About this book…

Welcome to the world of **CASIO** scientific calculator. In this booklet, you will find some simple mathematical problems of secondary school level, which are carefully selected to demonstrate the use of the **CASIO** *fx*-350MS scientific calculator in performing mathematics operations. The examples presented are among those commonly encountered while teaching and learning mathematics in PMR and SPM levels (including Additional Mathematics) in Malaysia.

You will probably know by now that the calculator is a tool that could speed up calculations efficiently and thus allows you to spend more time in understanding theories and logic of Mathematics.

It is important to remember that this booklet is not meant to replace the User's Guide that comes with your **CASIO** *fx*-350MS scientific calculator. Do read the User's Guide carefully before and while using this booklet.

We at **CASIO** sincerely hope that you will enjoy working through the problems provided in this booklet. Having understood the usage of your **CASIO** *fx*-350MS scientific calculator, may it serve you more efficiently!

About the authors…

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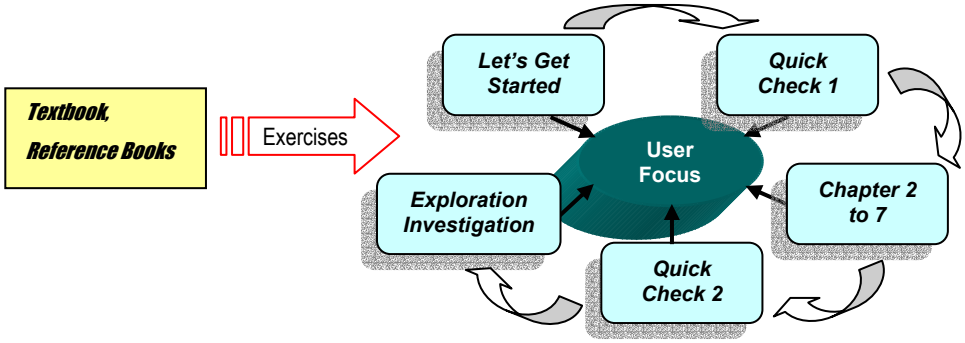
Fong Mun Chou obtained his Bachelor degree (Mathematics) from *Universiti Putra Malaysia*. He has conducted many **CASIO** Scientific Calculator workshops and Graphics Calculator workshops for teachers. He has also been involved in writing manuals and in developing activities on **CASIO** Graphics Calculator. He is currently a lecturer in a private college.

Purpose of this booklet…

This booklet is not intended to replace the *fx*-350MS User's Guide, nor any mathematics reference book. It is written with the hope that users of *fx*-350MS scientific calculator, especially students, can acquire what we called "calculator skills". These skills will not be tested in PMR and SPM examinations. However, we believe having developed these skills, students' interest in studying mathematics will be enhanced further. Perhaps they would have more fun exploring and investigating new mathematical ideas and concepts, and we wish to see in future students *enjoy* doing mathematics and tackling challenging mathematical problems.

Structure of this booklet…

The booklet is written with the assumption that the user has secondary school mathematics background. As it is designed for Form 2 to Form 5 students, worked examples in this booklet are selected problems from some topics in PMR's Mathematics and SPM's Mathematics and Additional Mathematics. A section called ***Quick Check*** is put in for users to try out and gauge their "calculator skills". Three activities are included in the ***Exploration and Investigation*** section so that users may extend the use of *fx*-350MS to learn mathematics beyond the conventional paper-pen-practice situation. Extension of some worked examples and short-cuts on using the *fx*-350MS to perform calculations are included within these pages. ***Appendix 1*** is a list of *English ~ Bahasa Malaysia* mathematical terms used throughout the booklet.



Using this booklet…

Suppose you have no prior knowledge of using scientific calculator, then you should begin by going through the worked-examples in ***Chapter 1-Let's Get Started***. Subsequently, you should attempt exercises in ***Quick Check 1*** to gauge your 'calculator skills', as this will help to boost your confidence level. The worked examples in ***Chapter 2*** to ***Chapter 8*** range from Form 2 to Form 5 levels, thus we suggest that you select the topics that you are familiar with. You can then attempt exercises in ***Quick Check 2***, and try the ***Exploration and Investigation*** activities during your leisure time.

Understanding the theories of mathematics requires one to spend time in improving and reinforcing the fundamental principles by working through exercises provided in textbooks and reference books. May this booklet and the *fx*-350MS scientific calculator help you in achieving this.

TABLE OF CONTENTS

CHAPTER 1 Let's Get Started

There are two things you need to know before we start:

To activate any function in yellow, precede it by pressing the SHIFT *key*.
To activate any function in red, precede it by pressing the ALPHA *key*.

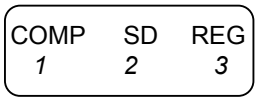
Now, let's have fun.

Example 1 Evaluate $\frac{2}{5}+\left(4-\frac{3}{8}\right)$, expressing your answer in fraction form.

OPERATION

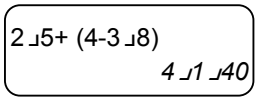
1. First choose COMP mode.

MODE 1



2. Now key in the expression.

2 $a^b/_c$ 5 + (4 − 3 $a^b/_c$ 8) =



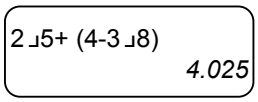
When the calculator hangs with an "ERROR" message, press either AC *,* ◁ *or* ▷.

Example 2 Express the answer in Example 1 in decimal form and improper fraction form.

OPERATION

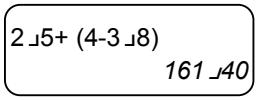
1. Immediately after operations 1 and 2 in Example 1, press

$a^b/_c$



2. Now, try pressing these keys.

SHIFT $a^b/_c$



Right after Example 2, try pressing AC *followed by the Replay key* △ .

Example 3 How many minutes are there in 8.345 hours?

OPERATION

1. First enter COMP mode.

MODE 1

```
                    D
                    0
```

2. Press the following keys.

8 • 3 4 5 °''' =

```
8.345□
          8 □20 □42
```

This means 8.345 hours is equivalent to 8 hours 20 minutes and 42 seconds.

Pressing ◁ or ▷ when an "ERROR" message is displayed will position the cursor at the location where the error occurred.

Example 4 Calculate $3^2 + 6^2 \div 5$ and $(3^2 + 6^2) \div 5$.

OPERATION

1. First enter COMP mode.

MODE 1

```
                    D
                    0
```

2. To calculate $3^2 + 6^2 \div 5$, press

3 x^2 + 6 x^2 ÷ 5 =

```
3²+6²÷5
                 16.2
```

3. Using the INS function to insert the parentheses, press

▷ SHIFT INS(DEL) (

```
(3²+6²÷5
                 16.2
```

Press ▷ numerous times until the cursor is below '÷', then press

) =

```
(3²+6²)÷5
                    9
```

Hence $3^2 + 6^2 \div 5 = 16.2$ and $(3^2 + 6^2) \div 5 = 9$.

Example 5 Evaluate $(8^3+7^2)/\sqrt{89}$, expressing the answer correct to 4 decimal places.

OPERATION

1. First choose COMP mode, then evaluate $(8^3+7^2)/\sqrt{89}$.

MODE 1

(8 x^3 + 7 x^2)

÷ $\sqrt{}$ 8 9 =

```
                    D
                    0
```

```
(8^3 + 7^2)÷√89
          59.46588107
```

2. To express the answer correct to 4 decimal places, press the following keys.

MODE MODE MODE 1

```
Fix 0~9?
```

Choose 4 to specify the number of decimal places.

4

```
(8^3 + 7^2)÷√89
            59.4659
```

So the required answer is 59.4659. To return to normal mode (Norm), press

MODE MODE MODE 3 1

```
Norm 1~2?
```

Example 6 Evaluate $\sqrt[4]{3^5+\pi}$.

OPERATION

1. Key in the expression for evaluation. Make sure the calculator is in COMP mode.

4 SHIFT $\sqrt[x]{}$ ^ (3 ^ 5

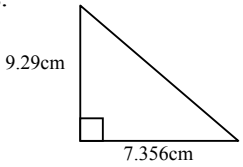
+ SHIFT π EXP =

```
4 ×√(3^5+π)
          3.960921648
```

Note that we can omit the bracket) in performing this calculation.

Evaluate $\left(\frac{1}{51}+\pi^2\right)^4$ *and express the answer correct to 5 significant figures.*

Example 7 Find the area of the right-angle triangle given below, expressing your answer correct to 5 significant figures.



OPERATION

1. After entering COMP mode, evaluate the area by using the formula $\frac{1}{2} \times base \times height$.

MODE 1

2 x^{-1} X 7 • 3 5

6 X 9 • 2 9 =

D
0

2^{-1} X 7.356 X 9.29
34.16862

2. Now to express answer correct to 5 significant figures, choose 5 to specify the number of significant figures.

MODE MODE MODE 2 5

2^{-1} X 7.356 X 9.29
$3.4169 \times_{10}^{01}$

Note that this is not the final answer. Since the power of the 10 after 3.4169 is 1, we move the decimal point one place to the right to obtain the required answer, i.e. 34.169cm.

Example 8 Calculate $\frac{1}{4} + \frac{1}{\frac{1}{5} - \frac{1}{6}}$ and store this value into variable A..

OPERATION

1. While in COMP mode, press

4 x^{-1} + (5 x^{-1} –

6 x^{-1}) x^{-1} =

$4^{-1}+(5^{-1}-6^{-1})^{-1}$
30.25

2. To store the value into A, simply press

SHIFT STO RCL A (–)

$4^{-1}+(5^{-1}-6^{-1})^{-1} \rightarrow$ A
30.25

Try to think of other ways to key in the expression in Example 8.

Example 9

A retailer is selling Kasio watches at the price of RM239 each. Calculate the price of a Kasio watch after a
(i) 17% discount in price, (ii) 28% increase in price.

OPERATION

1. First calculate the discount.

2 3 9 X 1 7 SHIFT %

=

239X17%
40.63

2. The discount is RM40.63. The discounted price is

−

239X17%-
198.37

3. To calculate the price after a 28% increase, press

2 3 9 X 2 8 SHIFT %

=

239X28%
66.92

+

239X28%+
305.92

Therefore, the increased price is RM305.92.

Example 10

Show that $\log 27 + \log 15$ is equal to $\log(27 \times 15)$.

OPERATION

1. First, calculate $\log 27 + \log 15$ while calculator is in COMP mode.

log 2 7 + log 1 5

=

log 27+log 15
2.607455023

2. Now calculate $\log 405$, since $27 \times 15 = 405$.

log 4 0 5 =

log 405
2.607455023

Comparing the two results, it is therefore shown that $\log 27 + \log 15 = \log(27 \times 15)$.

Verify that $\sqrt{15 \times 7}$ *is equal to* $\sqrt{15} \times \sqrt{7}$. *Also verify that* $(4^3)^5 = (4^5)^3$.

Example 11 Given $(\log A)^2 = 3$, determine the value of A.

OPERATION

1. First calculate the square root of 3.

[√] [3] [=]

√3
1.732050808

2. To determine A, press

[SHIFT] [10^x log] [=]

10Ans
53.95737429

The value of A is approximately 53.96.

Whenever [=] *is pressed when performing calculations, the calculated value is stored into Answer Memory* [Ans] .

Example 12 Calculate $\tan(-218°)$ and $\sin(2.7\text{rad})$.

OPERATION

1. While your calculator is in COMP/Deg (degree) mode, press

[tan] [(–)] [2] [1] [8] [=]

tan -218
-0.781285626

2. To calculate $\sin(2.7\text{rad})$, press

[sin] [2] [•] [7] [SHIFT] [DGR▸ Ans] [2] [=]

sin 2.7r
0.42737988

Hence, $\tan(-218°)$ and $\sin(2.7\text{rad})$ are approximately -0.78 and 0.43 respectively.

Example 13 Convert $78.5°$ to its radian equivalent and 2.1rad to its degree equivalent.

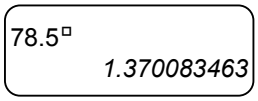
OPERATION

1. First enter Rad mode, then perform the conversion.

MODE MODE 2

7 8 • 5 SHIFT DGR▸ Ans 1

=



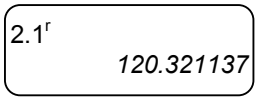
Hence, $78.5°$ is approximately 1.37 radian.

2. Return to Deg mode and perform the conversion.

MODE MODE 1

2 • 1 SHIFT DGR▸ Ans 2

=



Hence, 2.1rad is approximately $120.32°$.

Show that $\frac{\pi}{6}$ radian and $\frac{3\pi}{2}$ radian are equivalent to $30°$ and $270°$ respectively.

Example 14 Find all angles between $0°$ and $360°$ inclusive which satisfy the equation $\cos x = 0.38$.

OPERATION

1. First make sure your calculator is in COMP/Deg mode.

MODE 1 MODE MODE 1

```
                    D
                    0
```

2. Now, evaluate $\cos^{-1} 0.38$ to determine α, the basic angle.

SHIFT cos^{-1} cos 0 • 3 8 =

```
cos-1 0.38
        67.66631734
```

3. Press °''' once and thus obtaining the basic angle α as approximately $67°40'$.

```
cos-1 0.38
        67°39°58.74
```

4. To determine the second angle, which lies in the fourth quadrant, press

3 6 0 − Ans =

```
360-Ans
        292.3336827
```

°'''

```
360-Ans
        292°20°1.26
```

Therefore the solutions are $67°40'$ and $292°20'$, approximately.

Using similar operations as in Example 14, find all angles between $0°$ *and* $360°$ *inclusive which satisfy the equation* $\cos x = 0.53$.

CHAPTER 1 Let's Get Started

Example 15 For $y = 2x^2 + 3x - 4$, calculate the values of y for $-3 \le x \le 3$. Construct a table using these values. Take x as integer.

OPERATION

1. While in COMP mode, store the value of -3 into the variable X.

(–) 3 SHIFT STO RCL X)

-3→X
-3

2. Then key in the expression $2x^2 + 3x - 4$ using the ALPHA key.

2 ALPHA X) x^2 + 3 ALPHA X) – 4 =

$2X^2+3X-4$
5

This means $y = 5$ when $x = -3$ is substituted into the function $y = 2x^2 + 3x - 4$.

3. Then determine the value of y when $x = -2$. Press

(–) 2 SHIFT STO RCL X)

−2→X
-2

followed by △ =

$2X^2+3X-4$
-2

This means $y = -2$ when $x = -2$.

4. And to determine value of y when $x = -1$, press

(–) 1 SHIFT STO RCL X)

-1→X
-1

followed by △ =

$2X^2+3X-4$
-5

This means $y = -5$ when $x = -1$.

5. Use similar operations as in step 3 to find the values of y when $x = 0, 1, 2, 3$. The values obtained are $y = -4, 1, 10, 23$ respectively. Hence, we can construct a table of the function $y = 2x^2 + 3x - 4$ for $-3 \le x \le 3$.

x	-3	-2	-1	0	1	2	3
y	5	-2	-5	-4	1	10	23

Edit an expression or calculations by using ◁ or ▷ .
For example, to edit $4 + 35$ to 4×35, press ◁ numerous times until the cursor is below the '+' sign, then press X =

Quick Check 1

Using your calculator, work through these exercises to gauge your 'calculator skills'.

1. Evaluate (a) $(-7.25)^3$ (b) $\frac{2}{7}-\frac{3}{8}\times\frac{4}{9}$ (c) $(11.6)^5$

2. Evaluate (a) $\sin 178°$ (b) $\tan 45°$ (c) $\log 100$

3. Evaluate (a) $10^{3.85}$ (b) $\sqrt[5]{150}$ (c) $\sin^{-1} 0.36$

4. Find the value of x for which $\log x = 2.878$.

5. What is the value of x, given that $x = e^7$?

6. Perform the following: $5 \to A$, $3 \to B$, $-4 \to C$, $3/5 \to D$, $\pi \to E$. Then, evaluate $A + B^2 \times \frac{D}{C} - 5E$.

7. Express (a) $112.68°$ (b) $245°45'$ (c) $650°32'15''$ in radian.

8. Express (a) $3.11 rad$ (b) $\frac{7}{3} rad$ (c) $-2.9 rad$ in degree.

9. Which is greater? $\cos(0.1°)$ or $\cos(0.1 rad)$?

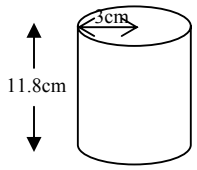
10. Evaluate $y = B\left(A^{3/2} + \log\sqrt{\frac{x^{-4}}{12\pi}} \right)$ where $A = 7$, $B = \frac{1}{3}$ and $x = 2.97$.

To check answers please see page 20 of this booklet.

CHAPTER 2 Surface Area and Volume of Solid

Example 1

A cylindrical can is such that the height of the can is 11.8cm and its radius is 3cm. Find the amount of material needed to produce this can.



OPERATION

1. First enter COMP mode.

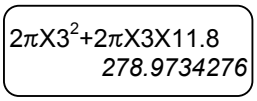
MODE 1

2. Calculate the area of the can using cylindrical formula, $2\pi j^2 + 2\pi jt$.

2 SHIFT π EXP X 3 x^2 +

2 SHIFT π EXP X 3 X 1

1 • 8 =



Therefore, the amount of material needed to produce this can is 278.97cm^2.

Find the volume of the can in the example given above.

CHAPTER 3 Quadratic Functions

Example 1 Determine the roots and axis of symmetry of the quadratic function $y = 2x^2 - 11x + 15$.

OPERATION

1. Use the formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to determine the roots. While in COMP mode, press

[1] [1] [+] [√] [(] [(] [(–)]

[1] [1] [)] [x^2] [–] [4] [X]

[2] [X] [1] [5] [)] [=]

$11+\sqrt{(}(-11)^2-4X2X15$
12

[÷] [(] [2] [X] [2] [)] [=]

Ans÷(2X2)
3

The first root is 3.

2. To determine the second root, we use the REPLAY function.

Press [△] once to return to this display screen on right.

$11+\sqrt{(}(-11)^2-4X2X15$
12

Press [◁] numerous times until the cursor is below the '+' sign.

Now press [–] [=]

$11-\sqrt{(}(-11)^2-4X2X15$
10

Followed by the key strokes [△] [=]

Ans÷(2X2)
2.5

The second root is 2.5.

3. To find the axis of symmetry, press

[+] [3] [=]

Ans+3
5.5

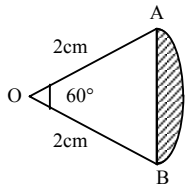
[÷] [2] [=]

Ans÷2
2.75

The axis of symmetry is $x = 2.75$

You may scroll through the last nine calculations by pressing the Replay function [△] [▽].

Example 1 AOB is a sector of a circle with centre at O and radius 2cm. Find the area of the shaded region.



OPERATION

1. First enter Rad (radian) mode.

MODE MODE 2

```
                R
                0
```

2. Calculate the area of sector using the formula $\frac{1}{2}r^2\theta$ and store the calculated result.

1 $a^b/_c$ 2 X 6 0 SHIFT DGR▸ Ans 1 X 2 x^2 = M+

```
1 ⌟2X 60° X2²
        2.094395102
```

3. Now calculate the area of the triangle *AOB* using the formula $\frac{1}{2}r^2\sin\theta$.

1 $a^b/_c$ 2 X 2 x^2 X sin SHIFT DGR▸ Ans 1 =

```
1 ⌟2X2² X sin 60°
        1.732050808
```

4. The area of the shaded region is

− RCL M+ =

```
Ans-M
        -0.362344294
```

Therefore, the area of shaded region is approximately 0.3623cm^2, ignoring the negative sign.

Show that the length of arc AB in the above example is approximately 2.0944cm.

Press 0 SHIFT STO RCL M+ *to clear the memory stored in M.*

Exploration and Investigation 1

Simulating Die Throws

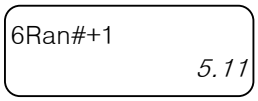
The faces of a cubical die are numbered from one to six. The probability of getting any one of these numbers is $\frac{1}{6}$. Here we would like to suggest a way of simulating series of throws, using the Ran# function of *fx*-350MS, without using the actual die.

Procedure

1. Set your calculator to COMP mode.

2. Key in 6Ran#+1, that is: [6] [SHIFT] [Ran#] [+] [1] followed by [=]

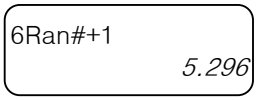
You will probably see something similar to the screen on the right. (Your displayed result may be different.)



3. Continue pressing [=]. Notice that for each press of [=], the displayed output will change.

4. To simulate 5 throws (five times), first key in the formula 6Ran#+1 and press [=].

Suppose you get the display on the right. By taking the unit digit, i.e. 5, the first throw is 5.



Next, we press

	Key Press	*Display*	*Number generated*
Second throw	[=]	6Ran#+1 3.832	3
Third throw	[=]	6Ran#+1 6.268	6
Fourth throw	[=]	6Ran#+1 2.278	2
Fifth throw	[=]	6Ran#+1 6.454	6

Hence, our simulation generates the throws of 5, 3, 6, 2, 6. Your simulation may generate different outputs.

CHAPTER 5 Permutations and Combinations

Example 1

A Mathematics Society committee consists of a president, a vice-president, a secretary and a treasurer. How many ways can such a committee be chosen from 45 members?

OPERATION

1. To determine

4 5 SHIFT nPr nCr 4 =

45P4
3,575,880

This means that there are 3,575,880 ways to form the committee.

Example 2

A group of five students is to be chosen from a class of 30 for a debate. In how many ways can such a group be formed?

OPERATION

1. To form a combination of any five students from 30 students, press

3 0 nCr 5 =

30C5
142,506

This means that the number of combination is 142,506.

Pressing SHIFT MODE 3 = *will erase all memory and return the calculator to its default mode:* COMP *mode.*

CHAPTER 6 Elementary Statistics

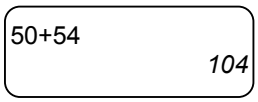
Example 1 The weight distribution of 100 students is given in the table. Calculate an estimate of the mean and the standard deviation for this distribution.

Weight (kg)	***Frequency***
50-54	10
55-59	11
60-64	22
65-69	29
70-74	12
75-79	16

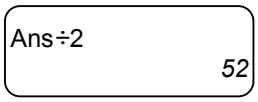
OPERATION

1. First, determine the mid-point for all class intervals.

5 0 + 5 4 =



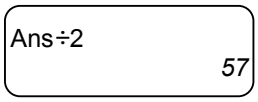
÷ 2 =



Then,

5 5 + 5 9 =

÷ 2 =

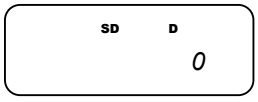


2. Use similar operations as in step 1 to find the rest of the mid-points, we will get the result as below.

Weight (kg)	***Mid-point***	***Frequency***
50-54	52	10
55-59	57	11
60-64	62	22
65-69	67	29
70-74	72	12
75-79	77	16

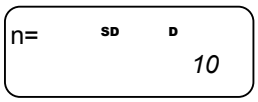
3. Now enter SD (standard deviation) mode. Press

MODE 2

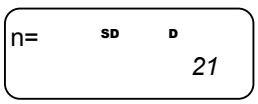


4. Input all data obtained in step 2.

5 2 SHIFT ; , 1 0 M+



5 7 SHIFT ; , 1 1 M+



6 2 SHIFT ; , 2 2 M+	n= SD D 43
6 7 SHIFT ; , 2 9 M+	n= SD D 72
7 2 SHIFT ; , 1 2 M+	n= SD D 84
7 7 SHIFT ; , 1 6 M+	n= SD D 100

5. An estimate of the mean is

SHIFT S-VAR 2 1 =

$\bar{x}$ 65.5

6. To find the standard deviation of weight, press

SHIFT S-VAR 2 2 =

xσn 7.466592262

To input multiple entries of the same data, use SHIFT ; , *. For example, pressing* 3 SHIFT ; , 5 *input the data 3, five times.*

Press SHIFT MODE 1 = *to clear all statistics memory before performing the next statistical calculation.*

Exploration and Investigation 2

Sequence of Numbers

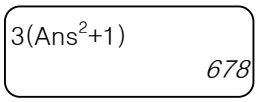
One way of generating sequence of numbers is by using the [Ans] key. Suppose we want to generate a sequence with general term $3(n^2+1)$, for $n = 1,2,3,4,5$.

Procedure

1. Make sure your calculator is in COMP mode. Then key in the following: $3(Ans^2+1)$

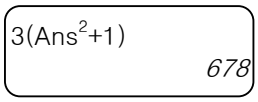
[3] [(] [Ans] [x^2] [+] [1] [)] followed by [=]

What do you see? Our display screen is as shown on the right. Your display screen may look different. *Why*?

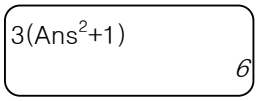


2. Now, press [1] [=] followed by pressing the replay key △ once to return to the previous screen as shown on right.

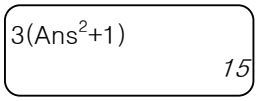
(Remember, your display screen may look different!)



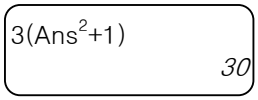
3. Press [=] once. We will get the display as shown on right.



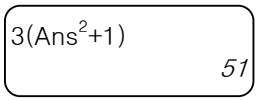
4. Continue on with [2] [=] △ [=]



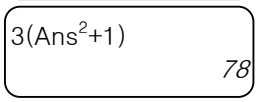
Then [3] [=] △ [=]



and [4] [=] △ [=]



Finally [5] [=] △ [=]

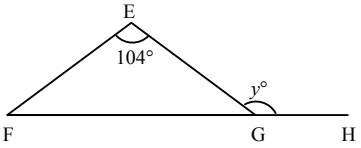


Therefore, we have generated the following sequence of numbers: 6, 15, 30, 51, 78.

Try and design another way to generate the above sequence of numbers using your *fx*-350MS.

Example 1

EFG is an isosceles triangle in which $\angle FEG = 104°$. FG is produced to H. Find $\cos y°$.



OPERATION

1. First calculate $\angle FGE$. While in COMP/Deg mode, press

(1 8 0 − 1 0 4) ÷ 2 =

(180-104)÷2
38

So, $\angle FGE$ is equal to 38°.

2. To determine $\cos y°$, press

1 8 0 − Ans =

180-Ans
142

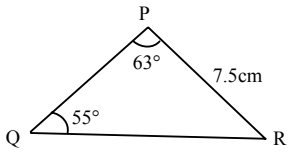
cos =

cos Ans
-0.788010753

Hence, $\cos y°$ is approximately -0.788.

Example 2

PQR is a triangle in which $\angle PQR = 55°$, $\angle QPR = 63°$ and $PR = 7.5$cm. Find the length of QR.



OPERATION

1. Use the formula $\frac{QR}{\sin 63°} = \frac{7.5}{\sin 55°}$ to determine QR. While in COMP/Deg mode, press

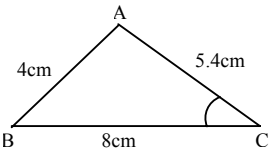
7 • 5 X sin 6 3 ÷ sin 5 5 =

7.5Xsin 63÷sin 55
8.157885924

Hence, the length of QR is approximately 8.16cm.

Example 3

ABC is a triangle in which AB = 4cm, AC = 5.4cm and BC = 8cm. Find $\angle ACB$.



OPERATION

1. Use the formula $\cos\angle ACB = \dfrac{AC^2 + BC^2 - AB^2}{2 \times AC \times BC}$ to determine $\cos\angle ACB$. Ensure calculator is in COMP/Deg mode.

5 • 4 x^2 + 8 x^2

− 4 x^2 =

$5.4^2+8^2-4^2$
77.16

÷ (2 X 5 • 4

X 8 =

Ans÷(2 X5.4 X8
0.893055555

$\cos\angle ACB = 0.893055555$.

2. To determine $\angle ACB$, press

SHIFT cos^{-1} cos =

cos^{-1} Ans
26.74024593

Hence, $\angle ACB$ is approximately 26.74°.

Answers to Quick Check 1

1 (a) *-381.078125*	**(b)** *5/42*	**(c)** *210,034.1658*	**2 (a)** *0.034899496*	**(b)** *1*	**(c)** *2*
3 (a) *7,079.457844*	**(b)** *2.724069927*	**(c)** *21.10019602,@ 0.368267893*	**4** *755.0922277*	**5** *1,096.633158*	**6** *-12.05796327*
7 (a) *1.966637001*	**(b)** *4.289146637*	**(c)** *11.35402128*	**8 (a)** *178°11'23.5''*	**(b)** *133°41'24.5''*	
(c) *-166°9'27.94''*	**9** $\cos 0.1°$	**10** *5.595526906*			

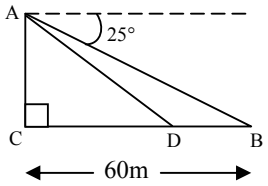
Answers to Quick Check 2

1 (a) *43,758*	**(b)** *55,440*	**(c)** *362,880*	**2** *5, 10, 13*		
3 (a) *1,951*	**(b)** *65.03333333*	**(c)** *19.78633086*	**4** *0.201653658*	**5** *95,040*	**6** *11,400*
7 (a) *35.73496445°*	**(b)** *0.9125573*				

CHAPTER 8 Angles of Elevation and Depression

Example 1

An observer stands at A, which is at the top of a tower, AC. He sees a car on the road at B, which is 60m from C. The angle of depression of B from A is $25°$. Calculate the height of the tower.



A traffic light is located at D, where CDB is a straight line. The angle of elevation of A from D is $40°$. Calculate the distance BD.

OPERATION

1. Calculate the height of the tower using $AC = 60\tan 25°$.

[6] [0] [X] [tan] [2] [5] [=]

60Xtan 25
27.97845949

The height of the tower is approximately 27.98m.

2. To find the distance BD, first determine CD using $\tan 40° = \frac{AC}{CD}$.

[÷] [tan] [4] [0] [=]

Ans÷tan 40
33.34342961

Therefore, CD is approximately 33.34m.

3. The distance of $BD = BC - CD$.

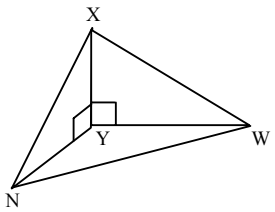
[6] [0] [−] [Ans] [=]

60−Ans
26.65657039

Hence, the distance BD is approximately 26.66m.

Example 2

Three points N, Y and W are at sea level. Y is the foot of a vertical lighthouse. N is 257m due north of Y and W is due west of Y. The height of the light house is 52m.



(a) Calculate the angle of elevation of X from N.
(b) The bearing of W from N is 040°. Calculate the distance YW.
(c) Calculate the angle of elevation of X from W.

OPERATION

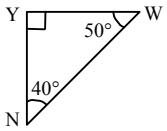
1. Find the angle of elevation by using $\tan \angle XNY = \frac{52}{257}$. Make sure your calculator is in COMP/Deg mode.

SHIFT $\tan^{-1}$ tan 5 2 $a^b/_c$ 2 5 7 =

$\tan^{-1}$ 52 ⌟257
11.43849422

The angle of elevation of X from N is approximately 11.44°.

2. Use the formula $\frac{YW}{\sin 40°} = \frac{257}{\sin 50°}$ to find the distance YW.



2 5 7 X sin 4 0 ÷ sin 5 0 =

257Xsin 40÷sin 50
215.6486052

YW is approximately 215.65m.

3. Perform this calculation right after step 2. Using $\tan \angle XWY = \frac{52}{YW}$, press

SHIFT $\tan^{-1}$ tan 5 2 $a^b/_c$ Ans =

$\tan^{-1}$ 52 ⌟Ans
13.5570993

Hence, the angle of elevation of X from W is approximately 13.56°.

Quick Check 2

Using your calculator, work through these exercises to gauge your mathematics skills and 'calculator skills'.

1. Evaluate (a) ${}^{18}C_8$ (b) ${}^{11}P_5$ (c) 9!

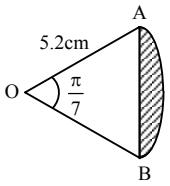
2. What is the output of Pol (3,4)? How about Pol (6,8) and Pol (12,5)?

3. The following is the Mathematics test scores of 30 students.

37	38	38	39	41	45	45	45	45	49
54	57	57	57	62	66	70	72	77	77
79	79	79	88	90	90	90	92	95	98

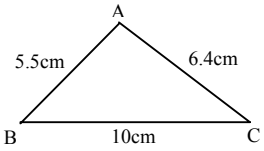
Find (a) $\sum x$, (b) mean, (c) standard deviation.

4. AOB is a sector of a circle with centre at O and radius 5.2cm. Given that $\angle AOB = \frac{\pi}{7}$, find the area of the shaded region.



5. In how many ways can 12 students sit in 5 chairs arranged in a row?

6. A golf club has 32 members which includes 5 doctors, 4 lawyers and 3 engineers. In how many ways can a committee of 5 be chosen if it is to contain one of each of these professions.

7. 

ABC is a triangle in which AC = 6.4cm, BC = 10cm and AB = 5.5cm. Find
(a) $\angle ABC$ (b) $\sin \angle BAC$.

To check answers please see page 20 of this booklet.

Exploration and Investigation 3

Whose Number is Greater?

Random numbers are very useful, especially in the study of Statistics. Here is a 'Random Number' game that you and your friend(s) may like to play.

Procedure

1. Set your calculator to COMP mode.

2. Suppose there are two players. Player 1 keys in $\text{Ran\#}^{-1}$, that is

SHIFT Ran# • x^{-1} , followed by SHIFT STO RCL A (–)

You will probably see a display similar to the screen on the right. This value is stored in the variable A.

$\text{Ran\#}^{-1}\rightarrow\text{A}$
5.952380952

3. Player 2 presses ◁ ◁ (*until the cursor is below* '→') DEL to delete '→A'.

followed by keying in SHIFT STO RCL B °,,,

$\text{Ran\#}^{-1}\rightarrow\text{B}$
7.874015748

Press RCL A (–) and RCL B °,,, to view and compare these values. The person who has the greater value wins this round. You may continue playing more rounds.

	Display	
Player 1	$\text{Ran\#}^{-1}\rightarrow\text{A}$ *5.952380952*	*The value stores in B is clearly greater than value stores in A. Hence, player two wins this round.*
Player 2	$\text{Ran\#}^{-1}\rightarrow\text{B}$ *7.874015748*	

You may play this game using expression created by you. For example, you may use the expression $10^{Ran\#}$ or $15/Ran\#$.

Appendix 1

English ~ Bahasa Malaysia Mathematical Terms

English	***Bahasa Malaysia***
Angle of depression	*Sudut tundukan*
Angle of elevation	*Sudut dongakan*
Arc	*Lengkok*
Area	*Luas*
Axis of symmetry	*Paksi simetri*
Circular measure	*Sukatan membulat*
Class interval	*Selang kelas*
Combinations	*Gabungan*
Decimal	*Perpuluhan*
Distribution	*Taburan*
Equation	*Persamaan*
Estimate	*Anggar*
Expression	*Ungkapan*
Fraction	*Pecahan*
Improper fraction	*Pecahan tak wajar*
Isosceles Triangle	*Segitiga kaki sama*
Mean	*Min*
Permutations	*Pilihatur*
Power	*Kuasa, eksponen*
Probability	*Kebarangkalian*
Quadrant	*Sukuan*
Random number	*Nombor rawak*
Right-angled Triangle	*Segitiga sudut tegak*
Roots	*Punca-punca*
Sequence	*Jujukan*
Significant figures	*Angka bererti*
Standard deviation	*Sisihan piawai*
Variable	*Pembolehubah*