

MATH S222

**Mathematical Models
with Applications**

Course Guide



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MATHEMATICAL MODELS WITH APPLICATIONS

MATH S222 COURSE GUIDE

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1 Introduction

Welcome to the **MATH S222** course!

This **Course Guide** contains essential information about the content and components of the course that you will need to know before starting your study. You are advised to read this guide carefully.

MATH S222 *Mathematical Models with Applications* is a 10-credit, two-semester, middle-level course. The course adopts half the syllabus of the Open University (UK) course MST209. The other half syllabus of MST209 formed another 10-credit course MATH S221.

MATH S222 is about the use of mathematics to solve real-life applications. You will learn how to represent real world problems in the form of mathematical *models* and the type of mathematical *methods* that are useful in working with these models.

This course contains 13 units. Half of the course material deals with Newtonian mechanical models of the motion of moving objects; the other half of the course is concerned with non-mechanical models which include the modeling of heat transfer and population dynamics. Many examples and exercises show how these models can be constructed and applied to the real world.

[Note: MATH S222, MATH S207 and MATH S204 form an excluded combination.]

2 Learning Outcomes

On completion of this course, you will be able to:

- 1 *Use* differential equations, linear algebra, and matrix and vector calculus in working with mathematical models.
- 2 *Apply* the basic principles of classical Newtonian mechanics to model the motion of moving particles, oscillations, and damped and forced vibrations.
- 3 *Apply* mathematical techniques and modelling skills to solve practical problems in the engineering science, applied science and technology disciplines.
- 4 *Construct* and *apply* mechanical models and dynamic models to solve certain kinds of real-life problems.
- 5 *Use* computing software to solve mathematical problems through graphing, interpreting and analyzing results.

3 Prerequisite study

To study MATH S222 successfully, it is better if you have studied the two foundation mathematics courses MATH S111/MATH S121 or MATH S121/MATH S122 (or an equivalent foundation course). If you have not studied any of these foundation mathematics courses, you are advised to work through the **Preparatory Unit**, well before you begin this course.

This **Preparatory Unit** is sent to all students registered for MATH S221 and MATH S222 (these two courses share the same preparatory unit). If you have done MATH S221, you can skip the Preparatory Unit.

4 Components of the course

The course consists of:

- Diagnostic Quiz;
- Preparatory Unit;
- MATHS 222 Handbook;
- Course Guide.
- 13 study units;

- Course software: Mathcad;
- Computing Booklet;

Before starting the course, you will need to know a little about each of these components.

4.1 Course units

There are **13 study units** in the course.

The contents of each unit are divided into four to five sections; each unit is designed for you to study in two weeks. Each unit begins with a *study guide*, which tells you what you will need to recall from previous units, when you will need to use your computer and watch a video, and how best to organize your study of the unit. Towards the end of the unit, you will find a short section headed 'Outcomes', which consists of a list of learning outcomes for the unit; this will help you to ensure that you have mastered the contents of one unit before moving on to the next unit.

Each study unit contains many **examples** and **exercises** which are designed to give you practice in what the preceding text teaches.

- Unit 1: Statics
- Unit 2: Dynamics
- Unit 3: Oscillations
- Unit 4: Energy and consolidation
- Unit 5: Modeling with non-linear differential equation
- Unit 6: Modeling motion in two and three dimensions
- Unit 7: Modeling heat transfer
- Unit 8: Interpretation of mathematical models
- Unit 9: Damped, forcing and resonance
- Unit 10: Normal modes
- Unit 11: Systems of particles
- Unit 12: Circular Motion
- Unit 13: Rotating bodies and angular momentum

[The content of each unit is summarized in Appendix A.]

Important Note

In the original design of the course, some units are supported by multimedia activities. However, many of these are considered optional material that contains no new information beyond that in the course units.

In order to reduce the study loading, these multimedia activities have been moved from the study. When studying your unit, you can simply ignore the references/notes to multimedia activities.

4.2 Software Mathcad and Computer activities

This course consists of computer software (Mathcad) and computing activities.

▶ **Software: Mathcad.**

You will need to install it in your computer. The details of how to install it and the minimum computer specifications are given in the Computing Booklet.

Note Mathcad runs under a license management program.

In order to use install the Mathcad into your home computer, you need an appropriate Access Code for installation. **HKMU will send you an individual 'Mathcad Access Code' via your HKMU email. Please check your email for it.**

The Access Code is a 22-character string of letters and numbers required to install Mathcad. Each student will have a different Product Code.

The installation procedure can be found in the Computing Booklet.

▶ Computing activities

The computing activity associated with a unit section will be indicated in the study guide of each unit.

The computing activities require you to use the preset Mathcad worksheets, which are prepared by the course team to solve some activities.

Note

Mathcad worksheets are available to download on the MATHS222 OLE.

Go to <Course Material/Mathcad Files >

You will need to download the whole Zip file < **Mathcad File.zip** > to your home computer, and unzipped it to use.

4.3 Computing booklet

The computing booklet contains instructions on how to install and make use of the course software. It also contains other information about the course software and computing activities. Some of these introductory computing activities are designed to help you gain the basic skills needed to work with the computer algebra package.

Mathcad techniques and a glossary of useful tips for making best use of the Mathcad are also included in this booklet.

4.4 Course Handbook and its regulations

The Course Handbook provides a convenient source of basic definitions and formulas for use throughout the year of your study. Please read the handbook regulation carefully as follows

Handbook

You will not be allowed to bring MATH S222 Course Handbook to the exam. An identical copy of the MATH S222 Handbook will be provided to you together with the exam paper.

4.5 Other printed materials

4.5.1 Preparatory Unit

The **Preparatory Unit** is sent to all students enrolled in the course. It is intended for students who have not studied MATHS111/MATH S121 or MATHS112/MATH S122, or an equivalent foundation mathematics course. It contains the important topics that will be needed for MATH S222.

The first section of the Preparatory Unit covers differentiation and some of its applications. The second section covers integration and the associated techniques. The third section introduces the basic concept of complex numbers.

It is essential that you study this material before the commencement of the course, since no time has been allocated for it in the Academic Timetable. If you need to study the Preparatory Unit, you should do it *well before* you study *Unit 1*. The study of the Preparatory Unit is optional and it will not be assessed in either the TMAs or the examination.

[MATH S221 and MATH S222 share the same Preparatory Unit. If you have done MATHS221, you can skip it.]

4.5.2 Assignment booklets

The course contains **four** assignments and the questions are provided in Assignment Booklets. They will be posted on the MATH S222 OLE.

The weightings of the assignment component are stated in **Section 6**.

4.5.3 Academic Timetable and Assignment Schedule

In the first mailing, you will have received the Academic Timetable that provides you with a complete picture of the study schedule. This Academic Timetable also indicates how you should plan your study of the course and when you should submit your assignments by the indicated cut-off dates.

4.5.4 Stop Presses

Stop Presses will be sent to students if there is a need. It usually contains important up-to-date information about various aspects of the course. You should read each of these as soon as you receive it.

5 Your study plan and attendance of face-to-face classes

5.1 Starting work

The study of the Computing Booklet and the computing activities in Unit 0 are assigned for the first and the second week of the Academic Timetable. You should aim to work through this before you begin your study of *Unit 1*.

Whatever your situation, there is no need to wait for the starting date given in the Academic Timetable; you should start to read the course units as soon as you get them. You are strongly advised to spend as much time as you need on *Unit 1*, which revises many of the topics from the prerequisite courses that are important to MATH S222.

5.2 Tutorials and surgeries

You should refer to the **Academic Timetable** for the schedule of tutorials and surgeries arrangement. You should plan ahead for attending these face-to-face sessions. Although none of the tutorials is compulsory, you are strongly advised to attend. They will be of great benefit to your study.

The details on the arrangements of tutorial and surgery venues and time will be posted on the MATH S222 OLE at the beginning of the first semester.

6 Assessment components and weightings and passing threshold

You should refer to the *HKMU Student Handbook* for the regulations relating to assignments; in particular, you should ensure that you understand the procedures for the late submission of TMAs.

This course comprises **two assessment components**. They are **four Tutor Marked Assignments (TMAs) and a three-hour examination**. The details of each are described below:

Type	Number	Requirement	Course weighing (%)	Part of course covered
Tutor Marked Assignments (TMAs)	4 TMAs (TMA 01, 02, 03, 04)	Count the best 3 out of 4	30 %	Each TMA covers 3 to 4 units
Examination	1	-	70 %	All units except mathematical modeling exercises
Total marks			100 %	

6.1 Tutor mark assignment (TMAs) and passing threshold

The course will be assessed in four Tutor Marked Assignments (TMAs). The best 3 scores of these four TMAs will be counted towards the final assessment score.

TMA 01	Covers Units 1,2,3, 4
TMA 02	Covers Units 5,6 & 7
TMA 03	Covers Units 8, 9 & 10
TMA 04	Covers Units 11, 12 & 13

Each counted TMA is worth **10%** of the overall assessment score. In general, each TMA contains 3-4

questions and is marked out of 100 marks. Your answers to each TMA should be post to OLE Submission System or sent directly to your tutor before the official cut-off date for marking. **(This course contains no project assignment.)**

In order to pass the course as a whole, your mean score of the best 3 TMAS must be at least 40%.

6.2 Final examination and passing threshold

There is a three-hour examination at the end of the course. To help you to prepare for the examination, two specimen examination papers have been post to OLE for your reference. You can download it for revision.

The minimum passing threshold of exam score is 40%.

6.3 Assessment in computer component

About **10%** of the course work involves the use of Mathcad. In general, you will be referred to use one of the provided Mathcad worksheets for the unit to answer the computing parts of the TMA questions. Sometimes you may need to edit the data in the worksheet to make the problem correspond to the one related to the TMA question. No programming techniques are required to handle the Mathcad worksheets.

For computing related questions, you are required to include some computer printouts for your tutor to mark. Please send the absolute minimum of the required computer printouts to your tutor. Your tutor should never have to search through the printouts for the information he/she needs to be able to mark your solution, so please circle or underline the equation you entered (for example, use a highlighter to point it out), and annotate the printout results.

There will not be any questions in the examination which require you to use the computer. However there may be a short question asking you to interpret the Mathcad results.

7 Equipment required from students

To study the course, you are required to have

- a computer with DVD-ROM drive and able access to internet (Computer specification is provided in the Computing Booklet.)
- a calculator.

7.1 Calculator






A calculator will be required to answer certain questions in the examination, as well as being useful for numerical work during the year. If you have studied one of the recommended prerequisite foundation courses, the calculator you used there should be suitable for MATH S222. If you decide to buy a new calculator, make sure that it is an approved model by the Hong Kong Examination Authority. (An approved calculator list is attached in Appendix B.)

8 MATH S222 Online Learning Environment (OLE)

This course is supported by an online system, the Online Learning Environment (OLE).

Some of you already know how to use the OLE system. If you are new to HKMU, you may ask, '**What is OLE?**'. OLE is a Web-based learning system developed by the HKMU. The interactive Online Learning Environment is used for communication among students, tutors and the Course Coordinator. This system can enhance students' learning experience through its interactive tools. To help you to use the OLE system, read the letter: '**Introduction to the OLE**', together with Mailing 1.

If you enter the OLE, you will see the following components in the system:

 <p>News Course News</p>	 <p>Schedules Course Schedules Calendar</p>	 <p>Interactive Tools Discussion Board</p>	 <p>Course Materials</p> <ul style="list-style-type: none"> • Course Guide • MATHS222 Study Units • Specimen Exam Paper • Errata • Stop Press • Approved Exam Calculator List • Handbook • Mathcad File 	 <p>Assignments Multimedia Demonstrations Instructions Instructions(Tutor) Assignment File Submission & Extension TMA's Solution Guide</p>
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The OLE includes the Sub-component <**Submission and Extension**>. This Sub-component allows you to:

- Submit your TMAs;
- Check the status of your assignment scores;
- View the assignment status;
- Apply for a late submission extension of an assignment.

9 Where to get help for your study

(i) From your tutor

Your tutor is the contact person to help you in your study. Your tutor will mark your assignment and answer all your queries. When your TMA is returned, you should go through the TMA comments marked on the assignment script and take note of the comments written by your tutor to avoid similar errors in later assignments and in the examination. Make every effort to attend your tutorials and surgeries; there you will have the opportunity to talk to your tutor directly and to discuss with other students.

(ii) From your fellow students

One of the best ways of learning is by discussing your study with other fellow students. Unfortunately, you will see them only at the infrequent tutorials during the year. You should collect the address and telephone number of other students in your class; this way, you can keep in touch with them all the time. You may form a self-help group among students to meet regularly; this is a good way of getting people together to discuss common study difficulties, especially in the assignment questions.

(iii) From the Course Coordinator: Dr. Tony Chan

If there is any academic query which your tutor cannot settle for you, then your tutor will probably advise you to contact the Course Coordinator.

The Course Coordinator of this course is Dr. Tony Chan. His corresponding address is

Room A0921, 30 Good Shepherd Street, Ho Man Tin
Kowloon, Hong Kong
The school of Science and Technology
Office: 2768 6867;
Email: tmtchan@hkmu.edu.hk

(iv) From the OLE

The OLE provides you with an interactive learning environment for communication among students, tutors and the Course Coordinator. When you find problems that you would like to discuss with other students, you are welcome to post your problem on the OLE Discussion Board. Details of how to use the OLE component are in the **OLE User Guide**.

Appendix A Contents of the study units

<p>Unit 1 (adopted from MST209 Unit 5): Statics</p> <ul style="list-style-type: none">• Modeling force: e.g. particles, weight, normal reaction, tension and friction• Newton's third law for 2 or more particles• Calculation of torques for extended and rigid bodies: e.g. turning effects, combining and slipping or tipping of a force
<p>Unit 2 (adopted from MST209 Unit 6): Dynamics</p> <ul style="list-style-type: none">• Describing the motion with constant acceleration in one dimensional model• Predicting motion: using Newton's second law• Force models of the friction, air resistance and water resistance
<p>Unit 3 (adopted from MST209 Unit 7): Oscillations</p> <ul style="list-style-type: none">• Modeling system with one or two springs in motions• Setting up an equation of motions• Force law for modeling springs• Oscillations and static motion• Simple harmonic motion• Conservation of energy: potential energy function and energy conservation
<p>Unit 4 (adopted from MST209 Unit 8): Energy and consolidation</p> <ul style="list-style-type: none">• Introduce the topics of motion and energy of moving particle in mechanical systems• Consolidate the study of statics problems• Consolidate the study of dynamical problems• Consolidate the study of oscillations problems
<p>Unit 5 (adopted from MST209 Unit 13): Modeling with non-linear differential equation</p> <ul style="list-style-type: none">• Modeling population of predator and prey• Exponential growth model of a single or two population• Equilibrium and stability growth of population• Classifying equilibrium point of linear and non-linear system• Modeling a pendulum
<p>Unit 6 (adopted from MST209 Unit 14): Modeling motion in two and three dimensions</p> <ul style="list-style-type: none">• Modeling bumpy rides along a track• Force, velocity and acceleration of a vehicle on a slope• Motion of traveling vehicle along a complicated path• Modeling the trajectory of a projectile with/without air resistance• Energy and projectile motion
<p>Unit 7 (adopted from MST209 Unit 15): Modeling heat transfer</p> <ul style="list-style-type: none">• Continue the modeling process introduced in Unit 9• Set up a simple model• Model for conduction and convection• Model the transfer of heat energy through a pipe• Set up models using first-order of differential equations• Identify the particular stage of the modeling process reached at any given point.
<p>Unit 8 (adopted from MST209 Unit 16): Interpretation of mathematical models</p> <ul style="list-style-type: none">• Overview the modeling techniques and skills• Discuss how to create a model and formula mathematics• Discuss how to interpret the results and evaluate the outcomes• Compare numerical results with the real experimental data• Exploring modeling results on the computer• Dimensional consistency and change of units• Method of dimensional analysis• A case study of modeling on the transient heat transfer
<p>Unit 9 (adopted from MST209 Unit 17): Damped, forcing and resonance</p>

- A linear damping model
- Damping the spring motion
- Damped harmonic oscillator
- Weak, critical and strong damping
- Forced vibrations including direct and displacement
- Resonance
- Forcing in practice

Unit 10 (adopted from MST209 Unit 18): Normal modes

- Oscillations and normal modes
- Analyze oscillating mechanical systems
- Interpretation of normal mode eigenvectors
- Displacement from equilibrium of a system
- Free motion problems
- Normal mode in 2-dimensional problems

Unit 11 (adopted from MST209 Unit 19): Systems of particles

- Motion of two-particle and many particle systems
- Motion of the centre of the mass
- Potential energy of a system with particles
- Newton's Third law
- Center of mass
- Conservation of Linear momentum
- Elastic and inelastic collisions

Unit 12 (adopted from MST209 Unit 20): Circular Motion

- Kinematics of circular motion
- Differentiation of vector functions
- Velocity and acceleration in polar coordinates
- Angular velocity
- Uniform and non-uniform circular motion
- Law of conservation of angular momentum
- Law of torque

Unit 13 (adopted from MST209 Unit 27): Rotating bodies and angular momentum

- Newton's law of motion
- Torque law for a- or n- particle system
- Rigid body rotation about a fixed axis
- Angular momentum and moment of inertia
- Conservation of angular momentum
- Parallel axis theorem
- Rotation about a moving axis
- Total mechanical energy of rolling objects

Appendix B Approved calculator list for the examination

(In addition to the following models, calculators bearing the 'HKEA/HKEAA Approved' labels are also allowed.)

A.MAX

SC-801	SC-802	SC-809	SC-813
ATABA/AURORA			
AC-688	AC-689	AC-690	AC-692
AC-693	AC-694	AT-1	AT-105
AT-106 A	AT-108 A	AT-168	AT-208 N/B
AT-231 A/B/C/D	AT-232 /S	AT-233	AT-241 T
AT-244 H	AT-256 H	AT-268	AT-281 /S
AT-282	AT-283	AT-368	AT-508
AT-510	AT-512	AT-518	AT-520
AT-522	AT-601 A	AT-620 A	AT-630
AT-687	AT-2129 A/B	AT-6120	AT-6320
AT-9300	BD-1	BD-2	D-8 /N
D-10 /N	D-12 N	SC-170	SC-180
SC-200	SC-500		

BISTEC

B300	B500	B600	B700
B900			

BLT

BT-206	BT-2016-12	BT-2018-12	DC-308-8S/12
DC-318-8S/12	DC-338-8S/12	DC-408	DC-508
SC-183			

CANON

BS-100	BS-102	BS-120	BS 122
BS-123	BS-200	BS-300	BS-1200TS
CB II BK/G	CB III	F-45	F-65
F-73 /P	F-402	F-500	F-502
F-600	F-602	F-604	F-612
F-700	F-800 P	F-802 P	FC-4 S
FC-42 S	FINANCIAL/II	FS-400	FS-600
HS-20H	HS-100	HS-102H	HS-120L
HS-1200RS/T/TV/TS	KC-20	KS-10	KS-20
KS-30	KS-80	KS-100	KS-102
KS-120	KS-122	KS-123	L-20 II W AD
L-30 II W AD	L-813 II	L-1011	L-1214II/AD
L-1218	LC-22	LC-23	LC-34 /T
LC-44	LC-63	LC-64 T	LC-101
LC-500H	LC-1016	LC-1222	LC-1620H
LS-8	LS-21	LS-25H II	LS-31 II
LS-32	LS-39H	LS-41 II	LS-42
LS-43 B/S	LS-51	LS-52 BK/W	LS-54 W
LS-61	LS-62 BK/W	LS-80/H	LS-81 Z
LS-82 H/Z	LS-88Hi/V	LS-100 II/H/TS	LS-102 Z
LS-120H/L/RS/V	LS-151	LS-500	LS-510
LS-550 G/B1	LS-552	LS-553	LS-560
LS-562	LS-563	LS-566H	LS-716H
LS-1000H	LS-1200H	M-10	M-20
M-30	OS-1200	PS-8 BK/W	PS-10BK/W
SK-100H	T-14BK/G/W	T-19	TR-10H
TR-1200H	TS-81/H	TS-83	TS-85H
TS-101	TS-103	TS-105H	TS-120TL
TX-1210Hi	WS-100	WS-120	WS-121H
WS-200H	WS-220H	WS-1200H	WS-1210Hi
WS-2222	WS-2224	WS-2226	

CASIO

AZ-45F	BF-80	BF-100	CV-700
D-20A	D-20D/M	D-40D	D-100 W/L/LA
D-120 L/W/T/LA/TE	DF-10L	DF-20L	DF-120TE
DJ-120	DN-10	DN-20	DN-40
DS-1 B/L	DS-2 B/L	DS-3/L	DS-8 E
DS-10E/L/G	DS-20 E/L/G	DS-120	FC-100
FN-10	FN-20	FX-8	FX-10 F
FX-39	FX-50 F	FX-55	FX-61 F
FX-68 /B	FX-78	FX-82/B/C/D/L/LB/SUPER/SX/W	FX-85 /M/N/V
FX-100/A/B/C/V/D	FX-115 /M/N/V/D	FX-120	FX-135
FX-140	FX-210	FX-350/A/C/D/H/HA/W	FX-451 M
FX-500 /A	FX-550 /S	FX-570 A-/C-/V/D/S	FX-911S/SA
FX-991/M/N/V/D/H/S	FX-992 V/VB/S	FX-3400 P	FX-3600 P/V/A/PV

FX-3650P HL-100 L HS-4A	FX-3800 P HL-122/L HS-8 G/L/LU/D	FX-3900PV HL-812 /E/L HS-9	FX-3950P HL-820 A/LU/D HS-88
HS-90 J-100W/L/LA JF-100/TE JN-20 JS-20/C/M/L/LA JS-120 LC-700 LC-798 G MC-801 S MS-6 MS-10 W/L MS-120 A/TE/V MS-270 L/LA NS-20L S-20 L SL-110 A/B SL-220 SL-330 SL-704 SL-790L SL-817 L SL-1200L US-20 WJ-10	J-10 A/D J-120 L/W/T JF-120TE JN-40 JS-25 JS-140 LC-710 LC-1000 /L MJ-20 MS-7/LA MS-20W/TE MS-140 A MS-470 L RC-770 SJ-20 SL-120 A/B SL-240/L SL-350 SL-720 /L SL-797 SL-850 SL-1510 US-100 WJ-20	J-20 JE-2 JL-210 JS-8 C JS-40 L/LA LC-401A LC-787 G/GU LC-1210 MJ-120 MS-8 W/A MS-70 L MS-170 L/LA NS-3 S-1 SL-80 E SL-200 SL-300H/J/L/LH/LU/LB SL-450 SL-760 A/C/LU/LB SL-805A SL-910L SL-1530T WD-100L WJ-100L	J-30 C JE-3 JN-10 JS-10 /C/M/L/LA JS-110 LC-403 C/E/L/LU/LB LC-797 G/GU MC-40 S MS-5A MS-9 MS-100 A/TE/V MS180 NS-10L S-2 SL-100 A/B SL-210 SL-310 M SL-510 /A SL-787 SL-807 /A/L/LU SL-1000 M SL-2000 M WD-120L WJ120L
CITIZEN			
CT-500 ELS-501 F-950 LC-510 N LH-700 SDC-814 SDC-834 SDC-850 SDC-878 SDC-8150 SDC-8480 SLD-705 B SLD-712 /N SLD-725 SLD-740 SLD-767 SR-30 SRP-40 SRP-75	CT-600 F-908 /N FT-200 LC-516 N LH-830 SDC-826 SDC-836 SDC-865 SDC-880 SDC-8360 SDC-8780/L SLD-707 SLD-720 SLD-732 SLD-742 SLD-781 SR-35 SRP-45 SRP-80	ELS-301 F-920 LC-505 LC-531 SB-741 P SDC-830 SDC-839 SDC-868 SDC-888 SDC-8401 SDC-8890 SLD-708 SLD-722 SLD-735 SLD-750 SLD-7001 SR-70 SRP-60 SRP-285II	ELS-302 F-940 N LC-508 N LC-5001 SDC-810 SDC-833 SDC-848 SDC-875 SDC-8001 SDC-8460 SLD-702 SLD-711 /N SLD-723 SLD-737 SLD-760 SLD-7401 SR-260 SRP-65
HEWLETT-PACKARD			
HP-6S HP-11 C HP-20 S	HP-6S Solar HP-12 C HP-21 S	HP-9S HP-15 C HP-30S	HP-10 B/BII HP-16 C
KARCE			
KC-107 KC127	KC-117 KC-153	KC-119 KC159	KC121
SHARP			
EL-231C/L EL-326L/S EL-337M EL-373 EL-480G EL-520 D/G/L/R/V EL-556G/L EL-782C EL-2128H	EL-233G EL-330A EL338A EL376G EL-501V EL-530 A EL-731 EL-792C EL-2135	EL-240C EL331A EL-344G EL386L EL-506A/G/R/V EL-531 GH/H/P/LH/RH/VH EL-733A EL-879L EL-5020	EL-310A EL-334H/A EL-354L EL387L EL-509G/D/S/L/R/V EL-546D/G/L EL-771C EL-2125
TEXAS INSTRUMENTS			
BA-III BUSINESS-EDGE TI-25X SOLAR TI-34 /II TI-65	BA-SOLAR FINANCIAL-INVESTMENT-ANALYST TI-30 /Xa/Xa Solar/XIIB TI-35 /X	BA-II/PLUS MATH EXPLORER TI-31 TI-36 /X Solar	BA-35 TI-COLLEGIATE TI-32 TI-60

TRULY

101 /A

106

SC-107B/C/F

SC-111 /X

102

107

SC-108

SC-118 /A/B

103

P-127

SC-109 /X

SC-128

105

SC-106A

SC-110 /X

[End of calculator list]

