort should be made to encourage all the departments of the school to show the need for shop work when the need exists.

4. The hypothesis that the school shop is used as a "dumping ground" has been somewhat substantiated in two ways. First, 45% of those students that were highest in mechanical aptitude did not take advantage of shop training. This indicates that something is wrong. Second, the students' choices of vocational interests do not correspond with the needs for shop work. Too many students, for example, would like to become an engineer without getting their hands dirty or without "degrading themselves to shop work."

5. As recommended in the annual narrative report, there is an need for the whole industrial arts program to be integrated with the science and mathematics departments with some team teaching included.

6. The recommendations made for a senior high school industrial arts program for all schools in Sarasota County in the Goodlad Report[1] should be carried out. Again, this program should be integrated with science, mathematics, and other subjects making shop work an essential part of it. One of the greatest inequities of our present school program is the lack of facilities for students who, for example, are doing a science project and need working space, tools and materials.

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[1]A study of the Sarasota County School System conducted under the direction of Dr. Goodlad, Northwestern University. (1955-56 school year).

7. There is a need for all shop teachers to join the nation wide movement to upgrade shop training in our schools so as to keep pace with the great surge in technological development. More informational units should be included in the shop training. The junior high shop teacher must remember that each year he is teaching a new group and that the incoming students do not start at the point where the preceding class ended. Childe has pointed out[2] that the things that are learned in shop work are acquired characteristics. According to biologists these acquired characteristics, like the art of fire tending, are not hereditary.

8. Shop work for grades 7 and 8 is and should continue to be varied program at Sarasota Junior High School. The students have been required to work in a variety of areas and have been permitted to operate most power tools with the exception of the circular saw. Few students of this age possess either the physical size or the mental maturity to operate this complex and dangerous piece of equipment. This basic machine, even though it was developed as a wood cutting device, has been adapted for use on many materials i.e. stone, cement, metal, plastics and many others including its use by the surgeon to amputate limbs in the operating room.

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[2]V. Gordon Childe, Man Makes Himself (New York: Mentor Books, The New American Library, 1957).

9. The industrial arts program should be arranged so that all students will have an opportunity to take shop after they have reached a stage of maturity which will enable them to learn all there is to know about this basic machine.

10. Further thought should be given to the possibility of separating the study of related information into an ordinary classroom under the direction of another teacher (such as the science or mathematics teacher) so that a more continuous use of shop equipment can be made. At least two teachers have expressed interest in this kind of program. They are both qualified mathematics and science teachers with a great deal of work experience.

11. Robert Frost, the noted poet and philosopher, has supported the belief that any honest endeavor has dignity and it behoves all shop teachers to really believe and practice this great truth.

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APPENDIX

Name TALLY

You have scored in the upper 25% of your class in Mechanical Reasoning Test. I would appreciate your answering the following questions.

1. Did you have any idea before you took the test that your mechanical reasoning was as high as it is? Yes 34 No 80

2. Are you especially glad that you scored as high as you have in the Mechanical Reasoning Test? Yes 95 No 19

3. Have the elective subjects that you have taken in school up to this point been of your own choosing? Yes 111 No 7

4. Would your parents encourage you to take a course in shop? Yes 46 No 70

5. What would be your first choice of a life's work if you had to choose right now? Ans. _____

6. Can you see any need for a shop course in training for this life's work? Yes 47 No 60

7. Do you hope to go to college? Yes 100 No 15

8. Do you think that a shop course could benefit the following?

	Yes	No
Carpentar	114	0
Doctor	9	98
Lawyer	8	99
Scientist	61	47
Housewife	67	41

9. Are you aware of the fact that girls can take shop at Sarasota Junior High School? Yes 107 NO 6

10. How many years of shop can a college preparatory student take at Sarasota Junior High School? Ans. _____

11. Have you ever taken shop in summer enrichment? Yes 16 No 99

Do not know — 68
0 years — 1
1 year — 5
2 years — 15
3 years — 14
4 years — 18

ALL TEST DATA ARE TO BE HANDLED IN A STRICTLY PROFESSIONAL MANNER.

TO ALL TEACHERS:

This year in grades 8 and 9 aptitude tests are being used. As you know, achievement tests are designed to measure what a student has done or learned; aptitude tests are designed to measure what a student CAN do with proper training and also at what level he probably can perform. An interesting observation made by one test states that a measured aptitude has never been known to decrease unless illness or brain damage has occurred. On the other hand, they have certainly been known to increase with widened opportunity.

The Differential Aptitude Tests are published by the Psychological Corporation and contain seven separate tests on which eight scores are derived. A ninth score represents a combination of two others which will be explained later. It is obviously impracticable to try to measure ALL aptitudes for which tests have been constructed; this would result in an unmanageable number of tests. Again, the reminder is given: TESTS ARE CLUES ONLY. We do not feel ourselves that we measure many of our most important educational objectives nor do we measure essential qualities in students. These might include: energy, goal directiveness, personality, persistence, sense of humor, leadership, or many other characteristics.

The value of this particular battery and its timing in the school year is to meet the needs of our students who take these tests. Their value will be directly proportionate to the effectiveness of the use of the results. As all teachers are counselors and will be advising students relative to their selection of courses for next year, their ability to apply these results in a way personally meaningful to students is essential.

Our joint tasks as junior high school teachers (helping maturing student to become realistic and at the same time helping them to raise their aims and accept the responsibility for hard work to reach these aims), can be served better as we increase our skill in using all tools. To many of us interpretation of this type of test result is relatively new. For that reason these reminders are being forwarded.

There are 9 test scores for students of grade 8. These are: Verbal Reasoning, Numerical Ability, 3. A composite score of these two, 4. Abstract Reasoning, 5. Space Relations, 6. Mechanical Reasoning, 7. Clerical Speed and Accuracy, 8. Language Usage Spelling, 9. Language Usage Sentences. The latter two are based entirely on usage alone.

The results are reported in percentile ranks on the basis of national norms and on charts which differ according to grade in school and sex of student. Results are reported to students on profile sheets. Although interpretation may be initiated by guidance people, certainly the truly effective use will be based

on the skill of individual teachers in working with individual students.

A sample profile sheet and a sample interpretation are appended for your consideration.

The combined scores of the Verbal Reasoning and Numerical Ability tests closely resemble results given on familiar intelligence tests, such as the Henmon-Nelson. Verbal Reasoning results should be considered in predicting college success if verbal complexity is involved in the college choice. Numerical Ability scores are used for prediction in such fields as mathematics, accounting, physics, chemistry, and engineering. Bookkeepers, craftsmen, and technicians also need this ability.

It is to be emphasized that certain combinations of scores are often more effective than the use of one single score. For example, while it is true that a high score in Numerical Ability is important for success in certain types of engineering, this is more valuable if high scores are also recorded in Space Relations and Abstract Reasoning.

* As with our Pintner Non-Verbal Intelligence Tests, the Abstract Reasoning provides a measure of nonlanguage reasoning. A caution should be observed here, however. There may or there may NOT be a high correlation between verbal and non-verbal abilities. While a high non-verbal score certainly identifies a student for special help in reading if the verbal score is low, it does not HAVE to follow that this student is per se capable of high verbal achievement. The reverse is also obviously true. Students high in verbal intelligence measure often do not excel on non-verbal skills. Actually, these are distinct and differentiated abilities. There is a correlation between success in this test and in high school science courses.

* Space Relations ability is needed in such fields as drafting, dress designing, architecture, art, die-making, certain fields of engineering, or mathematics in which there is need to visualize in three dimensions. It should be pointed out that the test is designed to omit any premium on visual discrimination as patterns are large and clear.

* Mechanical Reasoning measures one aspect of intelligence. The scores on this test are correlated with success in the physical sciences, and especially in the fields of technical training. The test makers state that the results are obviously less meaningful to girls than to boys. //If a girl expresses interest in mechanical or engineering work, her score probably will be more meaningful if compared with the scores of boys in her grade rather than with those of girls.

* Clerical Speed and Accuracy is the only test in the series in which timing is essential. While all tests in this series are timed

the timing is generous and they may be considered essentially power tests. This one is the exception. Timing is limited to three minutes and rigidly enforced. The results of the Clerical Speed and Accuracy tests do not have any correlation with intelligence. They do, however, indicate speed of perception, momentary retention, and speed of response

Language Usage: Spelling and Sentences. The spelling words were taken from Gates and were selected for their use in everyday vocabulary. The test on sentences provides opportunity for discrimination between good and bad grammar. These two tests are more like achievement tests but are included because they measure an essential skill. It is a skill obviously needed in stenography, proofreading, advertising, journalism, or wherever the written word is a basic requirement for success.

One important reminder here is that a high score on Verbal Reasoning and a low score on Language Usage may indicate a student who may benefit from remedial work.

Absence of certain abilities may be more indicative of future job selection that the presence of certain abilities. Lack of Abstract Reasoning ability may be a great hindrance in such fields as engineering or as actuary, for example. On the other hand, presence of this ability is not considered indicative of success unless it is accompanied by other abilities such as Numerical Ability AND Space Relations.

THE TESTS WHICH ARE STARRED WERE GIVEN IN GRADE 9. IT IS ESTIMATED THAT THE FLORIDA NINTH GRADE TESTING PROGRAM PROVIDES SCORES ON THE AREAS MEASURED BY THE OTHER SUB-TESTS.

THIS IS AN OVER-SIMPLIFIED EXPLANATION, ADDITIONAL MATERIAL MAY BE OBTAINED FROM MANY SOURCES INCLUDING TEXTS AND THE TEST MANUALS. REMEMBER THAT FOR COUNSELING PURPOSES A TEACHER MUST TAKE INTO ACCOUNT THE FULL PICTURE OF THE CHILD AS IT CAN BEST BE MEASURED. THIS WILL INCLUDE HEALTH, STAMINA, ENERGY, I.Q., ACHIEVEMENT, GRADES, RELIABILITY, MATURITY, ATTITUDES, AND THE TEACHER'S SUBJECTIVE JUDGMENT.

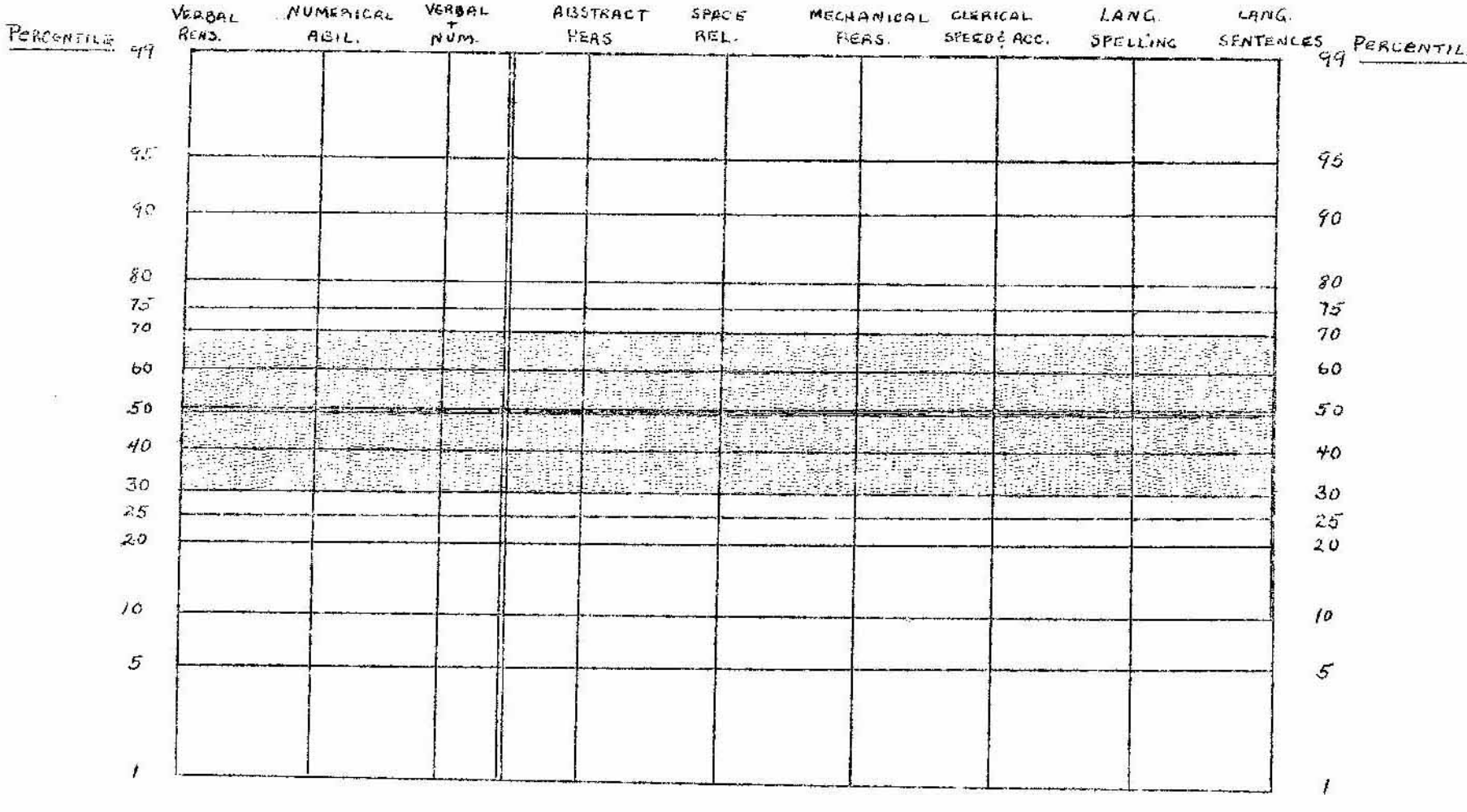
THESE TESTS HAVE BEEN INCLUDED IN THE TESTING PROGRAM BECAUSE IT IS FELT THAT THEY PROVIDE SOME MEASUREMENTS WHICH ARE NOT AT PRESENT BEING MEASURED BUT WHICH ARE IMPORTANT TO STUDENTS.

Student: _____ Grade: ____ H.R. Teacher _____

Sex: M ☐ F ☐ Date of birth: _____ Norms used: _____

Date of testing: _____ School: Sarasota Junior High School, Sarasota, Fla

DIFFERENTIAL APTITUDE TESTS



SARASOTA JUNIOR HIGH SCHOOL
Sarasota, Florida

THE DIFFERENTIAL APTITUDE TEST SCORES

The accompanying graph, or profile, of your test scores may help you to make some wise choices and decisions in the future, as you plan your educational and vocational future. If additional information regarding these tests or their interpretation is desired, please consult your teachers or any counselor.

WHAT IS AN APTITUDE TEST? An aptitude test is designed to measure what a person can do or is able to learn.

VERBAL REASONING This is the ability to handle words, to understand ideas expressed in words. This score may predict success in fields or subject areas where rather complicated word ideas are important, such as law, journalism. Success in certain school subjects, English, foreign language, science, and certain areas of mathematics will depend on how well a person reasons with words or verbally expressed ideas.

NUMERICAL ABILITY Ability to handle numbers and to deal with quantitative materials is measured in this test. This ability is very important in the fields of mathematics, chemistry, physics, engineering, and other areas which depend upon a person's skill in handling numbers. Various amounts of numerical ability are required in such jobs as bookkeeper, statistician, shipping clerk, and laboratory assistant. In the crafts, such as carpentry, tool making, etc., this skill is needed.

VERBAL REASONING AND NUMERICAL ABILITY These two skills together are thought to measure a person's ability to do general academic school work, since one, and often both, are needed to do successful work in school and college.

ABSTRACT REASONING This is one's ability to think or reason without the use of words. It is related to the two abilities described above. It is also closely related to the space and mechanical tests below, and should be considered with these two as combined scores. In other words, it is usually important to have high scores in at least two of these three.

SPACE RELATIONS

This test required the student to imagine how an object would look when turned different ways in space, and to visualize an object from a pattern. This very important aptitude, to be able to create a structure in one's mind, is needed in such fields as drafting, engineering, designing, art, architecture, die-making, or wherever there is a need to see object in three dimensions, height, width and depth.

MECHANICAL REASONING

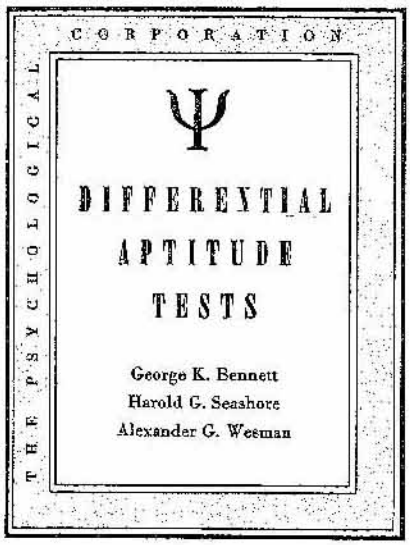
A person who stands high in this aptitude, who is able to "think mechanically," finds it easy to learn the operating principle of complex machinery. A student interested in physical sciences or technical training may find this score meaningful. This score may be useful in predicting success in mechanics, carpentry, assembly work, and other jobs. Boys and girls are compared with members of their own sex on these tests, and so some girls' mechanical reasoning scores may seem quite high. If any girl is interested in entering a mechanical field, she should request her score as compared with boys, which will give her a more realistic aptitude score for that purpose.

CLERICAL SPEED AND ACCURACY

This test score indicates how quickly and accurately a person can do a routine job. This skill is important in such jobs as filing, coding, and stockroom work. It does not necessarily predict success in secretarial work.

LANGUAGE USAGE:
SPELLING & SENTENCES

Taken together, these two tests give a good estimate of a person's ability to distinguish correct from incorrect English. Compare these scores with the verbal reasoning score. If these scores are appreciably lower than verbal reasoning, this may show a need for more concentrated effort in language, because this indicates you have not produced the quality work of which this test shows you are capable. Many jobs require high ability in language, such as writer, teacher, secretary, journalist, etc. But there is hardly a job in this world in which a person's skill in using good language is not desirable; in fact, it is essential. Persons with relatively low scores face the challenge of improving their English and would be wise to take full advantage of the remaining years of high school to develop to the utmost this highly important skill.



MECHANICAL REASONING

FORM A

Do not open this booklet until you are told to do so.

On your SEPARATE ANSWER SHEET, print your name, address, and other requested information in the proper spaces.

In the space after **Form,** print an A.

Then wait for further instructions.

DO NOT MAKE ANY MARKS IN THIS BOOKLET

The Psychological Corporation
304 East 45th Street
New York 17, N. Y.

Printed in U.S.A.
Ψ Reg. U.S. Pat. Off.

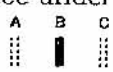
57-229 TB

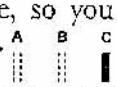
Do not make any marks in this booklet

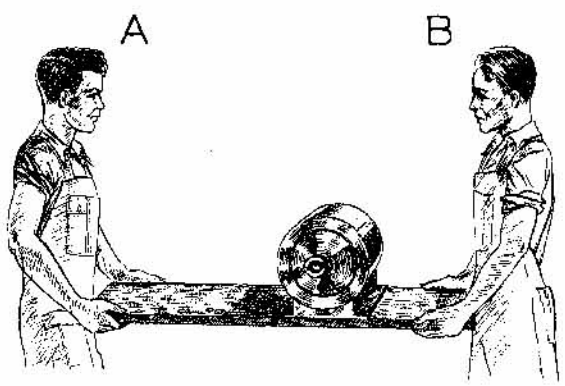
Mark your answers on the separate Answer Sheet

MECHANICAL REASONING

DIRECTIONS

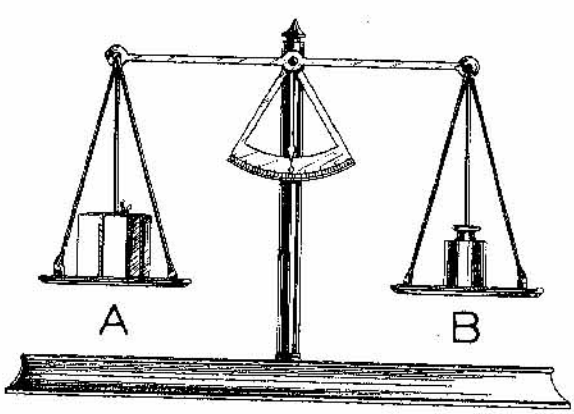
This test consists of a number of pictures and questions about those pictures. Look at Example X on this page to see just what to do. Example X shows a picture of two men carrying a machine part on a board and asks, "Which man has the heavier load? If equal, mark C." Man "B" has the heavier load because the weight is closer to him than to man "A," so on the separate Answer Sheet you would fill in the space under B, like this → 

Now look at Example Y. The question asks, "Which weighs more? If equal, mark C." As the scale is perfectly balanced, "A" and "B" must weigh the same, so you would blacken the space under C on your separate Answer Sheet, like this → 



X

Which man has the heavier load?
(If equal, mark C.)



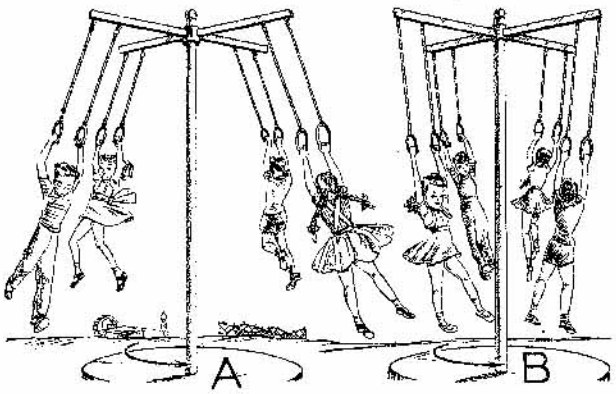
Y

Which weighs more?
(If equal, mark C.)

On the following pages there are more pictures and questions. Read each question carefully, look at the picture, and mark your answer on the separate Answer Sheet. Do not forget that there is a third choice for every question.

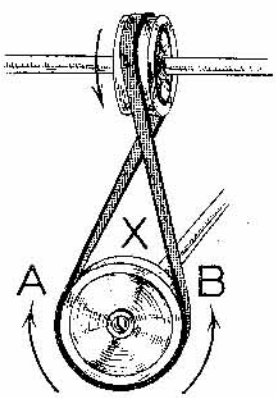
DO NOT TURN OVER THE BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Drawings by Helen Gabryel



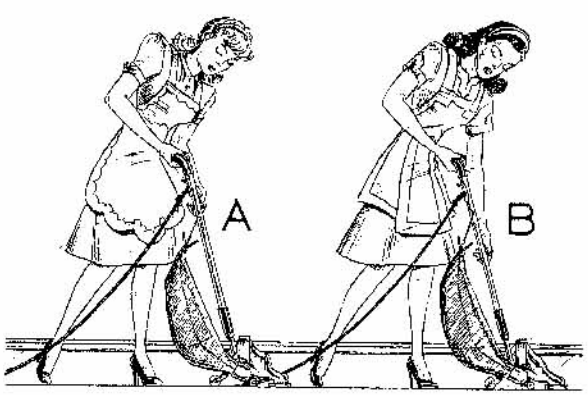
1

In which picture are the children whirling faster?
(If equal, mark C.)



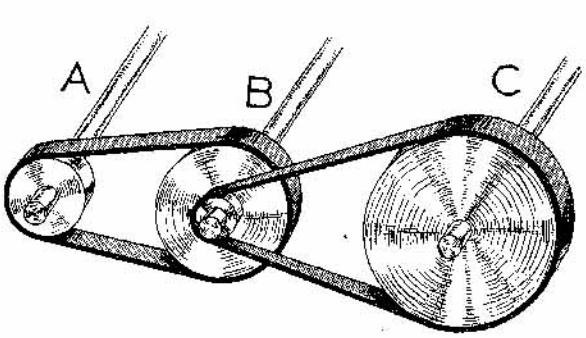
2

When the top pulley turns in the direction shown, which way will the lower pulley turn?
(If either, mark C.)



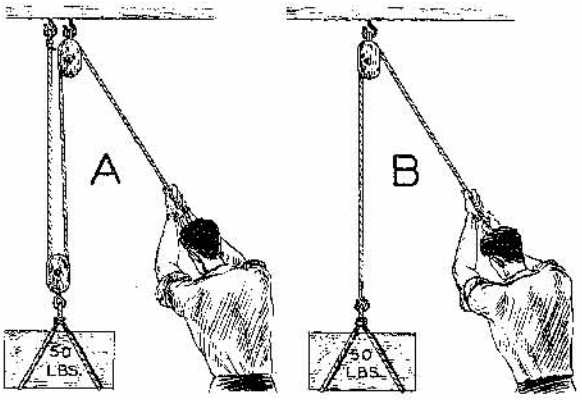
3

Which girl can lift the cleaner more easily?
(If equal, mark C.)



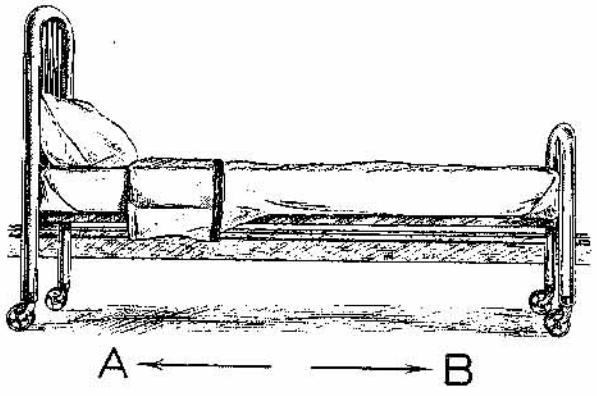
4

Which shaft will turn most slowly?



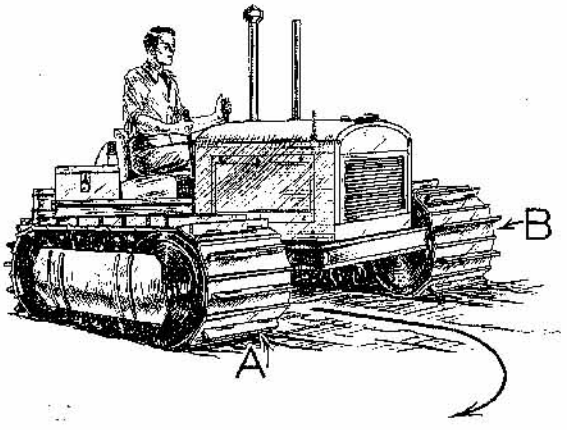
5

Which man must pull harder to lift the weight?
(If equal, mark C.)



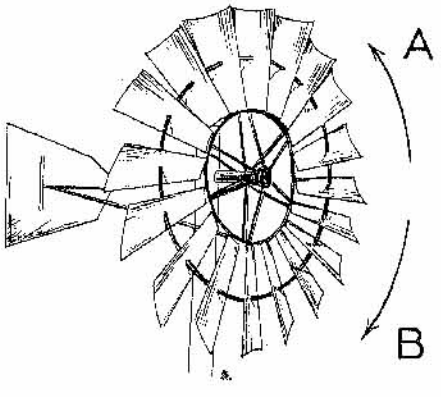
6

Which way has this bed just been rolled?
(If either, mark C.)



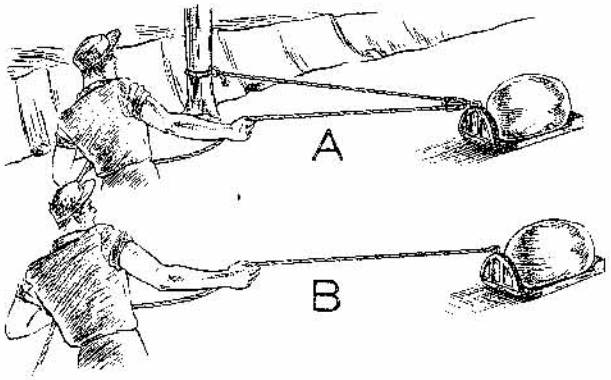
7

Which tread should move more slowly for the tractor to turn in the direction shown?
(If neither, mark C.)



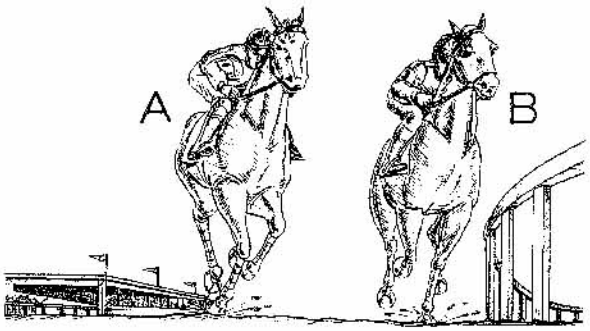
8

In which direction is this windmill more likely to turn?
(If either, mark C.)



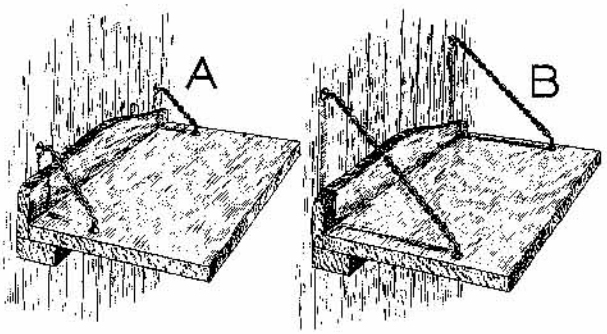
9

Which man has to pull harder?
(If equal, mark C.)



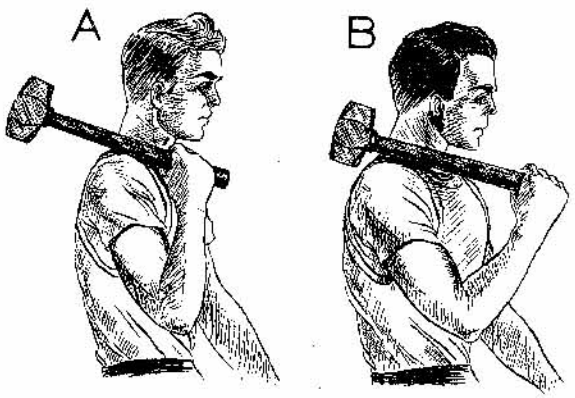
10

Which horse must go faster to hold his place on the turn?
(If equal, mark C.)



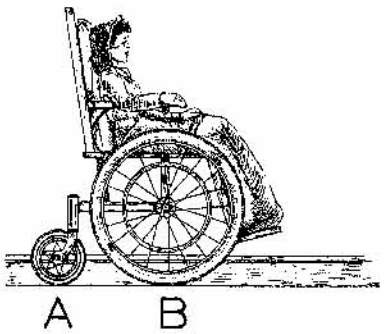
11

Which shelf is stronger?
(If equal, mark C.)



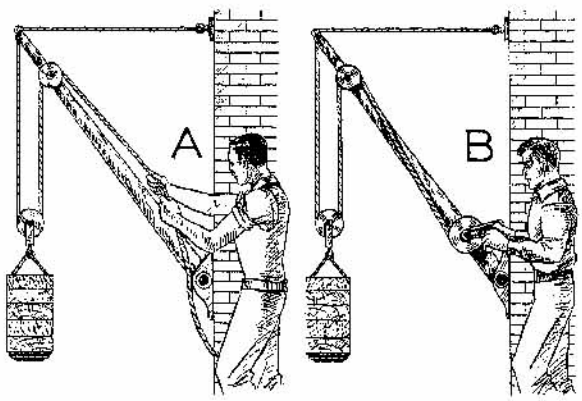
12

Which is the harder way to carry the hammer?
(If equal, mark C.)



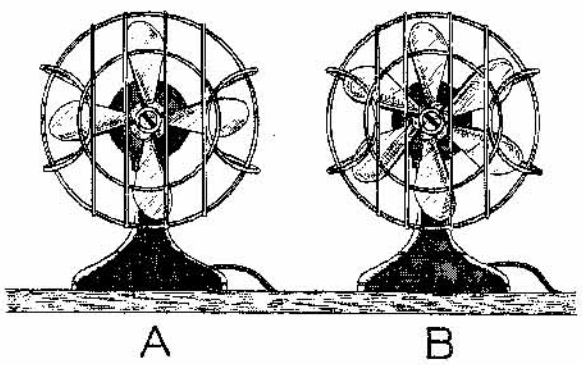
13

Which wheel will turn faster?
(If equal, mark C.)



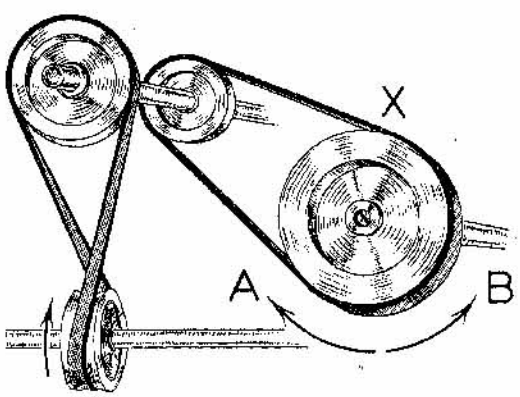
14

Which man can lift the weight more easily?
(If equal, mark C.)



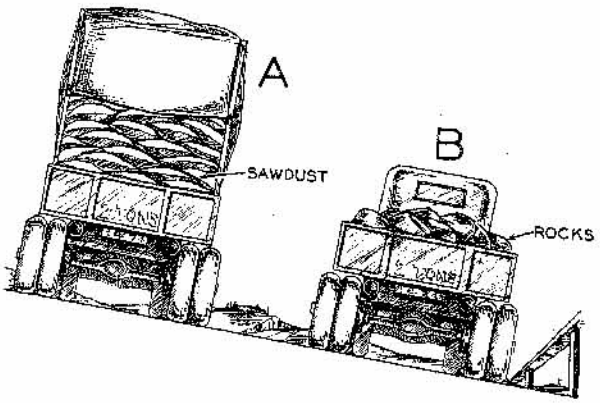
15

Which fan needs the more powerful motor?
(If equal, mark C.)



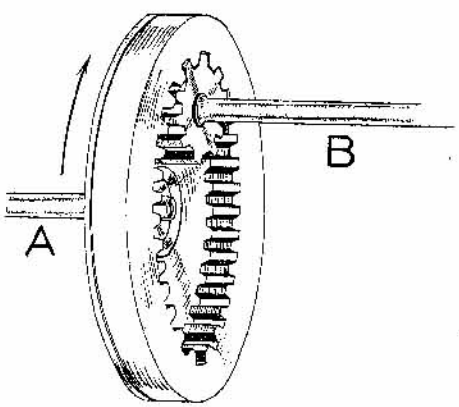
16

Which way will pulley "X" turn?
(If either, mark C.)



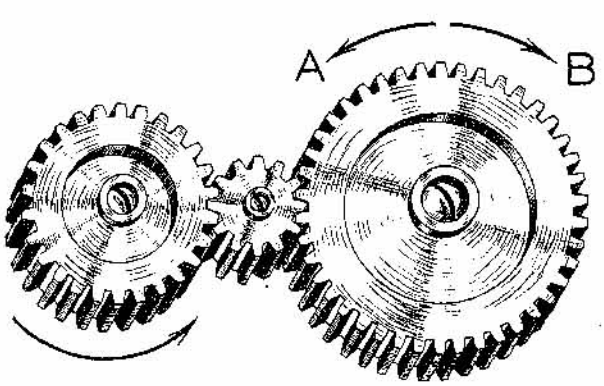
17

Which truck will turn over more easily?
(If equal, mark C.)



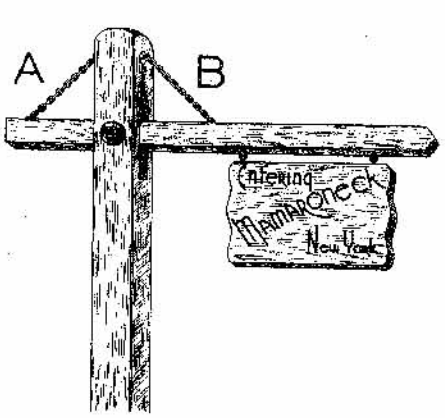
18

Which shaft turns faster?
(If equal, mark C.)



19

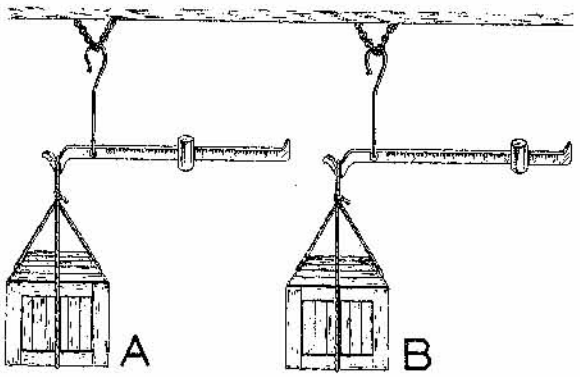
When the left-hand gear turns in the direction shown, which way does the right-hand one turn?
(If either, mark C.)



20

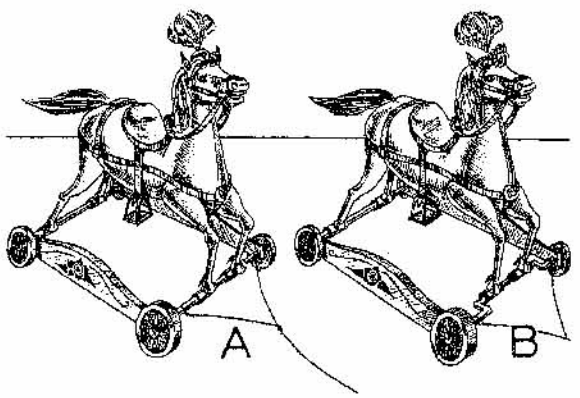
Which chain alone will hold up the sign?
(If either, mark C.)

PUT YOUR ANSWERS ON THE ANSWER SHEET.



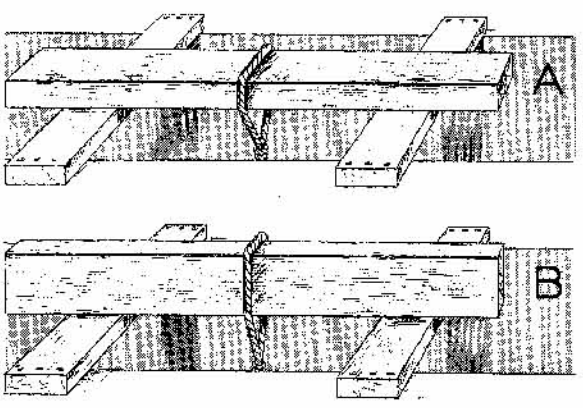
21

Which box weighs more?
(If equal, mark C.)



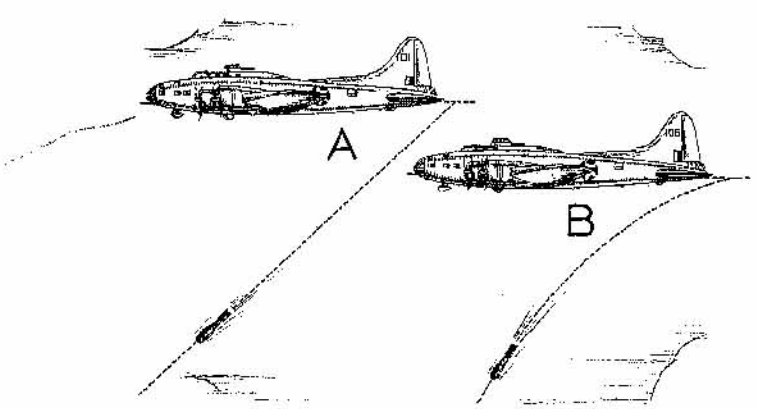
22

Which horse will jump more when it is pulled?
(If equal, mark C.)



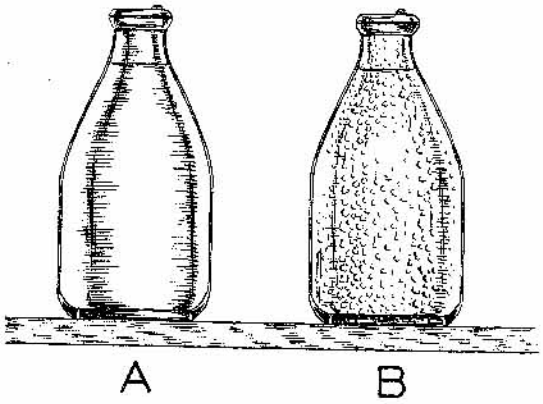
23

In which picture can you safely put a heavier weight on the rope?
(If equal, mark C.)



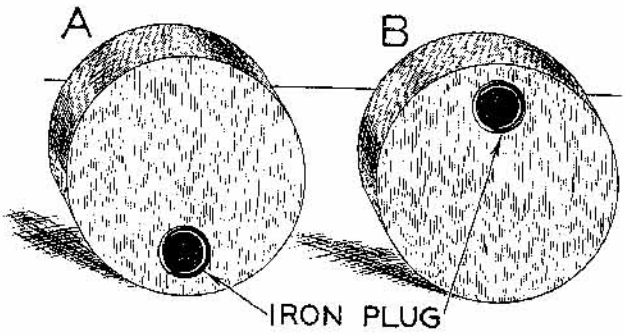
24

Which drawing shows how a bomb really falls?
(If both, mark C.)



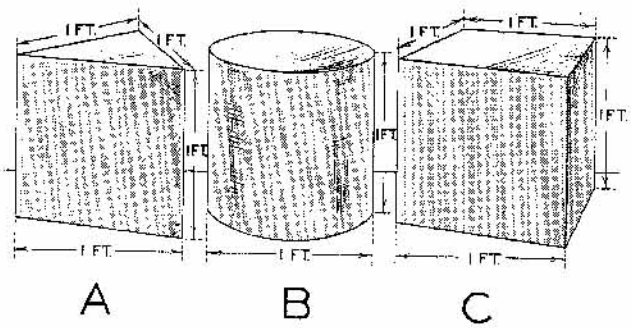
25

Which bottle has just been taken from the refrigerator?
(If neither, mark C.)



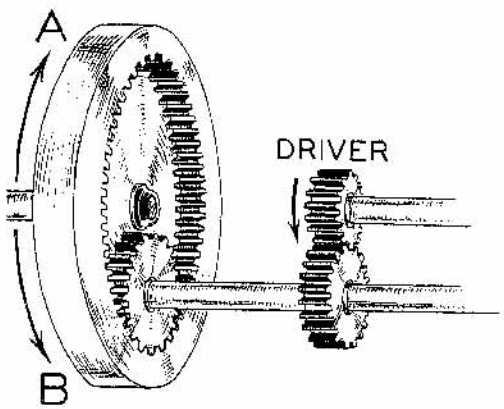
26

Which picture shows how this wooden circle will stand?
(If neither, mark C.)



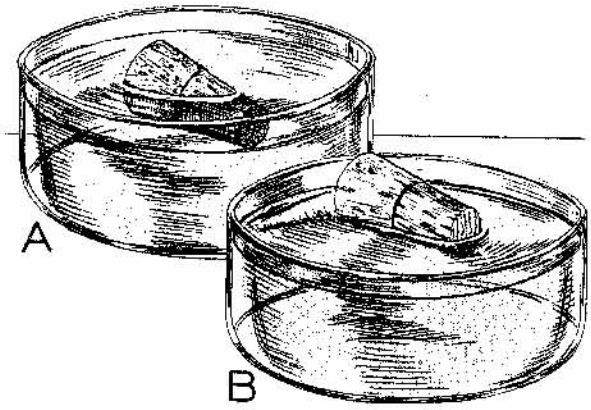
27

Which weighs least?



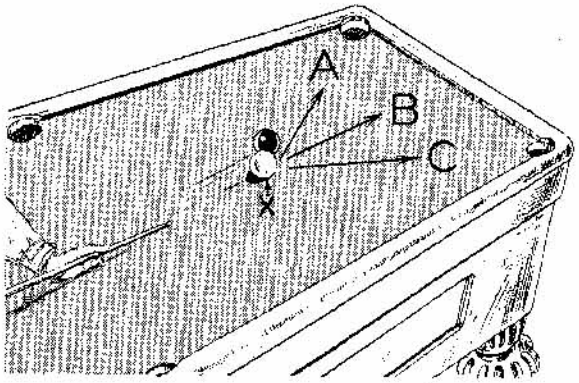
28

When the driver turns in the direction shown, which way will the left-hand gear turn?
(If either, mark C.)



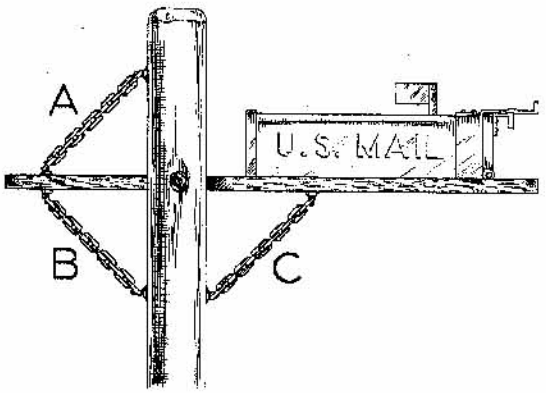
29

Which liquid is heavier?
(If equal, mark C.)



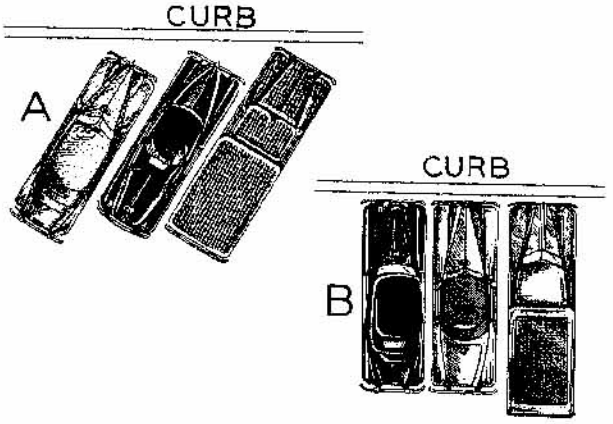
30

After hitting the black ball, which way will ball "X" go?



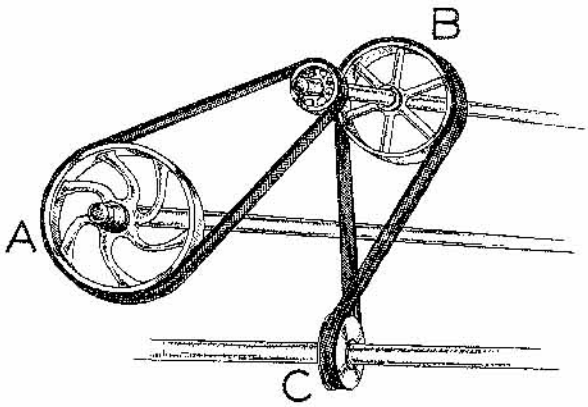
31

Which one piece of chain is needed to support the mail box?



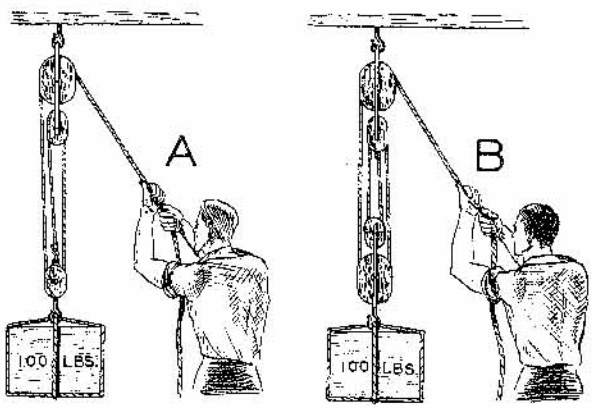
32

Which way can more cars be parked in a block?
(If equal, mark C.)



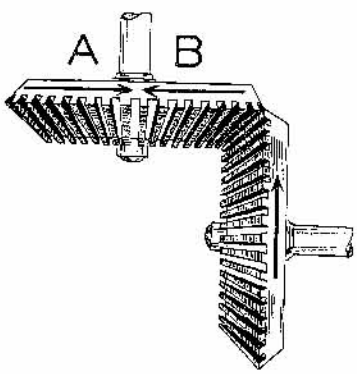
33

Which shaft will turn most rapidly?



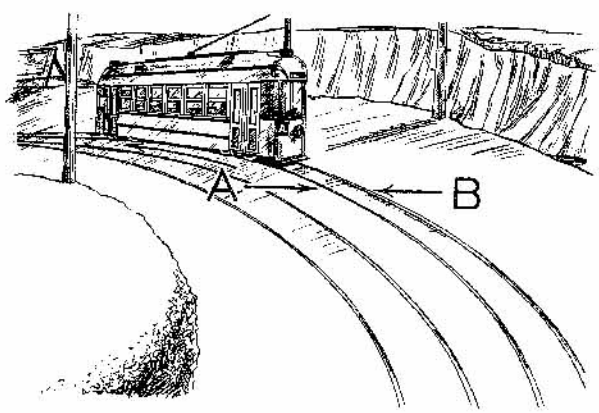
34

Which man can lift the load more easily?
(If equal, mark C.)



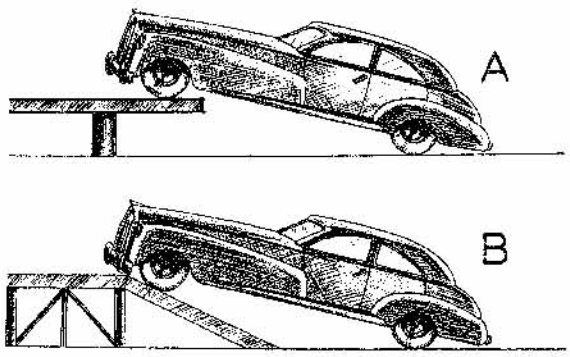
35

When the right-hand gear turns in the direction shown, which way does the top gear turn?
(If neither, mark C.)



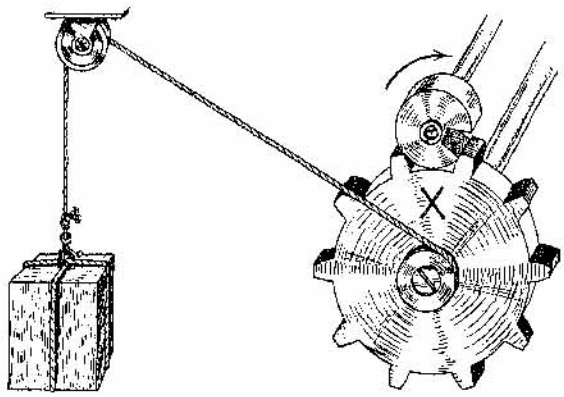
36

Which rail should be higher?
(If equal, mark C.)



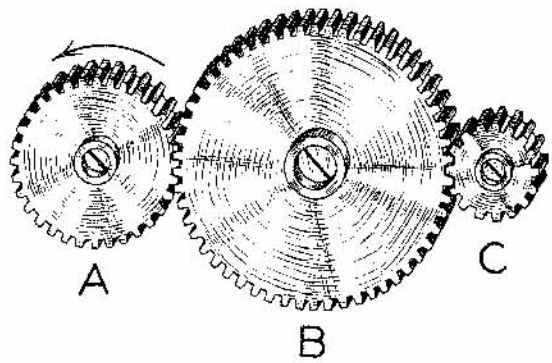
37

Which car is less likely to roll?
(If equal, mark C.)



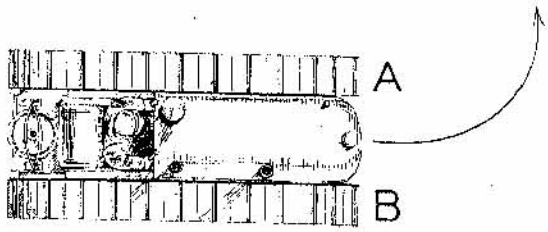
38

The top of wheel "X" will go:
(A) steadily to the right;
(B) steadily to the left;
(C) by jerks to the left.



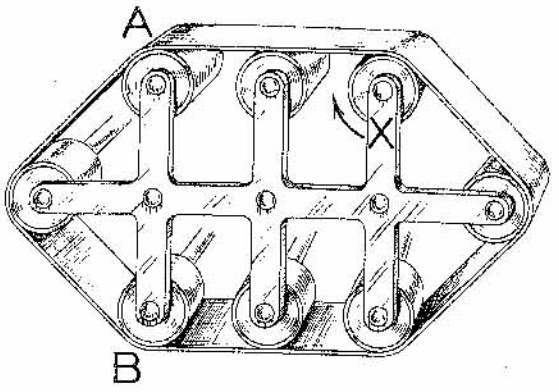
39

Which gear turns most times in a minute?



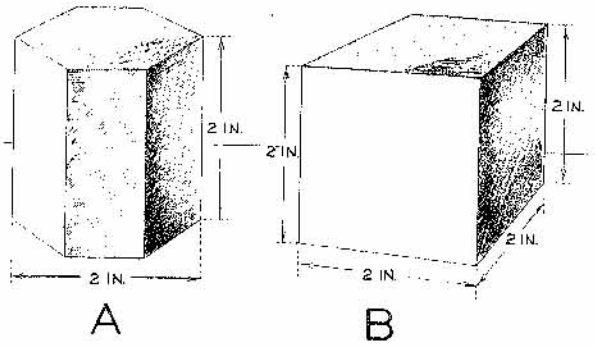
40

Which tread should be run more rapidly in order to turn the tractor in the direction shown?
(If neither, mark C.)



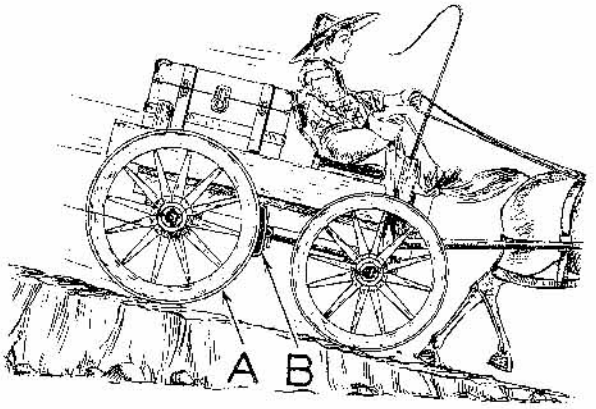
41

Which roller turns the same way as the roller at "X"?
(If both, mark C.)



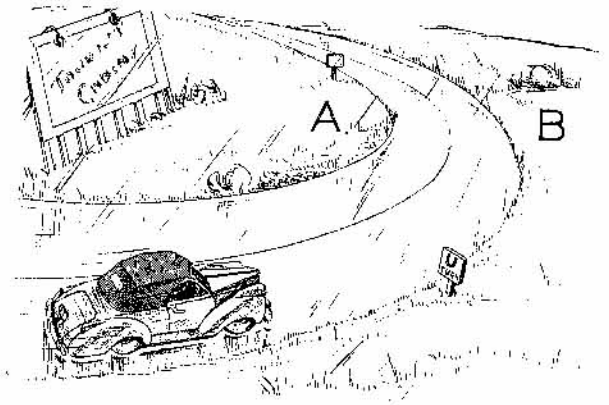
42

Which weighs more?
(If equal, mark C.)



43

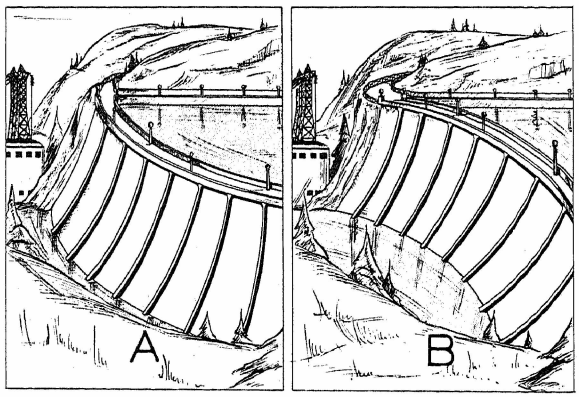
When the brake is put on, which part gets hotter?
(If equal, mark C.)



44

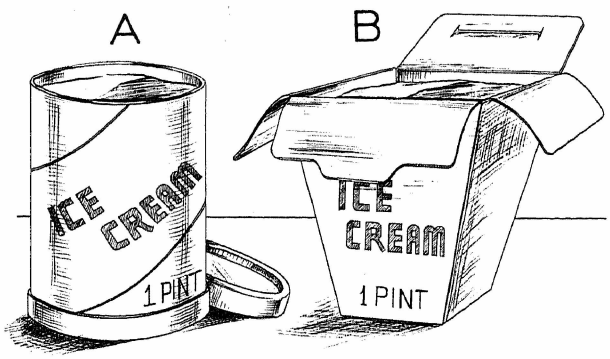
Off which side of the road is the car more likely to skid?
(If equal, mark C.)

PUT YOUR ANSWERS ON THE ANSWER SHEET.



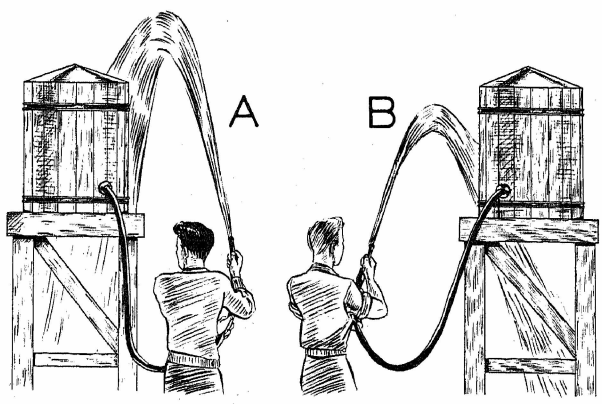
45

Which dam is stronger?
(If equal, mark C.)



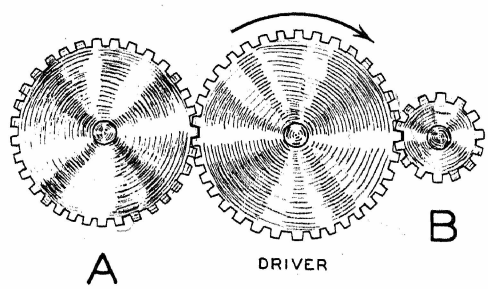
46

In which container will the ice cream stay hard longer?
(If equal, mark C.)



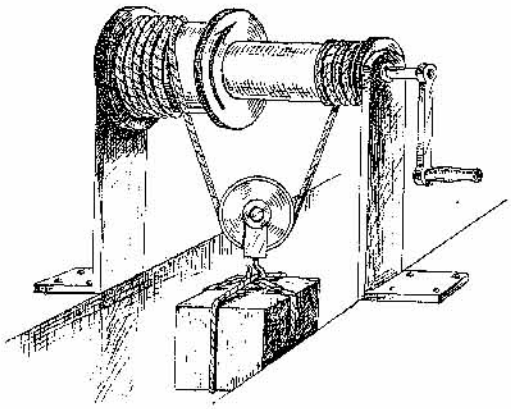
47

Which picture is correct?
(If both, mark C.)



48

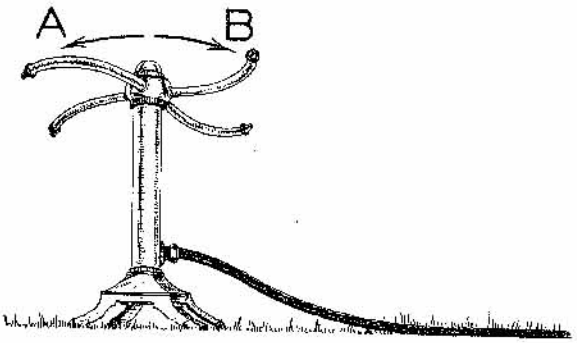
Which gear turns the same way as the driver?
(If neither, mark C.)



49

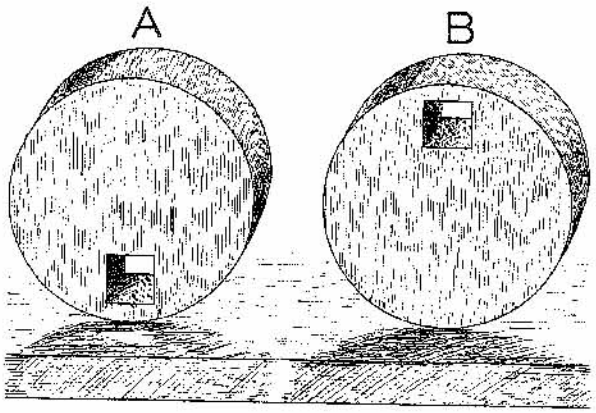
When the windlass is turned in the direction shown, the weight will:

(A) fall;
(B) stand still;
(C) rise.



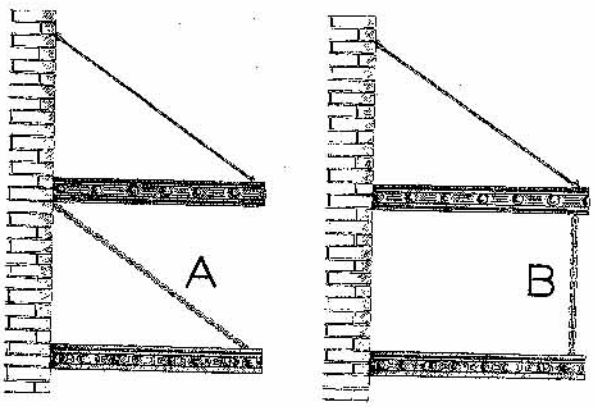
50

When the water is turned on, which way will the sprinkler turn? (If either, mark C.)



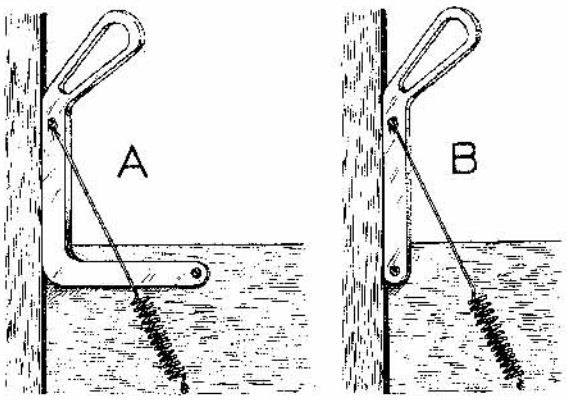
51

Which picture shows how this wooden circle will stand? (If neither, mark C.)



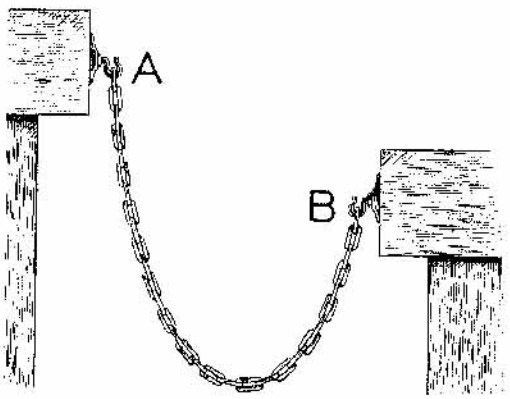
52

Which chain has more strain upon it? (If equal, mark C.)



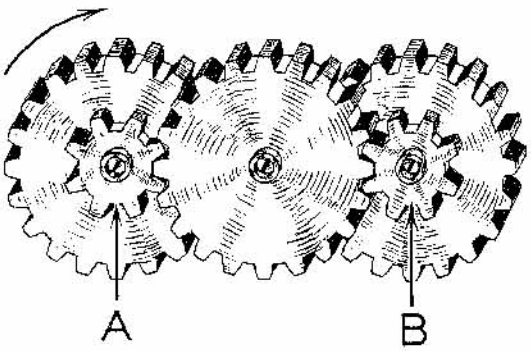
53

In which picture will the spring hold the handle where it now is?
(If both, mark C.)



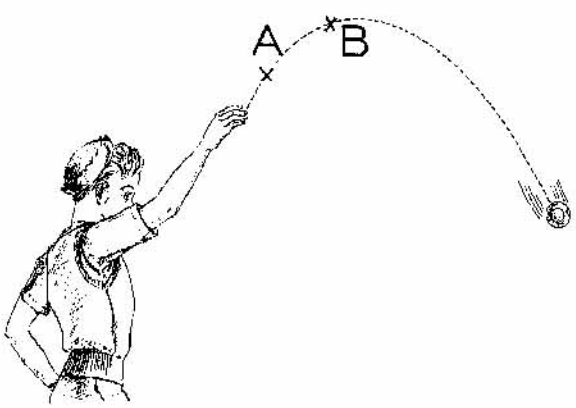
54

Which hook supports more weight?
(If equal, mark C.)



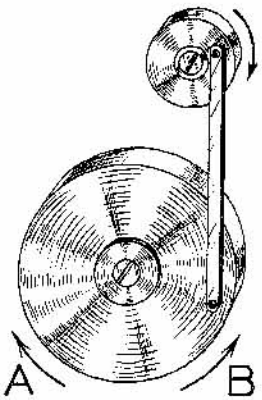
55

Which gear turns slower?
(If equal, mark C.)



56

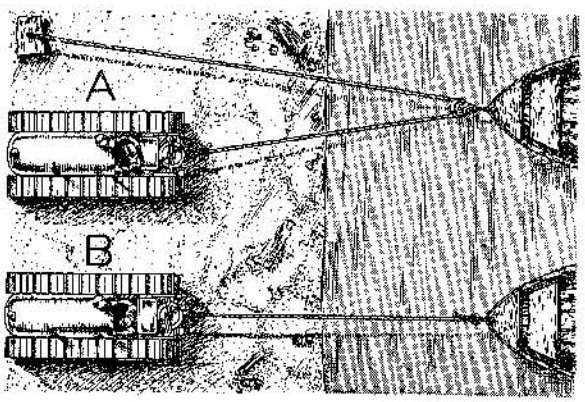
At which point was the ball going faster?
(If equal, mark C.)



57

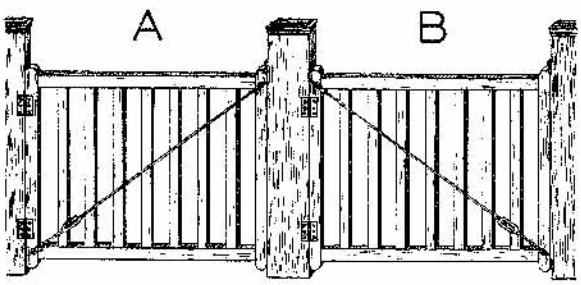
When the small wheel is turned around, the big wheel will:

(A) turn in direction A;
(B) turn in direction B;
(C) move back and forth.



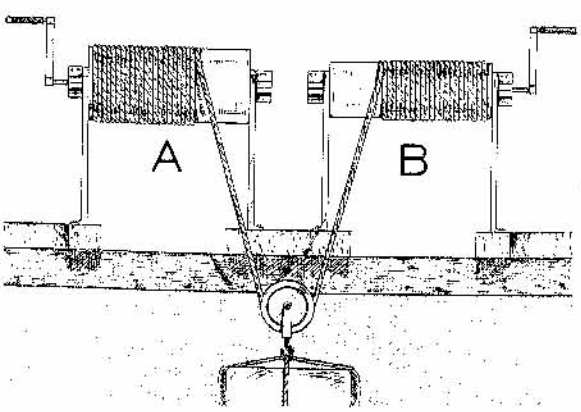
58

Which tractor must go further to pull the boat up on the beach?
(If equal, mark C.)



59

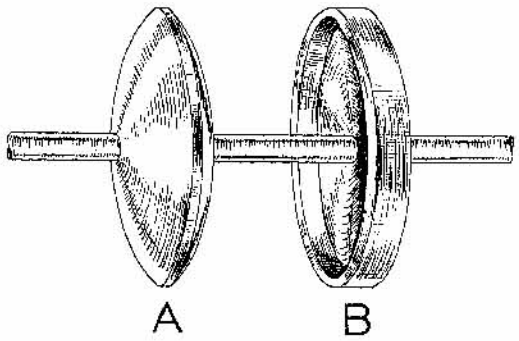
Which gate is better braced?
(If equal, mark C.)



60

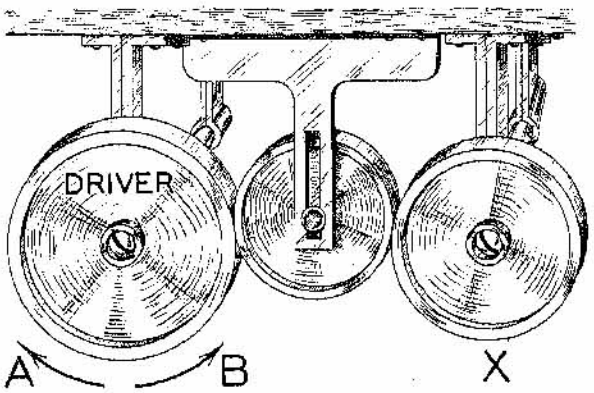
Which windlass will be harder to turn in order to lift the weight?
(If equal, mark C.)

PUT YOUR ANSWERS ON THE ANSWER SHEET.



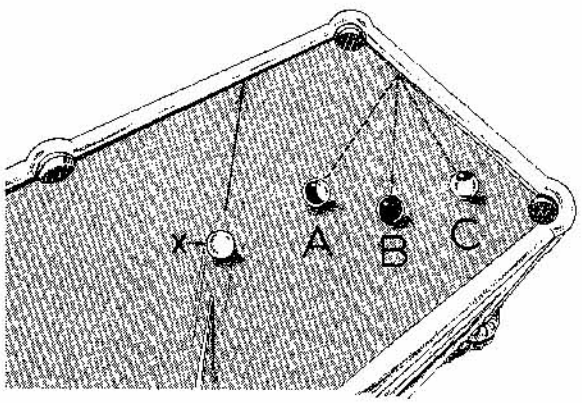
61

Which wheel is safer when spun at high speed?
(If equal, mark C.)



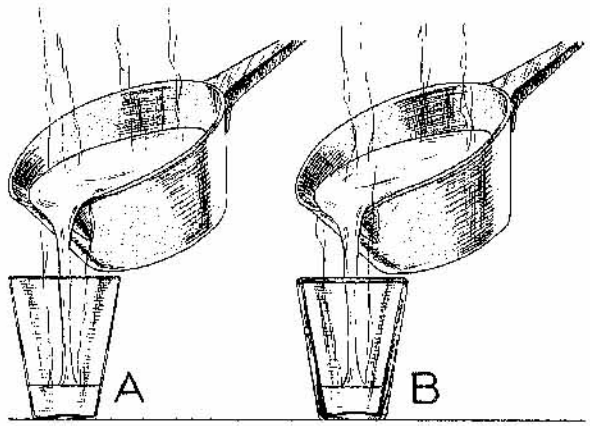
62

Which way must the driver turn to drive the wheel "X"?
(If either, mark C.)



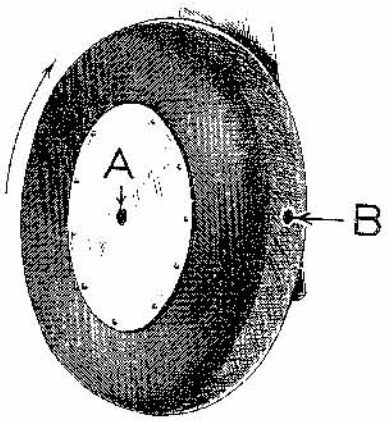
63

Which of these balls will the white ball "X" hit?



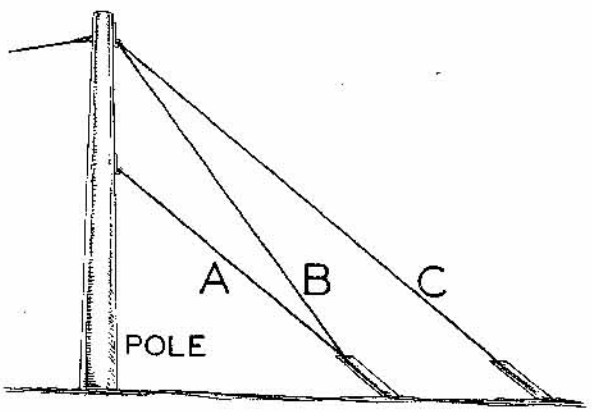
64

Which glass is more likely to break?
(If equal, mark C.)



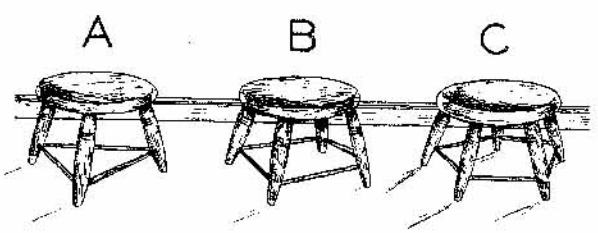
65

Which point moves faster when the wheel turns?
(If equal, mark C.)



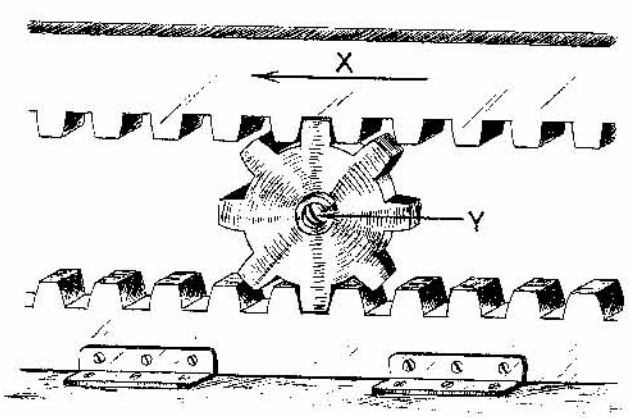
66

Which one piece of cable will give this pole the best support?



67

Which stool will be steadiest on uneven ground?



68

If "X" moves two feet in the direction shown, the center of the gear "Y" will move:

(A) more than two feet;
(B) less than two feet;
(C) two feet.

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SRA MECHANICAL APTITUDES

57 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

SRA MECHANICAL APTITUDES

FORM AH

Prepared by Richardson, Bellows, Henry and Company, Inc.

You are going to take a series of three tests called the SRA MECHANICAL APTITUDES. The purpose of the tests is to find out your ability to learn mechanical jobs. Each of the three tests is important, because each measures a different aspect of mechanical work: mechanical knowledge, space relations, and shop arithmetic.

This booklet will be used by many persons after you. In order that all of them may have the same chance to make a good score, please handle the booklet very carefully. Do NOT make marks of any kind on the booklet. Mark your answers ONLY on the Answer Pad. Use scratch paper for figuring.

Read the instructions for each test carefully. Do exactly what they say. Be sure you understand the practice exercises before the examiner gives the signal to start the test.

STOP HERE
DO NOT TURN THE PAGE

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Please use number 7-131 when reordering this test booklet.

MECHANICAL KNOWLEDGE

PRACTICE EXERCISES

How much do you know about tools, machines, and other equipment used by carpenters, plumbers, electricians, gardeners, machinists, auto mechanics, housewives, and others who work with mechanical devices? *Mechanical knowledge* is important for success in mechanical activities. This first test measures your information about **mechanical devices.**

Look at the problem below:

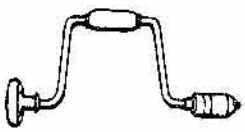
This is used to:

A. chop wood .....
B. scrape paint .....
C. remove nails .....
D. shape metal .....
E. break rocks .....

The picture shows a **hand axe**, which is used to chop wood. An × has been marked in the box after **chop wood.**

Now work the problems below. In each problem, put an × in the box after the right answer. *Mark your answers heavily. Do NOT make any marks except your answers.*

If you wish to change an answer, draw a circle around the box like (☒). Then mark the new answer in the usual way. DO NOT ERASE ANY MARK YOU HAVE MADE ON THE ANSWER PAD.



This is used in:

A. cranking gasoline engines .....
B. bending wood strips .....
C. opening cans .....
D. removing spark plugs .....
E. boring holes in wood .....

This is:

A. a machine bolt .....
B. a carriage bolt .....
C. a window bolt .....
D. a stove bolt .....
E. an eye bolt .....

You should have marked **boring holes in wood** ☒ and **a machine bolt** ☒ on the Answer Pad.

Be sure you understand how to work these problems. When the examiner gives the signal, you are to work more problems like those above.

Work quickly, but try not to make mistakes. You will have 10 minutes, but are not expected to finish in this time. *There are FIVE pages of problems.*

STOP HERE

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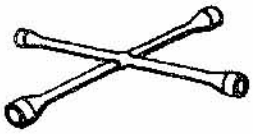
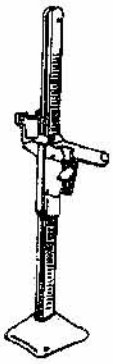
This is used in:
A. refilling storage batteries
B. greasing cars
C. putting out fires
D. killing insects
E. putting icing on cakes

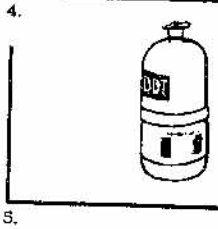


This is used in:
A. replacing spark plugs
B. carrying storage batteries
C. cranking engines
D. changing auto tires
E. drilling holes

This is used to:
A. cut wire
B. open cans
C. loosen valves
D. remove insulation
E. remove tacks

4.

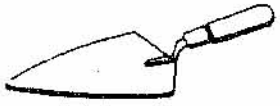




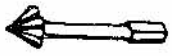
5.

This is used to:
A. kill insects
B. grease cars
C. develop films
D. control steam radiators
E. filter oil

This is used to:
A. measure heights
B. remove inner tubes from tires
C. straighten bumpers
D. jack up automobiles
E. open oil drums

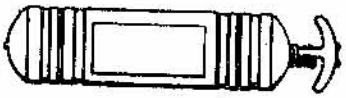


This is used by:
A. woodworkers
B. gardeners
C. blacksmiths
D. bricklayers
E. electricians



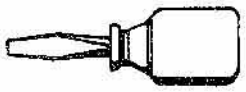
This is used to:
A. countersink for screw heads
B. remove broken screws
C. set hollow rivets
D. bore holes in glass
E. remove rivets

This is a:
A. draftsman's hammer
B. T-square
C. depth gauge
D. saw guide
E. spirit level

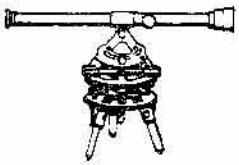


This is used to:
A. put out fires
B. spray paint
C. grease cars
D. spray insecticide
E. dig up asphalt

This is used to:
A. thread pipes
B. straighten bumpers
C. turn nuts
D. tap pipes
E. round corners of nuts

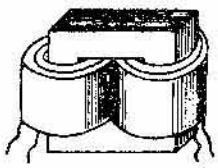


This is used to:
A. tool leather
B. tighten set screws in radio knobs
C. cut slots in wood
D. install window glass
E. drive screws in close quarters



This is used in:
A. drilling for water
B. predicting weather
C. laying out foundations
D. fighting fires
E. examining material for flaws

This is used to:
A. measure water temperature
B. oil machinery
C. test storage batteries
D. water plants
E. put out small fires



This is a:
A. transformer
B. rheostat
C. heating unit
D. toy motor
E. choke coil

This is used to:
A. gauge saw teeth
B. gauge wire
C. prevent leakage around cylinder heads
D. calibrate radio dials
E. adjust the timing of gasoline engines

This is a:
A. machinist's hammer
B. claw hammer
C. riveter's hammer
D. tack hammer
E. ball peen hammer

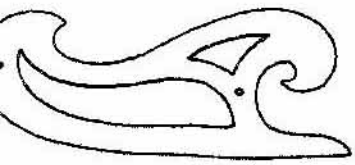
This is used to:
A. hold hot metal
B. cut metal tubing
C. pull gears
D. cut heavy wire
E. carry storage batteries

This is a:
A. cotter pin
B. paper fastener
C. wire staple
D. rung fastener
E. finishing pin

MECHANICAL KNOWLEDGE

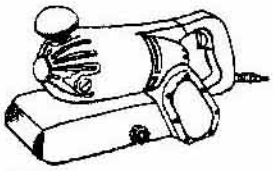
4

4 3 2 1



This is a:

A. French curve
B. protractor
C. ship curve
D. palette
E. curve gauge

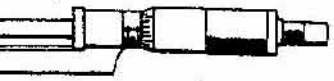


This is used to:

A. saw boards
B. grind metal parts
C. sand boards
D. paint walls
E. cut grooves

This is used to:

A. drill holes in metal
B. bore holes in wood
C. enlarge holes in wood
D. enlarge holes in metal
E. tap wood for large screws



This is used to:

A. punch holes in leather
B. test hardness of metal
C. hold very small objects together while glue sets
D. measure thickness
E. measure depth of holes

This is used to:

A. spray paint
B. oil locomotives
C. solder wires
D. grease machinery
E. weld plates

This is used to:

A. cut sheet metal
B. cut cloth
C. trim hedges
D. open cans
E. cut glass tubing

This is used in:

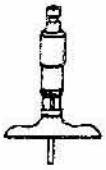
A. picking up small hollow objects
B. laying off distances
C. measuring outside dimensions
D. drawing circles
E. measuring inside dimensions

This is used to:

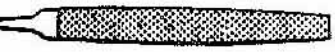
A. cut wire
B. pick up hot metal
C. tighten nuts
D. cut sheet metal
E. cut metal tubing

This is used to:

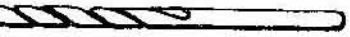
A. remove broken screws
B. bore holes in wood
C. measure inside dimensions of deep holes
D. bore holes in glass
E. countersink rivets



This is used to:
A. punch holes
B. remove broken screws
C. measure the depth of holes
D. measure oil pressure
E. test the hardness of metal



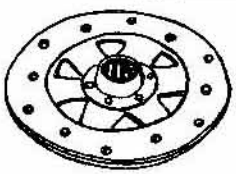
This is used to:
A. do finish work on metal
B. do finish work on wood
C. sharpen saws
D. do rough work on wood
E. sharpen knives and shears



This is used to:
A. remove broken screws
B. thread metal rods
C. drill holes in metal
D. enlarge holes
E. drill holes in rock

This is used to:
A. set nails
B. tool leather
C. support open wiring
D. apply solder
E. countersink nails

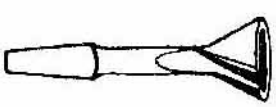
This is used to:
A. ink drawings
B. set rivets
C. scratch lines for sawing
D. tool leather
E. set nails



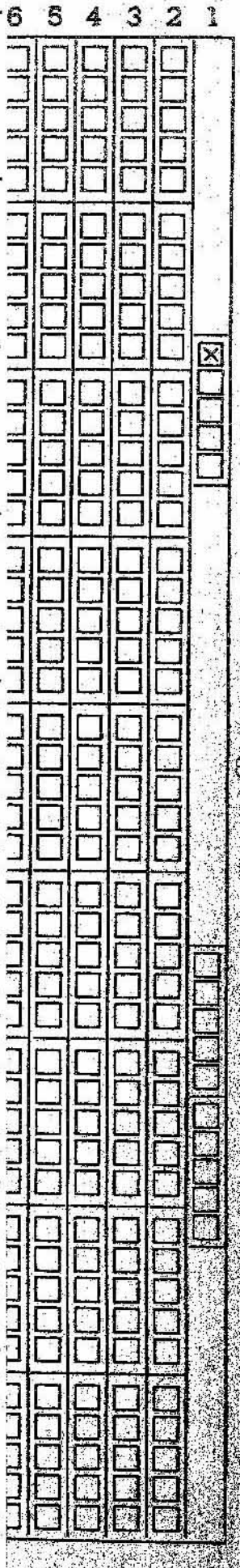
This is a:
A. manifold gasket
B. clutch plate
C. cylinder head gasket
D. universal joint disc
E. brake band

This is used to measure:
A. electric current
B. steam pressure
C. air pressure
D. oil pressure
E. wind velocity

This is used to:
A. drill holes in wood
B. drill holes in metal
C. drill holes in plate glass
D. remove broken screws
E. remove rust from small pipes



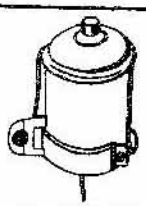
This is used to:
A. clean drains
B. remove broken radio tubes
C. sharpen dowels
D. drill large diameter holes
E. screw electric light bulbs into inaccessible sockets



GO AHEAD

MECHANICAL KNOWLEDGE

6

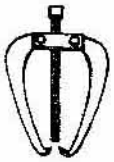


This is used to:

A. filter oil
B. mix gasoline and air
C. distribute current to spark plugs
D. filter gasoline
E. pump fuel

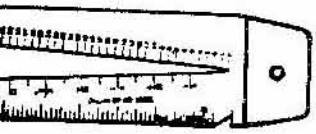
This is a:

A. plumb bob
B. clock pendulum
C. center punch
D. transit knob
E. balance point



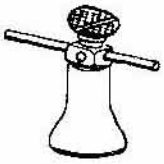
This is used to:

A. pull gears off shafts
B. thread pipes
C. measure outside diameters
D. remove cylinder glaze
E. flare metal tubing



This is used to:

A. draw angles
B. check saw teeth
C. cut grooves in wood
D. measure screws
E. check lathe centers

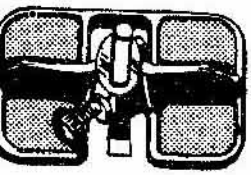


This is a:

A. jack screw
B. clamp
C. micrometer head
D. wheel puller
E. pipe cutter

This is a:

A. belaying pin
B. cleat
C. door stop
D. sash lock
E. drawer pull



This is used to:

A. clamp metal plates while engraving
B. cut grooves in boards
C. etch glass
D. thread screws
E. cut heavy wire

This is used to:

A. toss hot rivets
B. cut pipes
C. handle hot metal
D. cut wire
E. pull nails

This is used to:

A. take tires off rims
B. turn screws
C. pull spikes
D. pry boards loose
E. cut glass

STOP HERE
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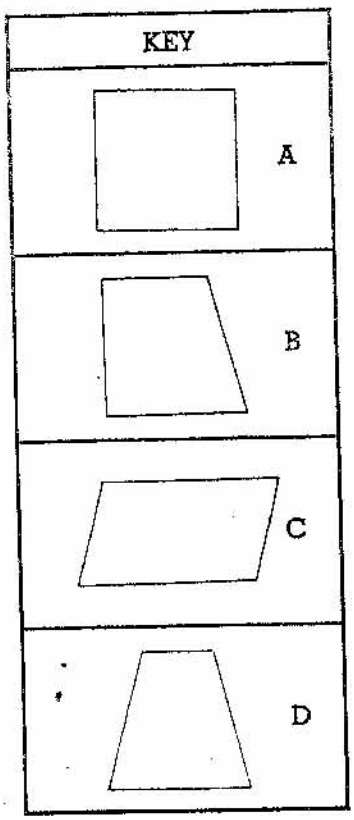
6 5 4 3 2 1


KEY
A
B
C
D

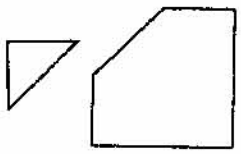
SPACE RELATIONS

PRACTICE EXERCISES

Can you visualize objects in space? Most mechanical jobs require ability to deal with spatial relationships. This second test measures your aptitude in **space relations.**

Look at the problem below:

P-1.



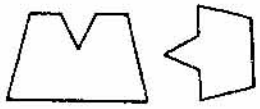
A
B
C
D

If the two pieces were fitted together, they would make figure **A** (as shown in the **KEY** on the opposite page). The right answer is **A.** An × has been marked in the box after **A.**

Now work the problems below. To work each problem, look at the pieces. Decide which of the four figures (**A**, B, C, or D in the **KEY**) could be made if the pieces were fitted together. *Some of the pieces may need to be turned around or turned over to make them fit.* In each problem, put an × in the box after the right answer. *Mark your answers heavily. Do NOT make any marks except your answers.*

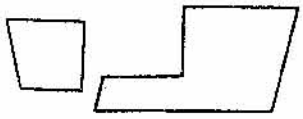
If you wish to change an answer, draw a circle around the box like ⊗ Then mark the new answer in the usual way.

P-2.



A
B
C
D

P-3.



A
B
C
D

You should have marked D ⊠ and C ⊠. Be sure you understand how to work these problems. Remember: *Each set of pieces will make ONLY ONE of the figures. It may be necessary to imagine turning some of the pieces over or turning them around in order to make them fit together.*

When the examiner gives the signal, you are to work more problems like those above. Work quickly, but try not to make mistakes. You will have 10 minutes, but are not expected to finish in this time. *There are FOUR pages of problems.*

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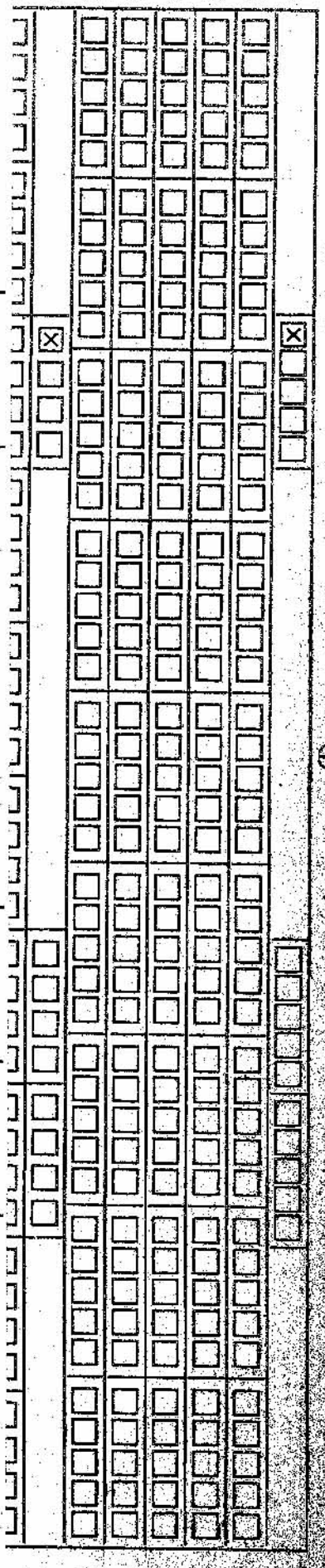
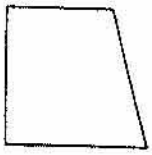
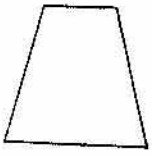
7

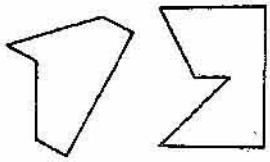
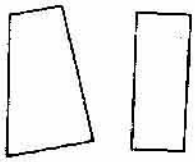
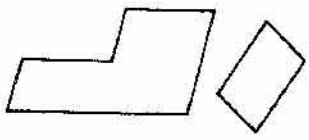
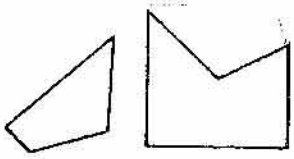
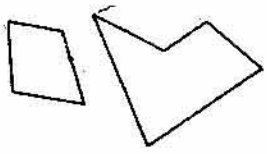
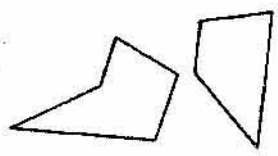
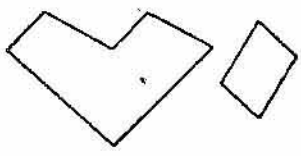
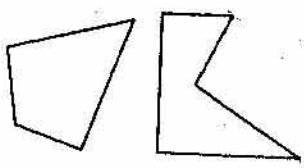
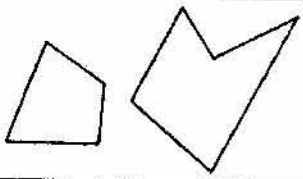
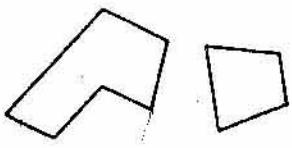
3 7 6 5 4 3 2 1



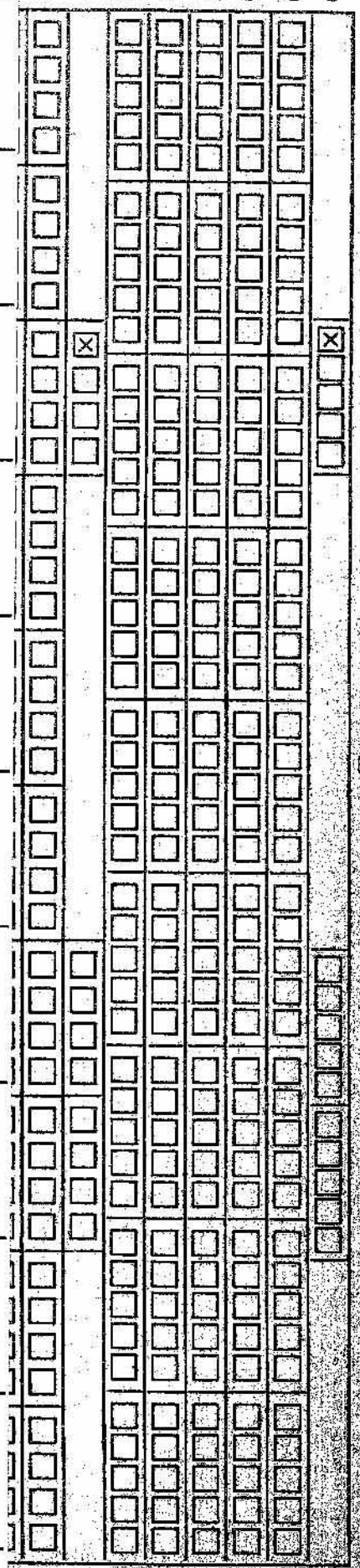
SPACE RELATIONS

KEY	
	A
	B
	C
	D

8

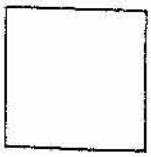
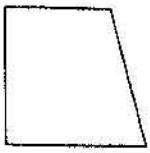
1.  A B C D
2.  A B C D
3.  A B C D
4.  A B C D
5.  A B C D
6.  A B C D
7.  A B C D
8.  A B C D
9.  A B C D
10.  A B C D

8 7 6 5 4 3 2 1



GO AHEAD

SPACE RELATIONS

KEY	
	A
	B
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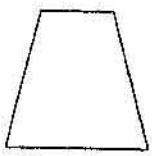
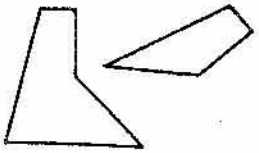
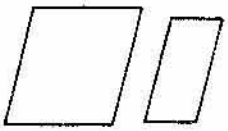
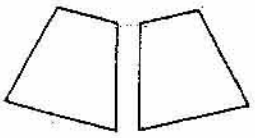
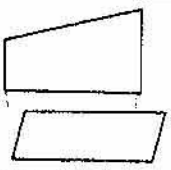
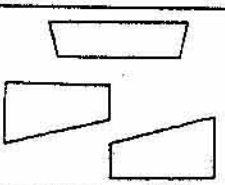
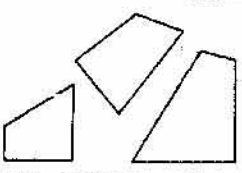
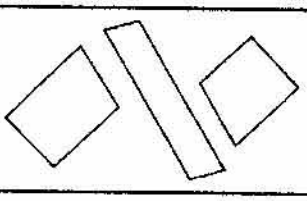
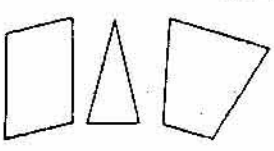
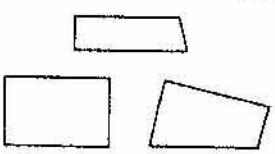
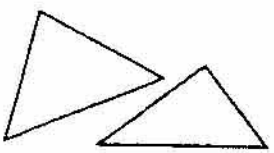
	D

11. 
12. 
13. 
14. 
15. 
16. 
17. 
18. 
19. 
20. 

A B C D

9 0 9 8 7 6 5 4 3 2 1

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SPACE RELATIONS

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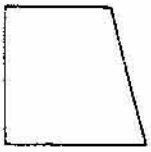	B
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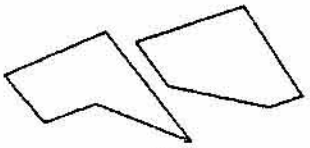
21. 
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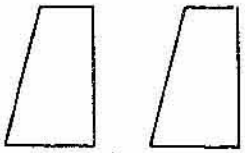
22. 
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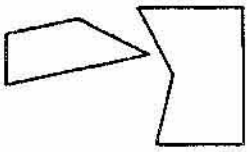
23. 
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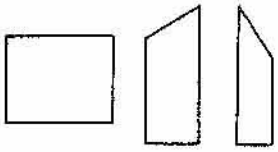
24. 
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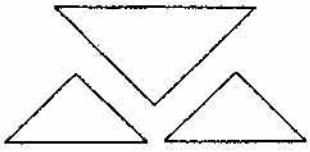
25. 
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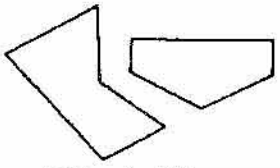
26. 
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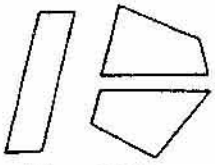
27. 
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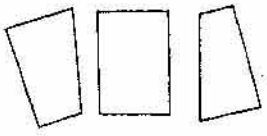
28. 
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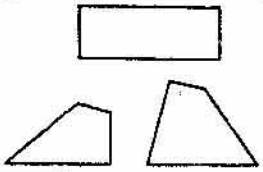
29. 
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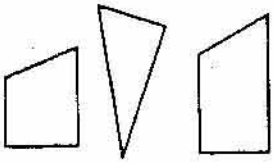
30. 
A B C D

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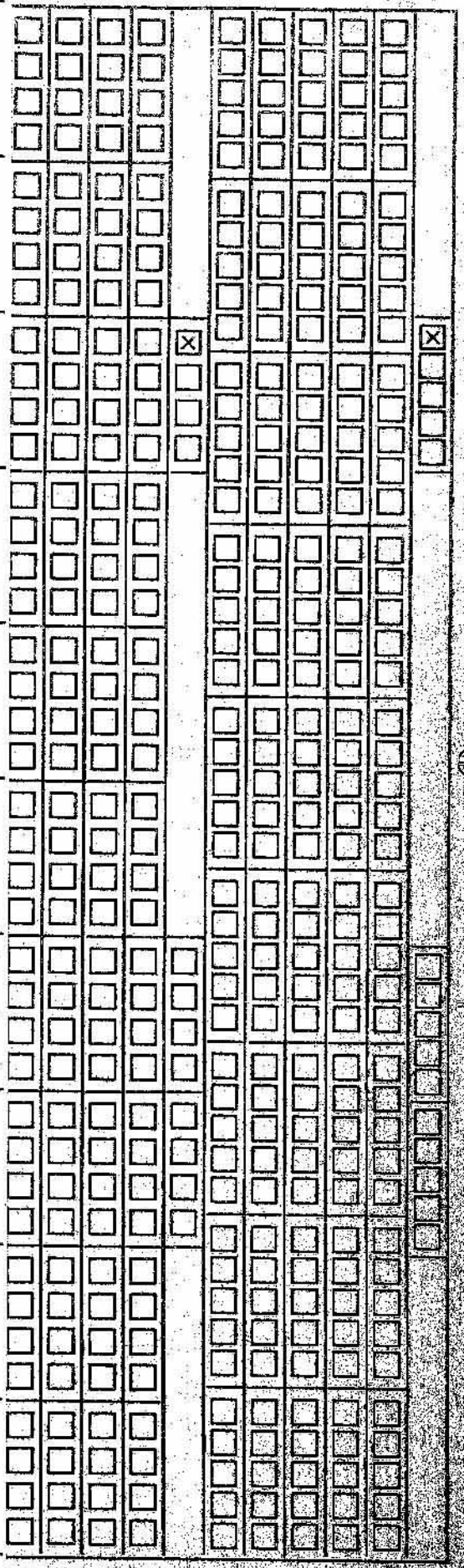

GO AHEAD

KEY

A

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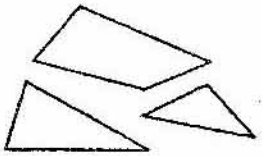
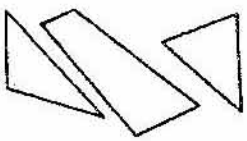
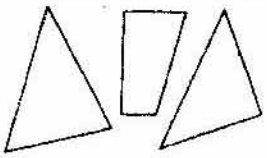
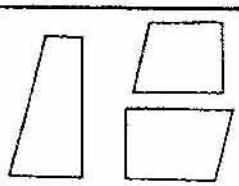
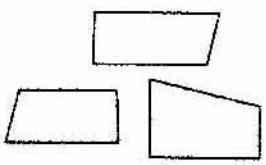
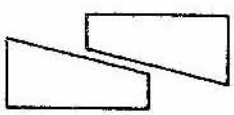
31.  A B C D

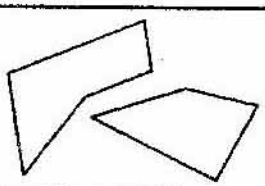
32.  A B C D

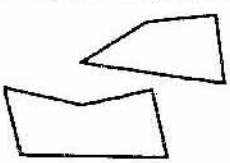
33.  A B C D

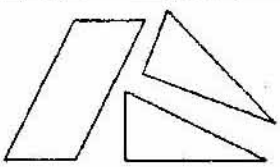
34.  A B C D

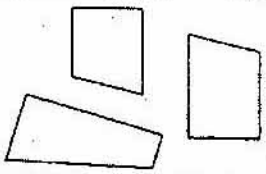
35.  A B C D

36.  A B C D

37.  A B C D

38.  A B C D

39.  A B C D

40.  A B C D

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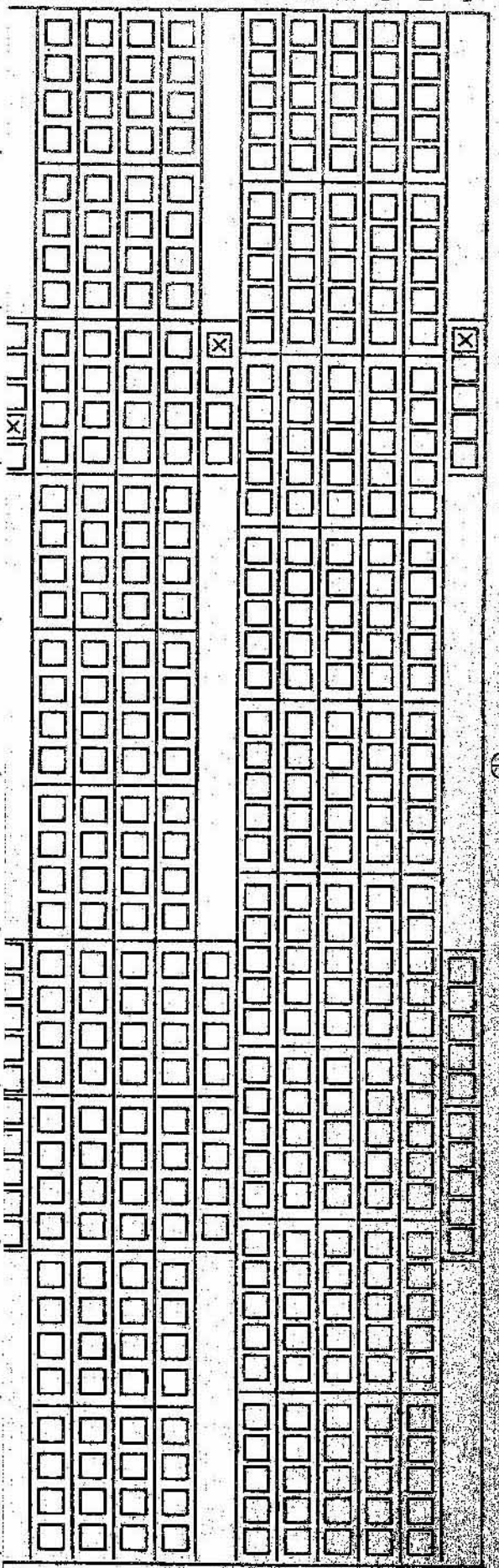

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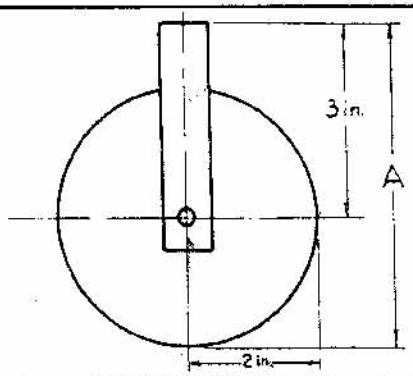
3 in.
A
2 in.

SHOP ARITHMETIC

PRACTICE EXERCISES

Can you handle figures easily and accurately? Most mechanical jobs require skill in number work. This third test measures your aptitude in **shop arithmetic.**

Look at the problem below:

hat is the reading at A?

A. 2.80 inches
B. 2.08 inches
C. 1.50 inches
D. 2.50 inches
E. *none of these*

The right answer is 2.50 inches. An × has been marked in the box after this answer.

Now work the problems below. In each problem, put an × in the box after the right answer. *Mark your answers heavily. Do NOT make any marks except your answers.* Use scratch paper for figuring.

If you wish to change an answer, draw a circle around the box like (⊠). Then mark the new answer in the usual way.

w long is A?

A. 3 inches
B. 5 inches
C. 4 inches
D. 6 inches
E. *none of these*

at is the diameter of the circle?

A. 2 inches
B. 5 inches
C. 4 inches
D. 6 inches
E. *none of these*

You should have marked 5 inches ☒ and 4 inches ☒.

Be sure you understand how to work these problems. When the examiner gives the signal, you are to work more problems like those above.

Work quickly, but try not to make mistakes. You will have 15 minutes, but are not expected to finish in this time. *There are THREE pages of problems.*

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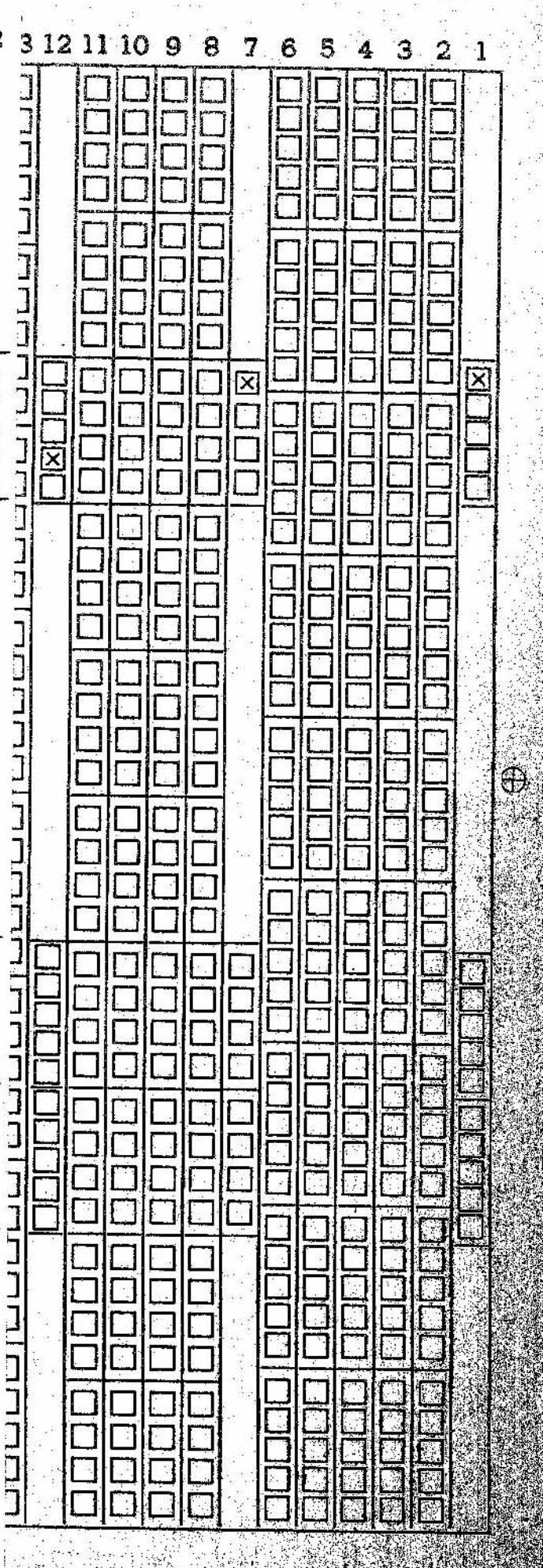
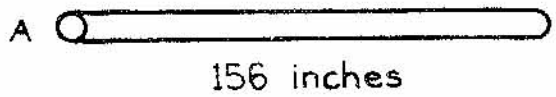
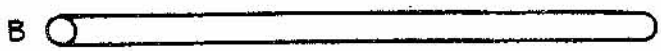
DO NOT TURN THE PAGE

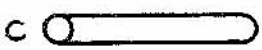




156 inches



192 inches



64 inches

TABLE OF SIEVE OPENINGS

Sieve No.	Sieve opening (millimeters)	Sieve opening (inches)	Wire diameter (millimeters)	Wire diameter (inches)
4	4.76	0.187	1.27	0.050
5	4.00	0.157	1.12	0.044
6	3.36	0.132	1.02	0.040
7	2.83	0.111	0.92	0.036
8	2.38	0.094	0.84	0.033
10	2.00	0.079	0.76	0.030
12	1.68	0.066	0.69	0.027
14	1.41	0.056	0.61	0.024

What is the total length of the 3 pipes?

A. 312 inches
B. 402 inches
C. 412 inches
D. 512 inches
E. *none of these*

How long is A?

A. 3 feet
B. 12 feet
C. 13 feet
D. 52 feet
E. *none of these*

how many times as long as C?

A. 128.00
B. 3.00
C. 2.50
D. 1.23
E. *none of these*

hat would be the length of a pipe that is
/6 as long as C?

A. 192 inches
B. 144 inches
C. 112 inches
D. 54 inches
E. *none of these*

iece 4.35 cm. long and a piece 6.25 cm.
are cut from a steel rod 16.40 cm. long.
w long is the remaining piece?

A. 6.20 cm.
B. 5.80 cm.
C. 5.70 cm.
D. 4.80 cm.
E. *none of these*

w many millimeters larger is the diameter
wire used in No. 6 sieves than that used
No. 14 sieves?

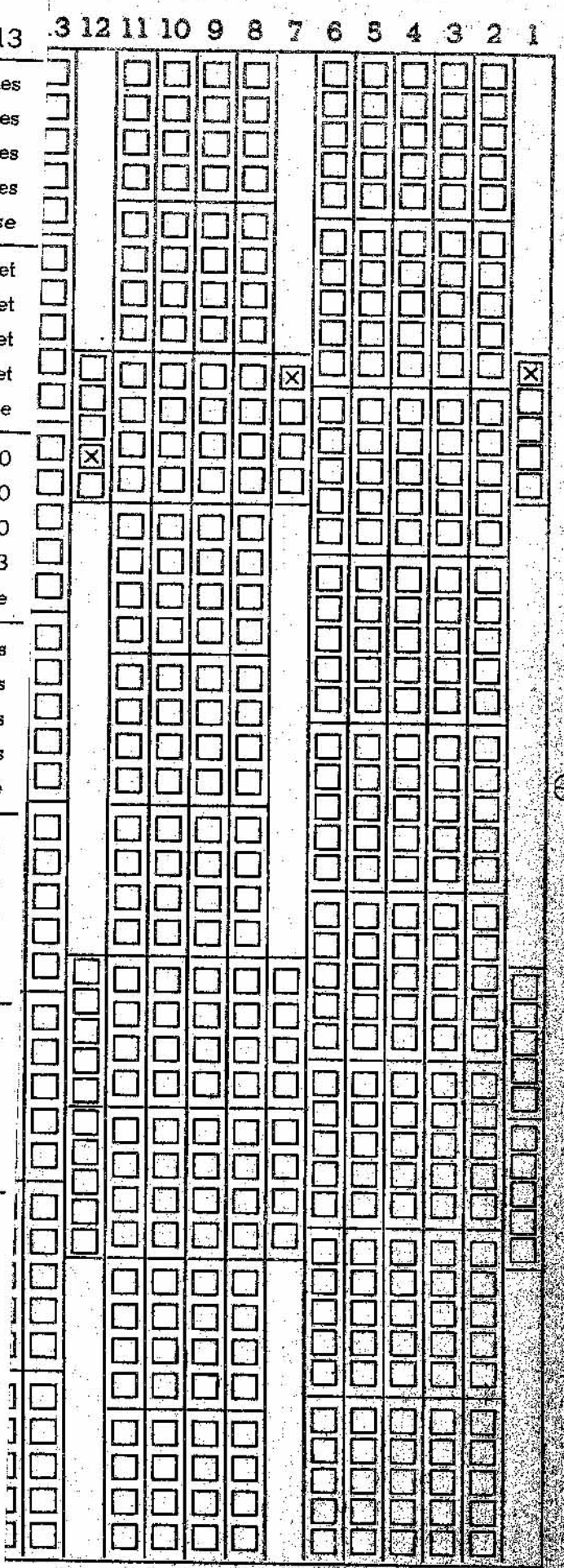
A. 1.950 mm.
B. .016 mm.
C. .420 mm.
D. .410 mm.
E. *none of these*

at is the sieve opening, in inches, of a sieve
which the wire diameter is 0.044 inches?

A. .157 inches
B. .044 inches
C. 5.000 inches
D. 4.000 inches
E. *none of these*

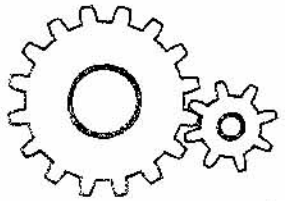
at is the sieve opening, in millimeters,
sieve that has 1/4 the opening of a
4 sieve?

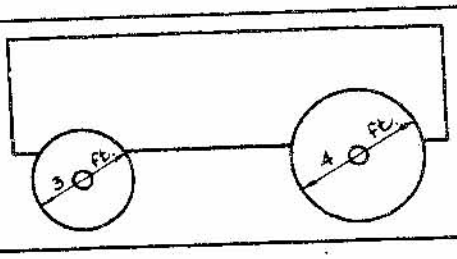
A. 1.4100 mm.
B. 1.1800 mm.
C. 1.1400 mm.
D. .3175 mm.
E. *none of these*

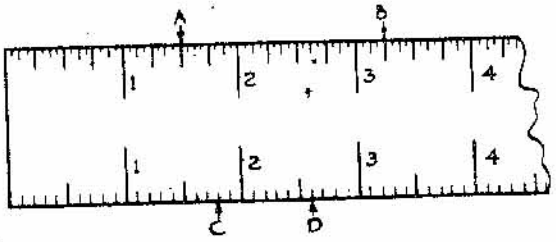


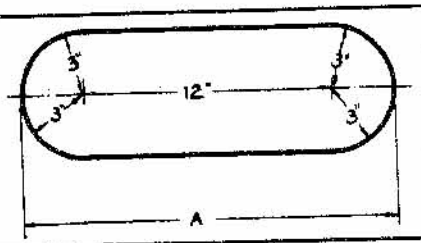
Please use Number 7-132 when reordering this answer pad.

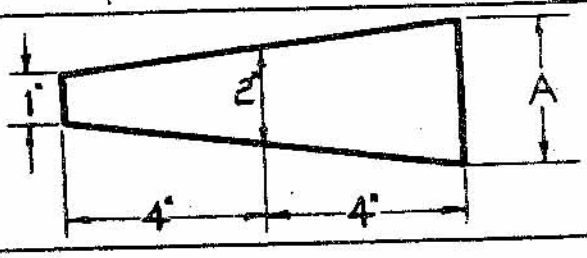
USE SCRATCH PAPER FOR FIGURING











9.

hen the 16-tooth gear turns 4 times, how many times does the 8-tooth gear turn?

A. 2
B. 4
C. 8
D. 16
E. *none of these*

10.

hen the larger wheel has made 60 complete turns, how many has the aller wheel made?

A. 45
B. 60
C. 75
D. 80
E. *none of these*

What is the reading at B?

A. 3.40 inches
B. 3.25 inches
C. 3.04 inches
D. 1.25 inches
E. *none of these*

low much larger is the reading at C than reading at A?

A. .30 inches
B. .03 inches
C. .25 inches
D. 1.75 inches
E. *none of these*

ow much is the reading at D ltiplied by the reading at C?

A. 468.00 square inches
B. 46.80 square inches
C. 4.68 square inches
D. 2.88 square inches
E. *none of these*

shop has 2 gallons, 3 quarts, and 1 pint cutting oil on hand. It uses 7 pints. w many pints are left?

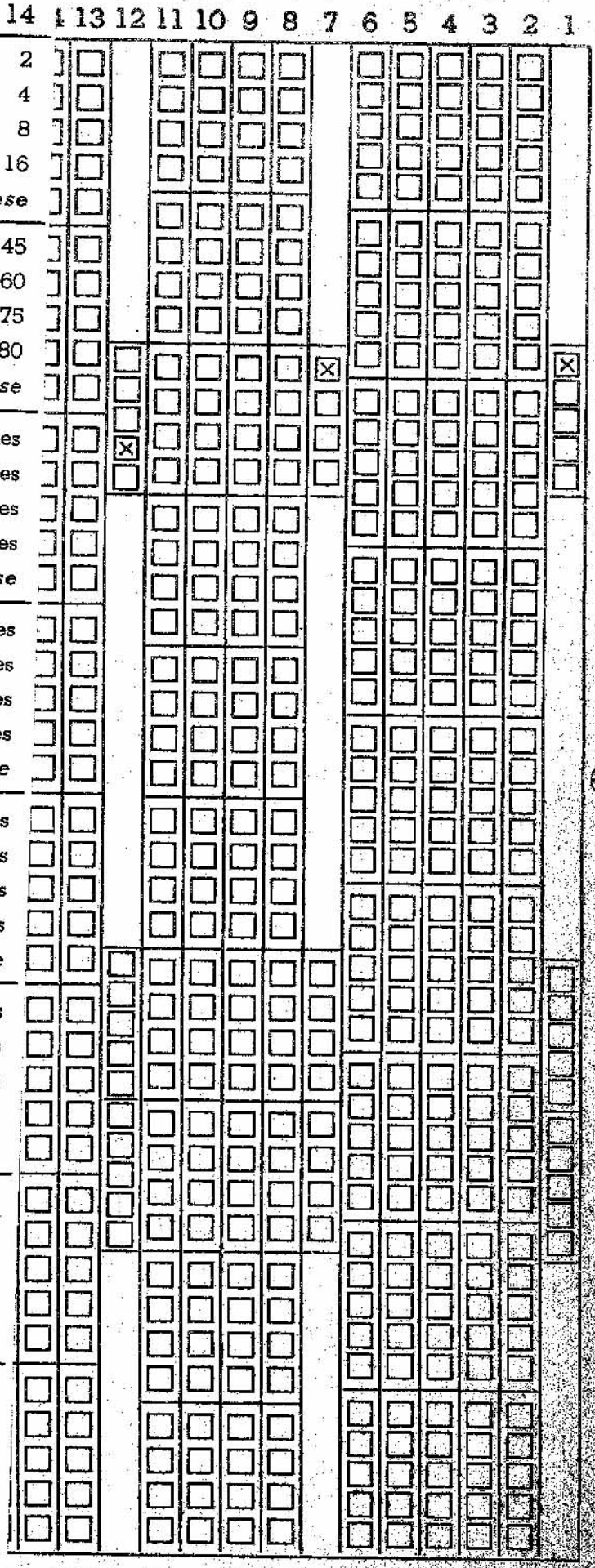
A. 8 pints
B. 15 pints
C. 22 pints
D. 38 pints
E. *none of these*

w long is A?

A. 12 inches
B. 15 inches
C. 16 inches
D. 18 inches
E. *none of these*

w long is A?

A. 8 inches
B. 5 inches
C. 4 inches
D. 2½ inches
E. *none of these*



GO AHEAD

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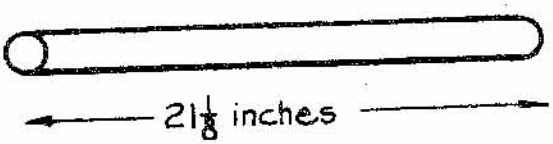
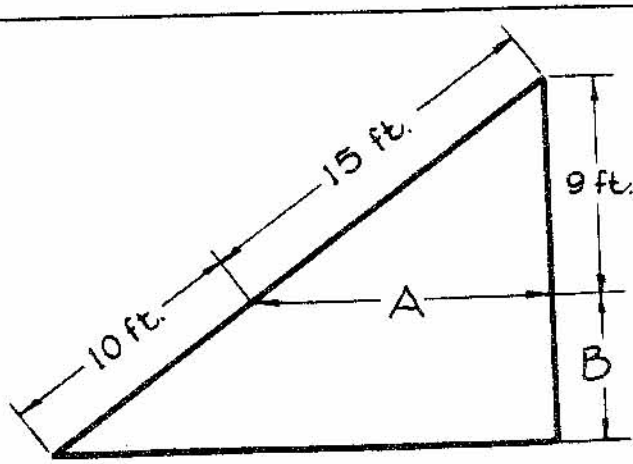
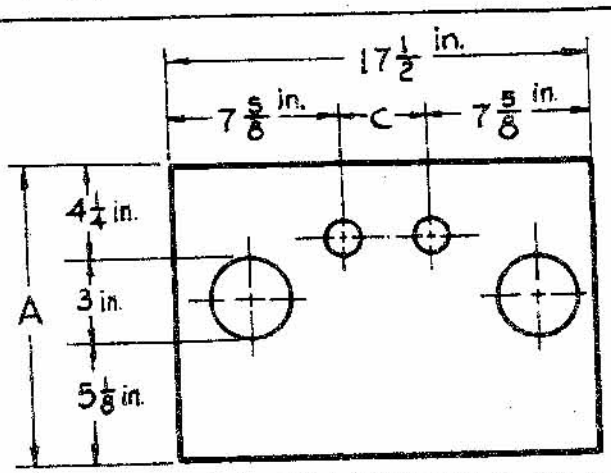
USE SCRATCH PAPER FOR FIGURING







is rod is to be cut into 2 parts so that
e is twice as long as the other. If 1/8
h is wasted in cutting, how long will
e longer part be?

A. 14 inches
B. 10½ inches
C. 7 inches
D. 5¼ inches
E. *none of these*

w many 2-inch pieces can be cut
m such a rod if 1/8 inch is wasted in
ch cut?

A. 10½
B. 10
C. 9
D. 5
E. *none of these*

e rod is to be cut into 3 equal parts.
.124 inch is wasted in each cut, how
g is each part?

A. 6.959 inches
B. 6.917 inches
C. 6.876 inches
D. 7.000 inches
E. *none of these*

e rod is 30% as long as another rod.
w long is the other rod?

A. 63 inches
B. 70 inches
C. 70 3/8 inches
D. 70 5/12 inches
E. *none of these*

w long is A?

A. 6 feet
B. 9 feet
C. 10 feet
D. 12 feet
E. *none of these*

w long is B?

A. 4 feet
B. 5 feet
C. 6 feet
D. 7 feet
E. *none of these*

at is distance A?

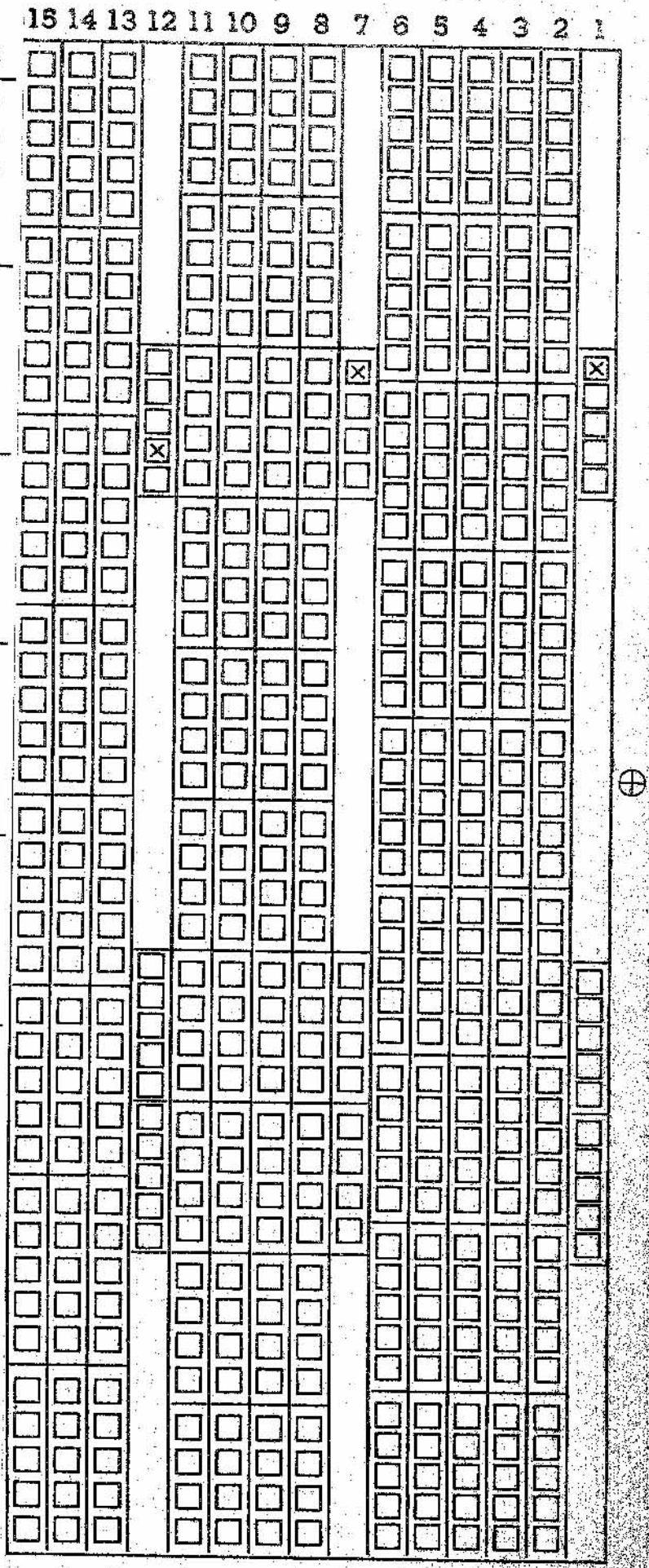
A. 12¾ inches
B. 12⅜ inches
C. 12¼ inches
D. 12⅛ inches
E. *none of these*

at is distance C?

A. 15¼ inches
B. 2¾ inches
C. 2¼ inches
D. 1¼ inches
E. *none of these*

END

(Turn to next page, and print your



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ANSWER PAD

for the

SRA MECHANICAL APTITUDES

FORM AK

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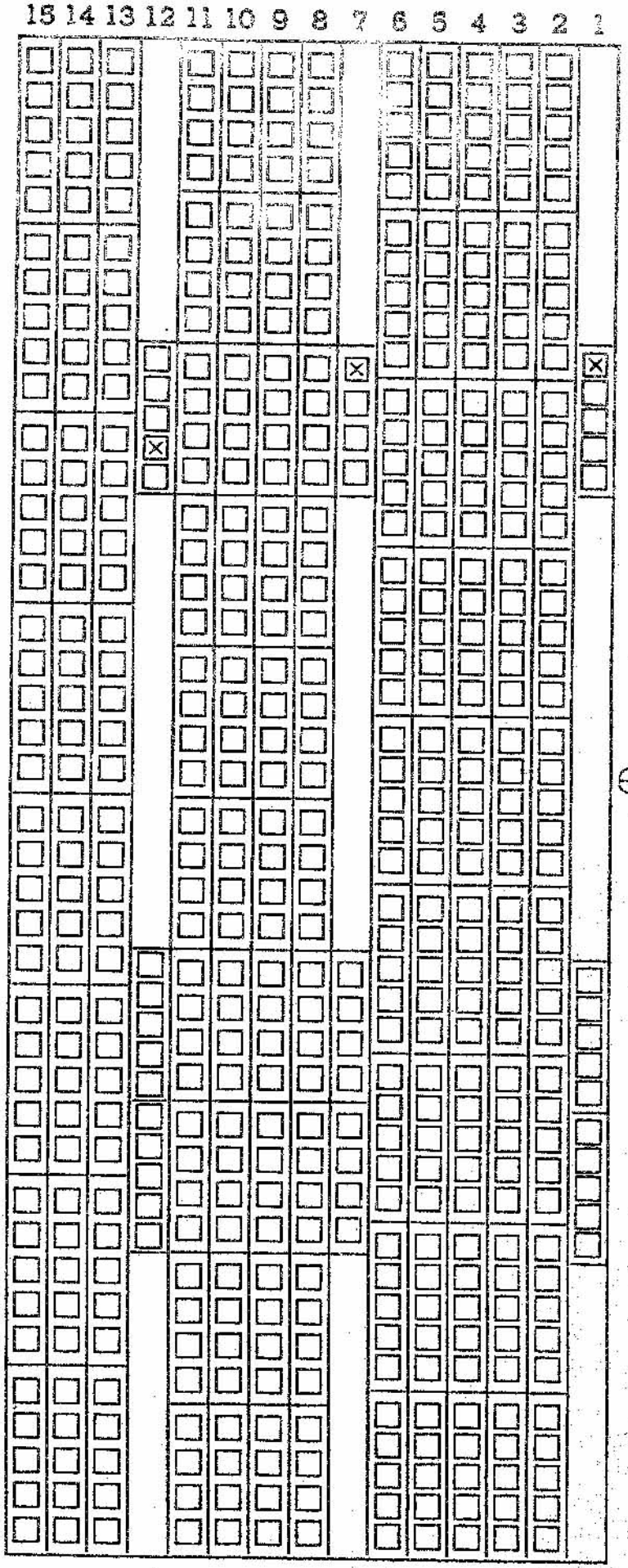
NAME (PRINT) Last First Initial AGE GROUP DATE



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