Operator's Manual

© 2010 Joerg Woerner
Datamath Calculator Museum

Apothecalc®

INTRODUCTION

The APOTHECALC computer is designed for the use of medical personnel having a need to perform apothecary calculations and conversions. The computer is designed to be easy to operate and to allow the user to concentrate on the problem rather than on the use of the computer.

The computer has three modes of operation. First of all it is a four function calculator; that is, it can add, subtract, multiply, and divide. Secondly, it can perform many commonly used conversions. Thirdly, it can perform a total of 11 complicated computations, such as determination of Body Surface Area and determination of the required drip rate given a desired dose, patient body weight and weight of medicine dissolved in a known solution volume.

When the computer is operating in the mode which performs these complicated computations, it will interact and "talk" with the user via the display prompting the user to input the correct variables.

The computer has been designed with several features to ensure that data entry errors are not made and that, if they are made, they can be detected and corrected.

© 2010 Joerg Woerner
Datamath Calculator Museum

It is the hope of New Specialties, Inc. that the APOTHECALC will assist the medical professional by providing a means whereby calculations can be made almost anywhere, quickly and accurately.

Before using your APOTHECALC, please read this manual. We hope that the instructions and examples will quickly help you develop skill and confidence in APOTHECALC.

© 1987 by New Specialties, Incorporated

TABLE OF CONTENTS

BASIC OPERATIONS 1
- To Turn The Computer On 1
- To Turn The Computer Off 1
- Automatic Shutdown 1
- Floating Minus Sign 1
- Floating Decimal Point 1
- Error Indication 1
- Accuracy and Rounding 1
- To Make Corrections 2

ARITHMETIC OPERATIONS 3
- Add, Subtract, Multiply or Divide 3
- Memory 4
- Conversions 5

PROGRAM MODE 7
1. Display Features 7
2. Table of Prompts 7
3. Table of Program Flags 8
4. Table of Unit Flags 8
5. Programs 8
   1. Drip 1 8
   2. Dose 8
   3. Medicine Infused 9
   4. Time 9
   5. Concentration 9
   6. Volume Rate 9
   7. Medicine Rate 10
   8. Volume 10
   9. Drip 2 10
   10. Drip 3 10
   11. Body Surface Area 10
6. General Program Operations 10
   1. Entering A Program 10
7. General Functions 11
   1. Use of Metric or English 11
   2. Data Retention and Overwrite 11
   3. Check Data 12
   4. Insuring accurate results 12
   5. Use of CMP Key 12
   6. Computations after Program Results are Displayed 13

© 2010 Joerg Woerner
Datamath Calculator Museum

8. Sample Problems 13
1. Drip 1 - with Rate 13
2. Dose - with Rate 17
3. Medicine Infused with Error Correction 20
4. Time 25
5. Concentration 28
6. Volume Rate with Concentration 29
7. Medicine Weight 32
8. Volume 33
9. Drip 2 - with Rate 35
10. Drip 3 - with Rate 37
11. Body Surface Area 39
12. Use of Metric Key and English Key 41
13. Use of the CMP Key 43
14. Other Methods to Solve Problems 46

ISCELLANEOUS 48
1. Replacement Battery 48
2. Warranty Information 48
3. Cautions 50

© 2010 Joerg Woerner
Datamath Calculator Museum

BASIC OPERATIONS

TO TURN COMPUTER ON

Press [**ON/C**] once. This applies power, clears the computer and places it in the "four function" mode.

TO TURN COMPUTER OFF

Press the [**OFF**] key once. This clears all operations, memories and error conditions, and removes power from the display.

AUTOMATIC SHUTDOWN

If no calculation is performed for 15 minutes, the computer will automatically turn off. All operations, memories and error conditions will be cleared and power will be removed from the display.

FLOATING MINUS SIGN

Any negative number is displayed with a minus sign immediately to the left of the number. To enter a negative number into the computer, the values of the number should be entered, THEN press the [+/−] key.

FLOATING DECIMAL POINT

A floating decimal point feature is incorporated into this computer. All you need to do is insert the decimal point by pressing the [•] key in the normal entry sequence and it will be maintained in the proper position relative to the other numbers.

ERROR INDICATION

The display shows ERROR whenever the computer answer exceeds the limit of the computer or, when an improper mathematical operation, such as dividing by 0, is requested.

ACCURACY AND ROUNDING

Each calculation produces a seven digit result. To avoid clutter on the display the computer will normally display results to one decimal point rounded such that if the hun-

dredth digit of the result is 5 or more, the tenths digit will be increased. If the hundredths digit is less than 5, the tenths digit will remain.

For example, if a result is 10.18356 the computer will display 10.2. If the result is 10.13356, the computer display will be 10.1.

Since it is recognized that, when results are small, you may want to see more accuracy, pressing the [=] key following a program or conversion will display all seven digits.

For example, if a result is calculated as 0.0825787, the computer display will be .1. But since this displayed result may be anywhere from .05 to .149 greater accuracy may be needed. Press the [=] key and the computer will then display .0825787.

TO MAKE CORRECTIONS

If an incorrect program key, i.e. [**DR1**], is pressed, simply press the correct program and continue.

If an incorrect operation [+ , − , × , ÷] key is pressed, simply press the correct operation key and continue.

If an incorrect number entry is made, it may be corrected without affecting the calculation in progress if it is corrected before pressing the [**ENT**], [**CMP**] or [**CNV**] keys.

There are two methods used to correct an incorrect number entry.

The first is to press the [**ON/C**] key once. This will erase all numbers on the display. You may then put the correct number into the computer.

The second method is to press the [→] key. Each time the [→] key is pressed, the right hand digit will be erased. After erasure, you may accept the new number or you may add additional digits.

For example, if you intended to enter 100 but actually entered 1000, pressing the [→] key once will change the display to 100 and you may continue with the computation.

For example, if you intended to enter 1083 but actually entered 1038, pressing the [→] key once will change the

display to 103. Pressing it again will change it to 10. You should then press [8]; the display will show 108, then press [3], the display will show 1083. You may then continue with your calculation.

ARITHMETIC OPERATIONS

All conversion and arithmetic operations are displayed with floating decimal (full display).

The keys associated with the arithmetic operations are:

1. Numeric Keys [0] thru [9] - enter numbers into display.
2. [÷] - Completes any previously entered arithmetical function and instructs the computer to divide the displayed number by the next entered quantity.
3. [×] - Completes any previously-entered arithmetical function and instructs the computer to multiply the displayed number by the next number entered.
4. [−] - Completes any previously-entered arithmetical function and instructs the computer to subtract from the displayed number the next number entered.
5. [+] - Completes any previously-entered arithmetical function and instructs the computer to add the displayed number to the next number entered.
6. [=] - Completes any previously-entered arithmetical function. Following [=] with a numeric entry automatically clears the previous result.
7. [+/−] - Changes the arithmetical sign of the number shown in the display (adds or removes "—" sign).
8. [•] - Inserts decimal point in number in display.

© 2010 Joerg Woerner
Datamath Calculator Museum

ADD, SUBTRACT, MULTIPLY OR DIVIDE

To perform addition, subtraction, multiplication, or division, the computer is designed so that you can key in the problem just as it is stated.

1. Key in number.
2. Press applicable operation key: [+], [−], [×], or [÷].

3. Key in number applicable to operation to be performed.
4. Press [=] to obtain answer.

After a result is obtained in one calculation, it may be directly used as the first number in a second calculation. There is no need to reenter the number from the keyboard; for example:

1.84 + 0.39 = 2.23 then 2.23 ÷ 365 = 0.006110

Key In	Press	Display	Comments
1.84	[+]	1.84	
.39	[=]	2.23	1.84+0.39=2.23
	[÷]	2.23	
365	[=]	0.006110	2.23÷365=0.006110

MEMORY

Your Apothecalc computer has a memory which can be used during all operations. The data is stored in memory until the computer is turned **[OFF]**. Any other operations will not affect the memory.

The keys associated with memory are:

1. **[STO]** - Stores the displayed quantity in memory without removing it from the display. Any previously stored value is replaced by the new value.
2. **[RCL]** - Recalls stored data from memory to the display. Use of this key does not clear memory.
3. **[SUM]** Key - This key is used with the 4 function computer memory function. Pressing this key will add the value displayed to the value existing in memory.

For example, if you have a value of 20 stored in memory, and a result 10 displayed from a computation, press the **[SUM]** key and the value in display will be added to the value in memory giving a total of 30 in memory.

Use of the memory does not affect any calculations in process; therefore, memory operations can be used whenever needed. To clear the memory, press **[0] [STO]** or **[ON/C] [STO]**, or **[OFF]**.

© 2010 Joerg Woerner
Datamath Calculator Museum

CONVERSIONS

Your Apothecalc computer incorporates the most common conversions used in apothecary application and can be accessed regardless of the operating mode. The conversion answers are normally rounded to the nearest tenth. But full accuracy can be obtained by using the **[=]** key.

The keys associated with conversion operations are secondary functions to some of the arithmetic keys. For example, the key with the "O" printed on its face also converts kilograms to pounds, as indicated by the "KG>LB" printed above it. Pressing the key converts the value on the left to the value shown on the right.

1. **[CONV]** - Pressing this key instructs the computer to perform the conversion specified for the NEXT key pressed, using the data shown in the display. Pressing this key also converts the double-function keys to the CONV function.
2. °F- °C - Pressing this key, after pressing **[CONV]** key, converts the displayed value from degrees Fahrenheit to degrees Celsius.
3. °C- °F - Pressing this key, after pressing **[CONV]** key, converts the displayed value from degrees Celsius to degrees Fahrenheit.

© 2010 Joerg Woerner
Datamath Calculator Museum

CONVERSIONS - Pressing one of the convert function keys after pressing **[CONV]**, converts the displayed value using the listed conversion factor:

Convert mg to micrograms	(× 1000)
Convert micrograms to mg	(÷ 1000)
Convert pounds to Kg	(× .45359)
Convert Kg to pounds	(÷ .45359)
Convert grains to mg	(× 64.7989)
Convert mg to grains	(÷ 64.7989)
Convert microdrops to ml	(÷ 60)
Convert ml to microdrops	(× 60)
Convert grams to grains	(÷ .0647989)
Convert grains to grams	(× .0647989)
Convert cc to liters	(÷ 1000)
Convert liters to cc	(× 1000)

Convert cc to mimims	(÷ .0616115)
Convert mimims to cc	(× .0616115)
Convert cc to quarts	(÷ .094635)
Convert quarts to cc	(× .094635)
Convert cc to pints	(÷ .047317)
Convert pints to cc	(× .047317)
Convert cc to drams	(÷ 3.8879)
Convert drams to cc	(× 3.8879)
Convert grams to ounces	(÷ 31.103)
Convert ounces to grams	(× 31.103)

To perform conversions:

1. Key in number.
2. Press [**CONV**].
3. Press applicable conversion key.
4. Press [=] to obtain full accuracy.

NOTE: In the conversion mode and in all programs, the computer uses standard drop size of 60 microdrops/ml.

© 2010 Joerg Woerner
Datamath Calculator Museum

PROGRAM MODE

DISPLAY FEATURES

The display used in the computer is an interactive display having several functions.

The right seven positions on the display are number data input and result displays.

The left three characters are PROMPT's. These are letter displays used by the computer to ask you for the data needed to complete a desired computation.

Below the alphanumeric display, there are small display "flags" which tell you which program is in use. A flag will appear at all times when a program is in use.

Above the alphanumeric display, there are small display "flags" which display the units of a program.

TABLE OF PROMPT'S

When in the program mode, the following prompts will appear:

© 2010 Joerg Woerner
Datamath Calculator Museum

PROMPT	VARIABLE	UNITS
DRI	DRIP RATE	Microdrops/minute
DOS	DOSE	Micrograms/kg-min
MG	Medicine in Solution	Milligrams
ML	Volume of IV Solution	Milliliters
DES	Weight of Medicine Infused	Milligrams
MIN	Time	Minutes
CON	Concentration	Micrograms/ml
RAT	Rate of Medicine Injection	Micrograms/min
LBS	Patient Body Weight	Pounds
KG	Patient Body Weight	Kilograms
IN	Patient Height	Inches
CM	Patient Height	Centimeters

TABLE OF PROGRAM FLAGS

DRIP 1	-	Drip 1 program
DRIP 2	-	Drip 2 program
DRIP 3	-	Drip 3 program
DOSE	-	Dose program
MGINF	-	Medicine infused program
TIME	-	Time to inject a desired amount of medicine program
CONC	-	Concentration program
MEDWT	-	Medicine weight program
VOL	-	Volume program
BSA	-	Body surface area program
VRATE	-	Volume-rate program

TABLE OF UNIT FLAGS

mcgtt/min	microdrops/minute
mcg/min-kg	micrograms/kilogram/minute
mcg/ml	micrograms/milliliter
ml/min	milliliters/minute
mcg/min	micrograms/minute
m^2	square meter
min	minute
mg	miligram
ml	milliliter

© 2010 Joerg Woerner
Datamath Calculator Museum

THE PROGRAMS

1. DRIP 1

This program displays a drip rate in microdrops/minutes following inputs of dose (mcg/kg/min), patient body weight (pounds or kilograms), weight (mg) of medicine dissolved in the IV solution and volume (ml) of the IV solution.

This program can also calculate the medicine injection rate in micrograms/minute.

2. DOSE

This program displays the dose in micrograms per kilogram per minute a patient is receiving following inputs of drip rate (microdrops/min or ml/hr) patient body weight (pounds or kilograms), weight (mg) of medicine dissolved in the IV solution, and the volume (ml) of the IV solution.

This program can also calculate the medicine injection rate in micrograms/minute.

3. MEDICINE INFUSED

When it is desired to know the total amount of medicine (in milligrams) a patient has received after having been injected with an IV solution for a known time, select the Milligram Infused, MGINF, program. After you enter the known drip rate (microdrops/min or cc/hr), the elapsed time during which the IV is being injected and the concentration of the IV solution (that is, the original volume (ml) and the original weight of medicine dissolved in the solution), the computer will calculate and display the weight (mg) of medicine given to the patient during the elapsed time.

4. TIME

If you desire to know how long it will take to give a patient a desired amount of medicine (mg) at a given drip rate (microdrops/min or ml/hr) of a known concentration (mg of medicine in ml of solution), use the TIME program. The result will be calculated and displayed in minutes.

5. CONCENTRATION

If you are placing a known weight (mg) of medicine into a known volume (ml) of solution and wish to know the concentration, use the CONC program. The computer will calculate and display the result in micrograms/ml.

6. V-RATE

If a desired rate (mcg/min) of medicine injection is known and you know the concentration (mcg/ml) of the IV solution, this program will calculate and display the volume injection rate in ml/min.

For example: if the concentration is not available to you in useable units and you know the weight in mg and the volume in millliliters, you may first use the CONC program. If you next use VRATE, the computer will save the results of the CONC program to use in VRATE.

This program and DRIP-3, described later, are very similar. They use the same inputs but the DRIP-3 gives results in ml/hr or mcgtt/min.

7. MEDWT

If you know the concentration of a solution in mcg/ml, and you know the total volume (ml) of the solution, you can use this program to determine the weight of the medicine dissolved in the solution.

8. VOL.

This program assists you in calculation of the volume of a solution you need to inject into a patient in order to get a desired weight (mg) of medicine into him when you know the concentration of the IV solution (mg of medicine dissolved in ml of solution).

The computer will calculate and display the results in ml.

9. DRIP 2

This program allows you to check the drip rate. If you know that a known volume (ml) of solution has been pumped into the patient in a known amount (min) of time, use DRIP2. When you have entered those two knowns, the computer will calculate the drip rate in microdrops/min or ml/hr.

10. DRIP 3

If you enter into the calculator the rate (mcg/min) at which you desire medicine to be administered to the patient and you also enter the concentration of the IV solution (mg of medicine dissolved in ml of solution), the computer will calculate the drip rate you must use in microdrops/min or cc/hr.

© 2010 Joerg Woerner
Datamath Calculator Museum

11. BSA

The computer will calculate the patient's Body Surface area when his height (in or cm) and weight (pounds or kg) are entered. The Body Surface Area result will be displayed in square meters.

GENERAL PROGRAM OPERATIONS

ENTERING A PROGRAM

To enter a program, press the key for the program desired. For example, if you wish the computer to calculate the dose, then press the **[DOSE]** key. When a program key is pressed, the lower program flag for that program will appear. In addition, the prompt for the first input needed will appear on the left display. You should

then enter the desired or known value for that input using the number keys [**1**], [**2**], etc.

Check that the number displayed is the correct number, then press the [**ENT**] enter key. The computer will accept the input and will automatically change the left hand prompt to request the next input. When the computer has received all the inputs necessary to complete the computation, it will do so and display the result on the right hand side of the display. It will also display at the top, the unit flag giving the units of the result.

GENERAL FUNCTIONS

USE OF ENGLISH OR METRIC

In the United States, patient height and weight are usually specified in inches and pounds. However, many people in the U.S. prefer to deal entirely in metric units.

This computer will ask for body height and weight in English units unless directed to use metric units. When a program using body height or weight is being used and the first prompt appears for LBS or IN, the user may press the [**MET**] Key. The prompt will then change to KG or CM. The computer will stay in metric mode until it is directed to return to English units by pressing the [**ENG**] key when the first KG or CM prompt in a program appears or until it is turned off.

© 2010 John Weerner
Personal Calculator Museum

DATA RETENTION AND OVERWRITE

The computer will "remember" the last data inputted into the program mode until it is turned off or cleared. For instance, if you entered 100 kg as a patient weight in a dose calculation, the 100 kg will be displayed as the weight for the next dose calculation. Thus, you can redo calculations without having to enter all the data. Only the data which changed needs to be entered.

If you wish to change the data, just key in the new data. The old data will be replaced with the new data which you keyed in and will appear in the display.

CHECK DATA

If you desire to check the data that was used in a program, simply request the program again by pressing the appropriate key. The computer will display the first data prompt on the left side of the display and will display the value of data used in the last computation on the right side of the display.

If the data is correct, press the **[ENT]** key to continue and the computer will then display the next prompt and data value.

If the data is not correct, then simply change the data to the correct value using the number keys, press the **[ENT]** key and continue.

When all data has been checked and/or corrected, the computer will automatically recompute the result and display it.

INSURING ACCURATE RESULTS

While your Apothecalc has been designed to provide reliable service for long periods of time, it is possible that the Apothecalc will malfunction. (See warranty section)

© 2010 Joerg Woerner
Datamath Calculator Museum

To insure that erroneous computer results do not cause problems with patients, it is recommended that

1. all computations be checked, i.e., done twice
2. at the beginning of your shift, a test calculation should be performed on at least one program with known results.
3. if the test program result is unsatisfactory or if the computer otherwise acts erratically, the use of the computer should be discontinued.

USE OF THE [CMP] (compute) KEY

At times, you may wish to repeat a calculation changing only one variable input. For instance, assume a solution is being administered to a patient at 20 microdrops/min and you have computed that this is a dose of 1.6 mcg/kg/min, then assume that the rate is increased to 23 microdrops/min in order to obtain a desired effect, and it is desired to compute the dose for this new rate.

The user should press the [**DOSE**] key, the computer will ask for DRI and display 20. Change this to 23 by pressing [**2**] then [**3**]. At this point press [**CMP**] and the computer will immediately calculate and display the dose using the patient weight and the concentration used in the last computation.

COMPUTATIONS AFTER PROGRAM RESULTS ARE DISPLAYED

Following a program, you may wish to perform an arithmetic or conversion operation on the result. For example, if you have completed a [**VRATE**] program and have obtained a result of 0.5 ml/min., you might want to use ml/hr instead in your report. When the result is displayed in ml/min., press the [×] key, press [**6**] then [**0**] then [=] The result is thus multiplied by 60 and will be displayed as 30.

Or if you have a result displayed as 1365 mcg/min and you want to have it in mg/min, press the [**CONV**] key, then press the key under mcg > mg. The computer will perform the conversion and display the result, 1.4; press [=] if you desire more accuracy. The computer will display 1.365.

© 2016 Joerg Woerner
Datamath Calculator Museum

Please note that the units flag and the program flag will disappear when the arithmetic or conversion operation is performed.

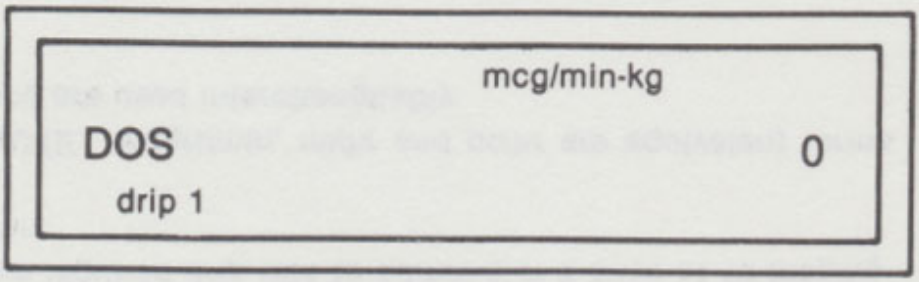
SAMPLE PROBLEMS

PROGRAM 1 - DRIP 1

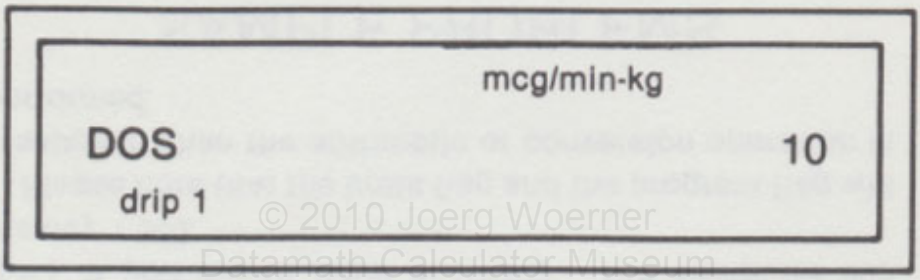
Given a patient of 150 pounds and that 500 mg of a drug has been dissolved in 500 ml of an IV solution, calculate the required drip rate to administer a dose of 10 mcg/kg-min.

NOTE: mcgtt/min, ml/hr and cc/hr are equivalent terms and are used interchangeably.

1. Press [**DR1**]

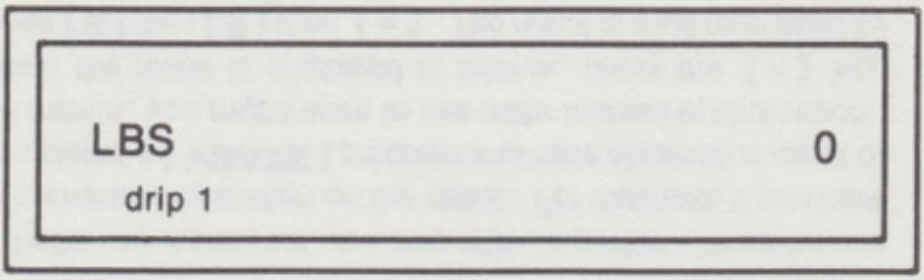


2. Press [**1**], then [**0**]

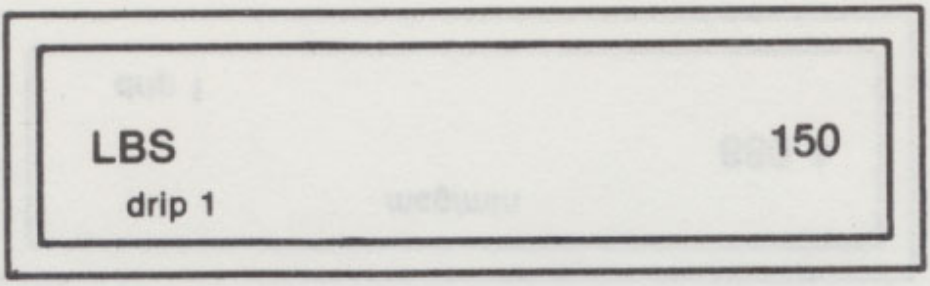


© 2010 Joerg Woerner
Datamath Calculator Museum

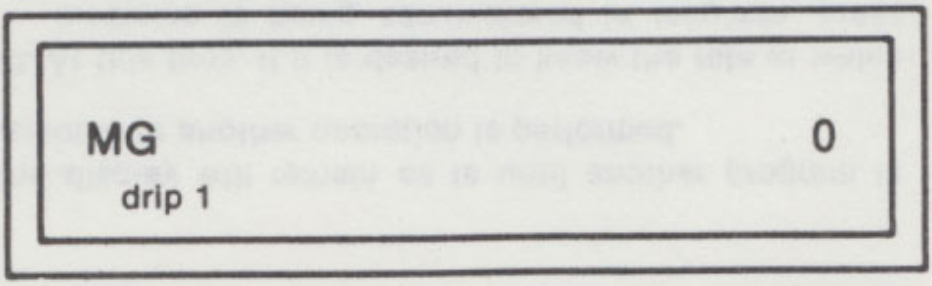
3. Check your entry. Since 10 is the desired dose, press [**ENT**]



4. The computer is now asking for patient weight in English units. Press **[1]**, then **[5]**, then **[0]**.

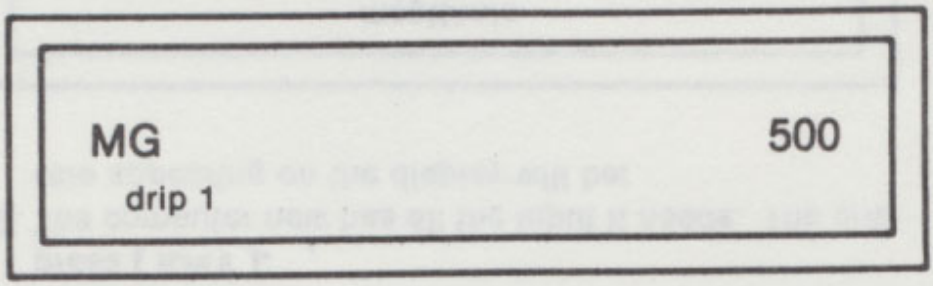


5. Check your entry. Since 150 LBS is the correct patient's weight, press **[ENT]**

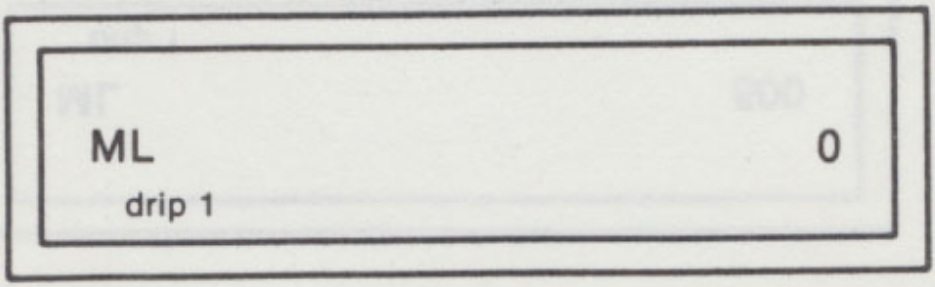


6. The computer is now asking for the weight of medicine dissolved in the IV solution.
7. Press **[5]**, then **[0] [0]**.

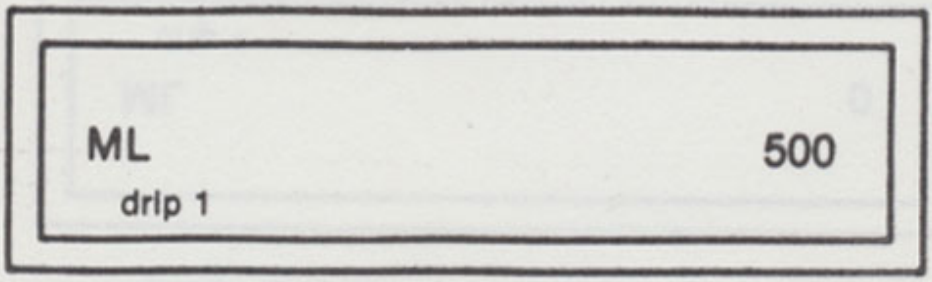
© 2010 Joerg Woerner
Datamath Calculator Museum



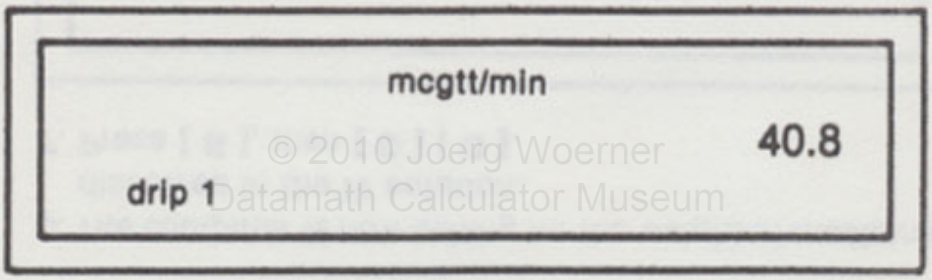
8. Check your entry. Since 500 mg is the actual medicine weight, press **[ENT]**.



9. The computer is now asking for the volume of the IV solution in milliliters.
   Press [**5**], then [**0**], then [**0**].



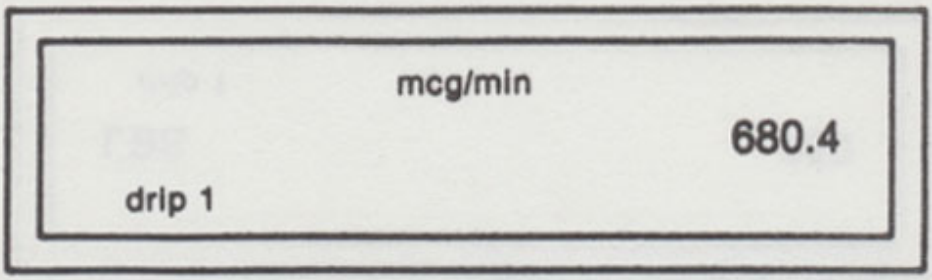
11. Check your entry. Since 500 ml is the proper amount, press [**ENT**].
12. The computer now has all the input it needs. The drip rate appearing on the display will be:



© 2010 Joerg Woerner
Datamath Calculator Museum

The display will remain as is until another program is selected or another operation is performed.

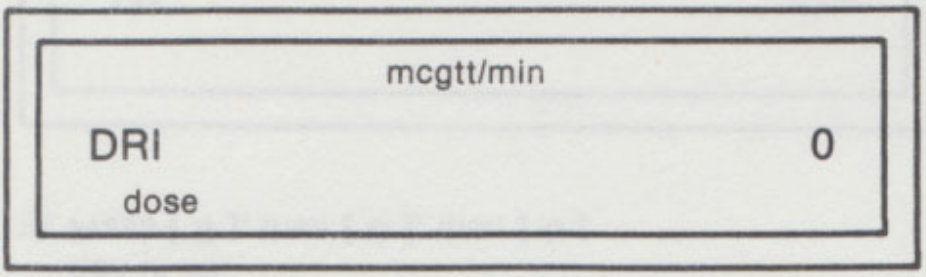
13. At this time, if it is desired to know the rate at which medicine is being administered in mcg/min, press [**RATE**].
14. The computer will calculate the rate and display it as:



PROGRAM 2 - DOSE

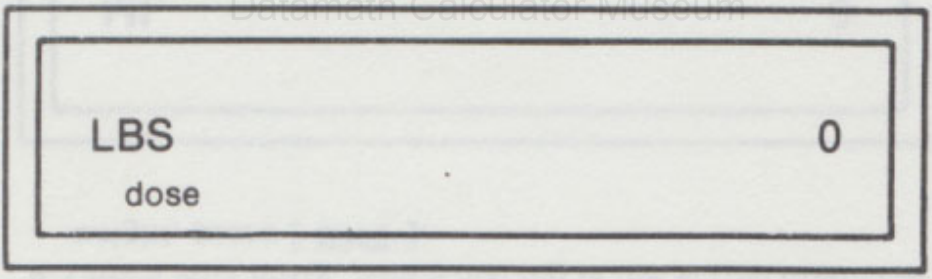
Given a patient of 150 pounds and that 500 mg of a drug has been dissolved in 500 ml of an IV solution, calculate the dose being received if the patient is being administered the solution at a rate of 30 cc/hr.

1. Press **[DOSE]**. The program flag will display DOSE and the computer will request the first input, drip rate.

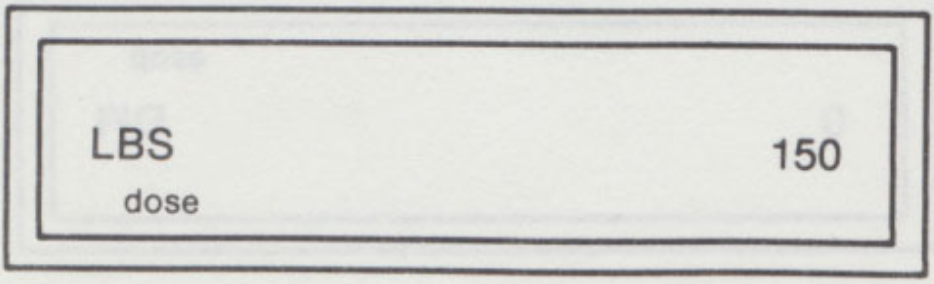


2. Press **[3]** then **[0]**
3. Check your entry. Since 30 is the actual drip rate, press **[ENT]**.

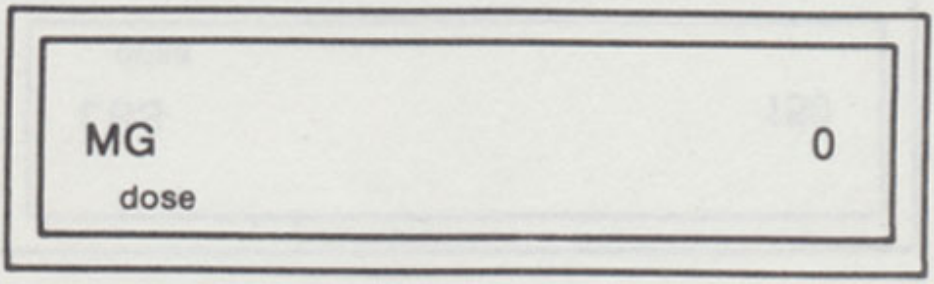
© 2010 Joerg Woerner
Datamath Calculator Museum



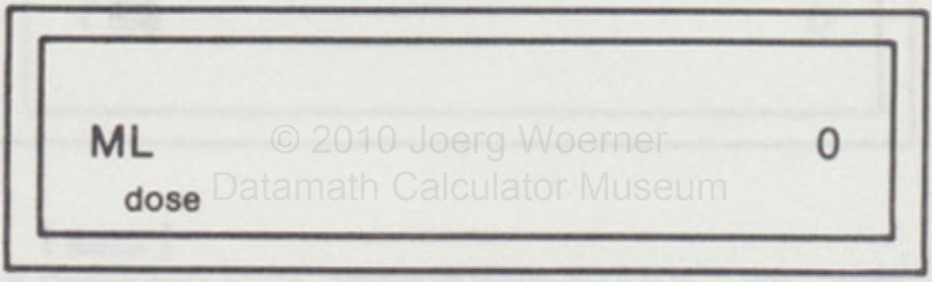
4. The computer is now asking for the patient's body weight in English units. Press **[1]**, then **[5]**, then **[0]**.



5. Check your entry. Since 150 pounds is the correct patient weight, press **[ENT]**.

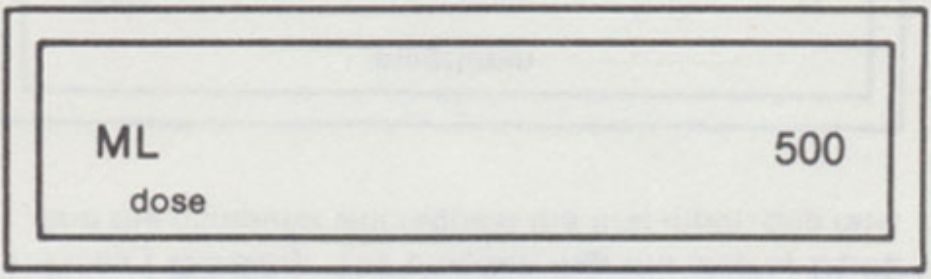


6. The computer is now asking for the weight of medicine dissolved in the IV solution.
7. Press **[5]**, then **[0]**, the **[0]**.
8. Check your entry. Since 500 mg is the actual medicine weight, press **[ENT]**.

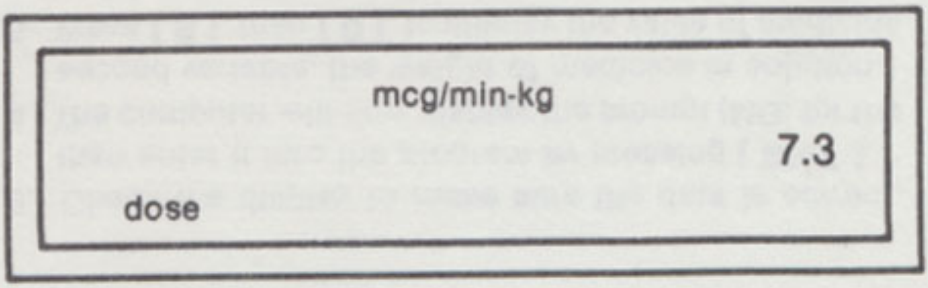


© 2010 Joerg Woerner
Datamath Calculator Museum

9. The computer is now asking for the volume of the solution in ml.
10. Press **[5]**, then **[0]**, then **[0]**



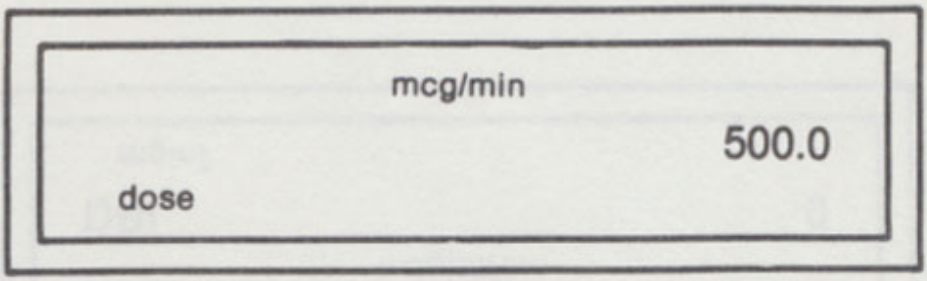
11. Check your entry. Since 500 ml is the correct volume, press [**ENT**].
12. The computer now has all the input it needs to calculate the dose. Appearing on the display will be 7.3.



This display will remain as is until another program is selected or another operation is performed.

13. At this time, if it is desired to know the rate at which medicine is being administered in mcg/min., press [**RATE**].
14. The computer will calculate the rate and display it as:

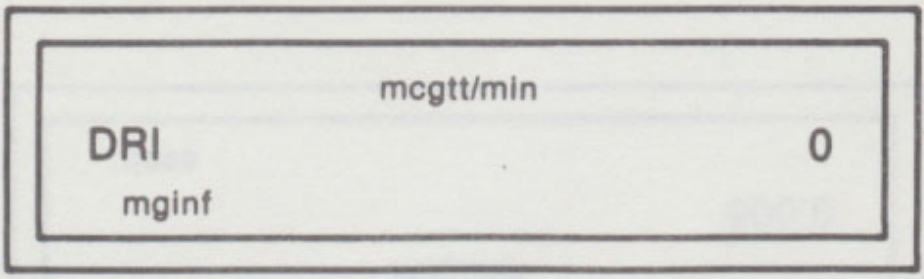
© 2010 Joerg Woerner
Datamath Calculator Museum



PROGRAM 3 - WEIGHT OF MEDICINE INFUSED

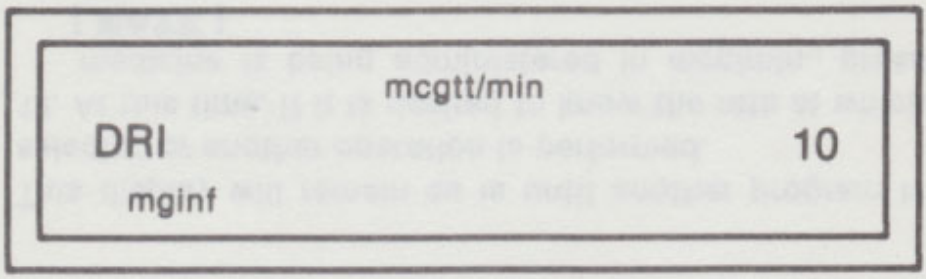
If you have a 500 ml IV solution with 50 mg of a drug in a solution, determine the weight of medicine administered to the patient in 3 hours using the drip rate of 10 mcgtt/min.

1. Press [**MGI**]. The computer display will show the bottom program flag MGINF, the prompt for the first input DRI and the unit flag for the first prompt mcgtt/min.



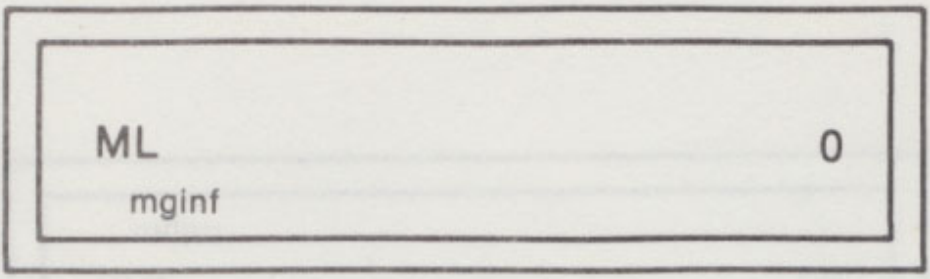
2. Press [**1**] then [**0**] to display the first input value.

Datamath Calculator Museum



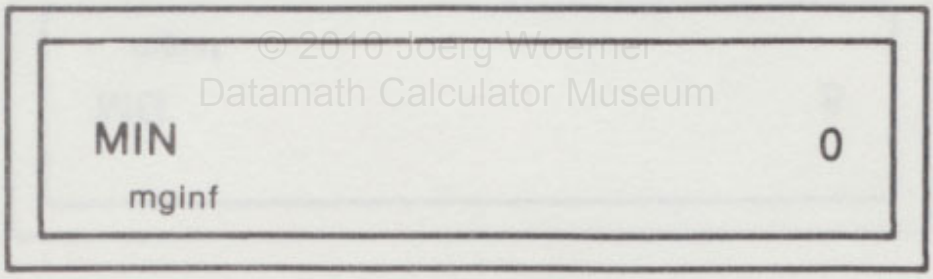
3. Check the display to make sure the data is correct, then enter it into the program by pressing [**ENT**].
4. The computer will now display the prompt (MG) for the second variable, the weight of medicine in solution.
5. Press [**5**], then [**0**], to display the value of medicine weight.
6. Check the display to make sure this value is correct and then press [**ENT**].

7. The computer will now display the prompt for the third input, solution volume.

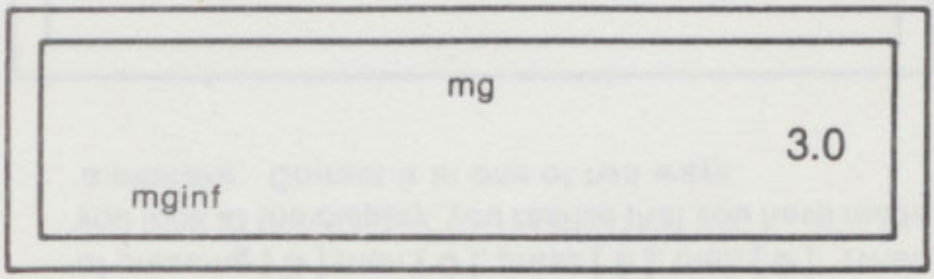


8. Press [**5**], then [**0**], then [**0**] to display the value of IV solution volume.
9. Check the display to make sure that this volume is correct, then press [**ENT**].
10. The computer will now display the prompt (MIN) for the last input, minutes.

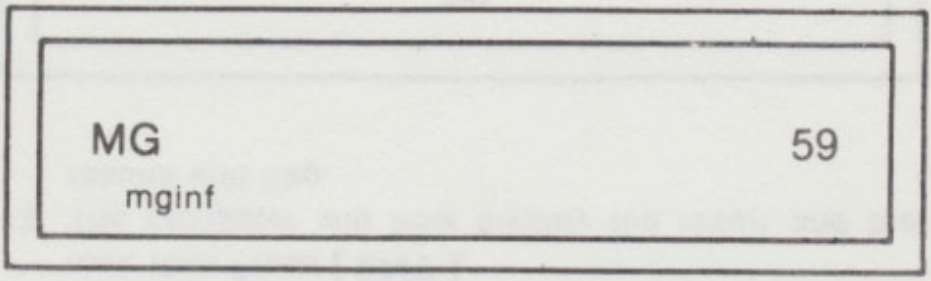
© 2010 Joerg Woerner
Datamath Calculator Museum



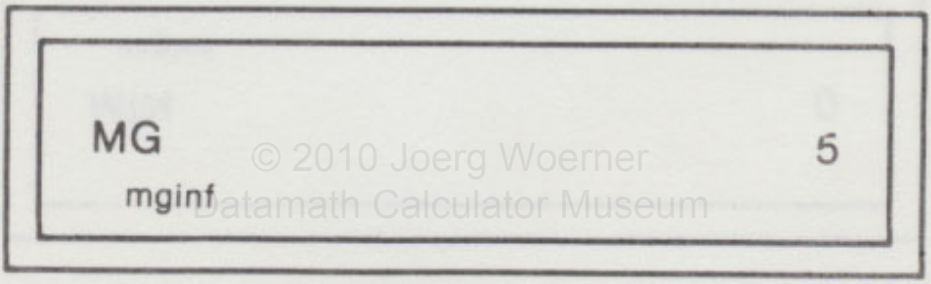
11. Press [**1**], then [**8**], then [**0**] to display the time.
12. Check the display to make sure that this value is correct, then Press [**ENT**].
13. The computer will now display the result and the results unit flag.



14. Now let's exercise the error correct feature. Run through the program again to step 4. In step 5 instead of pressing **[5]** then **[0]**, press **[5]**, then **[9]**. When you look at the display, you realize that you have made a mistake. Correct it in one of two ways.

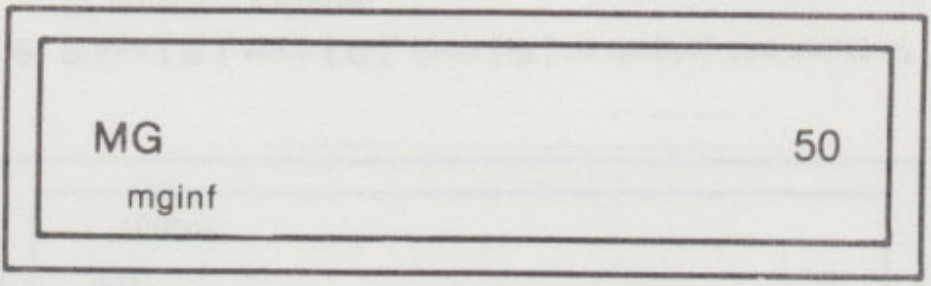


15. First, press the **[→]**. The display will now appear as

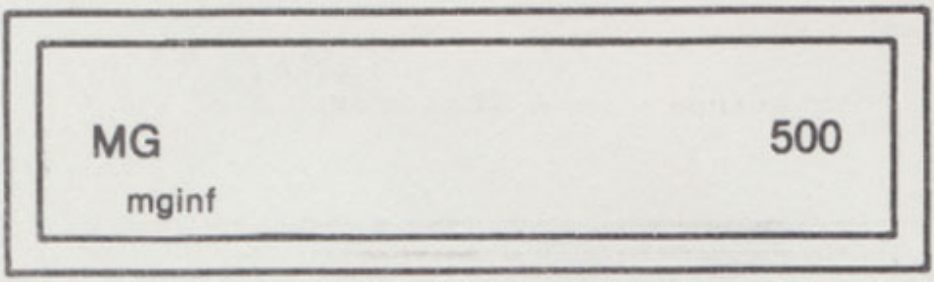


© 2010 Joerg Woerner
Datamath Calculator Museum

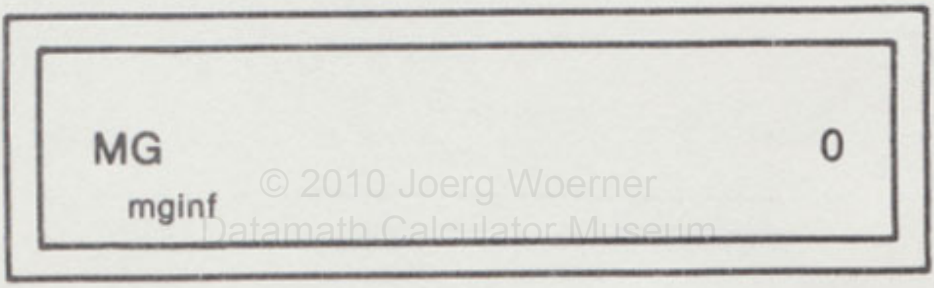
16. Now press the **[0]** key. The display will appear correctly as



17. To demonstrate the other method of error correction, press the [**0**] key again.
18. The display will now appear as



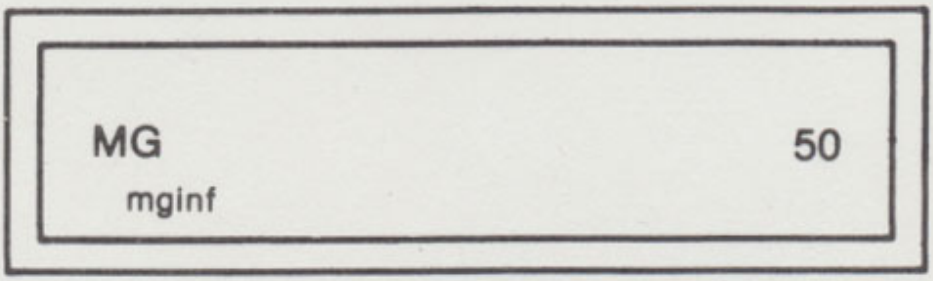
19. Since this is incorrect, press the [**ON/C**] key once, the right hand side of the display will clear.



© 2010 Joerg Woerner
Datamath Calculator Museum

CAUTION: The [**ON/C**] key can only be pressed once without making a data entry. If it is pressed more than once, all data in all areas of the program will go to zero.

20. Now you can press the [**5**] & [**0**] keys. The display will change to



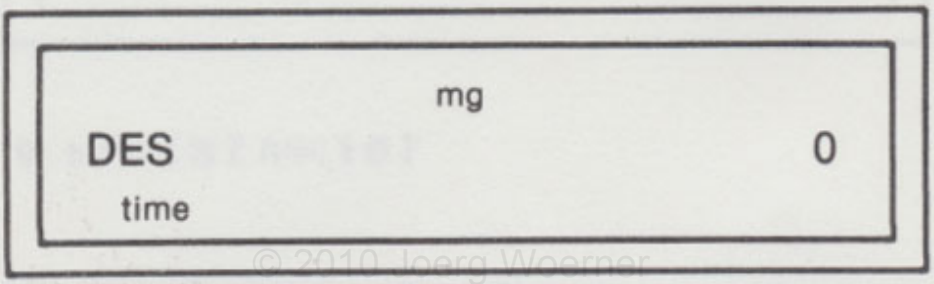
21. Since this is correct, press the [**ENT**] key and continue the sample problem at step 7.

© 2010 Joerg Woerner
Datamath Calculator Museum

PROGRAM 4 - TIME TO INJECT A DESIRED AMOUNT OF MEDICINE

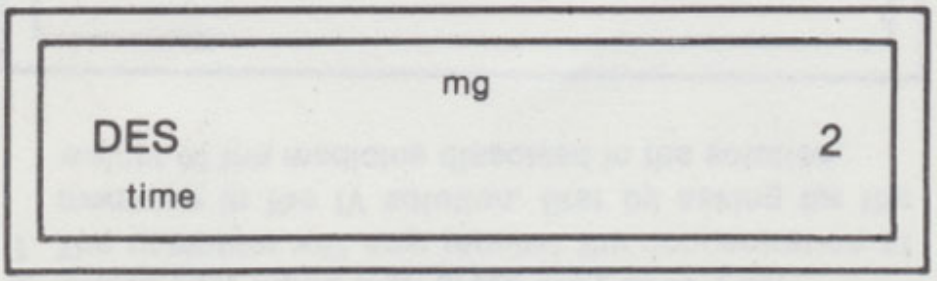
Assume that it is desired to administer 2 mg of a medicine. Compute the time it will take to administer that 2 mg using an IV at a rate of 5 microdrops/minute using a solution where 20 mg have been dissolved in 250 ml of IV solution.

1. Press the **[TIME]** key. The computer will turn on the lower program flag, Time. Prompt, DES, will appear and the upper unit flag MG will turn on indicating that you should input the desired amount of medicine in milligrams.



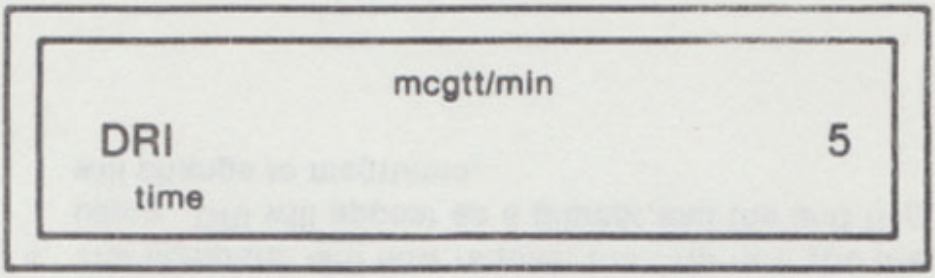
© 2010 Joerg Woerner
Datamath Calculator Museum

2. Press the **[2]** key.

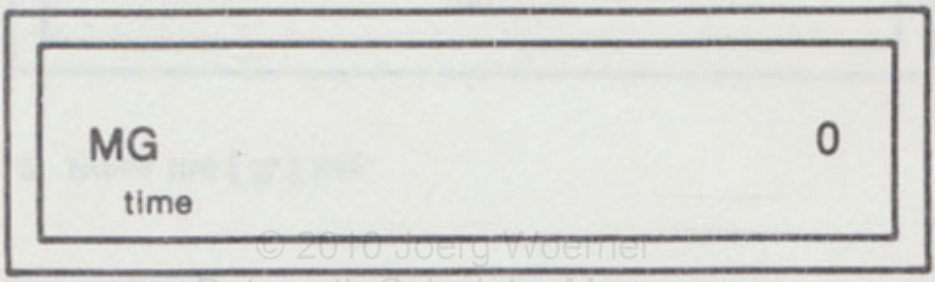


3. Check your input, then press the **[ENT]** key.
4. The computer will now request the Drip rate you are using. DRI will appear as a prompt and the unit flag will change to mcgtt/min.

5. Press [**5**], the drip rate being used.

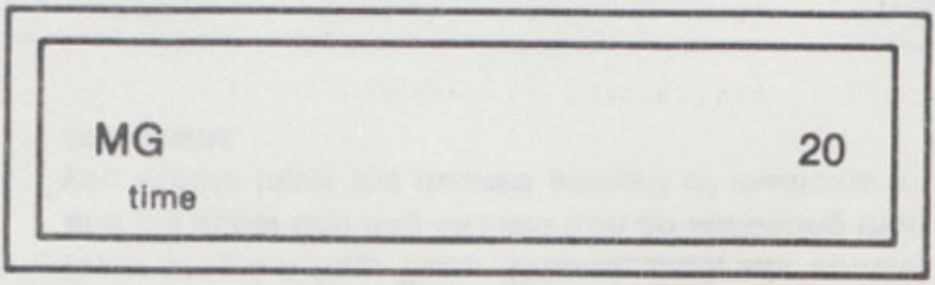


6. Check your input, then press the [**ENT**] key.
7. The computer will now request the concentration of medicine in the IV solution, first by asking for the weight of the medicine dissolved in the solution.



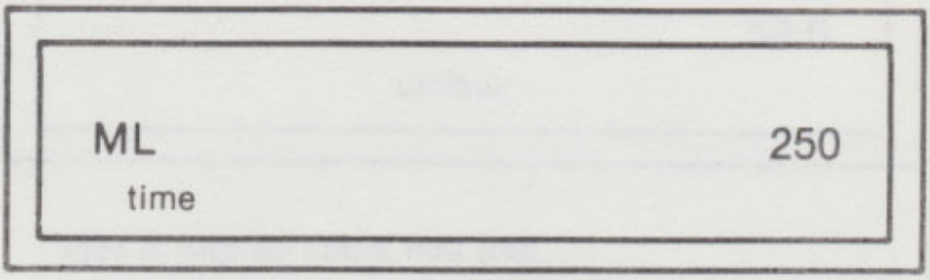
© 2010 Joerg Woerner
Datamath Calculator Museum

8. Press [**2**], then [**0**].



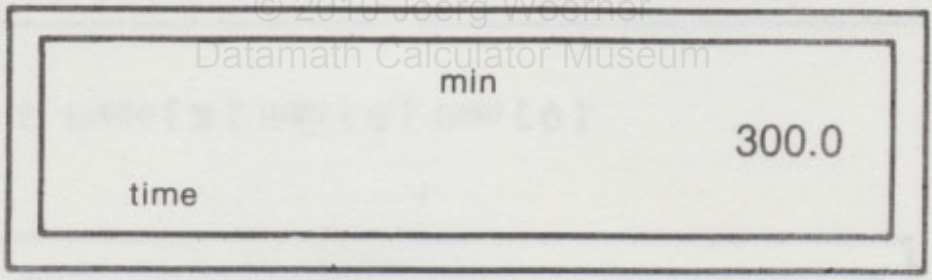
9. Check the display to make sure the entry is correct, then press [**ENT**].

10. The computer will now request the volume of the solution being used. ML will appear as a prompt.
11. Press **[2]**, then **[5]**, then **[0]**.



12. Check the display to make sure the entry is correct then press **[ENT]**.
13. The computer now has all the data necessary to complete the program. The result will be displayed as the right hand side of the display and the unit flag, MIN, will appear on the upper part of the display.

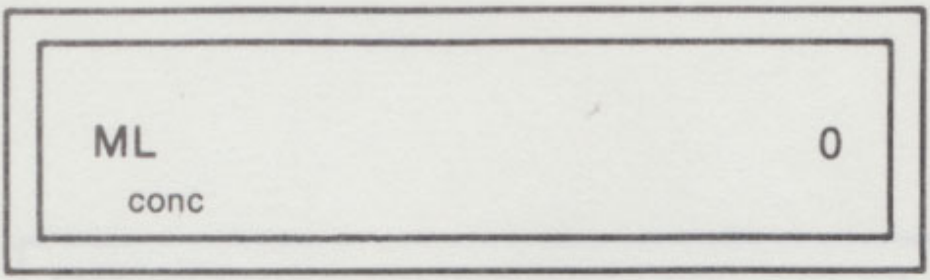
© 2010 Joerg Woerner
Datamath Calculator Museum



PROGRAM 5 - CONCENTRATION

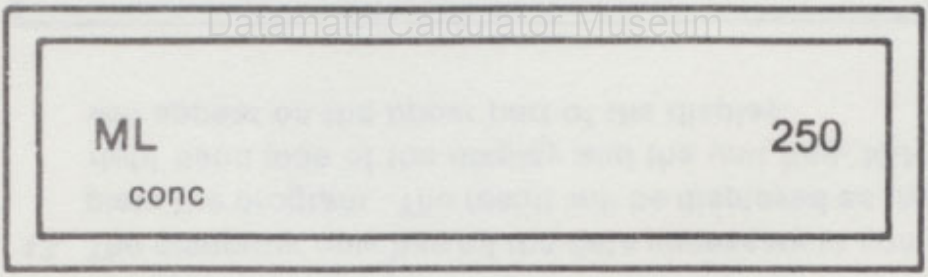
Problem: Calculate the concentration in mcg/ml when 7 mg of medicine are dissolved in 250 ml of IV solution.

1. Press [**CONC**]. The program flag CONC will appear on the bottom of the display and the first prompt MG will appear on the left part of the display.
2. Enter the amount of medicine in mg by pressing [**7**].
3. Check your entry, then press [**ENT**].
4. The computer will now request the second input.

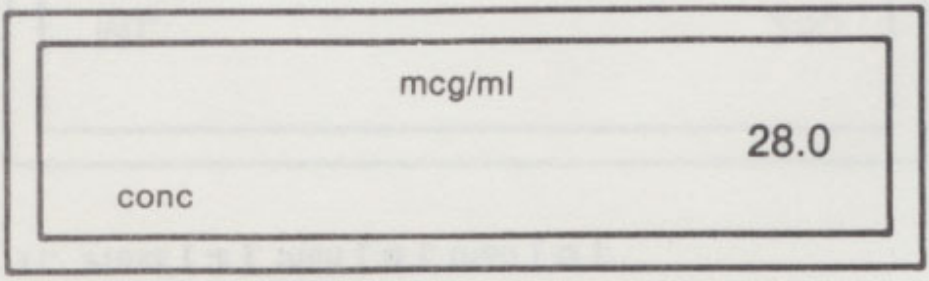


5. Press [**2**], then [**5**], then [**0**].

© 2010 Joerg Woerner
Datamath Calculator Museum



6. Check your entry, then press [**ENT**].
7. The computer will now compute the answer and display it with an upper unit flag.



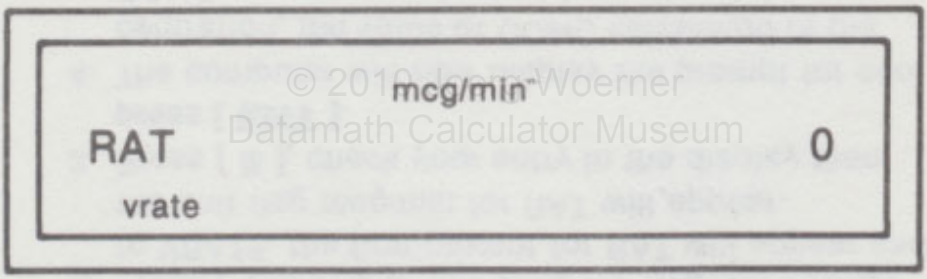
PROGRAM 6 - VOLUME RATE

Assume that it is desired to administer medicine to a patient at 5 mcg/min and that there is an IV solution with a concentration of 28 mcg/ml.

a. Determine the rate in ml/min that must be used to administer drugs at the desired rate.
b. Also, compute the result assuming that the concentration is unknown but it is known that 7 mg of medicine have been dissolved in 250 ml of solution.
c. Also, determine the result in units of cc/hr.

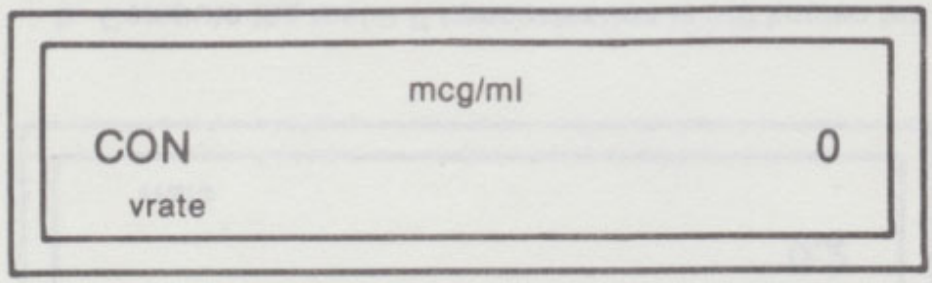
NOTE: To avoid program interaction, turn the computer off then back on before proceeding.

1. Press [**VRA**]. The computer will turn on the lower program flag VRATE, the first prompt RAT and the upper unit flag for the first prompt, mcg/min.



© 2010 Jason Woerner
Datamath Calculator Museum

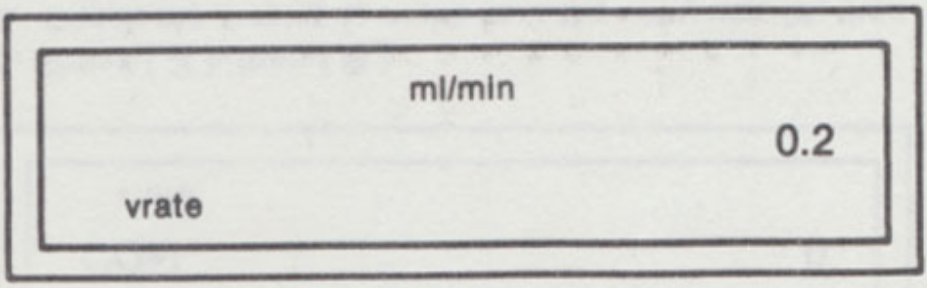
2. Press [**5**].
3. Check your entry, then press [**ENT**].
4. The computer will now ask for the second input.



5. Press [**2**], then [**8**].
6. Check the display to make sure the entry was 28, then press [**ENT**].

7. The computer will display the result with its unit flag, ml/min.

```
                    ml/min
                                        0.2
vrate
```

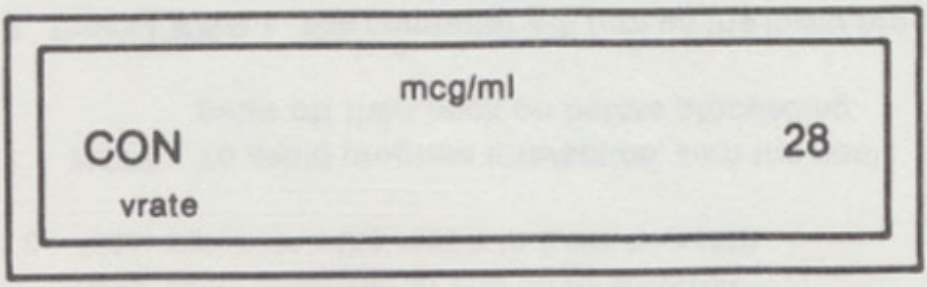


b. Compute the result if concentration is not known but it is known that 7 mg of drugs have been dissolved in 250 ml of IV solution.

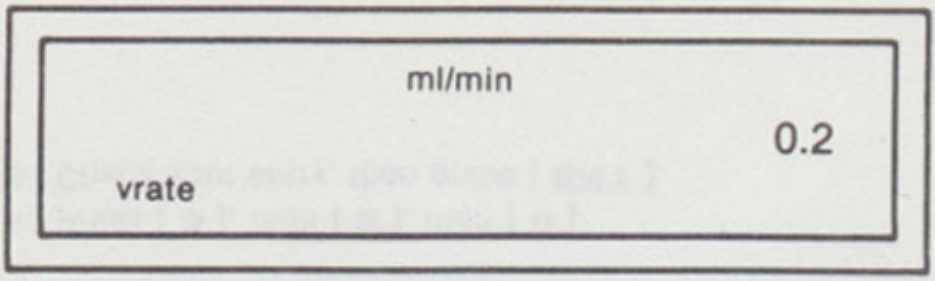
1. Compute CONC as in sample problem 5, obtaining a CONC of 28 mcg/ml.
2. Press **[VRATE]**. The program flag will change to VRATE, the first prompt for RAT will appear and the unit flag mcg/min for RAT will appear.
3. Press **[5]**, check your entry in the display then press **[ENT]**.
4. The computer will now display the prompt for concentration, the value of CONC calculated in the CONC computation just performed and the unit flag for CONC.

© 2010 Joerg Woerner
Datamath Calculator Museum

```
                    mcg/ml
CON                                     28
vrate
```

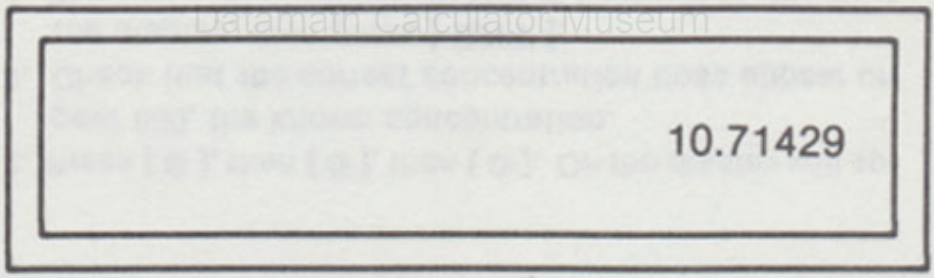


5. Press [**ENT**].
6. The computer will now display the result and the unit flag for the result.



c. Calculate the result in ml/hr.
   1. Perform the calculation for VRATE in ml/min, as above.
   2. Press [×], [**6**], [**0**], [=] to multiply the result by 60.
   3. The computer will now display the result without any flags.

© 2010 Joerg Woerner
Datamath Calculator Museum

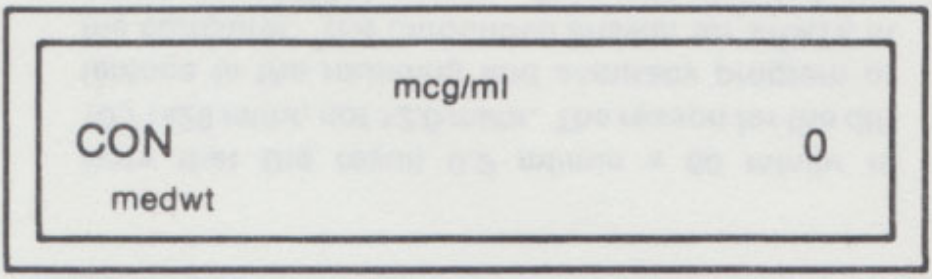


Note that the result 0.2 ml/min x 60 min/hr is 10.71429 ml/hr, not 12.0 ml/hr. The reason for the difference is the rounding and accuracy program of the computer. The unrounded answer for VRATE in ml/min is .1785714 ml/min. This was rounded and displayed as 0.2 ml/min. But the computer retained the full accuracy and used it in the next calculation.

PROGRAM 7 - MEDICINE WEIGHT

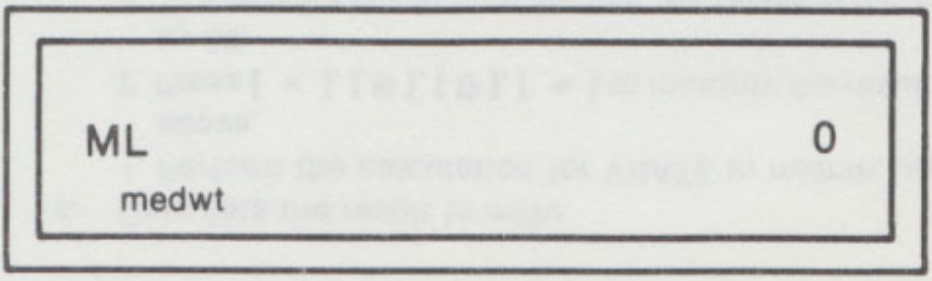
If you have an IV solution with a known concentration of 600 mcg/ml, compute how much medicine, in mg, is in the 350 ml of the solution which has been administered.

1. Press **[MWT]**. The computer will display the program flag, MEDWT, the first prompt CON and the unit flag for the prompt, mcg/ml.



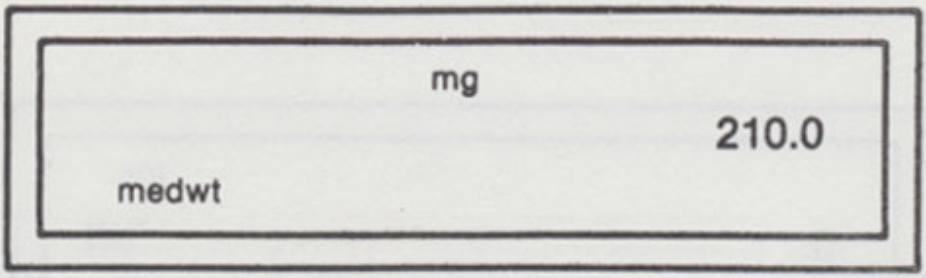
2. Press **[6]**, then **[0]**, then **[0]**. On the display will appear 600, the known concentration.
3. Check that the correct concentration does appear on the display, then press **[ENT]**.
4. The computer will now display the prompt for the next input, milliliters of solution.

© 2010 Joerg Woerner
Datamath Calculator Museum



5. Press **[3]**, then **[5]**, then **[0]**.
6. Check your entry, then press **[ENT]**.

7. The computer will then display the result with the result's unit flag.

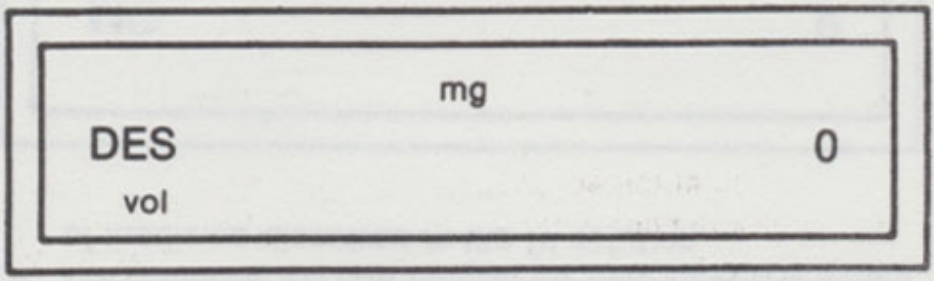


PROGRAM 8 - DESIRED MEDICINE WEIGHT TO ADMINISTER

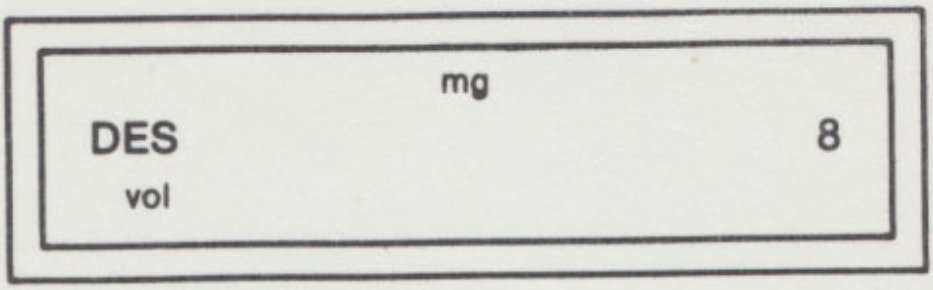
Given that you have 30 mg of a medicine dissolved in 250 ml of an IV solution, determine how many ml of that solution must be administered in order to give the patient 8 mg of the medicine.

1. Press [**VOL**]. The computer will display the program flag VOL, the prompt for the first input, DES, and the unit's flag for the first prompt, MG.

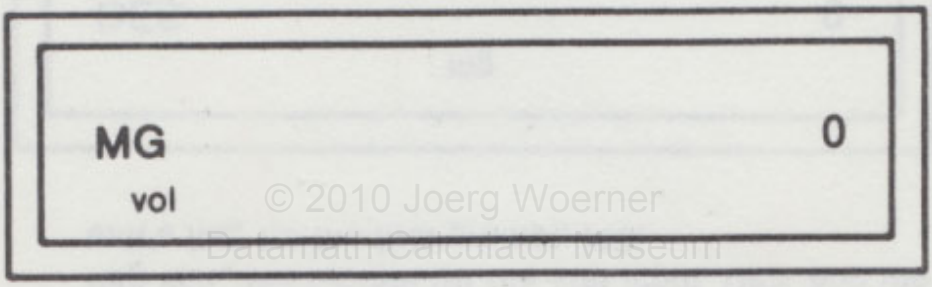
© 2010 Doug Wagner
Datamath Calculator Museum



2. Press [**8**]. The computer will then display 8, the desired amount of medicine to administer.

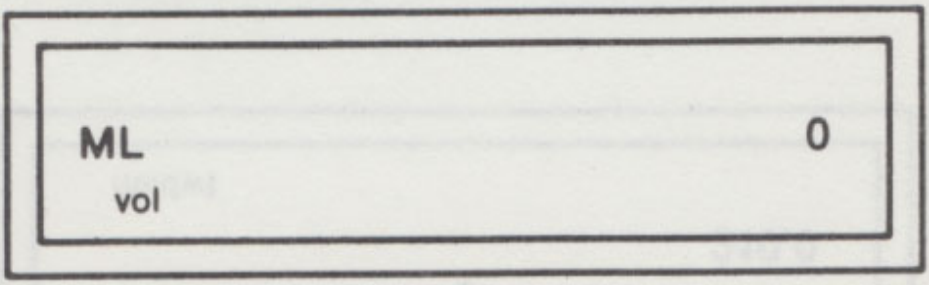


3. Check the display to make sure the entry is complete, then press [**ENT**].
4. The computer will now request the next input, the weight of medicine dissolved in the IV solution.

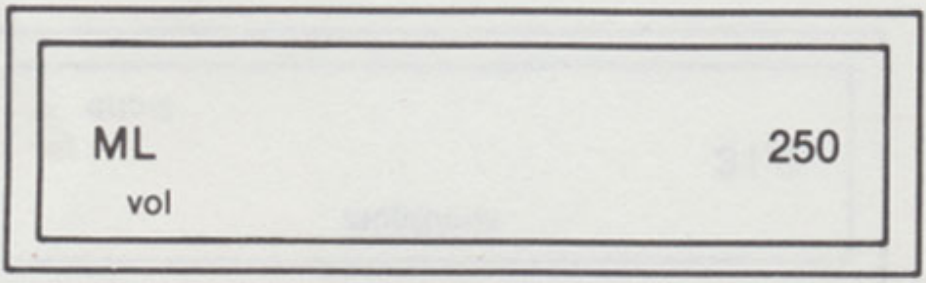


© 2010 Joerg Woerner
Datamath Calculator Museum

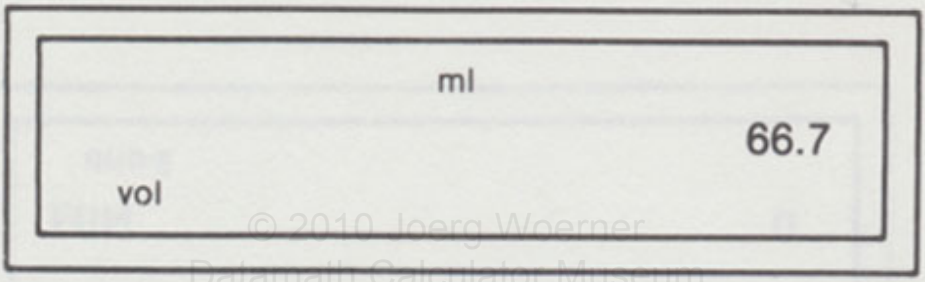
5. Press [**3**], then [**0**].
6. Check the display to insure the entry is correct, then press [**ENT**].
7. The computer will now display the prompt for the next variable, solution volume.



8. Press [**2**], then [**5**], then [**0**].



9. Check your entry, then press [**ENT**].
10. The computer will now display the result and the result's unit flag.

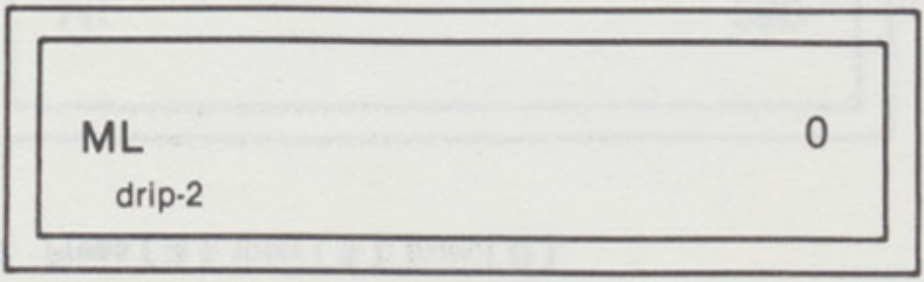


© 2010 Joerg Woerner
Datamath Calculator Museum

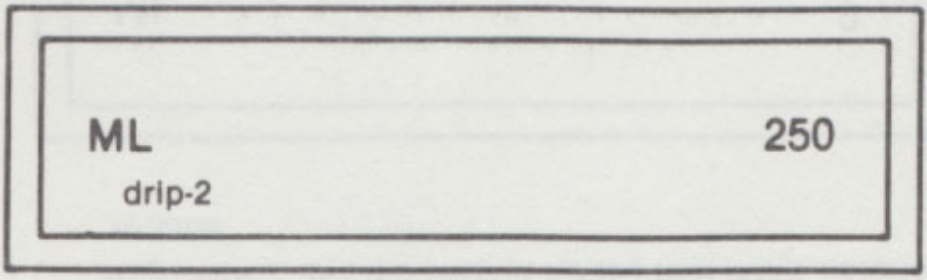
PROGRAM 9 - DRIP 2

If you have an IV solution of 250 ml, determine the drip rate necessary to administer it in 8 hours.

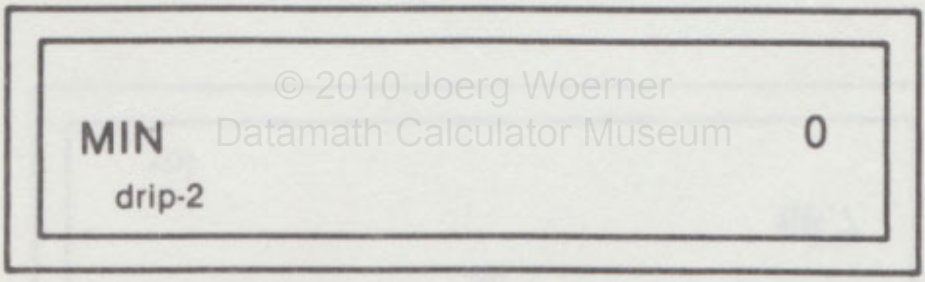
1. Press [**DR2**]. The computer will display the program flag DRIP-2, and the prompt for the first input, solution volume.



2. Press [**2**], then [**5**], then [**0**].

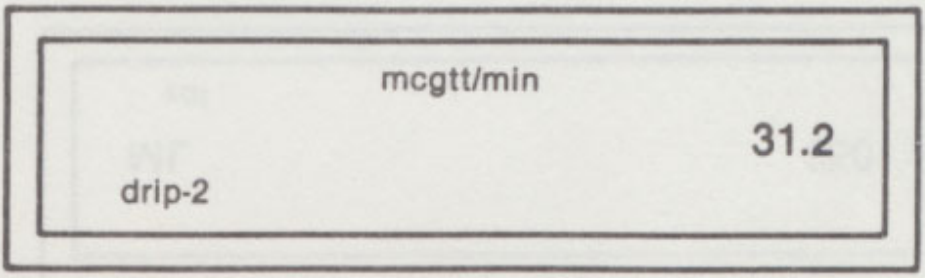


3. Check the display to make sure the entry is correct, then press [**ENT**].
4. The computer will now display the prompt for the second input, minutes.



© 2010 Joerg Woerner
Datamath Calculator Museum

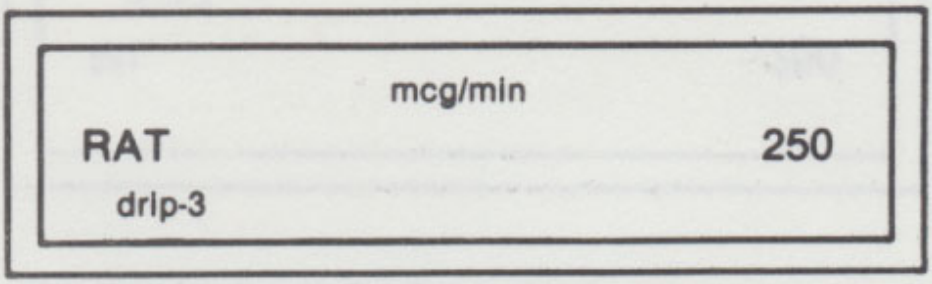
5. Press [**4**], then [**8**], then [**0**], 480 minutes.
6. Check the display to make sure the entry is correct, then press [**ENT**].
7. The computer will now display the result and the result's unit flag, mcgtt/min.



PROGRAM 10 - DRIP 3

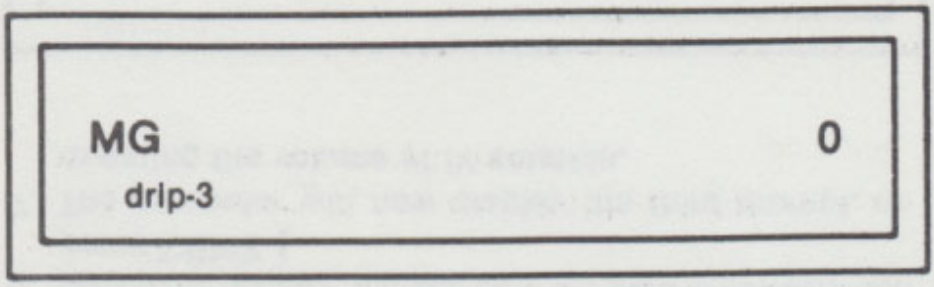
If you have an IV solution with a volume of 250 ml in which 400 mg of medicine is dissolved, calculate the drip rate to use if it is desired to administer the medicine at a rate of 250 mcg/min.

1. Press **[DR3]**. The computer will display the program flag, DRIP-3, the first prompt RAT and the unit flag for the first prompt, mcg/min.
2. Press **[2]**, then **[5]**, then **[0]**.

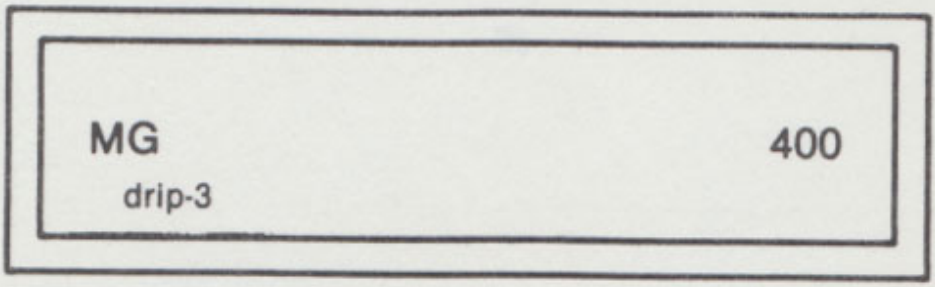


3. Check the display to make sure the data is correct, then press **[ENT]**.
4. The computer will now display the second prompt, requesting the weight of medicine, MG, dissolved in the solution.

© 2010 Joerg Woerner
Datamath Calculator Museum



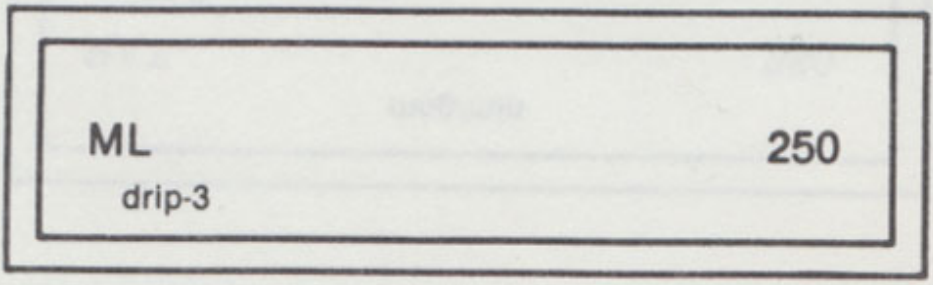
5. Press [**4**], then [**0**], then [**0**].



6. Check the display to make sure the data is correct, then press [**ENT**].
7. The computer will now display the third prompt, requesting the volume of IV solution.

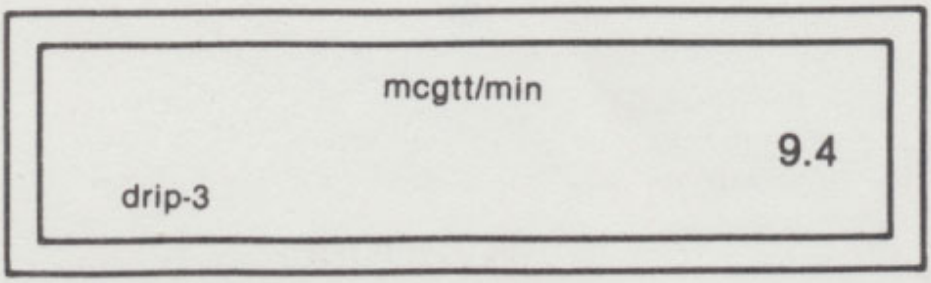
© 2010 Joerg Woerner
Datamath Calculator Museum

8. Press [**2**], then [**5**], then [**0**].



9. Check the display to make sure the data is correct, then press [**ENT**].

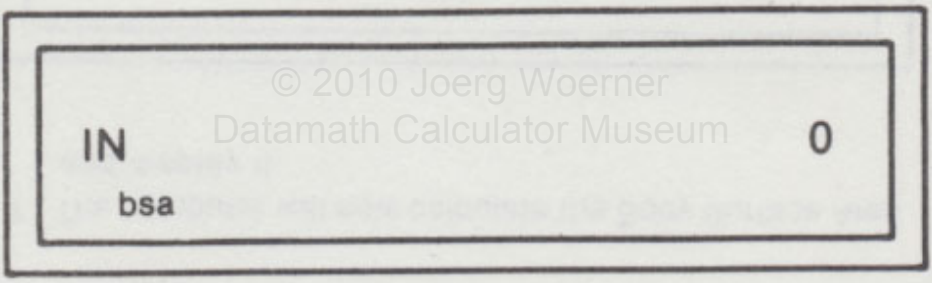
10. The computer will now display the result with the result unit flag.



PROGRAM 11 - BODY SURFACE AREA

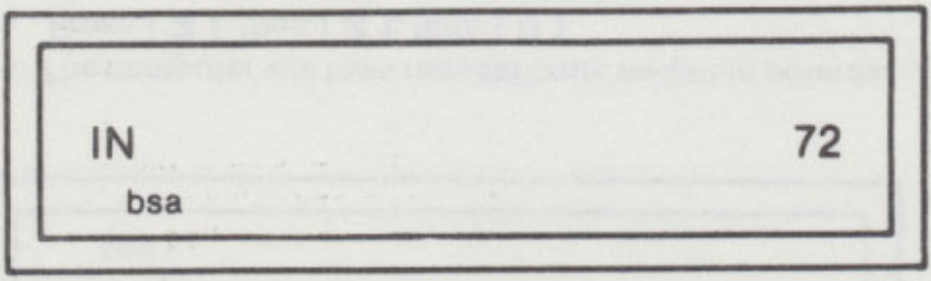
Compute the Body Surface Area for a 72 inch 220 pound individual.

1. Press **[BSA]**. The program flag will display BSA and the computer will request the first input, height, in English units.

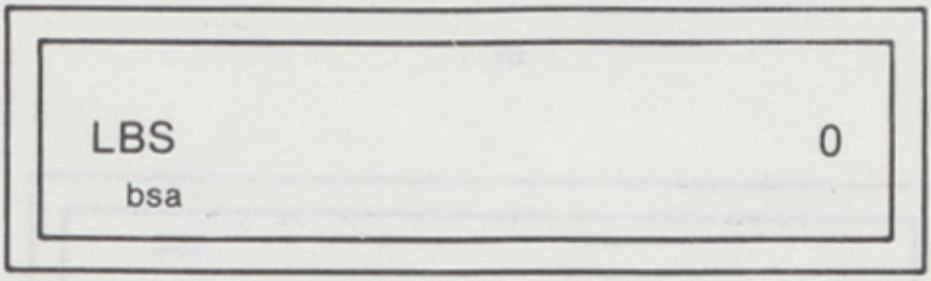


© 2010 Joerg Woerner
Datamath Calculator Museum

2. Press **[7]**, then **[2]**.



3. Check your data, then press [**ENT**].

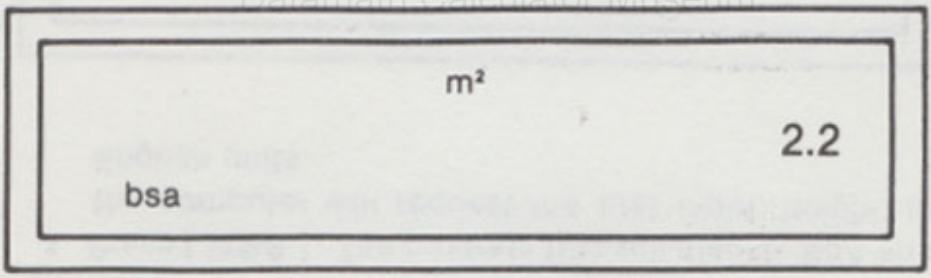


4. The computer will then request body weight in pounds.
5. Press [**2**], then [**2**], then [**0**].
6. Check your data, then press [**ENT**].

NOTE: Due to the complexity of the BSA computation, the computer screen will remain blank for a second or two.

7. The computer will now calculate the Body Surface Area and display it.

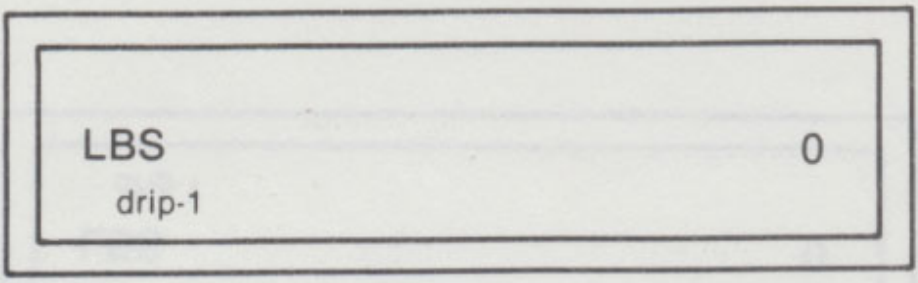
© 2010 Joerg Woerner
Datamath Calculator Museum



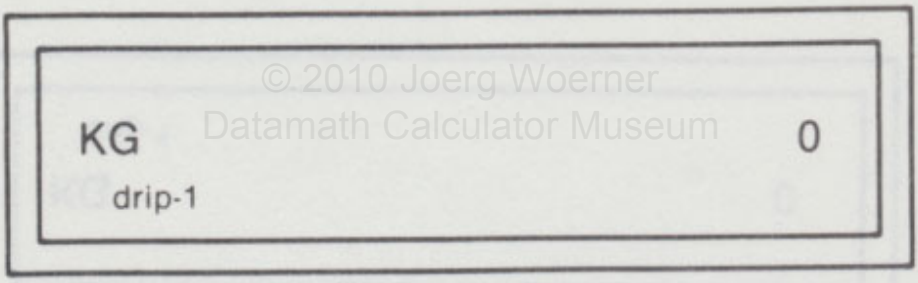
USE OF METRIC KEY AND ENGLISH KEY

Assume that in the Drip 1 sample calculation the patient's weight was listed as 68 kg instead of 150 pounds.

1. When the DOS value was entered, the computer display showed

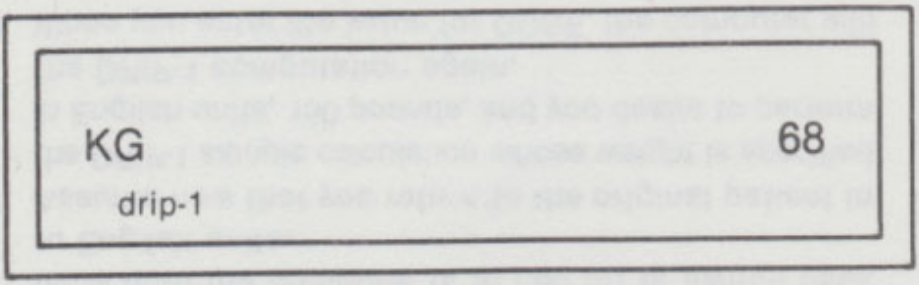


2. Since you desire to enter the patient body weight in metric units, kilograms, instead of pounds, press **[MET]**.
3. The computer display will now show

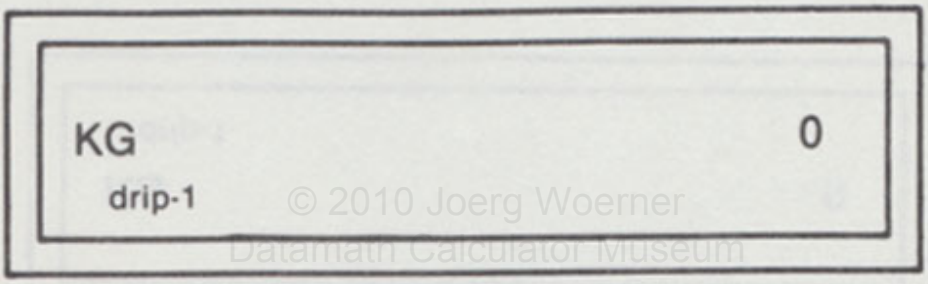


© 2010 Joerg Woerner
Datamath Calculator Museum

4. Press **[6]**, then **[8]**.

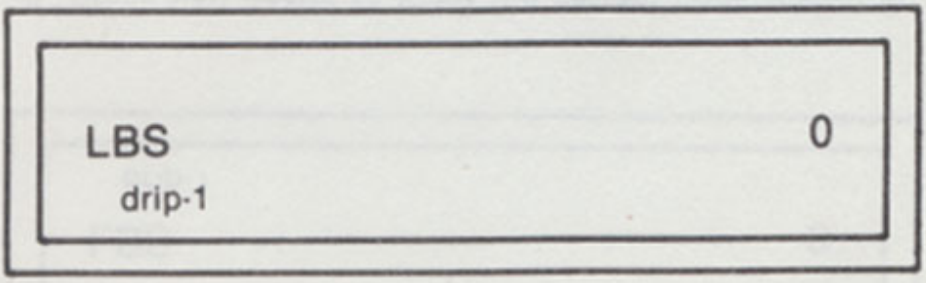


5. Since 68 kg is the correct patient body weight, press **[ENT]**.
6. The computer will now continue the DRIP-1 program as in the DRIP-1 example.
   The computer will continue to ask for body weight and height in the DRIP-1, DOSE and BSA programs in metric units until the computer is turned off or switch back to English units.
7. Assume now that you return to the original patient in the DRIP-1 sample calculation whose weight is specified in English units, 150 pounds, and you desire to perform the DRIP-1 computation again.
8. When you enter the value for DOSE, the computer will request body weight in metric units.

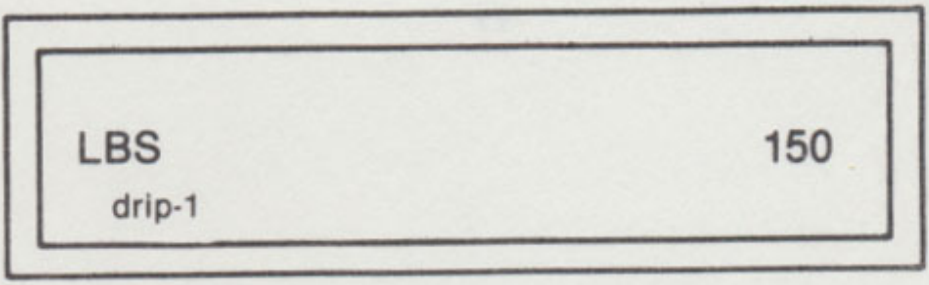


© 2010 Joerg Woerner
Datamath Calculator Museum

9. Since it is desired to use English units, press **[ENG]**.
10. The computer display will now show



11. Press [**1**], then [**5**], then [**0**].



12. Check your entry. Since 150 pounds is the correct body weight, press [**ENT**].
13. The computer will now continue the DRIP-1 program as in the DRIP-1 example.
    The computer will continue to ask for body weight and height in the DRIP-1, DOSE and BSA program in English units.

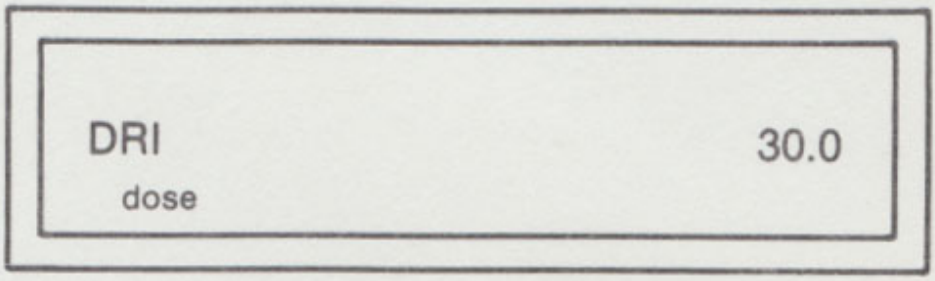
SAMPLE COMPUTATIONS -DEMONSTRATE USE OF THE CMP KEY

Datamath Calculator Museum

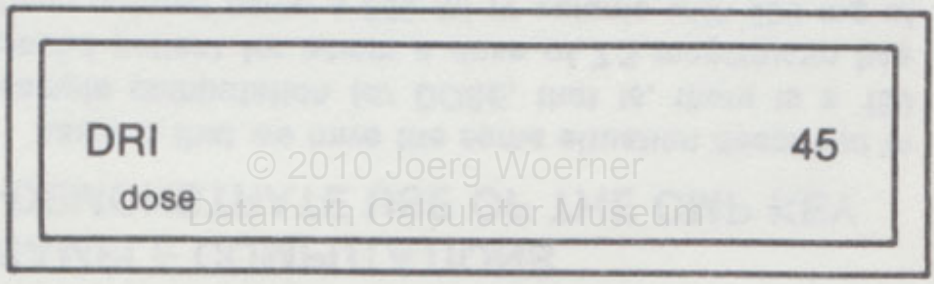
Assume that we have the same situation described in sample computation for DOSE, that is, there is a 150 pound patient for whom a dose of 7.3 mcg/kg/min has been ordered using a 500 ml IV volume with 500 mg of medicine dissolved. An IV of 30 mcgtt/min has just been computed and started. After observing the results, an increase in the drip rate to 45 mcgtt/min is ordered. The new dose being administered needs to be calculated.

In this case what is needed is dose... So...

1. Press the **[DOSE]** key. The computer will display the dose program flag, ask for the first input, DRI, and display the drip value it currently stores.



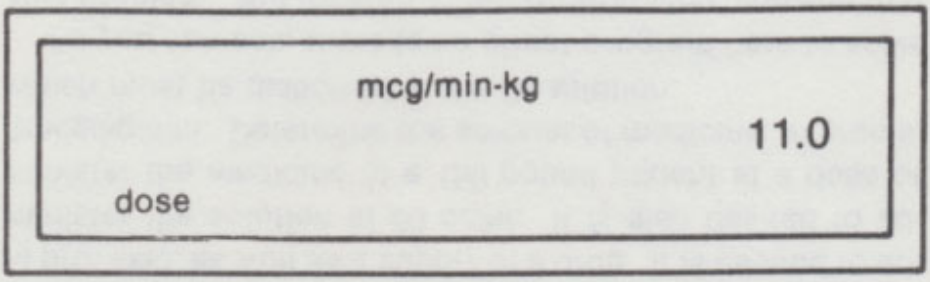
2. Since the DRIP value currently stored is the parameter we wish to change, press the **[4]** and **[5]** keys.



© 2010 Joerg Woerner
Datamath Calculator Museum

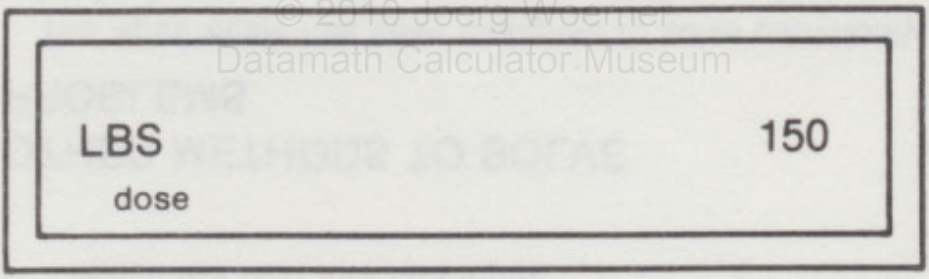
3. Check the value you have inputted. If it is correct, you may choose one of the two possible paths.
4. First of all, if you are confident that the patient body weight and concentration of the IV solution used in the last dose calculation is identical to that required for this calculation, press **[CMP]**. The computer will calculate and display the dose.

5. The computer will use the new DRIP value and the values for body weight and concentration which were used last. It will display the result.



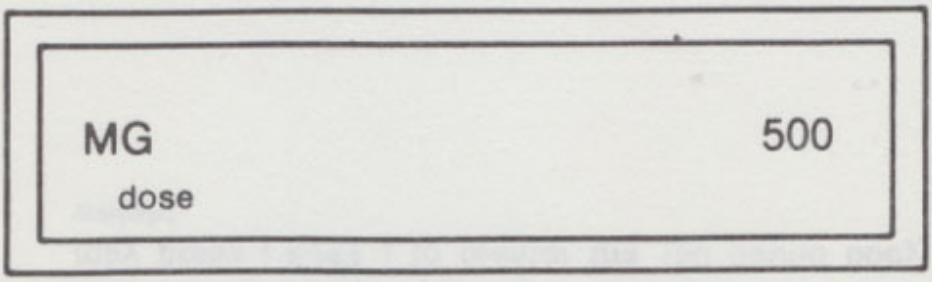
6. If, however, you want to check to make sure that the remaining inputs are correct, instead of pressing **[CMP]**, press **[ENT]**.
7. The computer will accept the DRIP and will display the next prompt, for body weight with the body weight it last used.

© 2010 Joerg Woerner
Datamath Calculator Museum



8. The body weight is correct. At this point you may press **[CMP]** to immediately compute a result, or you may press **[ENT]** to reenter the 150 pound body weight.

9. If **[ENT]** is pressed, the computer will display the prompt for the dissolved medicine weight along with the value it remembers as the last used medicine weight.



10. Again, since 500 mg is correct, you may press **[CMP]** to get an immediate result or you may press **[ENT]** to check the next and last input.

OTHER METHODS TO SOLVE PROBLEMS

© 2010 Joerg Woerner
Datamath Calculator Museum

The Apothecalc has been designed to solve commonly used equations, but there are other problems which may not be **directly** solveable.

There are ways in which the obvious capabilities of your Apothecalc may be expanded, further increasing your productivity.

The technique to use relies on the inherent speed of the computer, which will allow you to do many computations in a short period of time solving the problems by an iterative process.

Consider the following problem. An IV solution of 500 ml is provided, as well as a supply of a drug. It is desired to administer the solution at 50 cc/hr. It is also desired to administer the medicine to a 150 pound patient at a dose of 1mcg/kg/min. Determine the amount of medicine, in grams, which must be dissolved in the IV solution.

As you can see, there is no direct program here to solve this problem. But looking at our program list, you see that the DOSE calculation uses all the inputs available plus one, MG, which is the value you are looking for and **you**

know the answer to the dose computation. With only one unknown, you can find a solution. So guess a value for MG. It can be anything, 50 mg, for instance. Then solve the dose equation for inputs of 50 MG, 150 pound patient, 1000 ml of solution and a drip rate of 50 mcgtt/min.

The computer will tell us that it yields a dose of .6 mcg/kg/min. So that value was too low. You can say, "I wanted one but 50 mg will only give me .6, so I need to put more in." How much? Lets put 30 more in and check. The dose calculation for 80 mg is 1.0.

If you had tried to use 90 mg, you would have 1.1 mcg/kg-min and you would have known to try a little less.

Or you can calculate exactly how close you are. Use the 4 function mode to divide 1 mcg/kg/min by .6 mcg/kg/min. This gives a ratio of 1.666667.

So multiply your original guess, 50 mg, by 1.666667, arriving at 83.33333 mg.

Use 83.33333 mg in the dose calculation instead of 50. You now come up with a result of 1.0 mcg/kg-min.

There may be instances where the Apothecalc may be used to directly solve these other problems. For instance, the example just given can be directly solved on the computer with DRIP-1 program by substituting one variable. If you are interested in obtaining the specific detailed instructions for solving the problem in the example, directly, rather than by using the iterative methods or if there are specific Apothecary problems which you encounter and you would like to use the Apothecalc to solve them, contact our Engineering Department, P.O. Box 1879, Vidalia, GA 30474. If it is possible to solve those problems using the Apothecalc, we will send you detailed instructions on how to do so.

© 2010 Joerg Woerner
Datamath Calculator Museum

MISCELLANEOUS

REPLACEMENT BATTERY

The Apothecalc uses one alkaline "button cell" battery which should provide approximately two years of operation in normal use.

The battery should be replaced if you notice that the upper and lower "flag" displays become dim.

If the battery needs replacement, there are many available options which are listed below. One or more of these replacement batteries should be available at any outlet which sells watch and calculator batteries.

Some of the options listed are silver oxide type batteries. These will work satisfactorily in the computer and will provide longer life than the alkaline type but they are also more expensive. The list is provided alphabetically by manufacturer. New Specialties does not recommend any particular manufacturer.

Duracell	D357
Mallory	10L14
Maxwell	G13F, SR44W
Panasonic	LR44, WL14
Ray-O-Vac	RW-82, RW-42
Toshiba	G13, SR44W
Union Carbide (Everready)	A76, S76, 357
Varta	541/V357, V13GA, V13GS

© 2010 Jörg Woerner
Datamath Calculator Museum

LIMITED SIX MONTH WARRANTY

New Specialities, Inc. warrants the computer (except battery) to be free from defective materials and workmanship.

The warranty is valid for six months from date of purchase.

The warranty extends to the original purchaser only.

The warranty is void if the computer is damaged by accident or neglect, improper service or other causes not

related to defective materials or workmanship. The warranty is also void if the serial number is altered or defaced.

During the six month warranty period, New Specialties, Inc. will, at its option, refund the purchase price or will replace the computer with a new or reconditioned computer of equivalent quality when the defective computer is returned post paid to New Specialties, Inc. at the address below.

The replacement computer will be warranted for the remainder of the duration of the original warranty.

Except for the prepaid return postage, replacement or repair will be made at no cost to the purchaser.

Any implied warranties arising out of this sale, including BUT NOT limited to the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above six month period. New Specialties shall not be liable for loss of use of the computer or other incidental or consequential costs, expenses, or damages incurred by the purchaser.

Some states do not allow the exclusion or limitation of implied warranties or consequential damages; so, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

© 2010 Joerg Woerner
Datamath Calculator Museum

New Specialties, Inc.
P.O. Box 1879
Vidalia, GA 30474

NOTE: The computer is not waterproof. It will malfunction if water or other liquids enter its internals.

IMPORTANT

Record the serial number (from back of unit) and purchase date in the space below. Always reference this information in any correspondence.

SERIAL NO. _____ PURCHASE DATE _____

© 2010 Joerg Woerner
Datamath Calculator Museum

CAUTION

This electronic computer is a training and information aid and is not a medical instrument.

NOTE

This computer is designed to operate accurately within a wide range of atmospheric conditions. However, if exposed to extreme temperatures or direct sunlight for an extended period of time, the display may go blank. If this occurs, remove the computer from the heat or sunlight and it will display properly within several minutes. The computer should not be left in a closed automobile or aircraft parked in direct sunlight.

© 2010 Joerg Woerner
Datamath Calculator Museum

© 2010 Joerg Woerner
Datamath Calculator Museum

New Specialties, Inc.®