MULDIVO

calculating machine co. ltd.

calculators

for schools

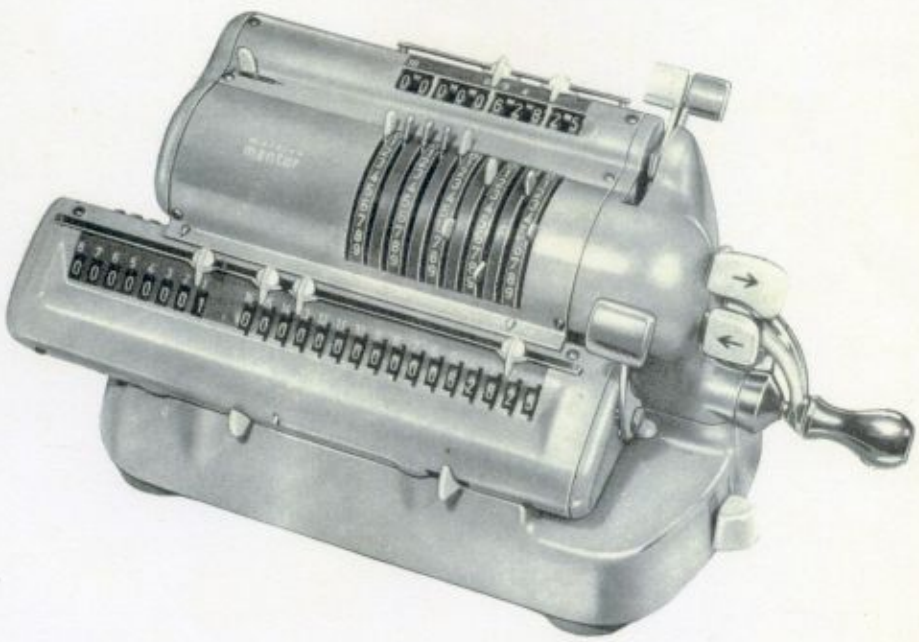
ad Office: DORSET HOUSE · SALISBURY SQUARE · LONDON, E.C.4 · Tel: FLEet Street 8761/7

the *muldivo*

mentor

DESK CALCULATOR

for Education, Commerce and Industry



versatile, fast, simple, dependable, small, light-weight, beautifully styled, economical; a perfect example of precision engineering

MULDIVO CALCULATING MACHINE CO. LTD.

Specifications overleaf ▶

the *muldivo*
mentor
CALCULATOR

THIS IS THE POINT . . . figuring must be fast and error-proof. That is what calculating machines are for. This is what the Muldivo MENTOR does for you better and more efficiently than any other machine in its class. A demonstration will show you how its operation is simple, convenient and fast. Its base measures only 8" x 5", and it is but 5" high. Weight : 10 lbs. only. Thanks to first-rate materials and the finest workmanship, its life span is practically unlimited. The barrel sections, for instance, are made of solid brass and bronze. We can supply a leather case with the machine, so that it can be ready for use anywhere. Ever since 1912 the name of MULDIVO has stood for fine workmanship and quality.

Large capacity

The versatile MENTOR enables you to carry out multiplications, divisions, additions and subtraction. Multiplications such as 999,999.99 x 999,999.99 are within its capacity. The result register has no less than 16 digits.

Error-proof, effortless setting

Long setting levers ensure easy, error-proof indexing of figures. No accidental shifting of adjacent levers. The plastic tops help to avoid confusion and error and eliminate sore fingers and broken nails. Large figures in the setting register make checking easy.

One-hand operation

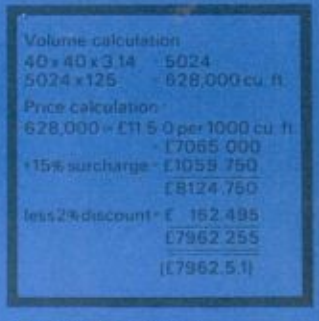
All levers and keys are arranged at the right. The crank can be turned from the wrist without arm fatigue. Moving the carriage to right or left is possible without letting go of the crank handle. One pull of a lever clears the setting levers and engages the back transfer.

Tens transmission

The MENTOR has tens transmission throughout both carriage registers. ***This is essential for schools:*** without it, children lose faith in their machine. It is also important in general calculation work, to ensure correct answers and enable shortcut multiplication.

Back-transfer

Products in continuous multiplications (a x b x c . . .) can be transferred back to the setting levers, instantly. A pull of a lever does the trick. No resetting by hand of intermediate products, thus eliminating a main source of error.



It takes 35 seconds

to do the above calculation. The problem calls for calculating the volume of a container 80 feet diameter by 125 feet high, and the cost of its liquid contents. The only figure to be set by hand is 40.

You can clear both registers at once or either register individually

You can clear the product and revolution registers together or either register individually. The carriage can be set permanently for the type of clearing operation desired. The carriage can be set to slide back automatically to its initial position after clearing.

The heart of the calculator

is the system of gears called the barrel section. Careful finish of all parts ensures reliable operation in all climates and conditions. The attractive yet functional case fully protects the mechanism.

MULDIVO CALCULATING MACHINE CO. LTD.

Dorset House · Salisbury Square · London E.C.4. Tel: FLEet Street 8761/7 (7 lines)

Area Offices: Birmingham · Bristol · Leeds · Manchester · Newcastle-on-Tyne · Nottingham
Glasgow · Belfast · Dublin

LEADING FEATURES OF THE MULDIVO MENTOR HAND CALCULATOR

Long plastic-tipped Setting Levers for easy, comfortable use, especially by children. The plastic caps are colour-coded to assist in learning place value.

Extra-large capacity Product Register. 16-figure results for the price of a 13-figure machine. This also minimises the danger of overspill when setting in dividends.

Direct Setting of Dividends. All 16 wheels in this register are fitted with knurled discs, enabling dividends to be entered directly, without having to set them first on the setting levers and then add. This greatly assists children in understanding and carrying out division.

Simple two-movement Back Transfer. One lever clears the barrel and engages back transfer, the carriage clearing lever does the rest.

Single Carriage Clearing Lever will clear either or both the carriage registers at will. Automatic carriage return on clearing can be engaged at will.

Neat logically-placed Carriage Movement Keys next to the operating handle where they lie naturally to your thumb. Full traverse of carriage to the left is actuated by pressing one button.

Tens Transmission throughout both carriage registers, for unfailing accuracy in calculation.

Modern Styling allied to traditional quality. All barrel segment components are of brass and bronze, the carriage frame is of first-quality steel.

M/312

THE MULDIVO MENTOR HAND CALCULATOR IN SCHOOLS

by a Schoolteacher

Teaching Aid

The machine is a learning and a teaching aid to be used with but not to replace present methods. It teaches the basic mechanics of calculation and reduces an abstract matter to a tangible one. After realising that the basic methods are "easy", the children soon learn to break down difficult problems, and their interest in and enjoyment of mathematics is greatly increased. It has been proved that even after a year's constant use the children, while retaining their initial keenness to use the machines, do not become over-dependent upon them, but acquire and develop the ability, even in exams, to overcome problems which previously they would have considered impossible.

Number Concept

By using machines, the pupil quickly gains a better idea of the "meaning" of numbers, e.g. to set the figure 9, the setting lever must first pass through 1, 2, 3, 4, etc., and this, in the pupil's mind, puts the figure 9 in its proper relationship to the numbers which go before it.

Learning Boosted by Physical Movement

The pupil is given an important aid to his learning ability by adding a physical movement to his already-present senses of seeing and thinking about the figures for, when making a calculation, he must make a movement which corresponds to the actual process he is using, i.e. to add, he turns the handle "forwards" (clockwise); to subtract, he turns the handle "backwards" (anti-clockwise).

"Mechanics" of Arithmetic

It is often difficult for some children to grasp the idea that multiplication is a series of additions, while division is a series of subtractions. By using a machine to demonstrate this, the concept is easily gained and the learning of tables quickly becomes a much easier matter.

Place Value

When the pupil sees units, tens, hundreds, etc. set out in columns, the idea of their relationship is strengthened and clarified; especially when the carriage is moved from column to column, as in multiplication, e.g. 456 x 123 = (456 x 100) + (456 x 20) + (456 x 3). This also forms an excellent basis for the teaching of decimals, (see below).

Number Patterns And Series

Children can explore on the machine the fascinating world of number patterns and series, for instance the calculator shows plainly how every square number is the sum of a series of consecutive odd numbers.

Checking

The machine enables analysis of mistakes by checking the lengthier pencil and paper method, and children soon obtain the confidence that the right answer is attainable. They quickly realise that getting the right answer is easy, as once a problem is taken to the machine, a simple step-by-step method ensures the correct result.

Decimals

The machine is especially useful when dealing with the decimal system, as decimals are illustrated very clearly, including the pointing-off of answers from decimal point positions in factors. The children quickly establish that the numerical answer is the same whether multiplying 12 x 45 or 1.2 x 4.5.

Percentages

Multiplication and division by powers of ten is simplified by moving the pointers, thus the way is paved for the mastering of percentages.

Confidence

Confidence is rapidly gained, especially in the initial stages, as the children think "I can add, therefore I can multiply; I can subtract, therefore I can divide". Very soon the very calculations that they thought too difficult (multiplication

and division) seem within their capabilities and, secure in their mastery of multiplication and division, and in their knowledge of the decimal pointing simplicity, it is not long before problems which would previously have caused the class to close their minds in fear will be cheerfully tackled and correctly answered, e.g. $\frac{(3.75 \times 2.6) - (8.03 \times 0.39)}{9.27 \times 0.359}$

The children know how to break this down, first doing 3.75 x 2.6, then 8.03 x 0.39 etc.

Enjoyment

When using the machines, the children seem to enjoy mathematics instead of finding it tedious. Especially is this so with backward children, for there is no greater spur to incentive than to know that they have got, and will continue to get, the right answer and, moreover, to be quite sure of the simple steps which they used.

Enthusiasm

In one school where machines were installed, the children who volunteered for additional time on machines after school hours varied from the lower levels in their classes to among the top 15 places. It was also observed that the interest of these same children in other subjects was considerably increased - they developed a heightened interest in their school work in general and exhibited a greater mental awareness.

Competition

The machine introduces a wholesome element of competition into mathematical work, the children being able to compete against the machine in obtaining correct answers. In such cases, a cry of "I'm not going to let a machine beat me!" has been heard. Competition between groups of children, with and without machines, is also useful, especially in developing their concentration, a point of inestimable value in exams.

Real-life Problems

Some statistics of everyday life can be compiled swiftly and these always prove interesting and exciting to the children, e.g. how many bottles of milk are consumed per day/per week/per month etc., quantities of food used in preparing school means, traffic statistics, and so on.

Time-Saving

The machines enable the class to carry out complicated problems which would be too time-consuming if ordinary pen and paper methods, involving long calculation, were used. This is especially useful for Sixth Forms who, with the actual calculations done speedily and accurately, can spend more time on the theory and method of the problem.

* *

Proof

A number of schools who have installed machines have said that the children show more interest and greater ability in mathematics, and one primary school headmaster reported that, since using machines, his percentage of 11+ passes has risen by 25%!

A hand calculating machine is one of the greatest boosts to the teaching of mathematics in schools, and MULDIVO is proud to be among the pioneers with the outstanding machine for educational use ..... the Muldivo MENTOR.

MULDIVO LIMITED

REPORT ON THE USE OF CALCULATING MACHINES
IN A MIXED GRAMMAR SCHOOL IN LEICESTERSHIRE

Date: January 1964 - March 1965.

Machines: 5 Muldivo Mentor, 4 Another Make.

Pupils: 750 boys and girls - 11 to 19 years old. (The school is expected to become an 'upper' school in the Leicestershire Plan in 1967, i.e. eventual age range from 14 to 19 years - all I.Q.s.)

NATURE OF THE REPORT

Although the school has been in possession of three or more calculating machines for more than a year, only a small part of the curriculum has been geared to their use. One important reason for this is that the facilities have not been ideal but upon the completion of a Mathematics Room in the new classroom block it should be possible to make the machines more readily available to the pupils both in school time and in their own time. It is hoped that next year's timetable can be arranged to enable most of the lower forms to average at least one period per week using the machines.

SITUATIONS IN WHICH THE MENTORS HAVE BEEN USED

(a) For their own sake:

It has been found worthwhile to capitalise on the novelty value of the machines to stimulate further the interest in various topics - the degree of accuracy which is demanded in problems; a more accurate alternative to the four figure logarithm tables for computation; a better understanding of the four rules of arithmetic; a better understanding of reciprocals; the positioning of decimal points; etc. (Forms 2A, 4C, 4D, 5A, Lower & Upper Sixth Form Maths for Biologists, Schol. 6th)

(b) Arithmetical work to 'O' Level:

Enables easier solutions to more practical problems to be obtained whilst still giving experience in applying principles. Simple interest; areas; volumes; averages; percentages; proportion; conversion of units; etc. (Forms 2A, 4C, 4D.)

(c) Statistics (Cambridge G.C.E. 'O' Level Additional Maths Syllabus):

Machines are not allowed in the examination room but afford a quick and accurate way of applying the principles - and surely this is what a statistician is required to do. Mean; median; standard deviation; variance; index numbers; moving averages; etc. (Forms 5A, Lower & Upper Sixth Maths for Biologists, Schol. Sixth.)

(d) Numerical Analysis:

Some elementary work done in this field with the Schol. Sixth Form. Evaluation of polynomials; square roots; interpolation formulae; simultaneous equations; Main advantage of the Mentor in this work is that the multiplying register and the product register may both be cleared independently.

(e) C.S.E. work:

It is hoped to make good use of the Mentors for both the basic course and the project work at the C.S.E. level when our courses for this commence at the beginning of the next academic year.

FURTHER COMMENTS

The use of the machines in the school is growing as the Staff gain familiarity and skill with them. Lunch time use of the machines on a voluntary basis by 5A and 2A has been reasonably successful. A few of the more backward children (by 'O' Level standards) have gained interest and satisfaction in maths by using the Mentor. Pupils of 18 or 19 years of age have been discounraged by their inability, at first, to obtain the results more quickly than by hand. It would therefore seem desirable to introduce the machines as early as possible in the school. There have been no requests by Sixth Formers for the loan of machines for working the calculations for a science practical. They do, of course, use slide rules. But for the cost several more machines could be used.

MULDIVO LIMITED

REPORT ON THE USE OF CALCULATING MACHINES IN A GIRLS GRAMMAR SCHOOL IN LEICESTERSHIRE

This girls' grammar school has had ten Muldivo Mentor calculating machines in operation for approximately a year. They have been in regular use throughout the school and all age-groups have worked with them.

The first and second year girls who are taking part in the Skemp Maths and Psychology experiment in common with other Leicestershire schools have also used calculating machines for the basic processes. This has helped them in understanding multiplication and division processes, particularly with decimals and in building up the concept of a number system. The thinking-out and setting-down of a clear picture of the series of operations required for the successful completion of a more complicated numerical calculation is a useful exercise in itself. After discovering how to use the machine for basic processes, pupils were given the opportunity of deciding how to use it to solve problems involving a succession of basic operations; at the same time they were beginning to use logarithms for the same purpose.

The Sixth Form have used the machines extensively for more advanced numerical analysis, solving of equations both by matrices and otherwise, integration, etc. They have enjoyed employing numerical integration, both to evaluate definite integrals they could not do by other methods, and to obtain values for Naperian logarithms and approximations to π etc; by means of integrals they were able to complete by conventional means, as well as by the machine. Towards the end of their 'A' Level course some girls found this has helped to tie together and consolidate their work, as well as providing an interesting stimulus and change from their usual methods of working. Some numerical analysis (iterative methods etc.) has been done with the Fifth Form, largely at the end of the year when, after their examinations, these girls are prepared to devote considerable time to topics which arouse their interest.

M/321

April 1965

STOWMARKET MODERN SCHOOL (East Suffolk)

REPORT ON THE USE OF MULDIVO CALCULATING MACHINES by Mr. Ward, Head of Maths Dept.

1. Circumstances

This school was fortunate enough to have two Muldivo Calculating Machines on loan for the period of one term. Having just attended a three-day course in the use of calculating machines I felt in a good position for passing on the benefit of my experience to the children.

Also having ascertained the considerable capability of the machines one can be in no doubt as to the advantage to be gained in their usage in schools.

2. Aims

The aims were as follows:-

(i) To gauge the reactions of the pupils having the machines available.
(ii) To ascertain how much the children could gain on a self-tutorial basis.

3. Method

The machines have been in constant use throughout the term, and the pupils have thoroughly enjoyed using them. I think that they fully realised the need of such opportunities in their school life. Through them I have found an increased interest in mathematics generally.

Each child was given three or four opportunities of using the machines (in pairs) and attempting the set of problems provided by Muldivo.

I found generally that the 'A' Streams could progress quite well, only needing occasional help from me, whereas the 'C' Streams proceeded more slowly needing more frequent help and guidance. This I was not always able to provide since I had the remainder of the class to attend to and this prevented them from making the progress they would otherwise have made, could they have had my constant attention and INSTRUCTION.

A third aim - to ascertain whether selected pupils cound make any significant improvement by frequent use of the machine - was unfortunately abandoned because I found it impossible to prepare, check and moderate such a large volume of work for such a few pupils.

I found in general that there was an increased understanding by the 'C' Streams of the use of the decimal point and the necessity of placing it in the correct position. This having been mastered, they could pass on to quite difficult and involved problems.

4. Conclusions

1a. It can be definitely stated that there is a need for these machines in schools. This can be judged by the favourable reaction by the children to the machines and by the way they came back every lunch time to use them. For many children, in fact, their interest in mathematics was re-awakened.

1b. I am absolutely sure that the machines will come into general use and that they will have a profound effect on the teaching of mathematics in sweeping away the difficulties of mechanical computation and enabling children to understand more difficult mathematical concepts and, moreover, children will have the means of solving the problems involved.

2. Although the experiment was strictly limited by the number of children who could operate the machines at any one time, the conclusion can be drawn that the children, relieved of the purely mechanical dealing with numbers, were able to master quite difficult problems using the machine once they had discovered or been shown the technique involved.

3. The children of lower ability need to be instructed in the technique of using the machine.

4. The machines are as reliable as the manufacturing company maintains.

M/323

REPORT NO. 1. For MULDIVO CALCULATING MACHINE CO. LTD.

September to November, 1963

CALCULATING MACHINES IN THE MATHEMATICS LABORATORY

No. of Machines: 6 (5 MULDIVO DER and 1 MULDIVO CER)
Pupils: 400 boys 11 years to 15+
School: Paignton Cy. Sec. School for Boys

GENERAL SITUATION

In order to understand the type of work attempted it is necessary to outline briefly the particular circumstances within the school.

Mathematics is taught in SETS for three double periods a week to each set. One double period is spent in the Mathematics Laboratory and two double periods under normal classroom conditions.

As we have only six machines it is not possible to form a concentrated experimental group and it has been decided to use machines within the Mathematics Laboratory. Although the Mathematical Laboratory work is varied and individual in its nature there is at present one specific section for the use of calculating machines. This is a temporary measure, and as soon as the boys (as a whole) have a working knowledge of the machines they will be more generally used for the individual experiment type work. This is already the case in the senior half of the school as many 4th and 5th year pupils have spent considerable out of school time perfecting their skills on the basic functions of the machine.

5th Year. Pupils in this form are in their final year at the school and either taking G.C.E., U.E.I., C.S.E., in Mathematics and Commerce. Although their time is rather limited they have devoted considerable out of lesson time to the machines and are quite competent operators.

The particular interesting work covered has been Compound Interest, Stocks and Shares, and root calculations, and all the remarks made in this report concerning SET 1 pupils apply to this Form.

SET 1 - 11 to 15+ years. These pupils now use calculating machines as an option against logs or manual calculation depending on the work concerned. Most pupils in this ability group realize the value of speed when dealing with their particular experiment and there is definite consideration given to the most appropriate method to adopt but often the machine is used as a check against log or manual working. There is no doubt whatsoever that the boys have accepted the machines as an aid to calculation, and after the initial enthusiasm to use the machines at all cost, have shown signs of using them intelligently and to real advantage.

The main purpose behind the inclusion of machines in our school is in conjunction with Mathematics Laboratory work in order that more time may be spent on experiments. These experiments often involve rather difficult calculations independent of the Mathematical idea concerned and the machines allow much more concentration on the idea leaving the calculation to the machine. It is true that any arithmetical experiment must be correct to certain limits depending on the nature of the work but this limit when imposed by the teacher rings rather false and many pupils feel that a false situation has been evolved or fabricated. With any experimental method it is very desirable that the pupil is able to use the figures from his own experiment irrespective of the complexity of the numbers. It is interesting to note that the pupil given a machine as an aid tends to fix his own limits by cutting out decimal places when they have little relevance to the experiment concerned.

An example of this was found in the model section in train set/and model cars. These experiments involve timing a train around a rather small track and relating the speed to M.P.H. Scaling up the speed to its comparison with an actual train - these calculations often involve converting inches per second to M.P.H. and inches of length to tens of feet. The basic principles involved in such experiments are much more important than the actual rather tedious calculations. Further examples can be found in the Solid Geometry Section where pupils calculate the volume of the regular Polyhedra they have constructed. With the use of machines the trigonometry calculations can be compared quickly with actual measurement.

MONEY CALCULATIONS Although it is possible to feed £.s.d. calculations into the machines pupils soon realise the need to convert to decimals in order to gain full use and advantage from their machine. Given the need and the desire this particular operation seems to be mastered quickly.

/Continued.....

REMEDIAL GROUP - SET 3. The machines have been used by these boys for basic addition/ subtraction in the first instance and the fact that "at last" the pupil is able to achieve success, i.e. obtain the correct answers to basic computation give an undoubted sense of achievement. Often pupils of Set 3 standard from a complete mental barrier against calculations of any type and the idea of completing a page of addition or subtraction sums with 100% success (or even 50%) is completely beyond their experience. With the machines these results are obtained by most pupils. At this stage the main point is inculcating a sense of achievement rather than one of learning a process. The next stage will be to encourage the pupils to attempt calculation (+ -) and to check them on the machine. In the rather free activity nature of the Mathematics Laboratory work this desire must come from the pupils themselves. Although at this stage a certain success in this direction can be claimed with a few pupils it cannot be claimed for the group as a whole. On the other hand one or two interesting points have become evident, i.e. (a) pupils have shown some indication of understanding place value of numbers - they are fascinated by the build up of numbers, i.e. 4,5,6,7,8,9,0 and the 1 appearing in the tens column, (b) the less able boy seems to enjoy building up his tables - in fact some pupils even build tables beyond 12 times. They also seem fascinated with tables of square numbers.

GENERAL OBSERVATIONS: It is rather early at this stage to make too many general statements but it is evident that the following points are fair to make for work with the less able pupil.

Advantages the machines have;-

a) Give an interest in pure numbers,
b) Give a sense of achievement in ability to obtain correct results.
c) The machines seem to create interest in calculation.
d) It is important to note that the machine work supplements normal calculation methods and does not replace basic skills.

Regarding the long term view of calculating machines as an aid to remedial teaching, I feel that they have rather limited application. These pupils have not found the basic operations too easy to master, other thansimple numbers addition and subtraction, and devote so much of their limited resources to pure operation that they completely lose sight of the basic principles involved. In the general teaching of remedial mathematics it is a simple matter to work the pupils hard on repetitive skills already mastered, but breaking new ground is extremely difficult. It will be interesting to see whether the machines encourage or present the pupils with a challenge to attempt new work but the experience so far indicates a passive tendency to turn the handle one way or the other until told to stop, and even at this stage the tendency is then to either turn the handle the other way, or to repeat the similar process with different numbers. This tendency is NOT the result or fault of calculating machines; it is very much the problem whatever method of teaching is attempted, but at this stage it would seem to me that the machines offer little to overcome this problem. However I will continue with the work through our remedial group teachers and indicate further observations in the second report.

There is obviously a great deal of work to investigate in relation to calculating machines in the Mathematics Laboratory situation and generally in Mathematics teaching. I am quite convinced that the general interest factor is as important as any. This is a machine age, and mathematics by machine has a definite place in the schools mathematics syllabus.

The machines have obvious limitations but this is an essential part of education to allow the child to experiment to find these for himself. When introducing these machines to our pupils I sensed an immediate acceptance of the grounds that "at last, an end to calculation" but despite this I have noticed considerably more manual calculation than ever before - it is true that this has come about incidentally, but in my opinion this is the true place of basic arithmetical calculation in any mathematics teaching.

This report is rather limited in content as the more able pupils have not had sufficient time to apply the machines to more advanced work but it is hoped that report No. 2. will be more detailed in this respect, as most Set 1 pupils have now mastered the basic skills and will be encouraged to apply the machines to more complex mathematical situations.

D. E. Eastment,
Head of Mathematics Department,
Paignton Cy. Sec. School for Boys.

A CALCULATING MACHINE EXPERIMENT

Conducted by the Mathematics Department
of a School in the Midlands Region with
10 Children whose I.Q.'s (9+) Range from 75 to 93

1.
$$\begin{array}{r} 24 \\ 19 \\ 58 \\ \hline 101 \end{array}$$

2.
$$\begin{array}{r} 56 \\ 42 \\ 192 \\ 17 \\ \hline 307 \end{array}$$

3.
$$\begin{array}{r} 72 \\ 98 \\ 165 \\ 59 \\ \hline 394 \end{array}$$

4.
$$\begin{array}{r} 156 \\ 428 \\ 17 \\ 29 \\ 4 \\ \hline 634 \end{array}$$

5.
$$\begin{array}{r} 74 \\ 59 \\ 264 \\ 107 \\ 314 \\ \hline 818 \end{array}$$

6.
$$\begin{array}{r} 356 \\ 24 \\ 142 \\ 19 \\ 8 \\ 256 \\ \hline 805 \end{array}$$

7.
$$\begin{array}{r} 384 \\ 416 \\ 72 \\ 6 \\ 39 \\ 142 \\ \hline 1059 \end{array}$$

8.
$$\begin{array}{r} 347 \\ 596 \\ 144 \\ 378 \\ \hline 1465 \end{array}$$

9.
$$\begin{array}{r} 268 \\ 743 \\ 299 \\ 465 \\ \hline 1775 \end{array}$$

10.
$$\begin{array}{r} 36 \\ 9 \\ 428 \\ 17 \\ 598 \\ 756 \\ \hline 1844 \end{array}$$

1. $79 - 53 = 26$

2. $546 - 321 = 225$

3. $194 - 67 = 127$

4. $524 - 167 = 357$

5. $590 - 427 = 263$

6. $811 - 467 = 344$

7. $700 - 555 = 145$

8. $4324 - 1675 = 2649$

9. $6004 - 3651 = 2353$

10. $7235 - 4680 = 2555$

1. $24 \times 4 = 96$

2. $36 \times 6 = 216$

3. $85 \times 5 = 425$

4. $71 \times 3 = 213$

5. $97 \times 6 = 582$

6. $234 \times 8 = 1872$

7. $156 \times 9 = 1404$

8. $302 \times 4 = 1208$

9. $5008 \times 6 = 30048$

10. $4567 \times 9 = 41103$

1. $6\overline{)43}$ = 7

2. $5\overline{)75}$ = 15

3. $6\overline{)91}$ = 15

4. $7\overline{)102}$ = 14

5. $8\overline{)342}$ = 42

6. $3\overline{)1431}$ = 477

7. $9\overline{)3004}$ = 333

8. $7\overline{)2326}$ = 332

9. $6\overline{)569}$ = 94

10. $4\overline{)5009}$ = 1252

MULDIVO CALCULATING MACHINE CO. LTD.
Dorset House, Salisbury Square,
London, E.C.4.

M/248/1/5

Scores and Times Before 8 Hours Calculating Machine Practice

	Name	I. Q. (9+)	A. Q. (9+)	Age Yrs. Mths	+ 10	Mins.	− 10	Mins.	× 10	Mins.	÷ 10	Mins.	Total (40)	%	Position
A	A	89	94	9.8	10	5	9	4½	7	5½	9	5¼	35	87.5	1
C	C	88	86	10.3	9	9	9	6	6	8½	1		12	25	62.5	3
E	E	93	78	9.8	9	10¼	5	4	5	7	3		8	22	55.0	5
B	B	93	80	10.0	9	6¾	6	3½	10	5½	3		7½	28	70.0	2
B	B1	82	81	9.10	3		9	10	3¾	4	7½	1		6½	18	45.0	8
D	D	81	82	10.1	6	8	8	5½	7	6¼	4		10½	25	62.5	3
D	D1	83	84	10.3	6	8¾	8	4	5	8½	3		9½	20	50.0	6
C	C1	76	80	9.6	6	8¼	2	3¼	9	5	1		5¼	18	45.0	8
A	A1	83	73	10.1	5	13	6	5	5	13+	2		12	18	45.0	8
E	E1	75	73	10.4	7	10	8	5½	5	9¾	0		3	20	50.0	6
		AV. 84	AV. 88	AV. 10.0	7	8.8	7.1	4.5	6.1	7.6	2.7	7.9	22.9	57.2%	

The Four Initial Tests were given during one day. Children gave answer papers in as soon as sums were finished - no checking time allowed.
In the Multiplication and Division Tests they were NOT permitted to have a Table Diagram at hand. Marks and Times were carefully recorded.
Children were paired off for Machine Practice. Each pair had TWO hours practice in each process. They set themselves sums - worked them out - then checked on the machine. They were encouraged to do as many sums as possible in the two hour practice time - Speed with Accuracy was aimed at.
For the Five Pairs to each have TWO hours practice in each of the Four Processes took Ten School Days.
Finally, the Initial Tests were done again - scores and times noted and the Initial and Final Results examined.

Calculating Machine Practice Groups

A (A, A1) D (D, D1)

B (B, B1) E (E, E1)

C (C, C1)

Grouped after Initial Test

= Half Marks or Less

M/248/2/5

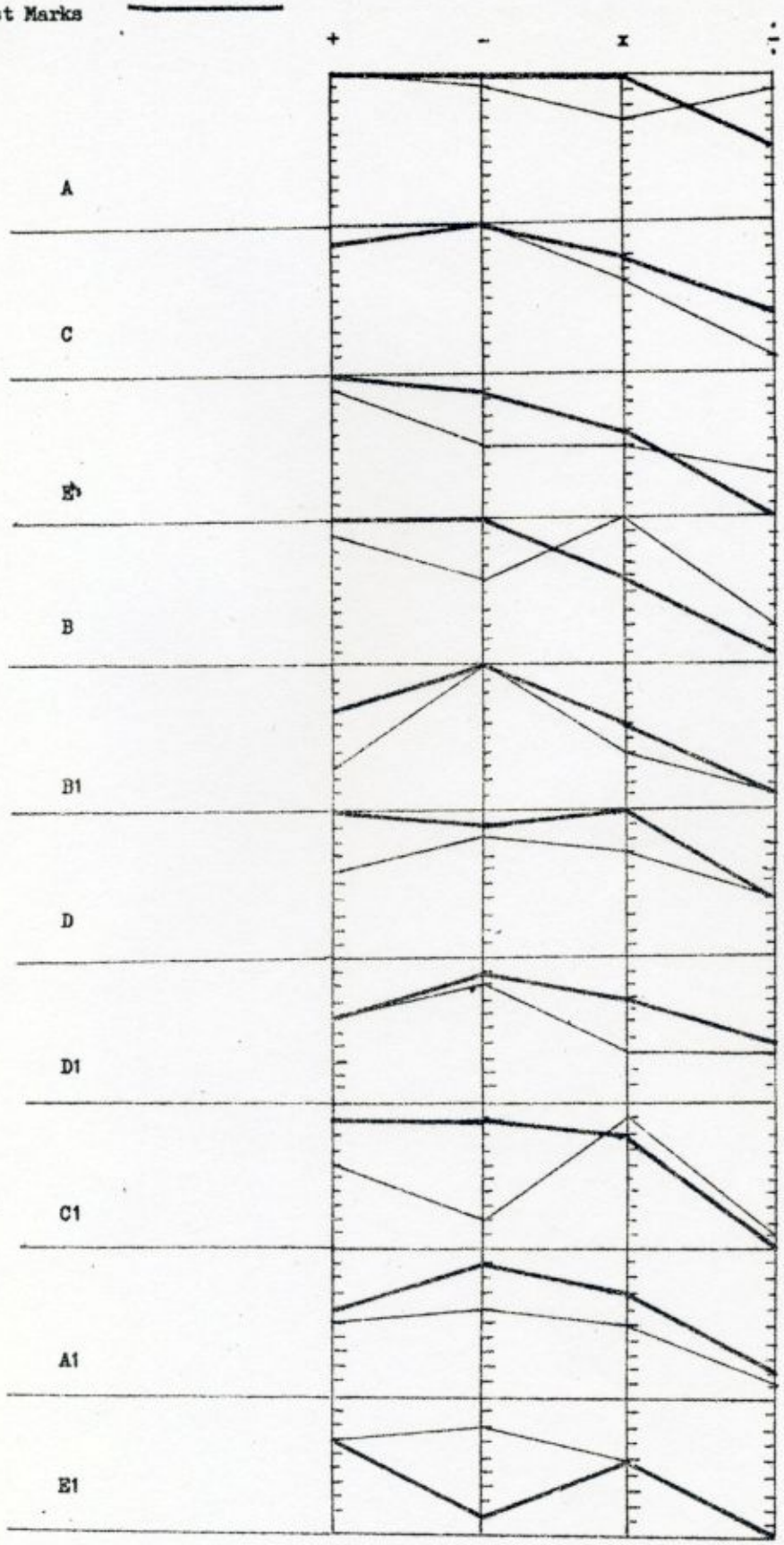
- Subtraction

x Multiplication

÷ Division

Initial Test Marks ————————

Final Test Marks ━━━━━━━━



V248/3/5

Process	Initial Tests				Final Tests			
	+	-	x	-	+	-	x	-
No with more than half marks	8	8	5	1	10	9	9	1
No with half marks or Less	2	2	5	9	0	1	1	9
No. with more than half in all Four tests combined	FIVE				NINE			
No. with half or Less in all four tests combined	FIVE				ONE			

Process	+	Time Mins	-	Time Mins	x	Time Mins	-	Time Mins
Av. for Initial Tests	7/10	8.8	7/10	4.5	6/10	7.6	2/10	7.9.
Av. for Final Tests	8/10	6.3	8/10	4.3.	7/10	6.7.	2/10	15.1

Observations After the Experiment

1. The Calculating Machine can never take the place of sound teaching of basic methods and rules.
2. When a child has a good grasp of a method - use of the machine in checking seems to build up confidence in performance (Note Results in Addition, Subtraction and Multiplication.
3. Use of a machine before a process has been mastered leads to confusion (Note results in Division Process).
4. The ability to use the machine correctly was soon acquired by these dull and retarded children.
5. It was noticed:-
   a) That children concentrated for much longer periods when a machine was available for checking.
   b) The children seemed to want to compete successfully against the machine "which never makes mistakes".
   c) Children worked two to a machine most amicably and we never once witnessed any argument about whose turn it was to use the machine.
6. I feel that a Calculating Machine can be used with advantage with small Groups of Dull and Retarded Children.

Scores and Times After 8 Hours Calculating Machine Practice

Name	I. Q. (9+)	A. Q. (9+)	Age Yrs. Mths	+ 10	Mins.	− 10	Mins.	x 10	Mins.	÷ 10	Mins	Total (40)	%	Position
A	89	94	9.8	10	4¼	10	3½	10	3½	6	11¼	36	90	1.
C	88	86	10.3	8	6½	9	4¼	8	6½	4	18	29	72.5	3
E	93	78	9.8	10	5¾	9	4¼	6	7½	0	18	25	62.5	7
B	93	80	10.0	10	7¼	10	4½	6	9¾	1	15¾	27	67.5	4
B1	82	81	9.10	7	6½	10	2¾	6	7¼	1	9¼	24	60.0	8
D	81	82	10.	10	6¾	9	4½	10	5¼	4	17	33	82.5	2
D1	83	84	10.3	6	5¾	9	2¼	7	5	4	13	26	65.0	5
C1	76	80	9.6	9	4¾	[illegible]	5¼	8	3¾	0	5¼	26	65.0	5
A1	83	73	10.1	6	7¾	9	5¼	[illegible]	8½	2	18½	24	60.0	8
E1	75	73	10.4	8	7¾	1	6¾	5	9½	0	15	14	35.0	10
	AV.84	AV.88	AV.10.0	8.4	6.3	8.5	4.3	7.6	6.7	2.2	15.1	26.4	66%	
	Initial Test Figures			7.0	8.8	7.1	4.5	6.1	7.6	2.7	7.9	22.9	57.2%	

Final Test Compared with Initial Test

	Addition Score	Addition Time	Subtraction Score	Subtraction Time	Multiplication Score	Multiplication Time	Division Score	Division Time
A	Same	-¾	+ 1	- 1	+ 3	- 2	- 3	+ 6½
C	- 1	-2½	Same	-1¾	+ 2	- 2	+ 3	+ 6
E	+ 1	-4½	+ 4	+¼	+ 1	+½	- 3	+ 10
B	+1	+½	+ 4	+1¾	- 4	+4½	- 2	+ 8¼
B1	+ 4	-2½	Same	- 1	+ 2	-¼	Same	+ 2¾
D	+ 4	-1¼	+ 1	- 1	+ 3	- 1	Same	+ 6½
D1	Same	-3	+ 1	-1¾	+ 4	-2½	+ 1	+3½
C1	+ 3	-3½	+ 7	+2	- 1	-1¼	- 1	Same
A1	+ 1	-5¼	+ 3	+¼	+ 2	-4½	Same	+ 5½
E1	+ 1	-2¼	- 7	+1½	Same	-¼	Same	+12
	(+)=7		(+)=7		(+)=7		(+)=7	

Increased Scores	23
Same Score	9
Decreased Scores	8
	40
Decreased Time	22
Same Time	1
Increased Time	17
	40

A Plus Score and a Minue Time are favourable Indications.

M/248/5/5