The House of Numbers

A simple study guide to passing the exams GED, HiSET or TASC of Mathematics

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Prologue

The American Board of Education and the Education Examination Center (ETS), recommend that all individuals who were unable to complete their high school education take one of these exams, GED, HiSET or TASC, in order to obtain a certificate equivalent to the Diploma received by students who have completed their secondary education (high school) in order to continue their education and obtain better employment opportunities.

The GED, HiSET and TAST Exams

These exams will assess knowledge in the subjects of social sciences, natural sciences, mathematics, writing and reading comprehension. The applicant has the opportunity to demonstrate that he/she has the equivalent knowledge of a high school graduate (HS) student, and therefore has the right to receive an equivalent diploma for effort and dedication.

The applicant may take the exam at any time he/she deems appropriate; it is no longer necessary to register at the offices of these institutions or to wait for a specific date and time to take the test. The applicant, without an appointment, can register, create an account and pay for the exams online (GED, HiSET, TASC). Finally, he/she decides the date, time, language, and location of the examination. Also, the applicant can take the exam either manually (paper and pencil) or electronically (GED is the only one offered at the national level and is 100% computerized).

These exams can be taken by subjects, i.e. mathematics first, sciences second on a different day and thus, continue until finished.

At the end of each partial exam, the applicant may receive the score and/or request a transcript in advance with the score after the exam. Obtain more information about by visiting these links:

1. The GED Exam: https://ged.com/es/
2. El the HiSET exam: https://hiset.ets.org/es/test-takers/
3. THE TASC test: http://tasctest.com/

To pass the GED exam, the applicant must accumulate 600 points or more. However, if he/she obtains an of average 145 points in each subject will pass the exam. The average to pass the HiSET exam is 45 points out of 100 per subject. The applicant, who decides to take the TASC exam, needs to maintain an average of 500 points of 800 on each subject. The written part is one more grade to average in these last two exams, the applicant should reach a minimum between 2 to 4 points of 6 or 8 points total in the essay examination.

CDEC-Chamber of Studies

The Mathematics Exam

Mathematics has applications in all sciences and in our daily living. It is for this reason, that, it has always been considered as of vital importance of any admission exam for technical or higher education. For example, the GED, HiSET and TASC examinations evaluate mathematical knowledge in the areas of **arithmetic, statistics, algebra, geometry, and trigonometry.**

As of 2014 math exams have been computerized and each question is accompanied by multiple answers, so when answering you must be very careful when selecting the correct answer.

However, some of these exams will give you the option to answer the questions on an answer sheet if you prefer.

When the applicant takes the test, he will have the opportunity to use paper and pencil to perform calculations. He will also have access to a calculator when it is authorized. In the GED exam, the calculator will be available on one side of the monitor screen with the questions that will be answered using the computer keyboard and mouse. The applicants should never assume that an answer is correct without first carefully analyzing and developing exercises and problems, even those that can be solved mentally.

In general, the Math exam includes at the end or at the beginning annexes with math laws, axioms, formulas, etc. Check them before answering. Visit the links below to view some of these questions:

https://hiset.ets.org/s/pdf/practice/math_fpt7.pdf

https://ged.com/practice-test/en/math/

https:// tasc practice-math test

In the math exam, the theoretical aspects have no part in the evaluation questions, only their application. The book, "The House of Numbers" is divided into 8 chapters, in which mathematical basic concepts and guided and individual practices have been combined. All the exercises and problems are solved and explained step by step. The book includes 40 practices, 17 tests and a general practice of the math exam similar to the real examination, which also includes the solutions. In addition, annexes with references about theoretical and practical aspects are included as a summary to refresh and strengthen the applicant's knowledge when taking the general practice of the math test.

CDEC would like to congratulate the applicants on taking the first step and committing to a serious preparation to win this battle. Honestly, we believe this book will be very helpful in illuminating students' knowledge by raising mathematical logical criteria and supporting them in gain the confidence necessary to succeed in taking the math test.

Study Guide

1. Take fifteen minutes to finish or leave all business pending before starting your daily study session, so that you feel ready, willing, and relaxed. Think about it as if you went into an elevator. Go up and leave everything else (problems and pending issues) on the first floor. If you practice doing this each day before starting to study, your concentration level will be indestructible. We recommend that you take an average of two hours to study and develop practices and tests to build your knowledge and increase your success. Begin your daily practices as if you were preparing to run a marathon, and then move on to the next chapters in this book.

2. Make sure you have a notebook, a pencil and a calculator on hand. It's recommended that you familiarize yourself with the TI-30XS scientific calculator or similar (e.g. Fx-80MS.,which you used on the test). Below, we give you a link to learn how to use it. Press on the keyboard of your computer: "CTRL" and at the same time the link TI-30XS with the arrow that identifies the mouse on the screen. Take advantage of this study material, write notes and revisit the link as often as necessary; this will help you quickly solve the math test. If you prefer to watch a video, use this CDEC electronic link. In each chapter of the book, you will also receive guidelines and examples for solving problems with the calculator.
3. When you finish your daily journey learning or reviewing Mathematics. Lie down early, relax and get a good night's sleep! This will help you stay calm, alert, and ready to continue learning a chapter or start a new chapter prepared for you in "THE HOUSE OF NUMBERS." Experts in techniques to increase the level of concentration, recommend closing your eyes and mentally count to ten, while you do so, mentally visualize the position of your hands, the position of the pencil, your feet...
4. As you read each chapter, it will be as if you hear the author's voice guiding you and communicating through the specially designed graphic symbols below, created with the purpose of clarifying concepts, suggesting shortcuts in working methods and using the calculator's applications to guide you step by step in the development of your mathematics skills.

   It is recommended that you stop to read the messages presented in these graphic designs because you will always find help to speed up your math skills or process of learning. We recommend you follow these guidelines, which will help develop your creativity, understanding, and math logical analysis to apply concepts and techniques learned in solving the exercises and problems that arise in the exam.

   Counselor Ideas, reviews Analysis, Guide practices

Content table

"Mathematics is an exact science based on logical procedures, it is a science in motion, that does not stop, that evolves and promotes technological advancement by its function and application in all sciences."

Chapter I Arithmetic basics

1.1 The numerical system

In very remote times, more than 5000 years ago, the mankind living in society saw the need to create and establish numerical systems. The most famous tribal civilizations and societies such as the Greek, the Egyptian, the Roman, the Arab, the Aztec, the Inca, the Maya, the Mesopotamian (Sumerians, Akkadians, Babylon, Syria...), Phoenicia, Hebrew, had develop their own numerical systems. However, there was invalidity in transcending its borders, so there was no universal system despite the diversification in the social and economic advancement of these societies because some use positional systems (8,10…) and others no positional systems base in symbols.

Neither the famous era of conquest inspired by the ambition for power and territorial expansion of the kingdoms that established hundreds of years of domination and exploitation; nor the revolution of the dominated societies and the emergence of new societies heir of great cultural and religious influence, neither the mixing nor advancement in the development of the sciences, could establish a numerical system with universal basic acceptance.

What is a numerical system?

A numerical system is a set of symbols and rules applied for the purpose of classifying and validating the absolute and numeric value that the numbers communicate. A numeric system has an alphabet-like function in a language because both use symbols, characters, or figures, as well as follow rules for establishing communication links to give an order to things, as well as represent quantities and quantify them (objects, animals and more).

The definition of a numerical system in specialized texts is synthesized and expressed in a simple equation: N= (S, R)

Where:

N = The decimal, binary, duodecimal, or dozens of numeric system, among others.

S = System-identified set of symbols [(decimal with base 10 (0, 1, 2, 3...),

base binary 2 (0 and 1), duodecimal or dozen base 12 (2, 3, 4, 6... own factors) ...]

R = Set of rules to provide the system unwrapping.

The Indo-Arabic and Roman civilizations left humanity as historical legacies with their numerical systems that remained in force despite the centuries and the emergence of the new nations.

Special mention deserves the Indo-Arabic system, which was introduced by the Arabs into Europe and then spread to the rest of the world by the European conquerors. A system that, over time, became the basis and inspiration of the current decimal system most use in the world.

Another system that survived the onslaught of time was the Roman numerical system which also won acceptance and was mainly used to establish categories, such as ordinal numbers.

To differentiate between these systems, a table is presented where the equivalence between these systems and their absolute values is displayed:

Numerical Systems

	Arabian	**(English/Arabic)**	**Roman**	**(English/Latin)**
	0	Zero/sifr		nulla
Digits(symbols)	1	one/wahed	Ⅰ	One/primus/ unus
	2	two/ithnan	Ⅱ	two/secundas/duo
	3	Three/thalatah	Ⅲ	3/tercious/ tres
	4	Four/arba-ah	Ⅳ	Four/quarttuor
	5	Five/khamsah	Ⅴ	Five/quintus/ quinque

	6	Six/sitah	VI	Six/sextus/ sex
	7	Seven/sab-aah	VII	Seven/septimus
	8	Eight/thamaniah	VIII	Eight/octavus/ octo
	9	Nine/tis-ah	IX	Nine/nonus/novem
Decimal	10	Ten/acharah	X	Ten/decem
	20	Twenty; 30, 40	20th	Twenty, XXX, XL
	50	Fifty...	L	Fifty, LX...
	100	Hundred...	C	Hundred...
	130	One hundred and thirty...	CXXX	One hundred and thirty...
	450	Four hundred and fifty...	CDL	Four hundred and fifty...
	500	Five hundred...	D	Five hundred...
	1000	Thousand...	M	Thousand...

Features:

1. In the Arabic system, the digits go from 0 to 9. The decimal system took this as the numerical base and expanded it by giving it oppositional notation-based arithmetic on power ten, raising its numerical value to the infinite, combining these digits to create larger numbers (10, 15, 43...).
2. The Roman numerical system uses seven uppercase letters of the alphabet, which when combined increase or decrease its numerical value (IV = 4, VI = 6, XV = 15...). Except for the numbers V, L, and D, the other numbers double or triple its value, if written together, for example (X=10, C =100, M =1000)(XX =20, CC = 200, MMM = 3000...).
3. Another characteristic of these numbers is that they increase their numeric value by a thousand when a line is written over the number, for example:

$$C = 100{,}000,\ M = 1{,}000{,}000$$

3 consecutive points (...) used to indicate et cetera, continuous, and so on or others.

The decimal number system

For example, in the decimal number system, the numbers have an arithmetic-based positional notation in power ten and 10 is the first unit greater than any single-digit number, every time it adds 10 units(one-ten), many immediate orders are obtained, for example, 10, 20, 30, 40...

For example, the positional notation that received each digit gives them a different numeric value, so each digit has a relative value that depends on the position they are in, for example, the numbers 67.59 and 6,759 the digits are grouped in the same order, however, the positional notation corresponding to them gives different numeric value > 1 such as integers and < 1 as decimals.

In the example, both numbers are cardinal numbers because answer the question How many units are there? However, even though the two numbers have the same 4 digits, they have different numeric values (VN) because, by their positional notation, they could be integers (whole numbers) or decimals (less than one unit or <1). 6,759 is greater because it contains 4 integers, while the number 67.59 is mixed because it has only two integers and two decimal numbers that are the digits to the right of the decimal point representing a smaller numerical value (NV).

The decimal system that establishes positional notation of the numbers generally uses the high comma (') to separate the millions and the low comma for the thousands, however, in some countries it is observed that they replace the high coma with a low comma to indicate millions and a second comma to indicate the thousands. Also, it is observed in some math texts that replace commas with dots or simply leave a space every three numbers to separate millions, thousands, and hundreds in that order. The example below uses low commas as well as the period to separate the decimal places.

How do I read a number according to its numeric value and the digits it contains in its whole and decimal part?

To answer this question let's start looking at the positional notation of a number with 13 digits: **5, 257, 289, 324,578** (Right-to-left digits). The digits of this long number are separated by commas every 3 digits to distinguish thousands from hundreds; however, it could be separated in groups of 6 digits to indicate million, billion, and so on. In this case, the positional notation of these digits is:

Order	**Name (English/Spanish)**	**Digits**
1st	units / unidades	8
2nd	tens/decenas	7
3rd	hundreds/centenas	5
4th	thousands/miles	4
5th	ten thousand / diez miles	2

6th	hundred thousand/cien miles	3
7th	millions/millones	9
8th	ten million / diez millones	8
9th	hundred million/cien millones	2
10th	thousand million /mil millones	7
11th	ten thousand million/diez mil millones	5
12th	hundred thousand million /cien mil millones	2
13th	billion / billon	5

These numbers are called a positive integer because of their positive sign, which does not need to be written to the left of the number, since it is understood that it is a positive number without having a negative sign (unless you have to highlight the sign to justify an action, or a mathematical condition specified as in algebra).

In the Spanish countries, the numbers are written leaving a space to indicate their position (unit, tens, hundreds, etc.), also still using high and low commas as well, unlike in the United States, low commas are used to indicate positional notation of numbers (The International System of Units recommend leaving a space to separate group of three digits and use a comma to indicate the positional notation of decimals) all read the numbers the same. For example:

5, 257, 289, 324,578

5 billion, 257 thousand, 289 million, 324 thousand, 578 units

If you write a period after the last digit representing units 8, it indicates that the digits or characters to the right of the period: 0, 1,2, ... 9 are numbers less than a unit or decimal numbers. These numbers, like integers, also feature a positional notation that maintains a higher to lower value conditioned by its proximity to the decimal point, for example, the number 8.129

9 Thousandths 9/1000
2 Cents/Hundredths 2/100 } Lower than the unit
1 Tenths /Tenths 1/ 10
. Decimal point
8 positive whole number units

Positional comparisons and equivalences in Spanish and English:

8. 1 2 9 = $8_{129/1000}$ rounding 8.13(mixed number)

Unidades > décimos > centésimos > milésimos

Units > tenths > hundredths > thousandths

Reads: eight units with one hundred and twenty-nine thousandths (mentioning the positional notation of the last decimal).

Practice I: The Numerical Systems

Rewrite the numbers that appear lines below on a piece of paper, separate the whole numbers (units, hundreds, thousands...) and decimals, considering their positional notation, and finally write how the number read, example: 1010 23/100 answer 1,010.23 It reads: "One thousand ten with twenty-three hundredths"

1. 1598
2. 102459
3. 2 045872
4. 53687412
5. 159457899
6. 28869789248
7. 12.045
8. 45,25
9. 1089.124
10. 0.20157

11. Write to using Romans numbers from one to one thousand (from 10 to 10).
12. Write in Roman numerals:
    149
    1587
    1028
    10550
    1000000
    4400
    669

Check your answers by visiting these links.
http://tip.dis.ulpgc.es/numeros-texto/default.aspx
http://www.calculateme.com/cRomanNumerals/ArabicNumeralsToRoman.htm