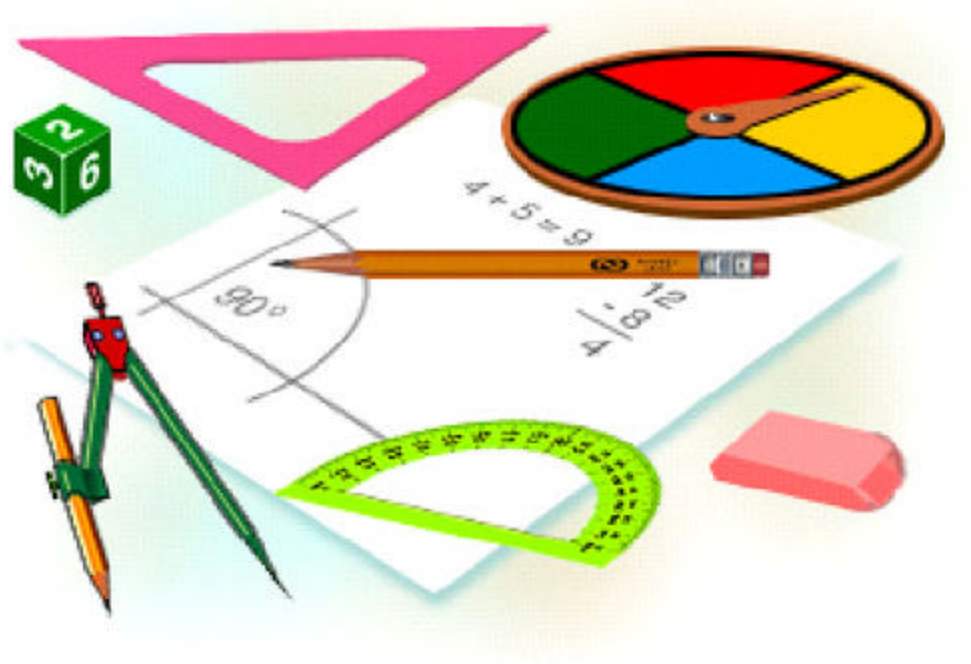
The Next Step

Mathematics Applications for Adults



Teacher's Manual:

Multiple-Choice Test Stragtegies

SECTION 3

Multiple-Choice Test Strategies

"We can try to avoid making choices by doing nothing, but even that is a decision."
-*Gary Collins*

OUTLINE

Mathematics – Teacher's Manual

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Calculator Use

The GED Test

The first GED Tests were developed in 1942 to help returning World War II veterans finish their studies and re-enter civilian life. Then, as now, the GED Tests measured the academic skills and knowledge expected of high school graduates in the United States or Canada. Recognized throughout North America, the GED program has served as a bridge to education and employment for an estimated 14.7 million people over its 60-year history.

The GED Testing Service has as its primary mission to provide a reliable vehicle—the GED Tests—through which adults can certify that they possess the major and lasting outcomes of a traditional high school education.

To this end, the GED Testing Service develops the GED Tests and provides information about the people who take them. The GED testing program is jointly administered by three separate entities: by the GED Testing Service of the American Council on Education; by each participating state, provincial, or territorial government; and by each of the 3,400 Official GED Testing Centers that serve as the main point of contact for GED candidates in communities across North America and overseas.

That is where the real story of the GED program lives—in the people who take the GED Tests as a step toward achieving their personal goals. GED candidates are a richly

diverse group. Some have recently left school. Others have been out of school for several years. Most take the tests to qualify for further education; others do it to encourage younger family members to stay in school or to qualify for a new job or promotion.

Many who take the GED Tests are preparing to enter a community college or four-year university. In fact, about one in twenty first-year college students is a GED graduate. GED graduates are successful doctors, public servants, office workers, mechanics, technicians, college professors, military leaders, business people, writers, and artists.

Today, a high school diploma remains the primary ticket to many entry-level jobs. In many cases, it's also the prerequisite for advancement in employment, occupational training, and postsecondary education. Change is indeed sweeping education and the workplace.

The GED Mathematics Test

The GED Mathematics Test is presented in two booklets: Part I permits the use of a calculator, Part II does not. Each part of the test is equally weighted. Therefore, a candidate must complete both parts of the test to receive a score. If a candidate doesn't successfully complete both parts of the test, he or she will have to take both parts again. A scientific calculator is provided to the candidate for use on Part 1. There are several sample questions prior to the

actual test administration to permit the candidate to practice with the calculator.

By permitting calculator use, the GED Testing Service has opened the door to increased realism in the types of mathematics problems, to multi-step problems, and to technology that is more common in the workplace. Approximately 20 percent of the items are alternate format (not multiple-choice). Alternate format items are included on both parts of the test. Item sets (several items corresponding to one graphic or other stimuli) play an increasingly important role. Multiple pieces of information are effectively communicated through graphics such as pie charts, bar graphs, and tables. The GED Mathematics Test includes many questions that require the candidate to access information from single sources such as these.

Measurement, Algebra, Geometry, Number Relations, and Data Analysis continue to be tested on the GED Mathematics Tests; however, the emphasis on these areas differs from that of the 1988 Test Series, with more emphasis on Data Analysis and Statistics. The GED Mathematics Test continues to include 25 percent set-up questions. These are questions that do not require the candidate to calculate the response but rather to identify the correct way to solve a problem.

Although it is important to recognize when there is not sufficient information to solve a problem, the emphasis on this type of question has decreased from 12 percent on the 1988 Series GED Tests to 4 percent for the latest series of tests.

Multiple-choice Test Strategies

On whatever government test you choose to write, you will be asked to solve multiple-choice questions. 80% of the GED mathematics test consists of multiple-choice questions. Your task is to choose the best answer for each item.

Work Backwards

For most items, it will be faster to solve the problem directly. Read the problem, decide which operation you need to solve the problem, do the work, and check your answer.

But in an algebra problem, you may be solving for a particular variable. Many of the facts are given. Perhaps the equation has already been written for you. In these cases, it may be faster to try each of the answer choices in the problem to see which choice is true.

Example The sum of three consecutive numbers is 30. What are the numbers?

(1) 6, 7, and 8
(2) 8, 9, and 10
(3) 9, 10, and 11
(4) 11, 12, and 13
(5) 14, 15, and 16

Since you know the numbers add up to 30, why take time to write an equation? Add the numbers for each answer option. You can quickly eliminate options 4 and 5 since 10 + 10 + 10 = 30. Clearly, options 4 and 5 total more than 30. Quickly add the numbers for the first three options.

Choice 1: 6 + 7 + 8 = 21
Choice 2: 8 + 9 + 10 = 27
Choice 3: 9 + 10 + 11 = 30

Option (**3**) is correct

By doing the calculations in your head, you save the time you would spend writing and solving an equation.

Estimate

Estimation can help you narrow down, or find the likely answer from, the choices in a multiple-choice problem. This strategy can be beneficial if you are unsure of a solution or have limited time.

Before using this strategy, make sure that the choices are far apart from one another. This strategy may not be helpful if the possible answers are close to one another in value, or if you are unsure which operation is required to solve the problem.

Example Troy bought 120 shirts for the spring sale at his store for $9 each. He sold all the shirts for $18 each. How much was Troy's profit?

(1) $147
(2) $1080
(3) $2160
(4) $19440
(5) Not enough information is given.

Step 1 Decide what steps you need to find the actual solution.

Part 1: Multiply (120)(9).
Part 2: Multiply (120)(18).
Part 3: Subtract Part 1 from Part 2

Step 2 Round each factor that is greater than 10 to its greatest place. The greatest place is the place farthest to the left.

120 rounds to 100
18 rounds to 20

Step 3 Work through the problem with the rounded numbers.

Part 1: 100 x 9 = 900
Part 2: 100 x 20 = 2000
Part 3: 2000 – 900 = 1100

Step 4 Compare your estimates to the choices. Option (1) is much lower than the estimate, so it can be eliminated. Options (3) and (4) are higher than the

estimate, so they can be eliminated. Since we have an estimated solution, option (5) can be ruled out. Option **(2)** is the most likely answer.

Answer: Troy's profit was $1080.

Computational estimation, where an individual finds an approximate answer for a computation, is one aspect of estimation. Following is a list of computational estimation strategies that you might wish to present to learners. This is not a comprehensive list and you may want to include other estimation techniques. Examples use addition and subtraction, but the estimation techniques can be used with other operations.

Rounding Method

There are many variations of rounding. Whether you round up or down or simply make adjustments depends on the circumstance.

Example: 3662 – 1180
Think: Round 3662 to 3700.
Round 1180 to 1200.

Then: 3700 – 1200 = 2500, therefore the exact answer should be approximately equal to 2500.

Front-End Method

Example: 345 + 175
Think: High estimate: 400 + 200 = 600
Low estimate: 300 + 100 = 400

Front-End Method with Adjustments

This method is especially good with computations involving money.

Example: $1.26 + $4.79 + $0.99 + $1.37 + $2.58
Think: I have $1 + $4 + $1 + $2 = $8, and I can round off the cents to (25¢ + 75¢ = $1) + (99¢ = $1) + (40¢ + 60¢ = $1) and then make an adjustment of $3 for the cents. Therefore, the estimate is $11.

Clustering Method

This method is used when numbers cluster around a central value.

Example:	72 250 + 63 819 + 73 180 + 67 490
Think:	Three numbers are around 70 000 and I know that 63 819 is closer to 60 000 but it is easier to multiply 70 000 x 4 which is approximately 280 000.

All of the answers on the GED test are to be recorded on an alternate format (multiple-choice) grid. GED candidates will be expected to solve the problem, determine the answer, write the answer in on the top line and then fill in the bubbles underneath.

Mathematics Test
Standard Grid

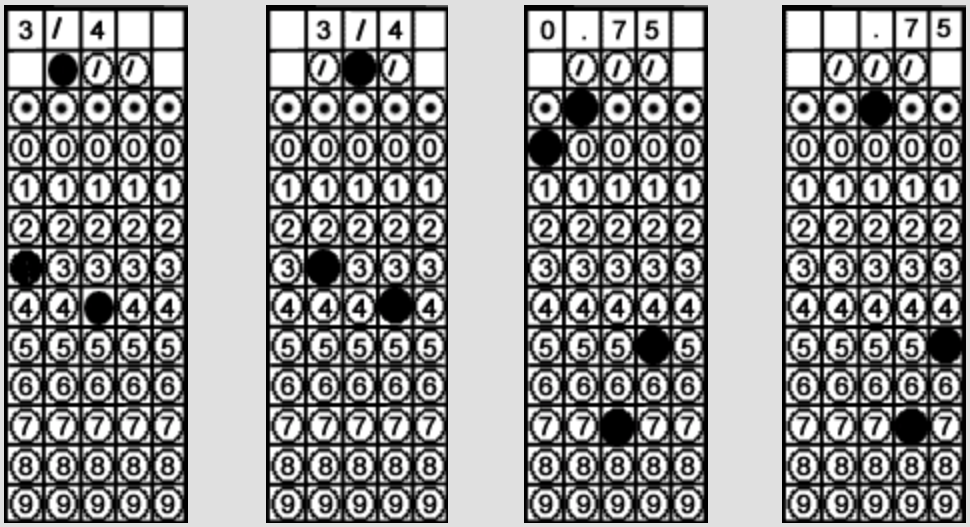
Mixed numbers such as 3 1/2 , cannot be entered in the alternate format grid. Instead, represent them as decimals numbers (in this case, 3.5) or fractions (in this case, 7/2). No answer can be a negative number, such as -8.

To record your answer for an alternate format question

- begin in any column that will allow your answer to be entered;
- write your answer in the boxes on the top row;
- in the column beneath a fraction bar or decimal point (if any) and each number in your answer, fill in the bubble representing that character;
- leave blank any unused column.

EXAMPLE:
The scale on a map indicates that ½ inch represents an actual distance of 120 miles. In inches, how far apart on the map will two towns be if the actual distance between them is 180 miles?

The answer to the above example is 3/4, or 0.75, inches. A few example of how the answer could be gridded are shown below.



Points to remember:

- The answer will be machine scored. **The circles must be filled in correctly.**
- Mark no more than one circle in any column.
- Grid only one answer even if there is more than one correct answer.
- Mixed numbers such as 3 ½ must be gridded as 3.5 or 7/2.
- No answer can be a negative number.

Mental Math

Being able to calculate mentally is an asset in everyday life. There are many tricks to help you to do mental calculations.

For example, 82×3 can be difficult to do in your head, but if you change your thinking process and think that $80 \times 3 = 240$ and $2 \times 3 = 6$, then $80 \times 3 = 240 + 6 = 246$. Here, 82 is closer to 80 than 90, therefore we tend to use 80 and then add the extra later.

If the number ends in a digit such as 8 or 9, we tend to go up to a multiple of 10 and then find the difference as opposed to going down. For example, $4 \times 78 = 4 \times 80 = 320$, but this is too large because originally, we had 4 groups of 78 and now we have 4 groups of 80 so we have to subtract 8 from 320 to get 312, which is the answer for 4×78.

Another mental tip when multiplying, is to double one number and halve the other. This can be used when one number is even, such as in 44×5. Looking at this problem,

you can see that doubling the 5 to get 10 will make the multiplication easier. If you double one number you must halve the other in order to achieve the same answer. This is because if you have several groups of an item and split each group in half, you will have the same total, but there will be twice as many groups with half as much in each group.

This is easily done when multiplying with an even number:

44×5 Half of 44 is 22, therefore I will multiply 22×10, which gives 220.

There are many more tips that you can use to aid in doing mental math. The following are some of these:

Compensation Method

Example: 198 + 64
Think: 200 + 64 = 264 (Oops! 2 too many)
Reasoning: 264 – 2 = 262

Add-Up Method

Example: 63 – 27
Think: 27 + ? = 63
Reasoning: 27 + 3 = 30 (3 more to get to 30; add ones to multiple of 10)
30 + 33 = 63 (33 more to get to 63)
63 – 27 = 3 + 33 = 36

Left-to-Right Method

Example: 87 + 35
Think: 80 + 30 = 110, 7 + 5 = 12 (10 + 2)
Reasoning: 110 + 10 = 120, 120 + 2 = 122

Creating a Simpler, But Equivalent, Computation

Examples: 58 + 36 = 60 + 34 (move 2 from the 36 to the 58)
400 – 168 = 399 – 167 (take 1 away from 400 first, then take away the other 167)
38 × 50 = 19 × 100 (half as many groups, but twice as much in each group)
48 + 16 = 24 + 8 (if 16 people share 48, half of them share half of 48)

Doing "Too Much" and Fixing It Up

Examples: $199 + 386 = (200 + 386) - 1$
$423 – 199 = (423 – 200) + 1$
$17 \times 19 = 17 \times 20 – 17$
24% of 80 = (25% of 80) – (1% of 80) = 20 – 0.8 = 19.2

Doing the Computation in Pieces

Examples: $217 + 358 = 217 + 300 + 50 + 8$
$423 – 218 = 423 – 200 – 10 – 8$
$17 \times 22 = 17 \times 20 + 17 \times 2$
$586 + 5 = 555 + 5 + 31 + 5$
12% of 900 = (10% of 900) + (1% of 900) + (1% of 900) =
$90 + 9 + 9 = 108$

Looking for Compatibles

Examples: $482 + 75 + 218 + 20 + 5 = (482 + 18) + 200 + (25 + 75)$
$4 \times 11 \times 25 = (4 \times 25) \times 11$

Using Compatible Numbers to Estimate Sums

Compatible people are people who get along. Compatible numbers are numbers that get along, too. Number pairs that are easy to add are compatible.

Fives are compatible:

75 + 25 = 100 **15 + 35 = 50**

Tens and any numbers that make tens are compatible:

30 + 40 = 70 **33 + 47 = 80**

When estimating sums, you can replace a pair of addends with compatible numbers before adding.

EXAMPLE

A double-decker train car has 77 people on the top level and 27 people on the bottom level. Approximately how many people are in the train car?

Solution:
To solve the problem, you can estimate.

Use compatible numbers 75 and 25, which are easy to add and close to 77 and 27.

77 + 27

75 + 25 = 100

Since 75 + 25 = 100, 77 + 27 is a bit more than 100. So, there are approximately 100 people in the train car.

GROUPING IN COLUMN ADDITION

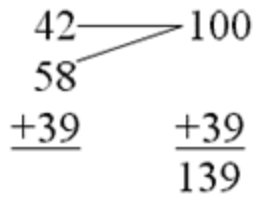
Suppose you want to add a few numbers in your head. You can group them in the way that makes it easiest for you to add them.

EXAMPLE 1

You are traveling through Arizona. It is 42 kilometres on Route 66 from Interstate 40 to Grand Canyon Caverns. It is 58 kilometres from the caverns on to Hackberry and 39 kilometres farther to where you can pick up Interstate 40 again. If you want to take the scenic route along Route 66, how many kilometres will you travel?

Solution:

Group the numbers in the way that makes adding easiest.
In this problem, it's easier to add 42 and 58 first, then add on 39 afterwards, giving a total of 139.

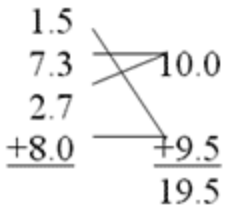


However, if it's easier to add the second and third numbers first, you should do so.

EXAMPLE 2

Use mental math to add 1.5 + 7.3 + 2.7 + 8.0.

Solution:



7.3 + 2.7 = 10, and 1.5 + 8.0 = 9.5
so, 1.5 + 7.3 + 2.7 + 8.0 = 19.5

Set-Up Questions

Some test questions, called **set-up questions**, do not ask you to solve a problem in the usual way. Instead, a set-up question asks you to choose a numerical expression or an equation that shows how to compute the correct answer.

Example 1

Shelly has driven 75 miles of the 340-mile distance between Springfield and Oakridge. Which expression below shows how many miles she has left to drive?

(1) 340 + 75
(2) 75 + 340
(3) 340 - 75
(4) 75 - 340
(5) 340 ÷ 5

You think: How much is 340 take away 75?

You choose the expression that represents this subtraction.

The correct answer choice is **(3) 340 – 75.**

Example 2

For the three-day weekend sale, the price of a toaster has been reduced by $5.89. The sale price is $17.60. Which equation below tells how to calculate the original price (*p*)?

(1) $p = \$17.60 - \$5.89$
(2) $p = \$17.60 + \$5.89$
(3) $p = \$17.60 + \$11.71$
(4) $p = \$17.60 - \$11.71$
(5) $p = \$17.60 \times \$5.89$

You think: The original price (p) is $17.60 plus $5.89.

You choose the equation that represents this addition.

The correct answer choice is **(2) *p* = $17.60 + $5.89**

As you see, solving a set-up question involves identifying a numerical expression that represents information given in a sentence or phrase.

Calculator Use

The Casio fx-260 Solar Scientific Calculator is the official calculator used for the GED Test. Each person taking the GED test will be issued the fx-260 during Part I of the Mathematics Test.

The Casio fx-260 Solar Model was selected, because it meets the test specifications and is likely to be found in a traditional high school setting. Knowing what calculator will be provided for use on the Mathematics Test and becoming familiar with its operation beforehand will help remove anxiety and ensure the examinee's success.

Technical Specs

Large, color-coded keyboard

Solar Power

10 Digit mantissa + 2-digit exponent display

11 Digit accuracy

Floating negative sign appears to the left of the number displayed

Rounds off all answers to the number of digits displayed

144 built-in mathematic functions

Fraction functions

Accurate 10 digit, 10 + 2 display

Backspace Key to fix entry mistakes Basic Scientific,

Exponential and Trigonometric functions

Single variable statistical calculations

Order of operations M-D-A-S

Polar-rectangular conversions

Slide-on hard case

Super Solar - no more battery costs

DMS<>DD,P<>R

Mean, Standard Deviation

Permutations & Combinations

START-UP INSTRUCTIONS: You may use the eraser of a pencil to press the keys.

1. Press the "ON" key, even if the **calculator** is on. Pressing the "ON" key puts the **calculator** in the correct mode for math calculations. After pressing the “ON” key, the screen should display "DEG" in small letters. “DEG” means the **calculator** is in the correct mode for math

calculations. The "ON" key is also the master clearing key, because this key clears the screen, clears the last function entered, and clears the memory. It is advisable to use this key to make sure the **calculator** is completely cleared and is in the correct mode (Comp) for the math calculations.

2. Check the screen: Fill the screen with 8's. If each 8 is not complete, the **calculator** should not be used. Now clear the screen by pressing the "ON" or "AC" key, and the **calculator** is ready to use. The screen should always be checked in this manner before you use the **calculator**.

BASIC OPERATION KEYS: "+", "- ", "x", "÷", "=".

All of these operations should be entered into the **calculator** as they appear in a "constructed problem." The **fx-260** will do the operations in the correct order, even when the problem contains multiple parentheses. Example: 4 x 9 + 3 5 x 6 + 2 is put into the **calculator** as it is written. Enter 4 x 9 + 3 5 x 6 + 2 = the answer is "11"

OTHER KEYS:

"=" Press "=" at the end of a problem, to have the **calculator** compute the answer. If the answer is already there, pressing the "=" key will not alter the correct answer.

"C" Pressing the "C" key only clears what is on the screen.

"AC" Pressing the "AC" key clears the screen and the last function entered. This key, because of its location, is

usually the most popular key for preparing the **calculator** for the next problem. Remember to press the "ON" key to clear the memory and return the **calculator** to the mode for math calculations ("comp" when in compute mode - the screen reads "DEG").

"SHIFT" This key shifts to the function written above the keys. Example: Find the square root of 36. Enter 36, SHIFT X^2. The answer is 6. NOTE: You should not press two keys at the same time. Press "SHIFT" and then press "X2". When the "SHIFT" key is pressed the word "shift" should appear in the left hand corner of the screen.

Here are other keys you may want to become familiar with:

"<" Backspace. Pressing this key clears the last digit displayed on the screen. This key can be used to clear a number entered by mistake.

"+/□" Sign Change key. This key, not the subtraction key, changes the sign of a number. Numbers are automatically entered as positive numbers, and then can be changed to negative numbers. Example: -5 is entered 5, +/ , and -5 appears. The -5 can be changed back to a 5 by pressing the +/ key again.

"[(--- " and "---)]" Parenthesis or bracket keys use opening and closing parentheses at each place they appear in a problem. The **fx-260** will allow for a maximum of 18 sets of brackets to be used. The **calculator** will display on the screen how many sets of parentheses and/or brackets

are open. Please remember to close parentheses and/or brackets.

"Xy" "X to the y power" key. Example: What does 7 to the power of 4 equal? Enter 7 Xy 4 = The answer is 2401.

"X2" and **"Ö"** Square and Square Root key. Example: What is 5 squared? Enter 5 X2 . The answer is 25. What is the the square root of 49? Enter 49, SHIFT, X2 the answer is 7.

"EXP" and **"ð"** Exponent or Pi key. One may use either function for the value of Pi, when using the "Comp" mode. In other words pressing "EXP" also equals 3.141592654, when using the "Comp" mode or you may press shift "EXP".

NOTE: You may develop different methods or steps for computing problems when you become more familiar with the fx - 260.

ADDITIONAL KEYS you might want to know about.

"a b/c" Fraction key. To enter 1/4 or 2¾? Enter 1, a b/c, 4. If you press = and a b/c again, .25 (the decimal equivalent) is displayed. Pressing the fraction key again will return the number to fraction form 1/4. To enter 2¾, Press 2, a b/c, 3, a b/c, 4. If you press "=" and a b/c again, 2.75 (the decimal equivalent) is displayed.

"%" Percent key. When solving percentage problems, you must enter the percentage part of the problem last.

Example: What is 5% of 50? Enter 50, X, 5, SHIFT, =. The answer is 2.5.

BASIC CALCULATION PROBLEMS

#1

12 + .17 - 15 =

Enter: 12 + .17 - 15 = Answer : -2.83

#2

32 ÷ 4 x - 3.2 = Note -3.2 is a negative number, and the "+/-" key must be used to change this number to a negative number.

Enter: 32 ÷ 4 x 3.2 +/- = Answer: -25.6

#3

6 x 5 + 3 ÷ 2 - 6=

Enter: 6 x 5 + 3 ÷ 2 - 6 = Answer: 25.5

#4

$4 \div 3(4 \times 10^{11}) =$

Enter: 4 ÷ 3 x (4 x 10 XY 11) = Answer: 5.33333333311

#5

$3 + 7 / 2 + 5 \times 3^2$ When you are computing fractions that have complex numerators and/or denominators, enter the

complex numerator and/or denominator in parentheses, when entering the problem in the **fx-260**.

Enter: (3 + 7) ÷ (2 + 5 x 3 Xy 2) = Answer: .212765957

#6

121 + 17 - (- 4) x -2

Enter: 121 SHIFT X2 + 17 - 4 +/- x 2 +/- = Answer: 20

#7

3[4 + 6(8 + 2)] =

Enter: 3 x (4 + 6 x (8 + 2)) = Answer: 192

#8

6/5 ð 43=

Enter: 6 ab/c 5 x EXP x 4 XY 3 = Answer: 241.2743158

Note : the exponent key is the same as Pi in this problem.

CONSTANT CALCULATIONS PROBLEMS

#1

4.5 + 3; 4.5 + 5; 4.5 + 11 Note : By entering the " +" key or "x" twice the **calculator** continues to add or multiply numbers to the first number (constant) entered, without entering the number again.

Enter: 4.5 + + 3 = Answer: 7.5

5 = Answer: 9.5

11 = Answer: 15.5

#2

8 x 4.5; 8 x 15; 8 x (-5)

Enter: 8 x x 4.5 = Answer: 36

15 = Answer: 120

5 +/- = Answer: -40

#3

14 + 14 + 14 + 14=

Enter: 14 + + = Answer: 28

= Answer: 42

= Answer: 56

ADDITIONAL PROBLEMS: (The answer key follows problem number 4.)

#1

28.9 + 7 1/7 ÷ 4.7 Answer: 30.53452109

#2

$4 \div 6^2 \times 4^2 - 13.4 =$ Answer: -11.62222222

#3

$24 \times 3^2 - (10.2 + 8\ ¼) =$ Answer: 25.64081537

#4

What is 98 increased by 15%? Answer: 112.7

(Remember to enter the percentage part of the problem last.)

ANSWER KEY for the four previous problems.

#1

28.9 + 7 1/7 ÷ 4.37

Enter:

28.9 + 7 a b/c 1 a b/c 7 ÷ 4.37 = Answer: 30.53452109

#2

$4 \div 6^2 \times 4^2 - 13.4$

Enter:

4 ÷ 6 Xy 2 x 4 Xy 2 - 13.4 = Answer: -11. 62222222

#3

24 x 3^2 - (10.2 + 8¼)

Enter:

24 SHIFT X2 x 3 Xy 2 - (10.2 + 8 a b/c 1 a b/c 4) = Answer: 25. 64081537

#4

What is 98 increased by 15%?

Enter:

98 x 15 SHIFT = + Answer: 112.7

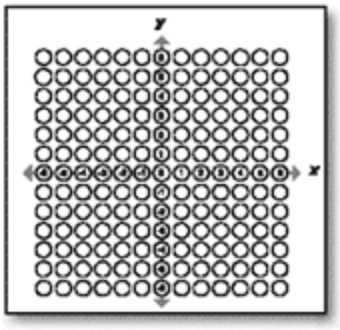
Turning the calculator off

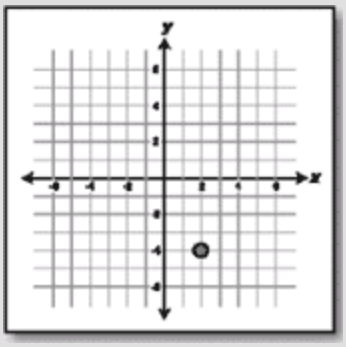
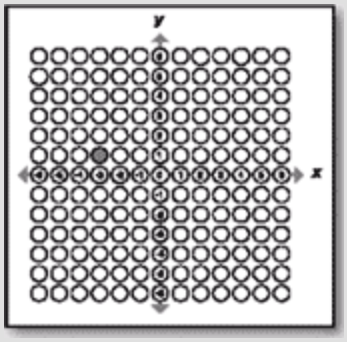
> This is a solar calculator. You can't turn it off. EVER! (okay, it shuts down after two minutes of non-use).

Mathematics Test
Coordinate Plane Grid

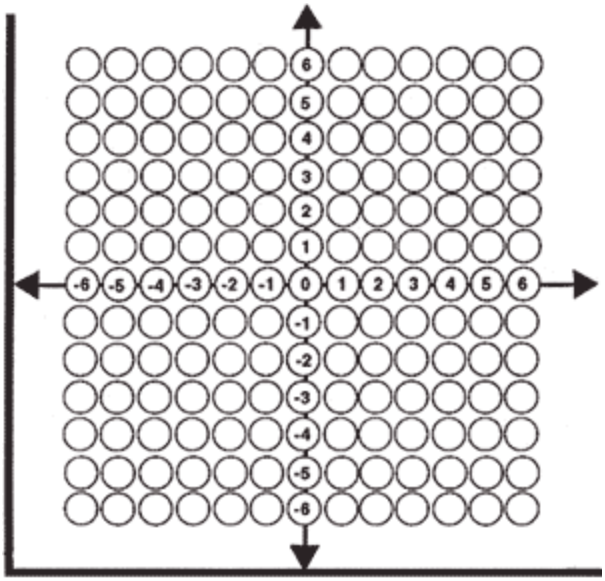
Points to Remember:

- **To record an answer on the coordinate plane grid, you must have an "*x*" value and a "*y*" value.**
- **No answer for a coordinate plane question will have a value that is a fraction or decimal.**
- **Mark only the *one* circle that represents your answer.**



EXAMPLE:	**CORRECT RESPONSE**
The coordinates of point A, shown on the grid below, are (2, -4).  **The coordinate of point B, not shown on the grid, are (-8,7). What is the location of point B?** **DO NOT MARK YOUR ANSWER ON THE GRID ABOVE.** **Mark your answer on the coordinate plane grid on your answer sheet.**	

Coordinate Plane Grid



GED

2002