

# IEB Maths and AP Maths Webinar with the Sharp EL-W506T

# SHARP

# Plan of Action

- Introduction
- Basics
  - Where to download the simulator
  - Cool new functions
  - Shortcut for Class marks
- Maths stuff
  - Degrees to radians
  - Time calculations
- Calculus
  - Differentiation
  - Integration
- Complex numbers
- Graphs – absolute graphs
- Statistics
- Probability distributions
- Finance
- Matrices
- Equation Solving

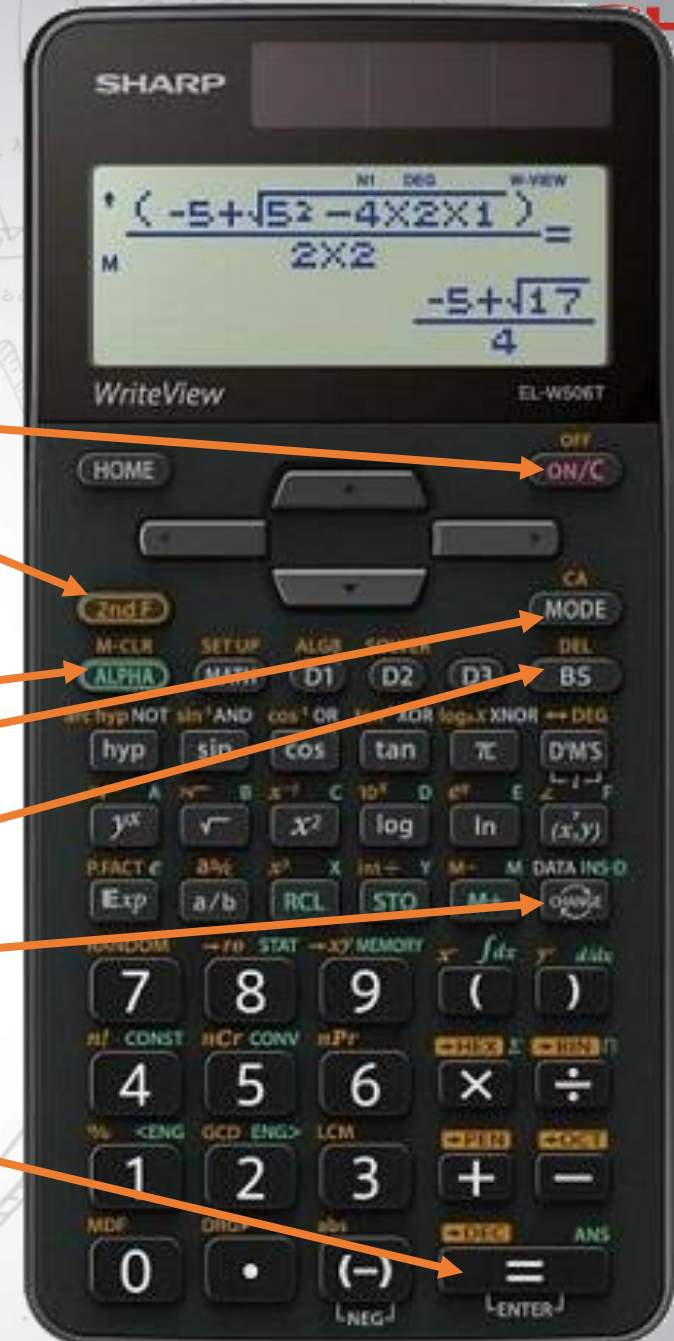
# Calculator Introduction

- 640 Functions
- Upgraded for the CAPS and AP maths curriculum
- Amazing new functions include a multiplicand function, highest common factor, lowest common multiple and many more!




# Calculator Basics


- Turn the calculator on
- 2<sup>nd</sup> Function – used to activate orange functions
  - Turn the calculator off by pressing 2<sup>nd</sup> F and ON
- ALPHA – used to activate teal functions
- Mode – change to different modes
- BS – backspace – to delete something.
- Change – change between mixed, improper and decimal answers.
- Equals – to find an answer or used as enter.



# Modes

- Press 
- 0: Normal
  - Fractions, integers, probability, trigonometry and much more
- 1: Stat
  - Single data, linear regression and more
- 2: Table
  - Functions but can also be used for teaching finance and factorising
- 3: Complex
  - For doing complex number calculations
- 4: Equation
  - Solving various equations – linear, quadratic and cubic.



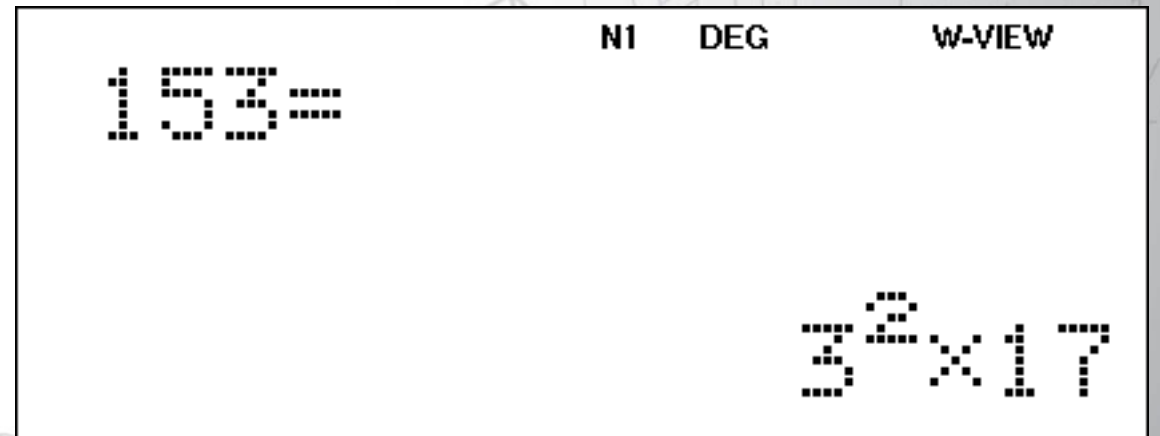
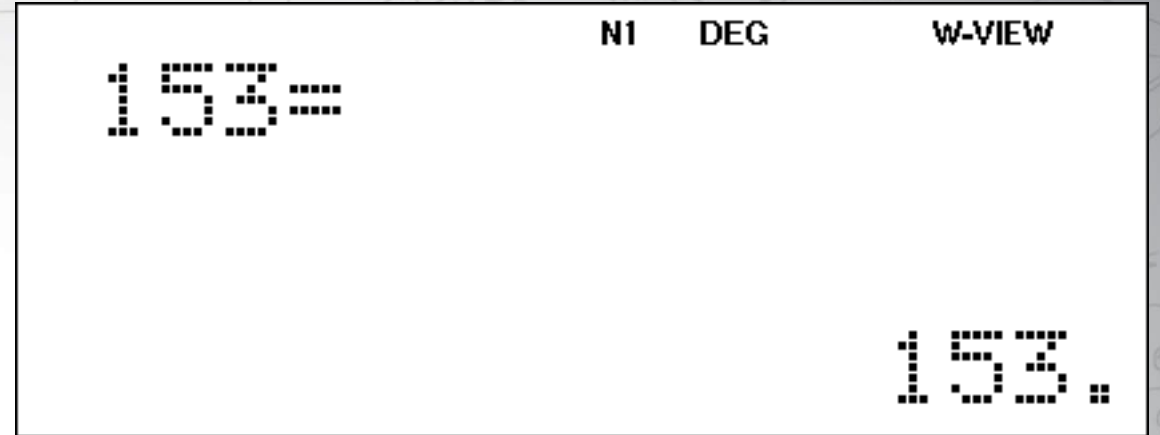
- Press 
- 5: Matrix
  - Up to 4 x 4 matrices
- 6: Vector
  - Up to 3 elements, solve cross and dot products
- 7: Distribution
  - Various statistical distributions – normal, binomial and Poisson.
- 8: Drill
  - Practice basic mental maths.
  - Great for grade 8 and 9 students



# Prime Factorization

- Press **2ndF** **Exp** to find the prime factors of a number.
- E.g. find the prime factors of 153.

- Press **1** **5** **3** **=**
- Now press **2ndF** **Exp**

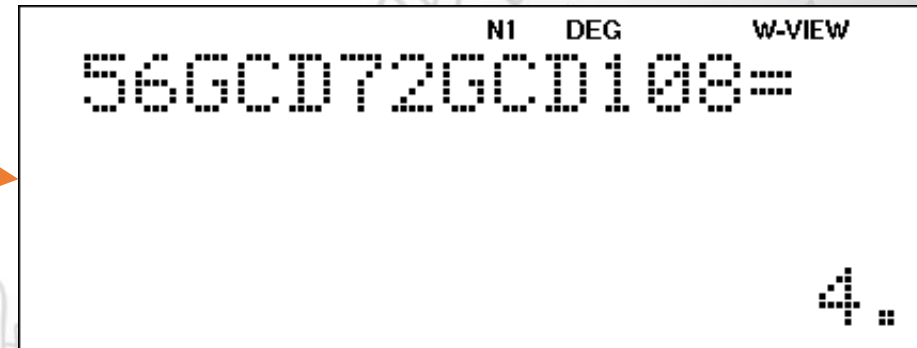
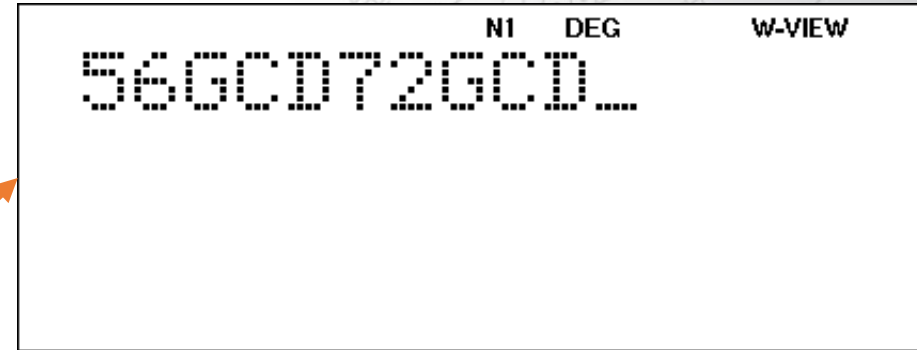
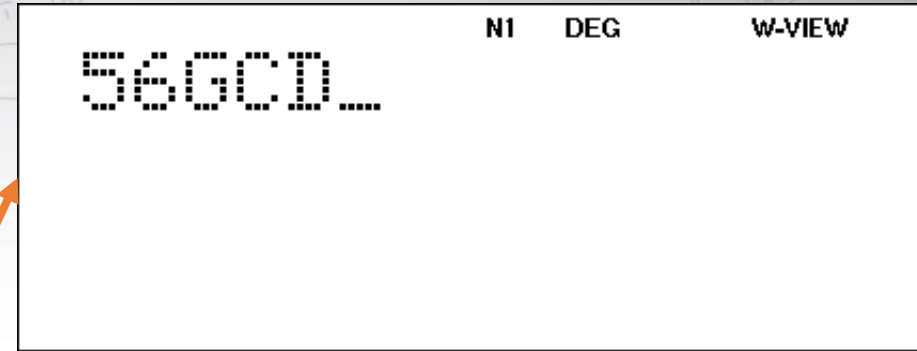


# Highest Common Factor (GCD)

- To find the highest common factor we use **2ndF** **GCD ENG>** **2**

- E.g. Find the HCF of 56, 72 and 108.

- Press **5** **6** **2ndF** **GCD ENG>** **2**  
**7** **2** **2ndF** **GCD ENG>** **2**  
**1** **0** **8** **=**





# Lowest Common Multiple

- To find the lowest common multiple we use **2ndF** <sup>LCM</sup> **3**

- E.g. Find the LCM of 14, 18 and 32.

- Press **1** **4** **2ndF** <sup>LCM</sup> **3**

- 1** **8** **2ndF** <sup>LCM</sup> **3**

- 3** **2** **=**

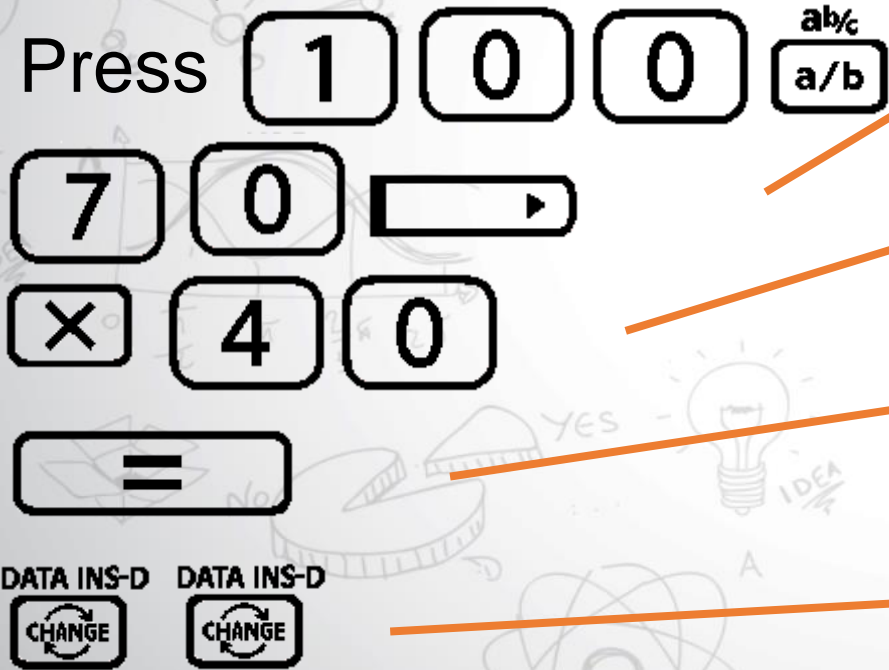
N1 DEG W-VIEW  
14LCM...

N1 DEG W-VIEW  
14LCM18LCM...

N1 DEG W-VIEW  
14LCM18LCM32=  
2016.

# Teacher Shortcut – Class marks

- E.g. First 3 students get 40, 55 and 23 out of 70 for test.
- To calculate their percentages quickly:
- Press



NI DEG W-VIEW

$$\frac{100}{4}$$

NI DEG W-VIEW

$$\frac{100}{70}$$

NI DEG W-VIEW

$$\frac{100}{70} \times 40$$

NI DEG W-VIEW

$$\frac{100}{70} \times 40 = 57\frac{1}{7}$$

NI DEG W-VIEW

$$\frac{100}{70} \times 40 = 57.14285714$$

- For the next mark just type in the mark

**5** **5**

- And press

**=**

55\_ NI DEG W-VIEW

Kx55= NI DEG W-VIEW  
78  $\frac{4}{7}$

↑ Kx55= NI DEG W-VIEW  
↓ 78.57142857

- And again, mark

**2** **3**

**=**

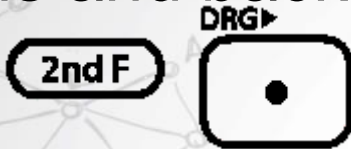
23\_ NI DEG W-VIEW

Kx23= NI DEG W-VIEW  
32  $\frac{6}{7}$

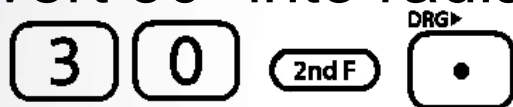
↑ Kx23= NI DEG W-VIEW  
↓ 32.85714286


# Degrees, Radians and Gradians

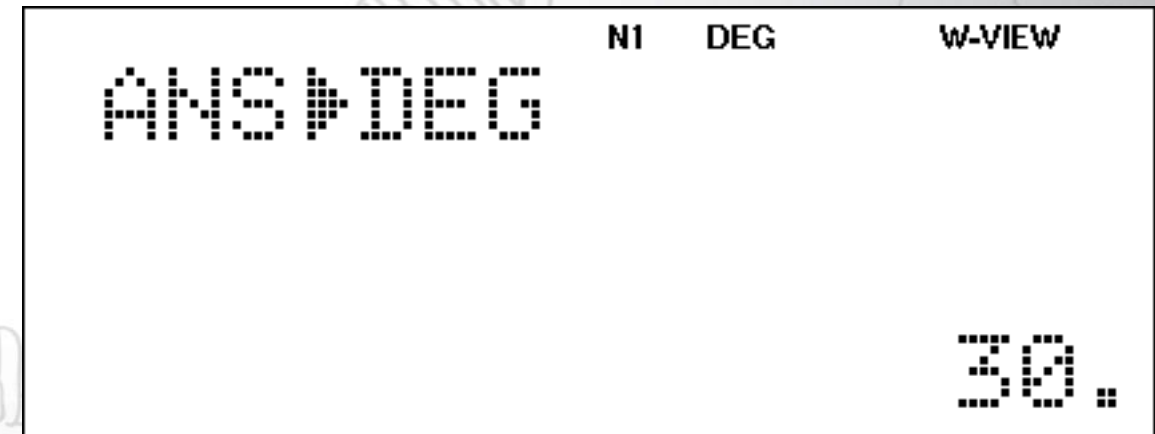
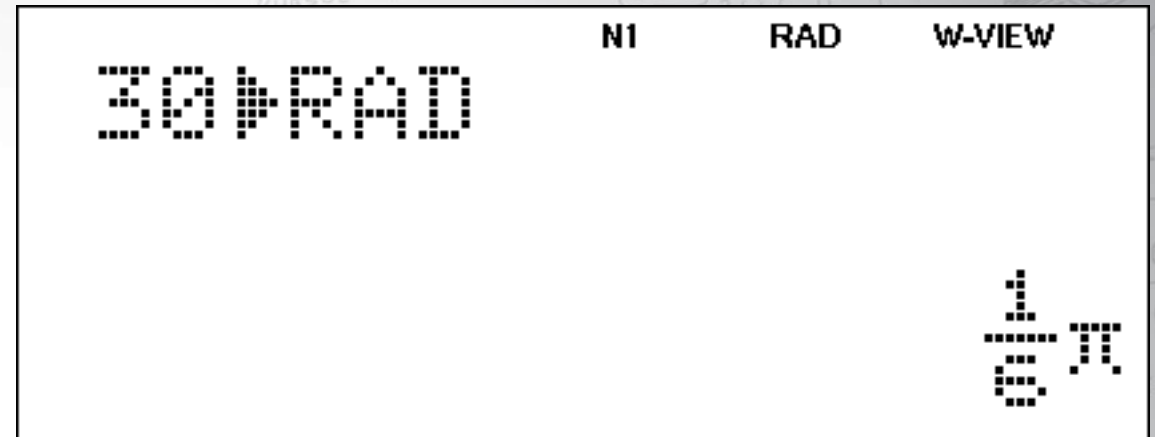
- We can change our angle units from degrees to radians to gradians and back again by using



- E.g. convert  $30^\circ$  into radians.

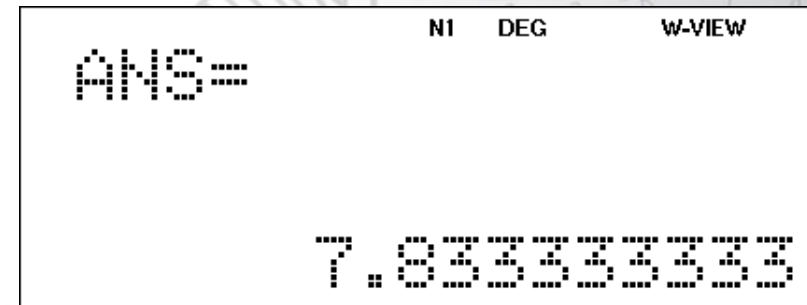
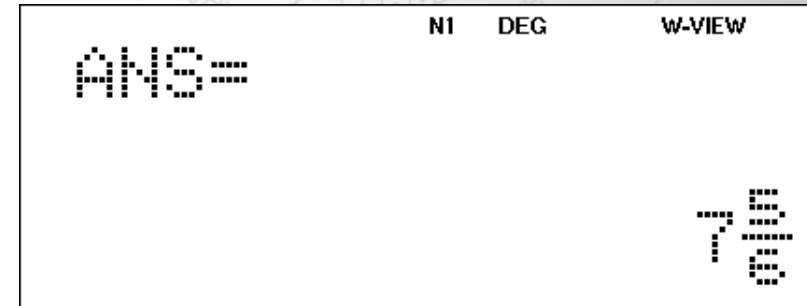
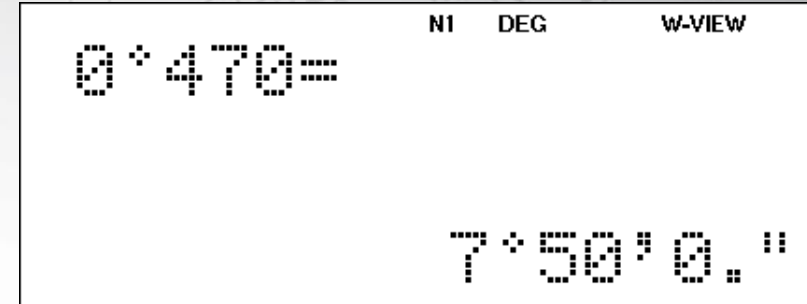
• Press 

- To convert back to degrees again press 
- Note: You can also use the Setup menu to change back to degrees or save it into a D-key.



# DMS / Time Functions

- Changing minutes to hours
- E.g. How many hours are 470 minutes?
  - Press **ON/C** to clear any chain calculations
  - Press **0** **↔DEG D°M'S** **4** **7** **0** **=**
  - Press **2ndF** **↔DEG D°M'S** to change it into fraction or decimal format (remember to use your **DATA INS-D CHANGE** button).



# DMS/ Time Functions

- Finding time in a speed-distance-time calculation.
- E.g. How long does it take to travel 450km at an average speed of 117km/h?

• Press **4** **5** **0** **÷**

**1** **1** **7** **=**

• Press **DATA INS-D CHANGE** **DATA INS-D CHANGE**

• Press **2nd F** **D°M'S**

- The answer is 3 hours, 50 minutes and 46.154 seconds.

NI DEG W-VIEW

$$450 \div 117 =$$

$$3 \frac{11}{13}$$

NI DEG W-VIEW

$$450 \div 117 =$$

$$3.846153846$$

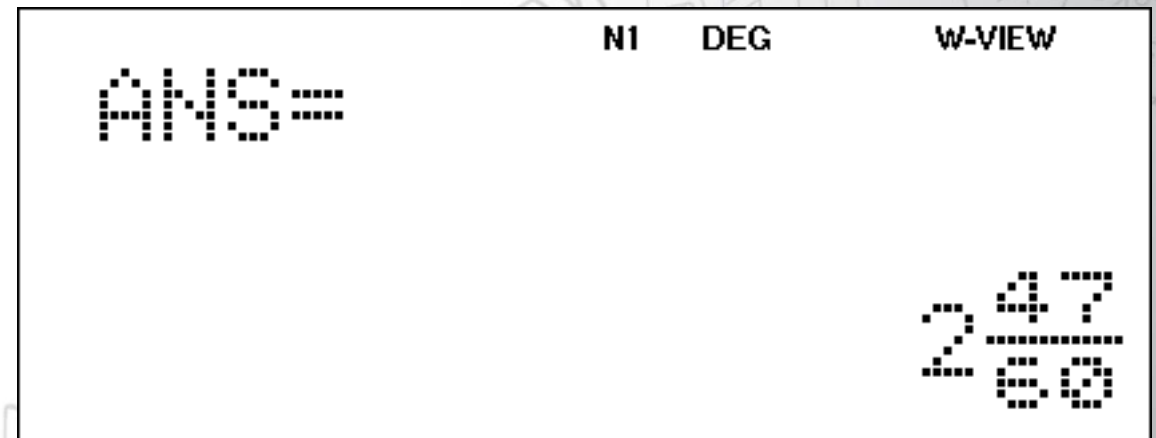
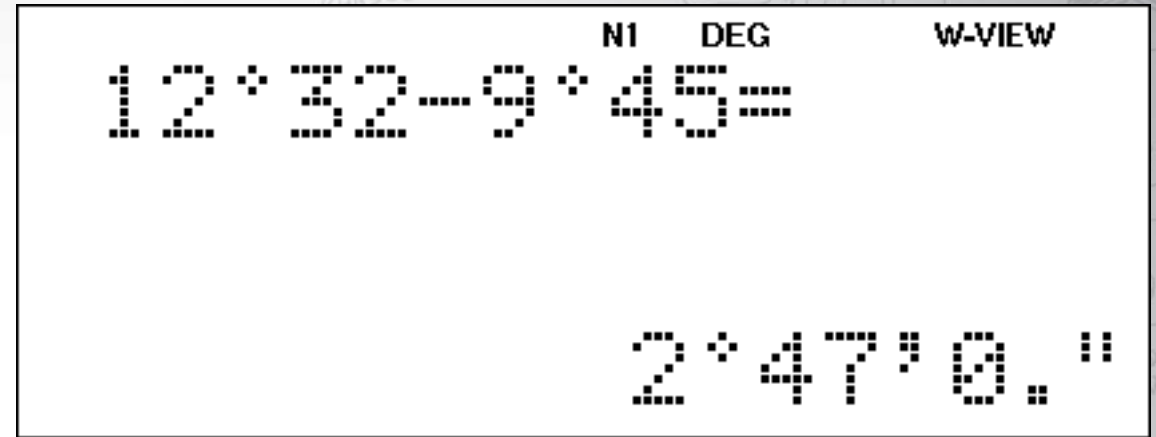
NI DEG W-VIEW

$$\text{ANS} =$$

$$3^{\circ} 50' 46.154''$$

# DMS / Time Functions

- Adding / Subtracting Time
- E.g. find the length of time spent on a bus if the bus left at 9.45 and arrived at 12.32.
  - Press **1** **2** **↔DEG** **D°M'S** **3** **2** **-** **9** **↔DEG** **D°M'S** **4** **5** **=**
  - The answer is 2 hours and 47 minutes
  - To change back to a fraction notation press **2nd F** **↔DEG** **D°M'S**

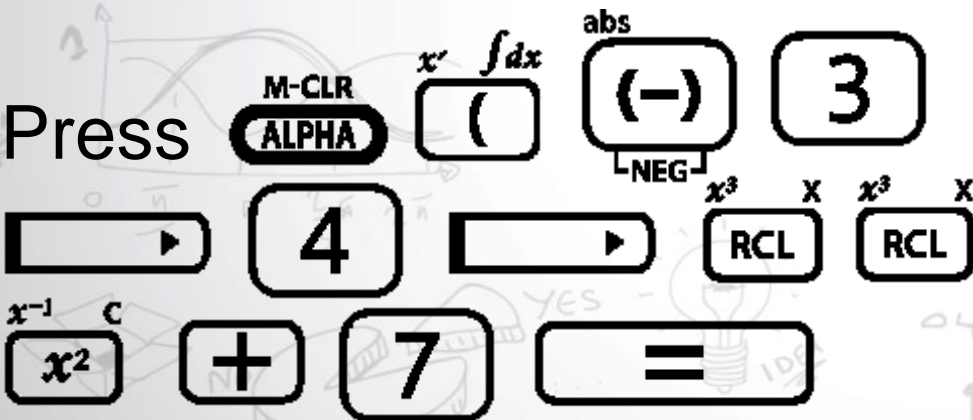


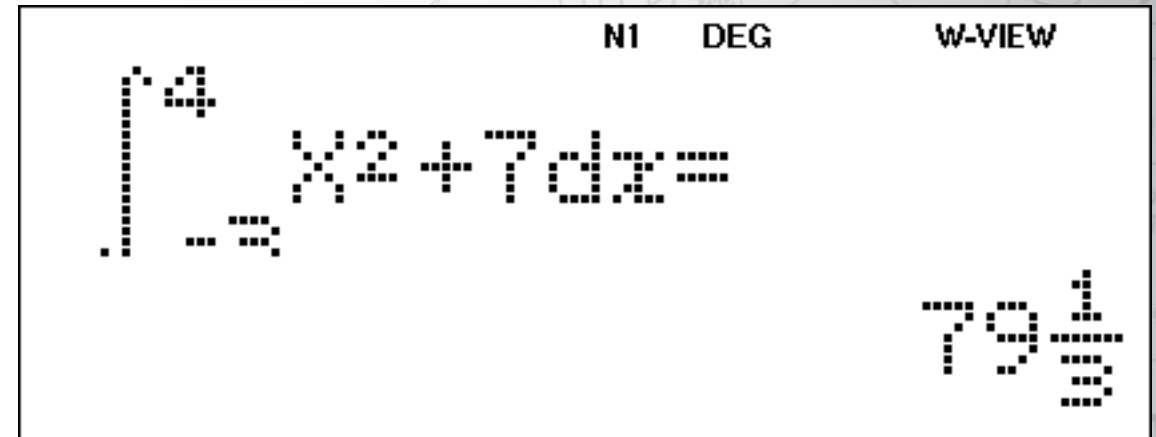
# Calculus - Integration

- Finds the definite integral

- Use 

- E.g. Find  $\int_{-3}^4 x^2 + 7$

- Press 



$$\int_{-3}^4 x^2 + 7 dx = 79\frac{1}{3}$$



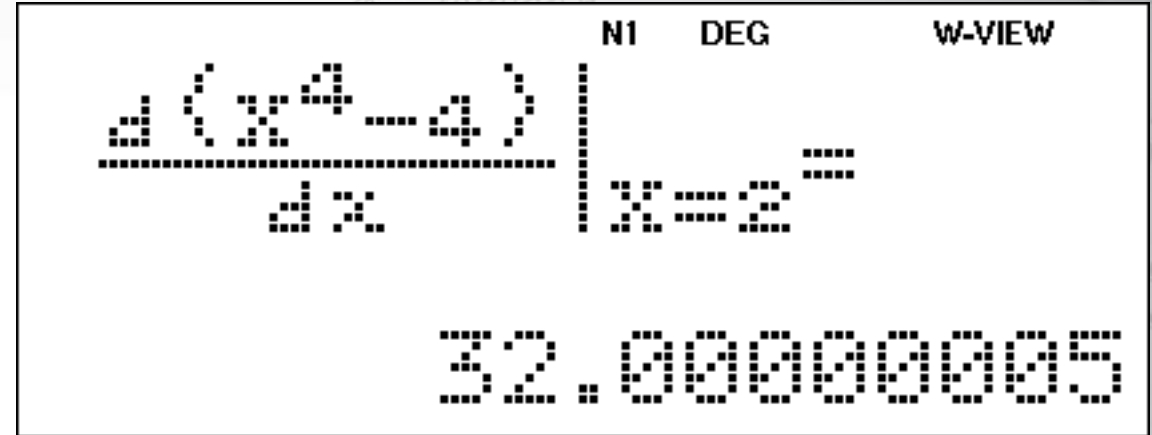
# Differentiation

- Finds the derivative at a point


- Use

- E.g. Find  $\frac{d}{dx} (x^4 - 4)$  when  $x = 2$

- Press

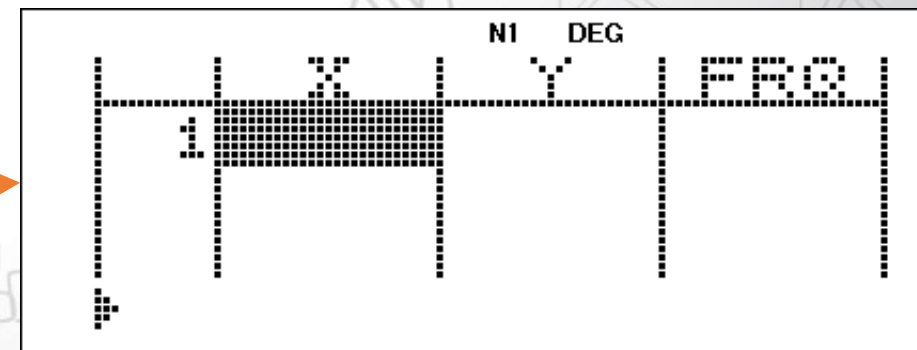
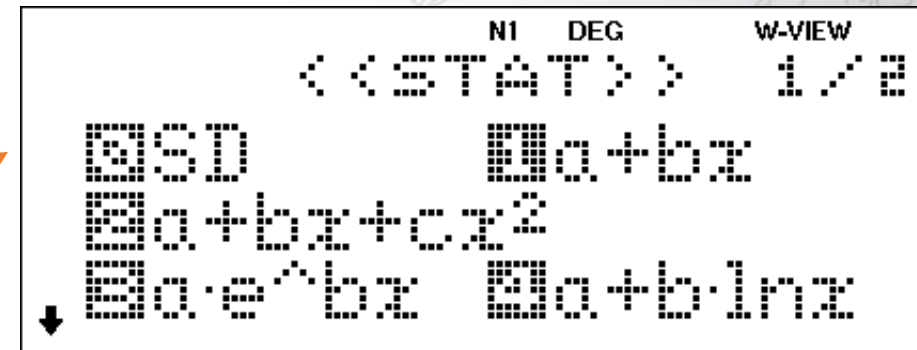
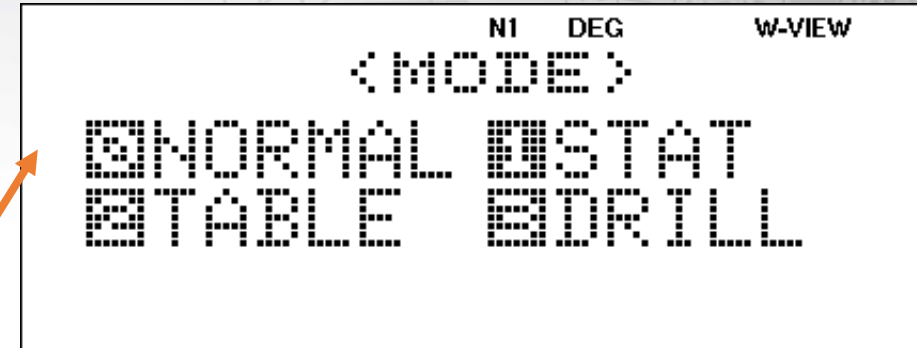


# More Calculus

- Gradient at a point –
- We can use our linear regression function to find the average gradient between two points.
- E.g. (3; 4) and (5; 10)
- Press 

1

1



- Type in each coordinate:

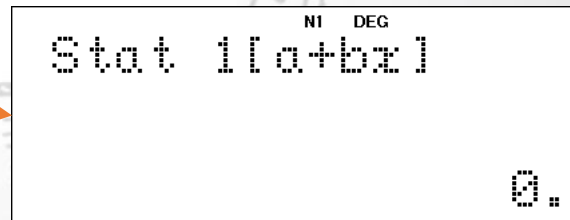
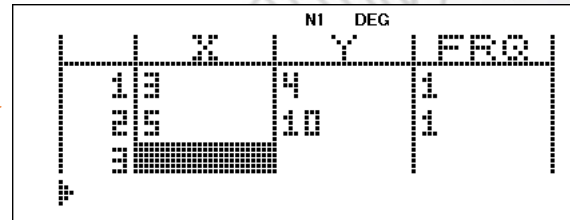
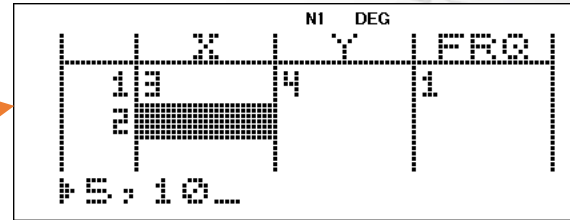
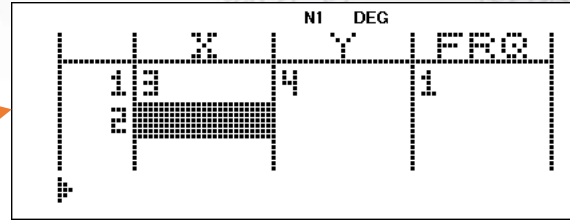
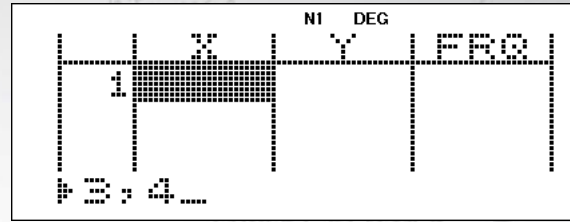
3  $(x, y)$  4

=

5  $(x, y)$  1 0

=

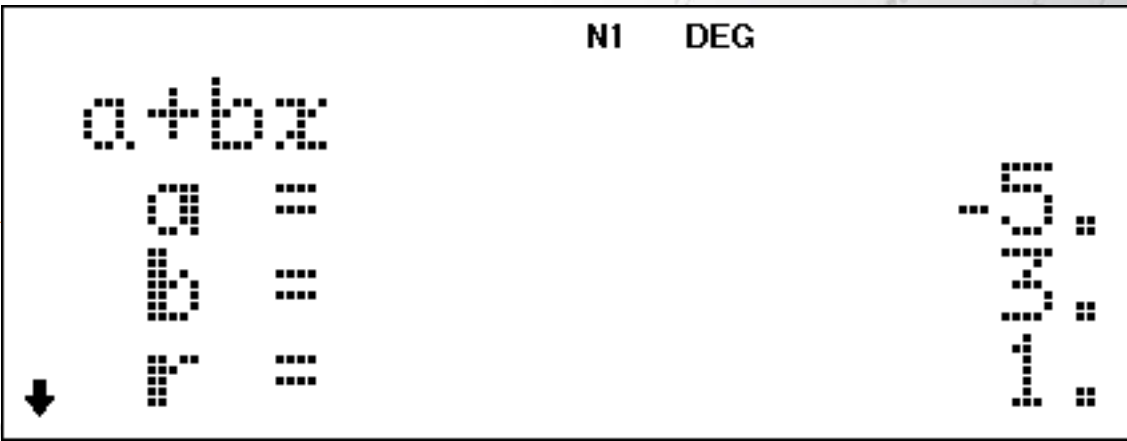
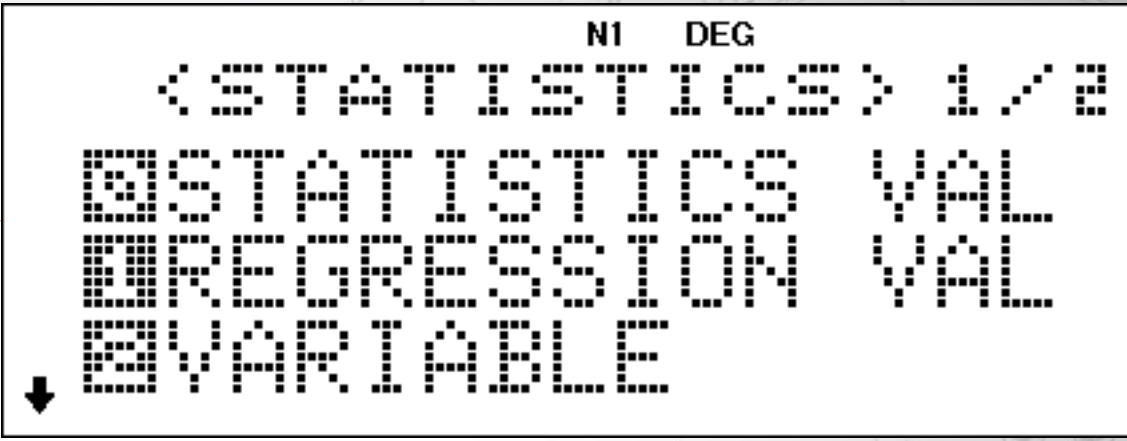
- Press  when you are done.



- Now we find the gradient:

- Press **M-CLR** **ALPHA** **8**

**1**

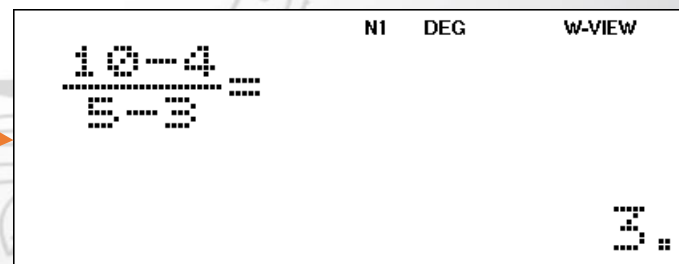
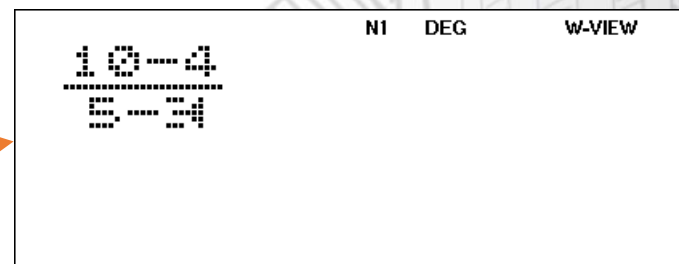
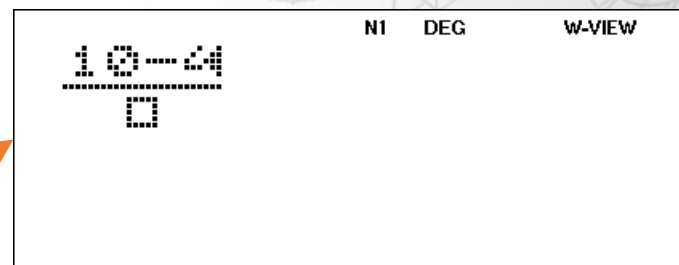
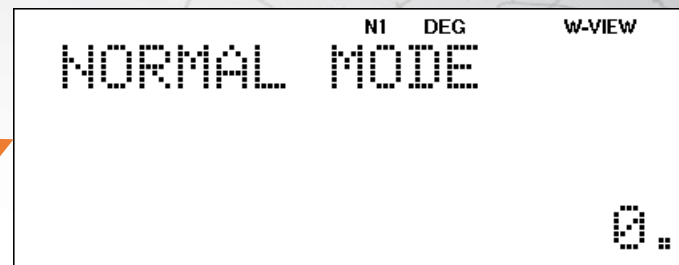
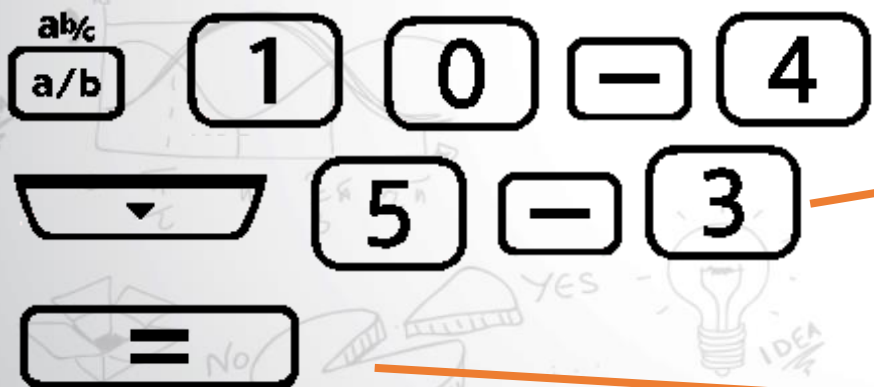


- Traditional route:

- $m = \frac{y_2 - y_1}{x_2 - x_1}$

- $m = \frac{10 - 4}{5 - 3}$

- Press **HOME**



# Calculus graphs and roots

- $y = x^3 + 13x^2 + 34x - 48$
- Press **MODE** **2**
- Type in the expression:

**RCL** **X** **RCL** **X** **y<sup>x</sup>** **3** **▶**  
**+** **1** **3** **RCL** **X** **RCL** **X** **x<sup>-1</sup>** **C**  
**+** **3** **4** **RCL** **X** **RCL** **X**  
**-** **4** **8**  
**=**

TABLE MODE  
Function1?  
 NI DEG W-VIEW  
 X<sup>3</sup>\_

NI DEG W-VIEW  
 X<sup>3</sup>+13X<sup>2</sup>\_

NI DEG W-VIEW  
 X<sup>3</sup>+13X<sup>2</sup>+34X\_

NI DEG W-VIEW  
 X<sup>3</sup>+13X<sup>2</sup>+34X-48\_

NI DEG W-VIEW  
 Function2?

- Skip function 2 for now so press **=**
- Leave start and step as is so press **=** **=**
- Use your up and down arrows to scroll through the table.
- To find the roots find where ANS or y is equal to 0.

NI DEG

X_Start:	0.
X_Step:	1.

NI DEG

X_Start:	0.
X_Step:	1.

NI DEG

X	ANS
0	.40
1	0
2	.80

0.

NI DEG

X	ANS
0	.40
1	0
2	.80

1.

NI DEG

X	ANS
0	.40
1	0
2	.80
3	1.20
4	1.60
5	2.00
6	2.40

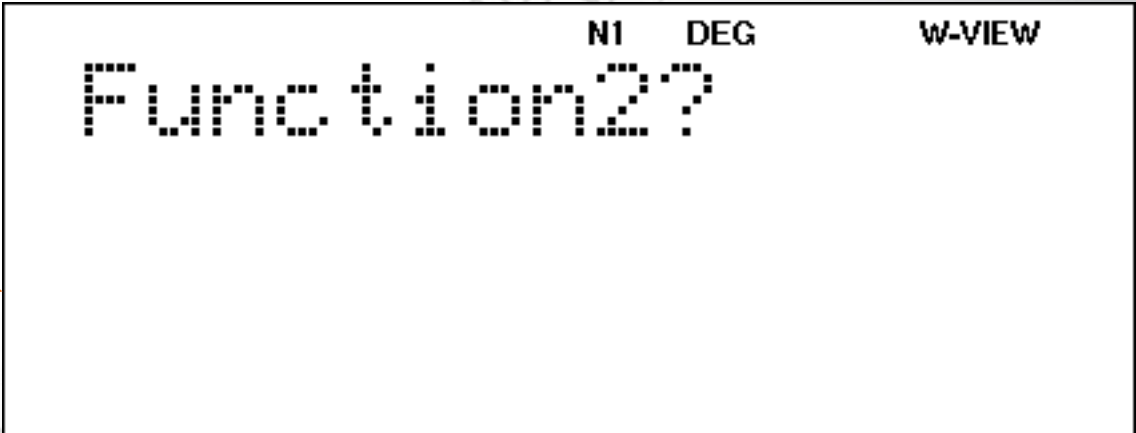
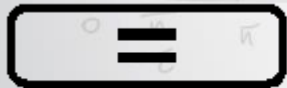
-6.

NI DEG

X	ANS
0	.40
1	0
2	.80
3	1.20
4	1.60
5	2.00
6	2.40
7	2.80

-9.

- Remember our equation:
- $y = x^3 + 13x^2 + 34x - 48$
- And what about the gradient?
- $y' = 3x^2 + 26x + 34$
- Lets put this into function 2:
- Press **ON/C**





- Type in the expression for the derivative:

3  $x^3$  RCL  $x$   $x^3$  RCL  $x$   $x^{-1}$  C  $x^2$   
+ 2 6  $x^3$  RCL  $x$   $x^3$  RCL  $x$   
+ 3 4  
=  
=  
=

NI DEG W-VIEW  
3X<sup>2</sup>\_

NI DEG W-VIEW  
3X<sup>2</sup>+26X\_

NI DEG W-VIEW  
3X<sup>2</sup>+26X+34\_

NI DEG  
X\_Start: 0.  
X\_Step: 1.

NI DEG  
X\_Start: 0.  
X\_Step: 1.

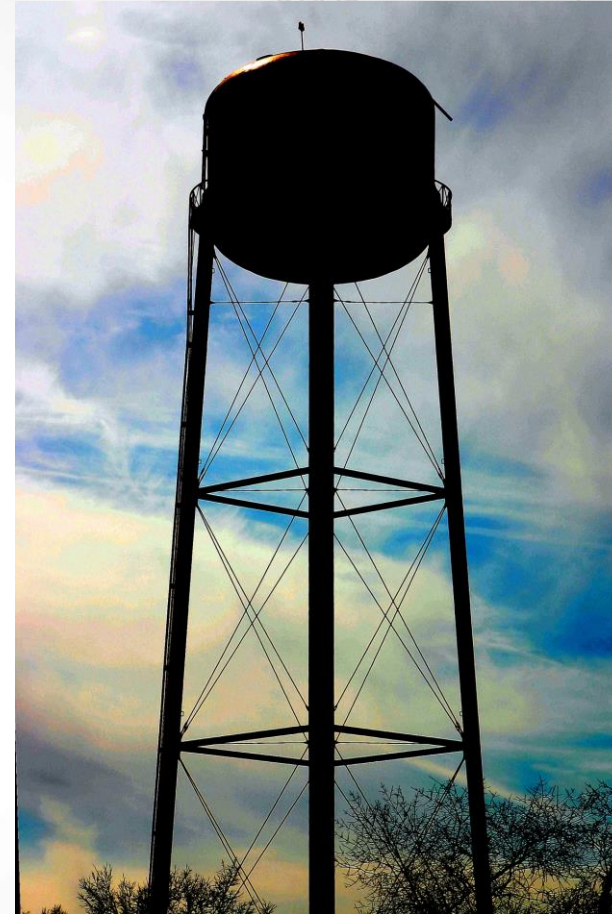
NI DEG

X	ANS1	ANS2
0	34	34
1	60	60
2	100	100

0.

# E.g. From Handbook and Study Guide Kevin smith (Grade 12) p.g. 203

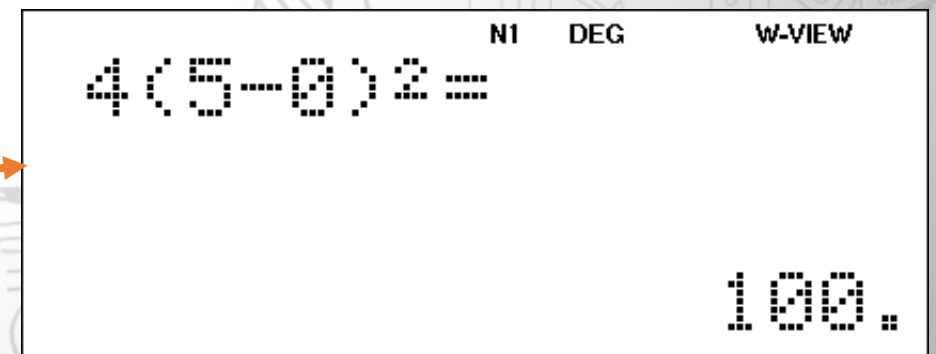
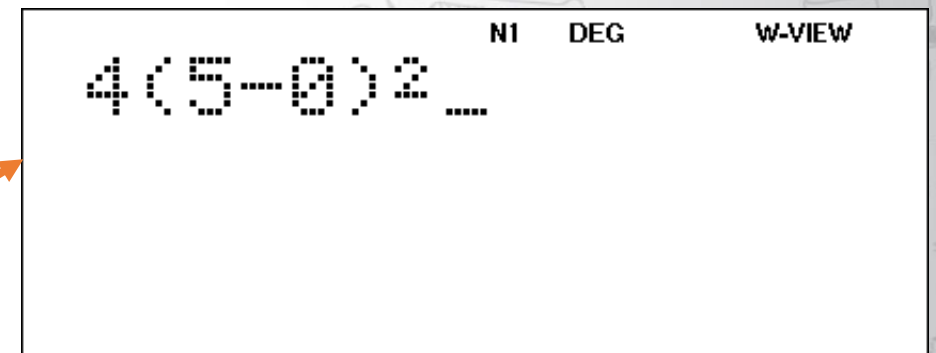
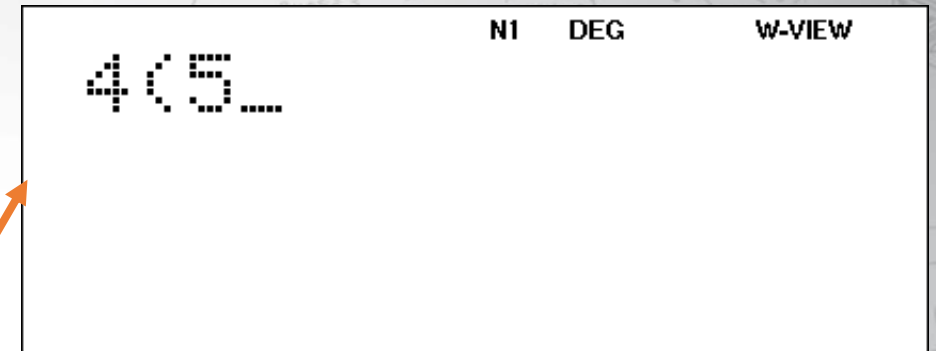
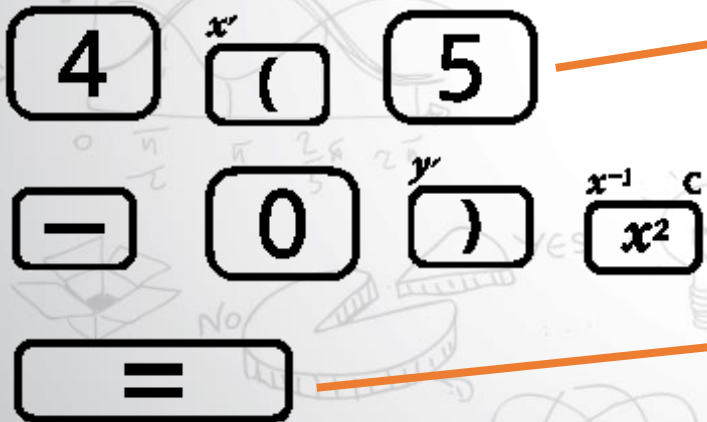
- The volume of water in a rainwater collection tank  $t$  minutes after it starts to empty is given by the equation  $V(t) = 4(5 - t)^2$  where volume is measured in litres (l)
  - a) Determine the initial volume of water in the tank.
  - b) At what rate is the water in the tank changing after 180 seconds?
  - c) How long will it take for the tank to empty?



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# a) Determine the initial volume of water in the tank.

- $V(t) = 4(5 - t)^2$
- Initial volume means that  $t = 0$
- And we substitute in:
- $V(0) = 4(5 - 0)^2$
- Type this into your calculator:



## b) At what rate is the water in the tank changing after 180 seconds?

- $V(t) = 4(5 - t)^2$
- Rate means we need gradient, which means we need to differentiate:
- First simplify / multiply out:
  - $V(t) = 4(5 - t)(5 - t)$
  - $V(t) = 4(25 - 10t + t^2)$
  - $V(t) = 100 - 40t + 4t^2$
- Now we can differentiate:
  - $V'(t) = -40 + 8t$

- We have that  $t = 180$  seconds so we have  $t = 3$  minutes and we substitute in:
- $V'(180) = -40 + 8(3)$
- Type this in:

**(-)** **4** **0** **+**

NEG

**8** **(** **3** **)**

**=**

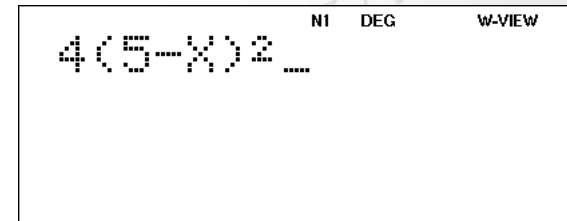
N1 DEG W-VIEW  
-40+...

N1 DEG W-VIEW  
-40+8(3)...

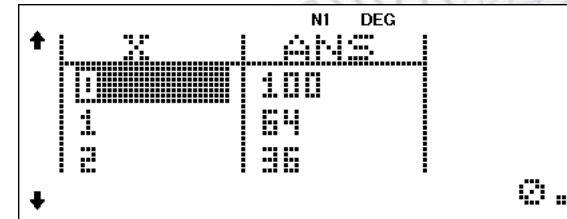
N1 DEG W-VIEW  
-40+8(3)=  
-16.

# c) How long will it take for the tank to empty?

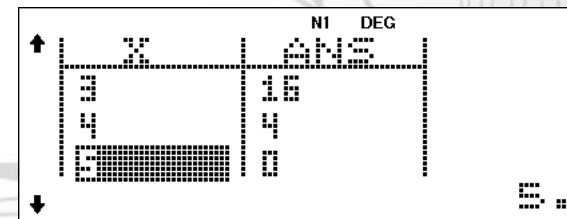
- What is  $t$  when  $V(t) = 0$ ?
- $V(t) = 4(5 - t)^2$
- Substitute:
- $0 = 4(5 - t)^2$
- Solve for  $t$ :
- $0 = (5 - t)^2$
- $0 = 5 - t$
- $t = 5 \text{ minutes}$



NI DEG W-VIEW  
4(5-X)²



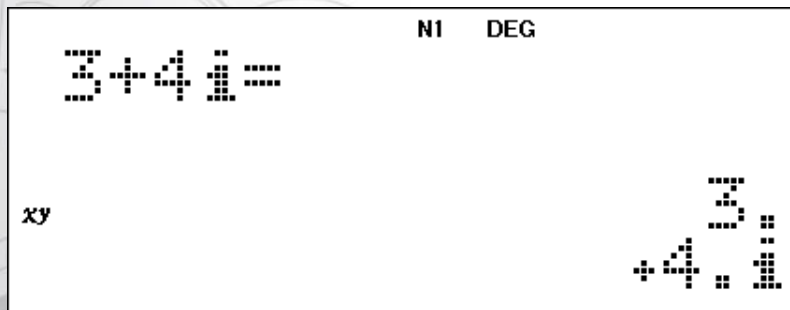
NI DEG  
↑ X ANS  
0 100  
1 64  
2 36  
↓ 0.



NI DEG  
↑ X ANS  
3 16  
4 9  
5 0  
↓ 5.

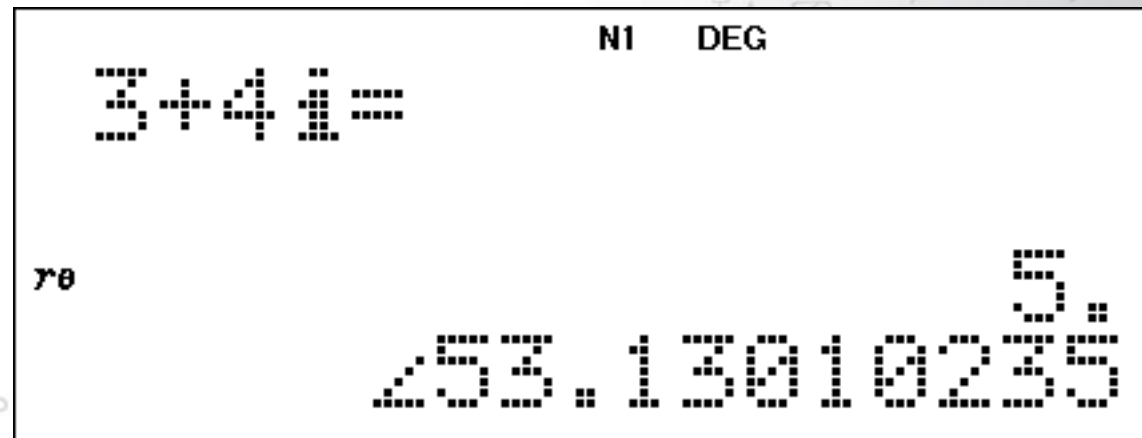
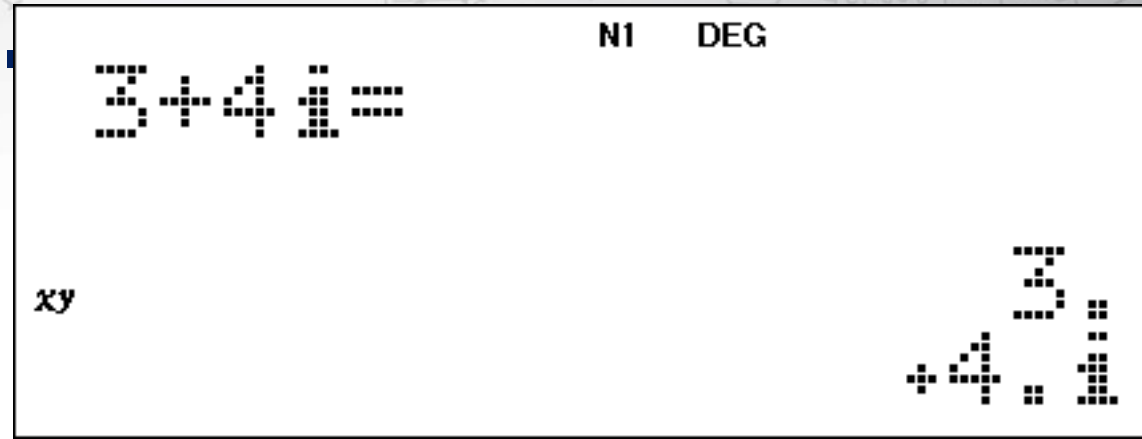
# Complex Numbers

- Press **MODE** **3**
- To make an i press **D°M'S**
- E.g. Type in  $3 + 4i$ 
  - Press **3** **+** **4** **D°M'S** **=**



# Changing between rectangular and polar coordinates.

- Press  $\boxed{3} \boxed{+} \boxed{4} \boxed{\overset{\leftrightarrow \text{DEG}}{\text{D}^\circ\text{M}'\text{S}}} \boxed{=}$
- Press  $\boxed{\text{2ndF}} \boxed{8}$ 
  - This gives the hypotenuse (5) and the angle the hypotenuse makes with the x-axis.



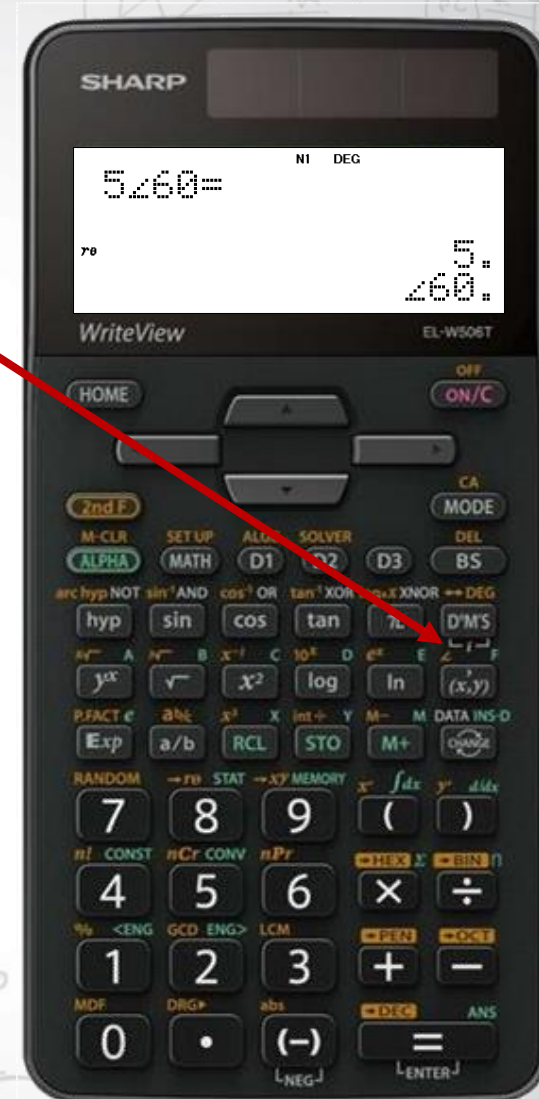


# Changing from polar to rectangular coordinates.

- To type in the hypotenuse and the angle, we use  $\text{2ndF}$   $(x,y)^F$
- E.g. Press  $5$   $\text{2ndF}$   $(x,y)^F$   $6$   $0$   
 $=$
- To convert back to rectangular coordinates press

$\text{2ndF}$   $9$

NI DEG  
5∠60=  
xy 2.5  
+4.330127019i



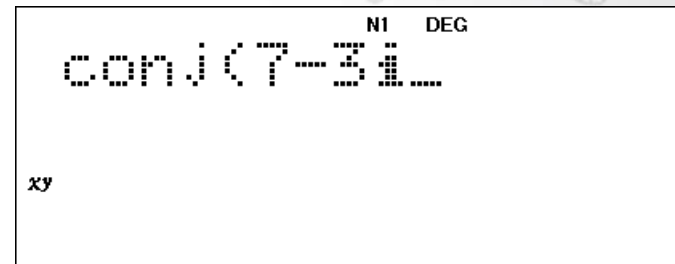
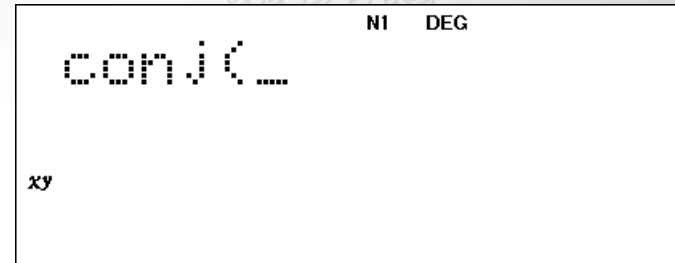
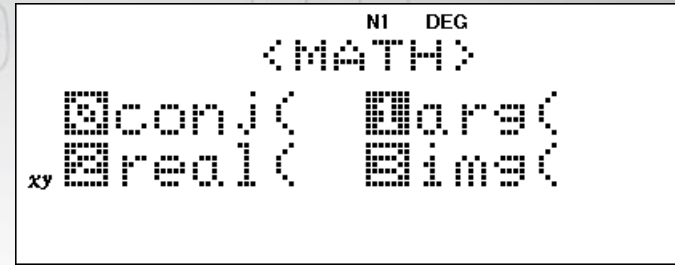
# Conjugate Form

- To find the conjugate form we use the **MATH** menu.
- E.g. Find the conjugate of  $7 - 3i$

• Press **MATH** **0**

**7** **-** **3** **↔DEG**  
**D°M'S**

**=**



# Real and Imaginary values

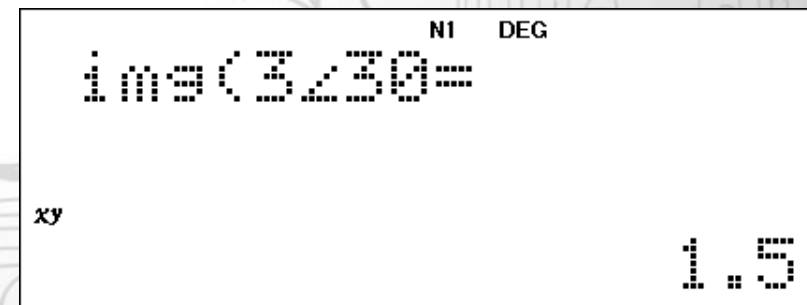
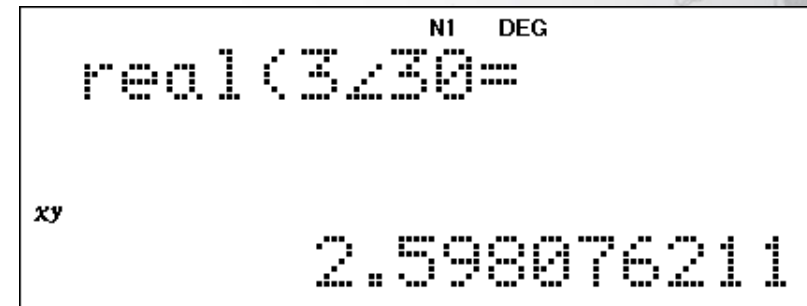
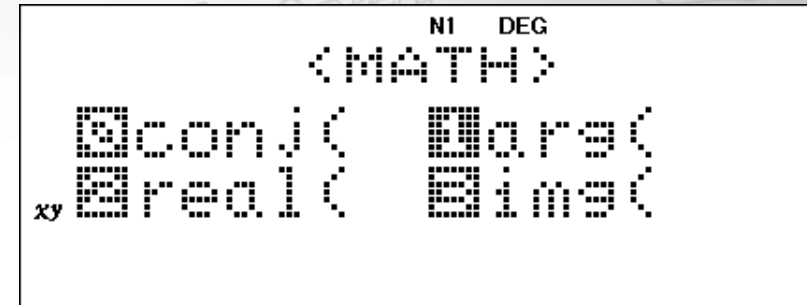
- We can also type in the hypotenuse and angle and find the real and imaginary values for them.
- E.g. Find the real and imaginary values for  $r = 3$  and  $\theta = 30$ .

• Press **MATH** **2** **3** **2ndF** **(x,y)** **3**

**0** **=**

• And press **MATH** **3** **3** **2ndF** **(x,y)**

**3** **0** **=**



# Graphs

- E.g.  $y = |x| + 3$

- Press **MODE** **2**

**2ndF** **(-)**

**RCL** **RCL** **▶**

**+** **3**

**=**






N1 DEG W-VIEW  
TABLE MODE  
Function1?

N1 DEG W-VIEW  
|N|

N1 DEG W-VIEW  
|X|\_

N1 DEG W-VIEW  
|X|+3\_

N1 DEG W-VIEW  
Function2?

- Press  again to skip function 2:
- Leave start at 0 and step as 1 so press  
- Use the  and  arrow keys to scroll through the table.

NI DEG W-VIEW  
Function2?

NI DEG  
X\_Start: 0.  
X\_Step: 1.

NI DEG  
X\_Start: 0.  
X\_Step: 1.

NI DEG

X	ANS
0	3
1	4
2	5

0.

NI DEG

X	ANS
5	8
6	9
7	10



7.

NI DEG

X	ANS
0	7
-3	6
-2	5

-4.

# Trigonometry Graph

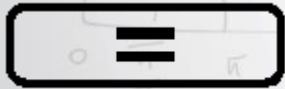
- Press  

- E.g.  $y = \tan x$

- Press   









NI DEG W-VIEW  
TABLE MODE  
Function1?

NI DEG W-VIEW  
tanX\_



NI DEG W-VIEW  
Function2?

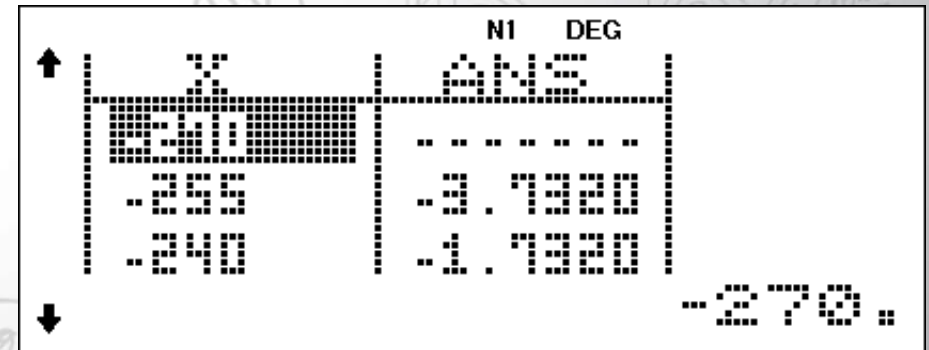
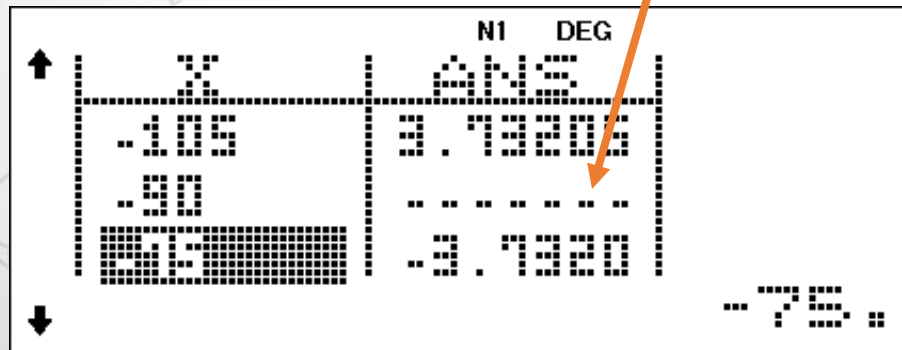
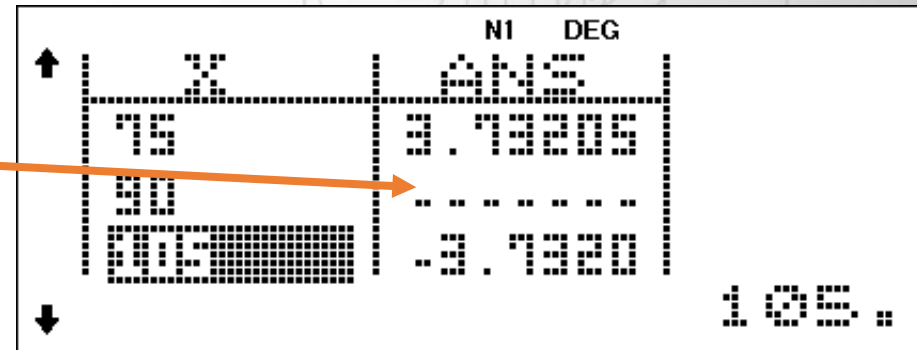
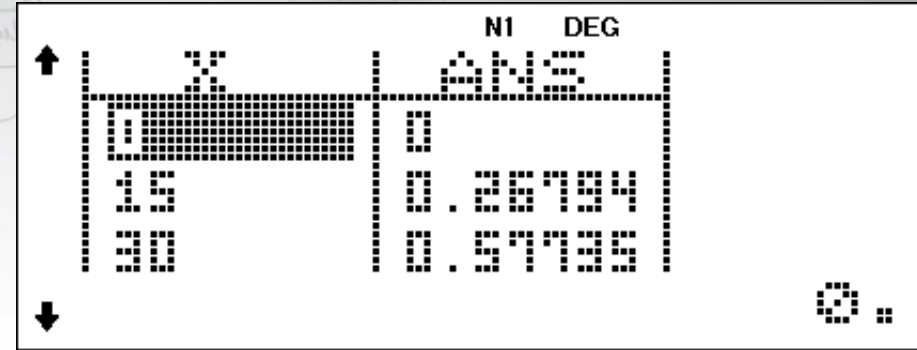
NI DEG  
X\_Start: 0.  
X\_Step: 1.

NI DEG  
X\_Start: 0.  
X\_Step: 15\_



X	ANS
0	0
15	0.26794
30	0.51735

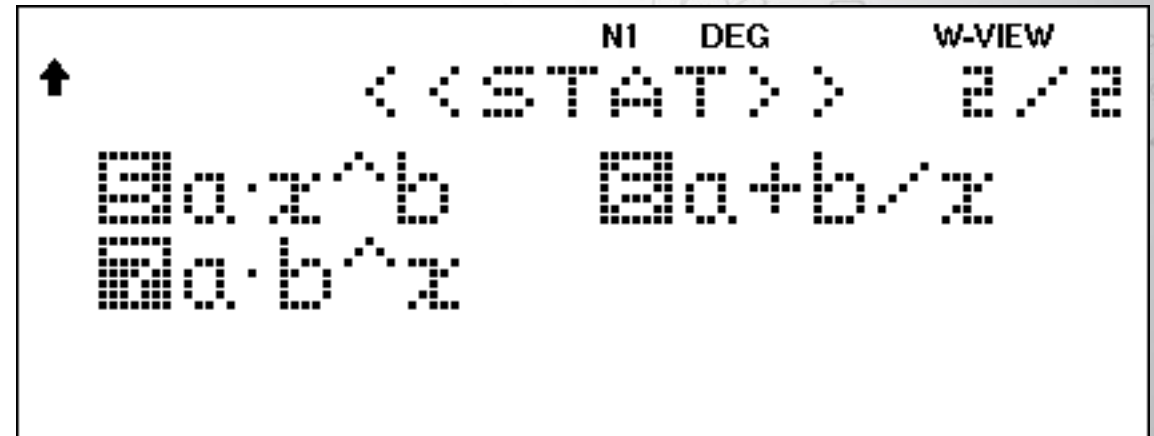
0.

- Use your  and  arrow keys to scroll through the graph.
- Look for your asymptotes.
- Look at how the values start to repeat every 180°



# Statistics Mode

- Press  
- You have several options
  - 0: SD
    - Does statistical analysis for univariate data
  - 1:  $a + bx$ 
    - Does statistical analysis for bivariate data
  - 2:  $a + bx + cx^2$ 
    - Does statistical analysis for quadratic data
  - The rest of statistical analysis options are not relevant to students.

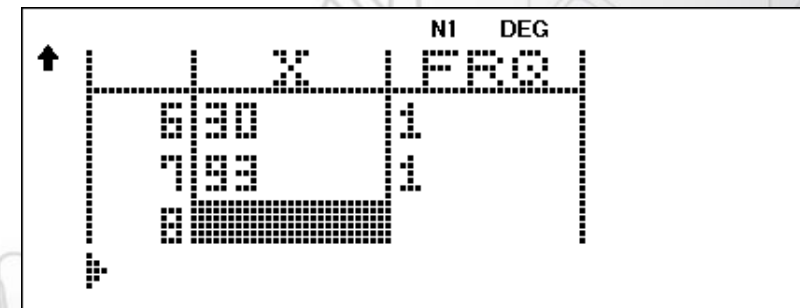
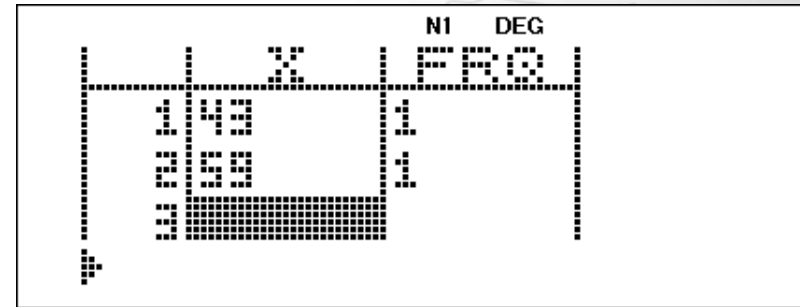
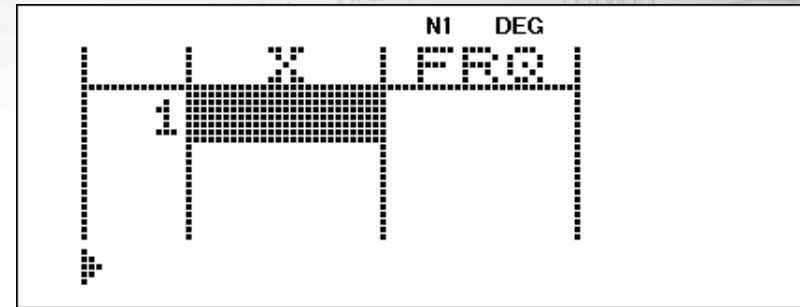






# Univariate Data

- Press **CA MODE** **1** **0**
- Insert data by typing in the data point and pressing **=**
- E.g. Type in the data points below:

- Press **4** **3** **=**
- 5** **9** **=** **8** **4**
- =** **7** **2** **=**
- 6** **1** **=** **3** **0**
- =** **9** **3** **=**



- Press  to change the screen from the data table to the calculation screen.
  - You can also press  to go back to the data table.



- Press  

Stat 0[SD] NI DEG  
0.

NI DEG  
<STATISTICS> 1/2  
[STATISTICS] VAL  
[ ]  
[ ]  
[ ]  
↓ [VARIABLE]

NI DEG  
↑ <STATISTICS> 2/2  
[SUM]  
[MIN/MAX] [QUARTILE]

- 0: Statistics Val

- Gives the various values for the statistics.
- Press  to see each of the screens.
- Press  to clear away the statistics.

		NI	DEG
n	=		7
$\bar{x}$	=	63.1428571	
$s_x$	=	22.1014975	
$s^2_x$	=	488.47619	

		NI	DEG
$\sigma_x$	=	20.4620106	
$\sigma^2_x$	=	418.693878	
$\Sigma x$	=	442.	
$\Sigma x^2$	=	30'840.	





		NI	DEG
xmin	=	30.	
Q1	=	43.	
Med	=	61.	
Q3	=	84.	

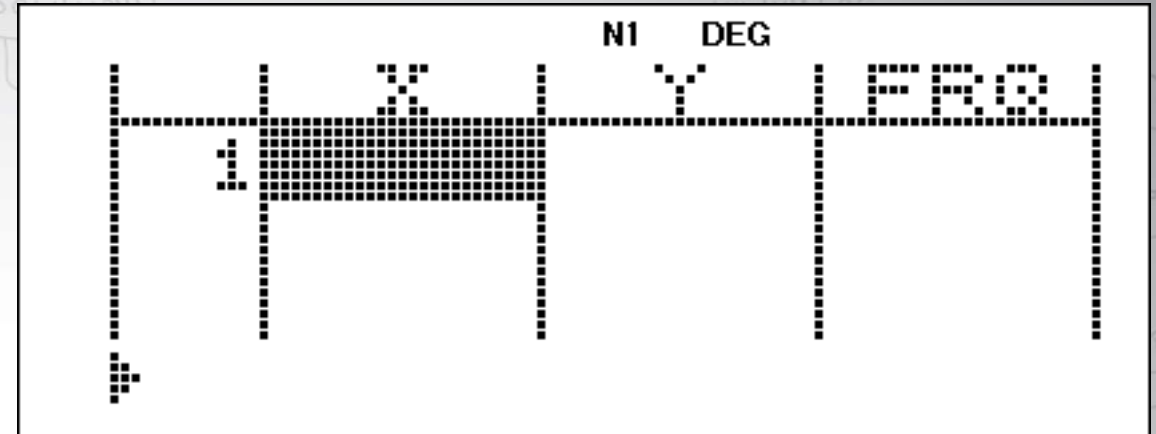
		NI	DEG
xmax	=	93.	

# Linear Regression

- Press   

- You can input the data in two different ways:

- First type in all the x-values (pressing  after each one) then use your arrow keys to move to the top of the y-column, and type in all the corresponding y-values (pressing  after each one).
- Alternatively, type in the x-value, press , type in the y-value and then press . This method is better for showing relationships to students.

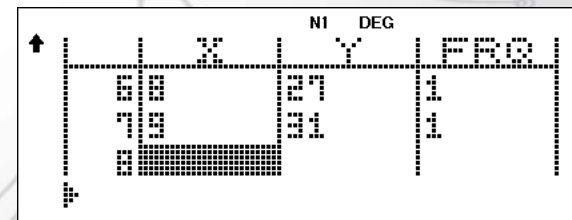
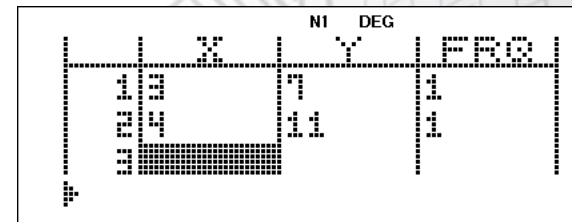





• E.g. Type in the data:

• Press **3**  $\angle$   $\overset{F}{(x,y)}$  **7** **=**

<b>4</b>	$\angle$ $\overset{F}{(x,y)}$	<b>1</b>	<b>1</b>	<b>=</b>
<b>5</b>	$\angle$ $\overset{F}{(x,y)}$	<b>1</b>	<b>5</b>	<b>=</b>
<b>6</b>	$\angle$ $\overset{F}{(x,y)}$	<b>1</b>	<b>9</b>	<b>=</b>
<b>7</b>	$\angle$ $\overset{F}{(x,y)}$	<b>2</b>	<b>3</b>	<b>=</b>
<b>8</b>	$\angle$ $\overset{F}{(x,y)}$	<b>2</b>	<b>7</b>	<b>=</b>
<b>9</b>	$\angle$ $\overset{F}{(x,y)}$	<b>3</b>	<b>1</b>	<b>=</b>

X	Y
3	7
4	11
5	15
6	19
7	23
8	27
9	31



- Now press  to change from the data table to calculation screen.
- Press  

NI DEG  
Stat 1|a+bx|  
0.

NI DEG  
<STATISTICS> 1/2  
BSTATISTICS VAL  
BREGRESSION VAL  
BVARIABLE  
↓

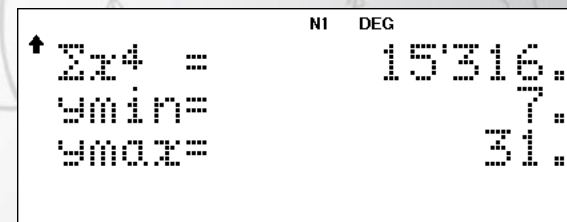
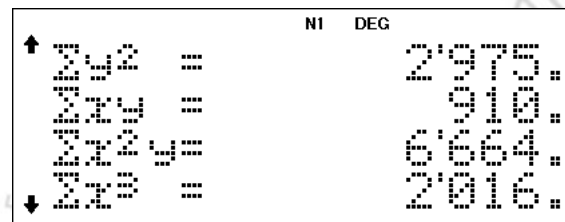
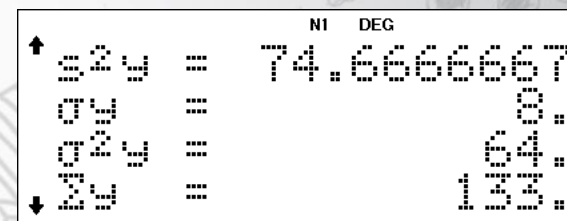
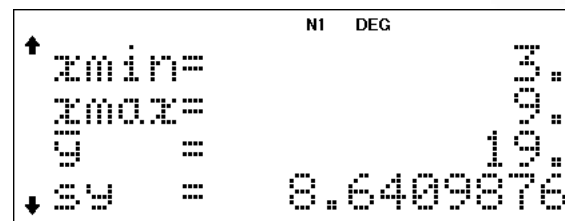
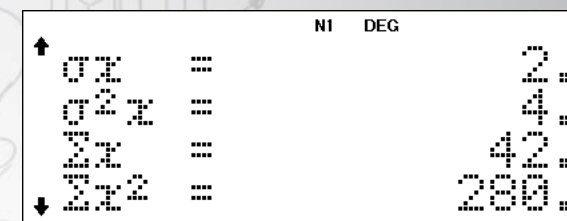
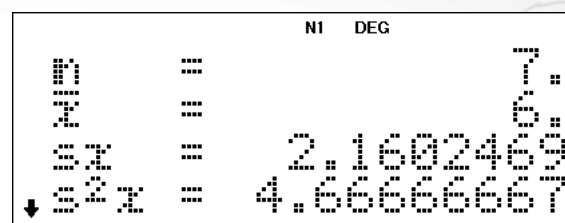
NI DEG  
↑ <STATISTICS> 2/2  
BSUM  
BMIN/MAX  
BCOEFFICIENT

- 0: Statistics Val

- Press **M-CLR** **ALPHA** **8** **0**

- Press  to see each of the screens.

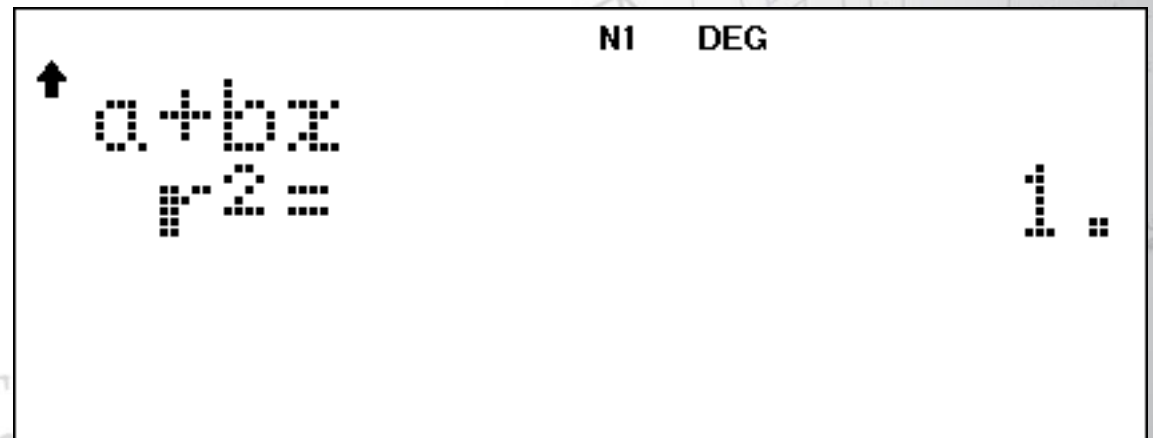
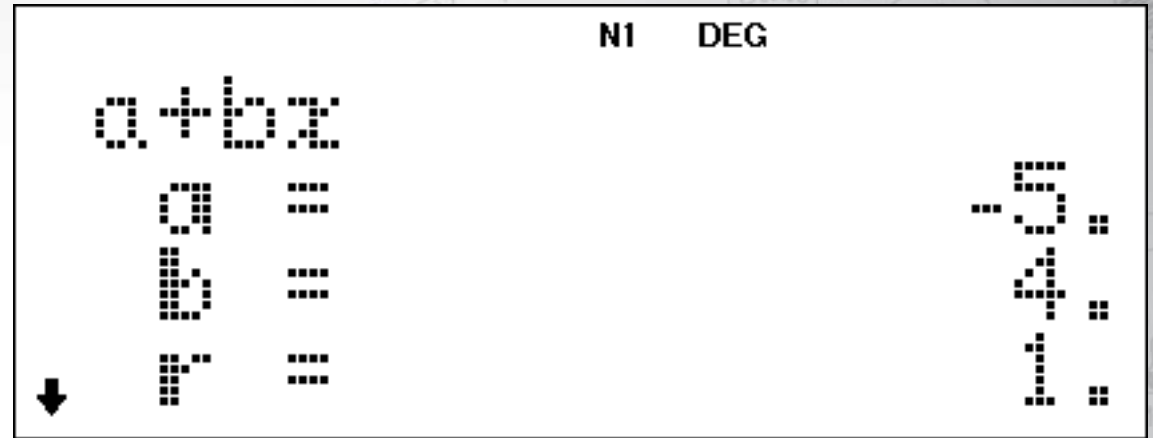
- Press **OFF** **ON/C** to clear away the statistics and do other calculations.



- 1: Regression Values



- Press **M-CLR** **ALPHA** **8** **1**

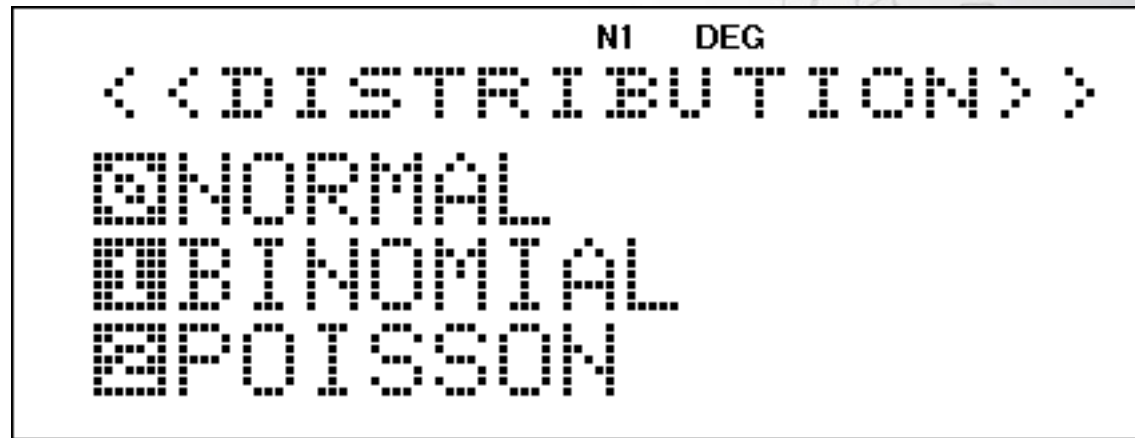
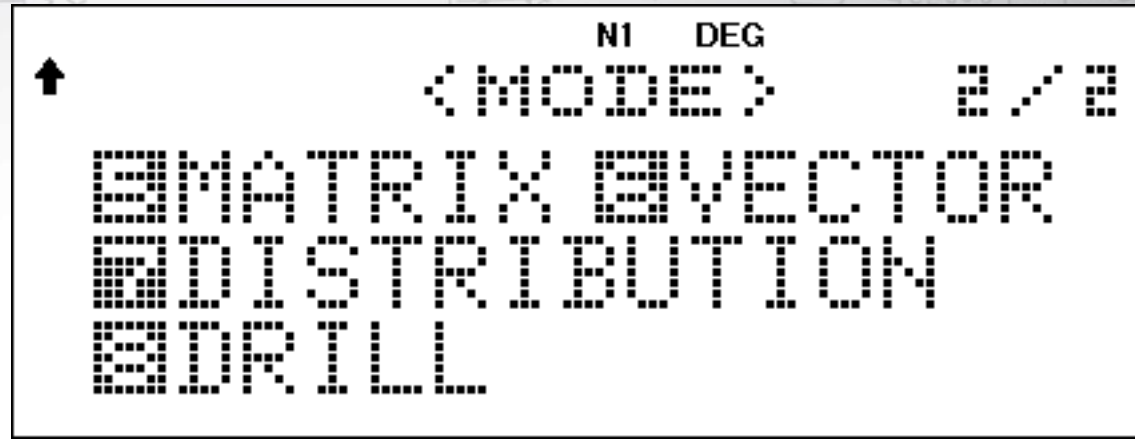
- Gives the regression line y-intercept (a) and the gradient (b).
    - Gives the correlation coefficient.





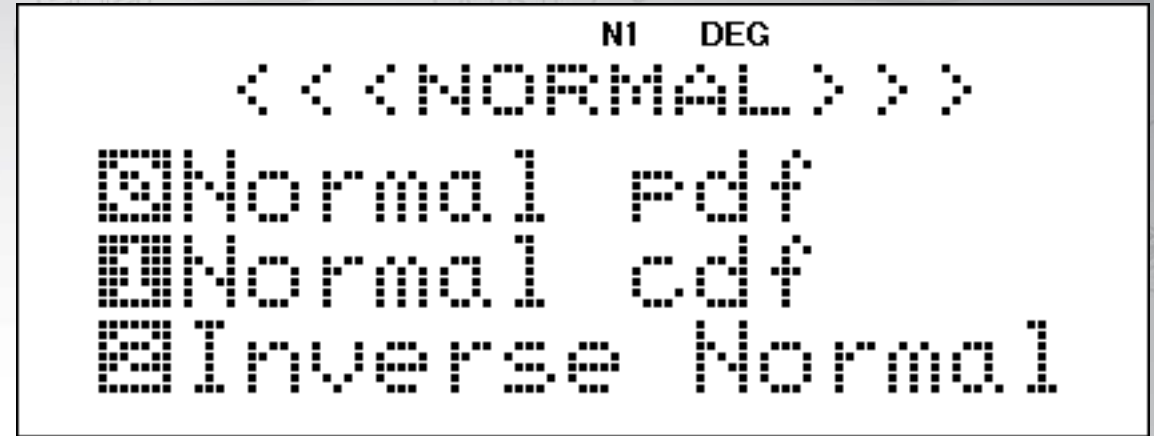
# Distribution Mode

- Press  
- You have 3 options:
  - 0: Normal
    - Normal Distribution
  - 1: Binomial
    - Binomial Distribution
  - 2: Poisson
    - Poisson Distribution



# 0: Normal

- Press **MATH** **7** **0**
- You have 3 options:
  - 0: Normal pdf
    - Calculates the normal probability density function.
  - 1: Normal cdf
    - Calculates the cumulative normal density function
  - 2: Inverse Normal
    - Calculates the inverse cumulative normal density function



- 0: Normal pdf

- Press **MODE** **7** **0** **0**

- Now type in the x value, mean and standard deviation, eg.

**2** **=**

**4** **=**

**0** **DRG** **•** **5** **=**

```

NI DEG
Normal Pdf
x: 0.
μ: 0.
σ: 1.
    
```

```

NI DEG
Normal Pdf
x: 2.
μ: 0.
σ: 1.
    
```



```

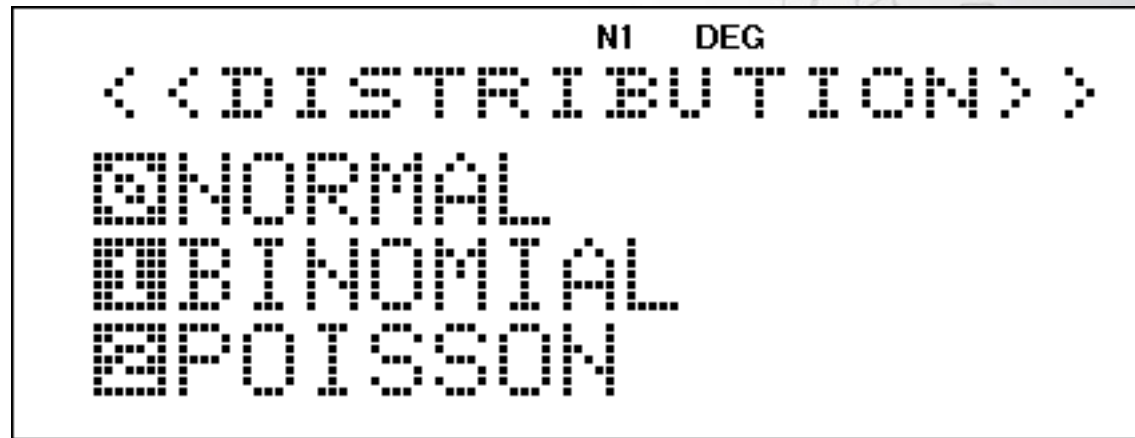
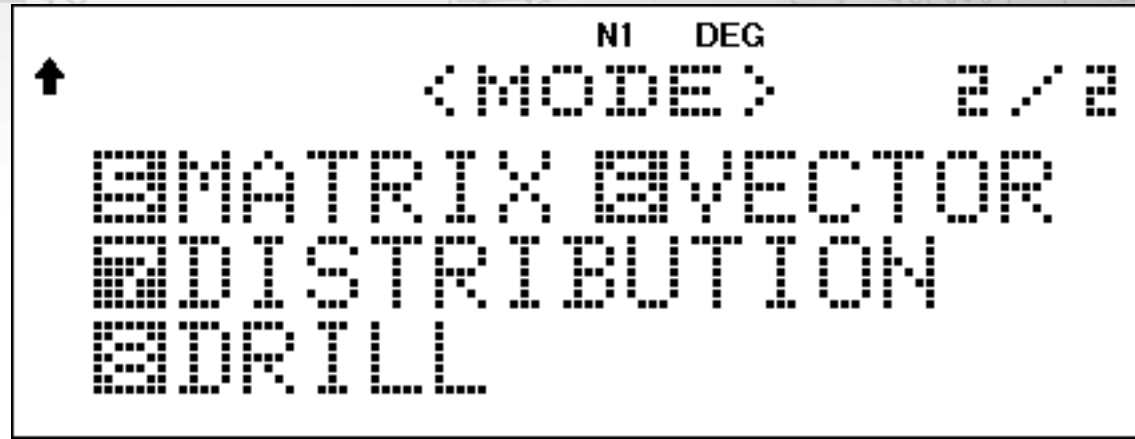
NI DEG
Normal Pdf
x: 2.
μ: 4.
σ: 1.
    
```

```

NI DEG
Normal Pdf
ANS=
0.00026766
    
```

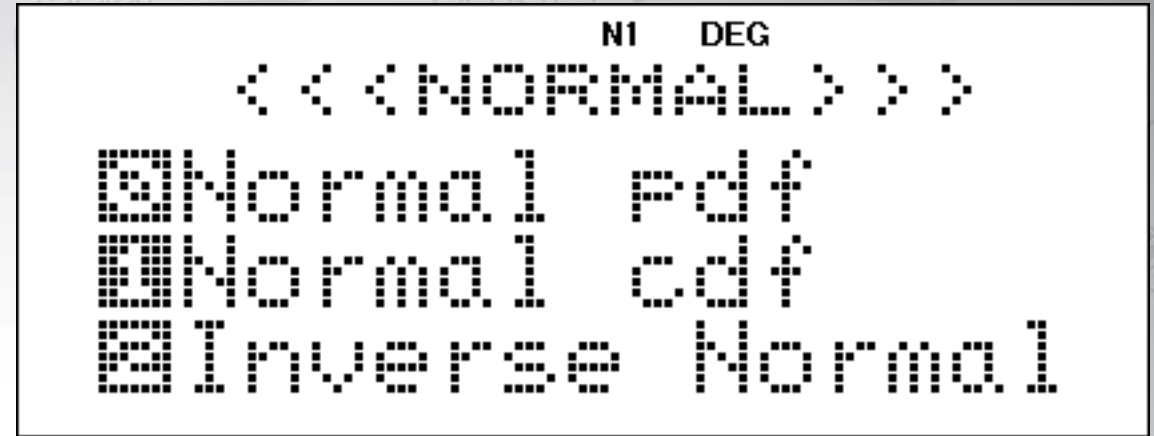
# Distribution Mode

- Press  
- You have 3 options:
  - 0: Normal
    - Normal Distribution
  - 1: Binomial
    - Binomial Distribution
  - 2: Poisson
    - Poisson Distribution



# 0: Normal

- Press **MATH** **7** **0**
- You have 3 options:
  - 0: Normal pdf
    - Calculates the normal probability density function.
  - 1: Normal cdf
    - Calculates the cumulative normal density function
  - 2: Inverse Normal
    - Calculates the inverse cumulative normal density function



- 0: Normal pdf

- Press **MODE** **7** **0** **0**

- Now type in the x value, mean and standard deviation, eg.

**2** **=**

**4** **=**

**0** **DRG** **•** **5** **=**

```

NI DEG
Normal Pdf
x: 2.0
μ: 4.0
σ: 1.0
    
```

```

NI DEG
Normal Pdf
x: 2.0
μ: 4.0
σ: 1.0
    
```

```

NI DEG
Normal Pdf
x: 2.0
μ: 4.0
σ: 1.0
    
```

```

NI DEG
Normal Pdf
ANS= 0.00026766
    
```

# Finance

- Simple Interest

- Press **MODE** **2**

- E.g.  $A = 1000 (1 + 5\% \times n)$

- Press **1** **0** **0** **0** **(**

**1** **+**

**5** **ab/c** **1** **0** **0**

**→** **×** **RCL** **RCL** **)**

NI DEG W-VIEW  
TABLE MODE  
Function1?

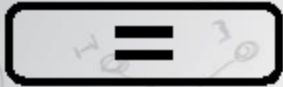
NI DEG W-VIEW  
1000(

NI DEG W-VIEW  
1000(1+

NI DEG W-VIEW  
1000(1+ $\frac{5}{100}$

NI DEG W-VIEW  
1000(1+ $\frac{5}{100} \times X$ )

• Press



NI DEG W-VIEW  
Function2?

NI DEG  
X\_Start: 0.  
X\_Step: 15.

NI DEG  
X\_Start: 0.  
X\_Step: 15.

NI DEG  
X\_Start: 0.  
X\_Step: 1

X	ANS
0	1000
1	1050
2	1100

0.

X	ANS
6	1300
7	1350
8	1400

8.

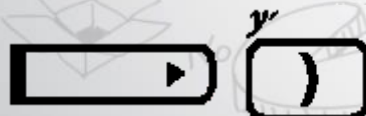
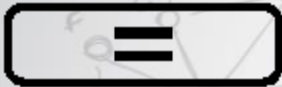
X	ANS
19	1950
20	2000
21	2050

20.



# Compound interest

- Lets add compound interest into function 2.
- Press **ON/C**



$$1000\left(1+\frac{5}{100}\times X\right)_-$$

Function2?

$$1000($$

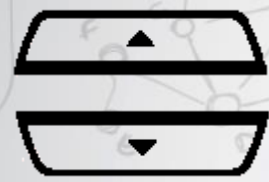
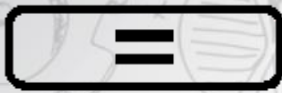
$$1000(1+_$$

$$1000\left(1+\frac{5}{100}\right)$$

$$1000\left(1+\frac{5}{100}\right)_-$$

$$1000\left(1+\frac{5}{100}\right)^{24}$$

• Press



NI DEG

X_Start:		0.
X_Step:		1.

NI DEG

X	ANS1	ANS2
1	1000	1000
1	1050	1050
2	1100	1102.5

NI DEG

X	ANS1	ANS2
4	1200	1215.50
5	1250	1276.28
6	1300	1340.09

NI DEG

X	ANS1	ANS2
18	1800	2406.61
19	1950	2526.95
20	2000	2653.29

NI DEG

X	ANS1	ANS2
34	2750	5516.01
35	2800	5791.81
37	2850	6081.40

# Decay

- We can change it to decay as well:

- Simple Decay:

- $A = P(1 - in)$

- Compound Decay:

- $A = P(1 - i)^n$

- Press **OFF** **ON/C**

- **←** x 10

**DEL**  
**BS**

**-**

**=**

NI DEG W-VIEW

$$1000(1 + \frac{5}{100} \times X) -$$

NI DEG W-VIEW

$$1000(1 - \frac{5}{100} \times X)$$

NI DEG W-VIEW

$$1000(1 - \frac{5}{100})^X$$

NI DEG W-VIEW

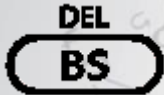
$$1000(1 - \frac{5}{100} \times X)$$

NI DEG W-VIEW

$$1000(1 + \frac{5}{100})^X -$$

- Let's edit the compound interest formula for decay:

- Press  x 11



NI DEG W-VIEW

$$1000\left(1 + \frac{5}{100}\right)^x$$

NI DEG W-VIEW

$$1000\left(1 - \frac{5}{100}\right)^x$$

NI DEG W-VIEW

$$1000\left(1 - \frac{5}{100}\right)^x$$

NI DEG W-VIEW

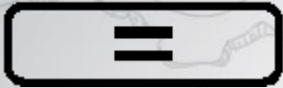
$$1000\left(1 - \frac{5}{100}\right)^x$$



NI DEG

X\_Start: 0.

X\_Step: 1.

- Leave the start and step as is, press



- Use your  and  arrow keys to scroll through various values
- You can use the simple increase but not the compound because of where the substitution takes place.

N1 DEG	
X_Start:	0.
X_Step:	1.

N1 DEG	
X_Start:	0.
X_Step:	1.

N1 DEG		
X	ANS1	ANS2
0	1000	1000
1	950	950
2	900	902.5

N1 DEG		
X	ANS1	ANS2
4	800	814.506
5	750	773.780
6	700	735.081

N1 DEG		
X	ANS1	ANS2
8	1150	1166.35
-2	1100	1108.03
-1	1050	1052.63

# What about an annuity?

- $PV = \frac{x[1-(1+r)^{-n}]}{r}$
- How much could we borrow with various amounts at 10% interest p.a. compounded monthly, over 5 years?
- Substitute what we know into the formula:

$$PV = \frac{x \left[ 1 - \left( 1 + \frac{10}{100 \times 12} \right)^{-5 \times 12} \right]}{\frac{10}{100 \times 12}}$$



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- Lets use table mode: **OFF ON/C** **OFF ON/C**
- Now type this into function 1:

$$x \left[ \frac{1 - \left(1 + \frac{10}{100 \times 12}\right)^{-5 \times 12}}{10} \right]$$

• **a/b** **x<sup>3</sup>** **x** **x<sup>3</sup>** **x** **x<sup>r</sup>**  
**a/b** **RCL** **RCL** **(**

**1** **-** **(** **1**

**+** **1** **0** **a/b** **a/b**

**1** **0** **0** **x** **1** **2**

**▸** **y<sup>r</sup>** **)** **x<sup>r</sup>** **A** **y<sup>x</sup>**

**(-)** **5** **x** **1** **2**

**▸** **y<sup>r</sup>** **)** **▾**

**1** **0** **a/b** **a/b**

**1** **0** **0** **x** **1** **2**

$$\frac{x \cdot 0}{\square}$$

$$\frac{x(1 - (10))}{\square}$$

$$\frac{x(1 - (1 + \frac{10}{4}))}{\square}$$

$$\frac{x(1 - (1 + \frac{10}{100 \times 12}))}{\square}$$







$$\frac{x(1 - (1 + \frac{10}{100 \times 12})^4)}{\square}$$

$$\frac{+ \frac{10}{100 \times 12} )^{-5 \times 12}}{\square}$$

$$\frac{+ \frac{10}{100 \times 12} )^{-5 \times 12}}{4}$$

$$\frac{+ \frac{10}{100 \times 12} )^{-5 \times 12}}{\frac{10}{4}}$$

$$\frac{+ \frac{10}{100 \times 12} )^{-5 \times 12}}{\frac{10}{100 \times 12}}$$

- Press  
- Lets make our payments go up in steps of R100 each time.
- Type in    and press 
- Use your up and down arrows to scroll down the table and see what you can get as a loan.

NI DEG W-VIEW  
Function2?

NI DEG  
X\_Start: 0.  
X\_Step: 1.

NI DEG  
X\_Start: 0.  
X\_Step: 1.

NI DEG  
X\_Start: 0.  
X\_Step: 100.

X	ANS
0	0
100	4706.53
200	9413.07

0.

X	ANS
800	37652.2
900	42358.8
1000	47065.3

1'000.

X	ANS
1800	84717.6
1900	89424.2
2000	94130.7

2'000.

X	ANS
3100	145902.
3200	150609.
3300	155315.

3'300.



# Matrix Mode

- Solve matrices from 1 x 1 to 4 x 4 in size.
- Press **MODE** **5**
- To set up a matrix press **MATH** **1**
- Set the size of the matrix by typing in the number of rows first and then the number of columns and press **=**
- Type in each matrix element from left to right and from top to bottom, pressing **=** after each one.

N1 DEG  
MATRIX MODE

0.

N1 DEG  
<MATH> 1/2  
MATRIX EDIT  
RECALL STORE  
↓ det trans

N1 DEG  
matrix: 2x2  
[ 0 0 ]  
[ 0 0 ]

- E.g. Enter the matrix

3    7    -2

- 8    -7    4

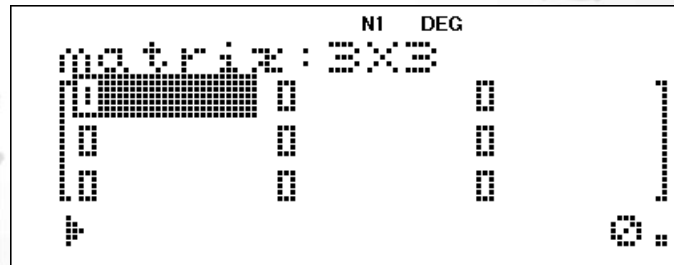
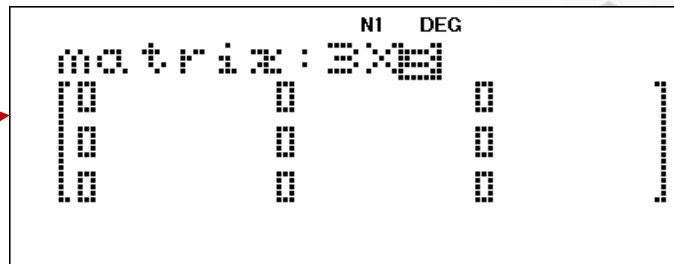
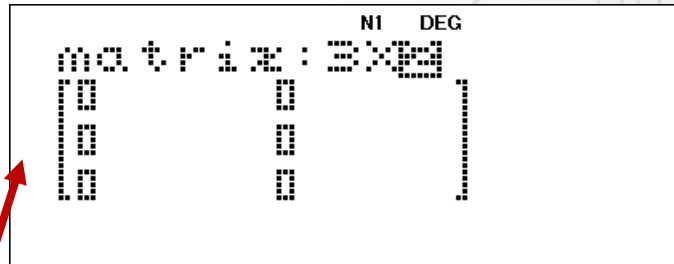
1    0    5

- Press **MATH** **1**

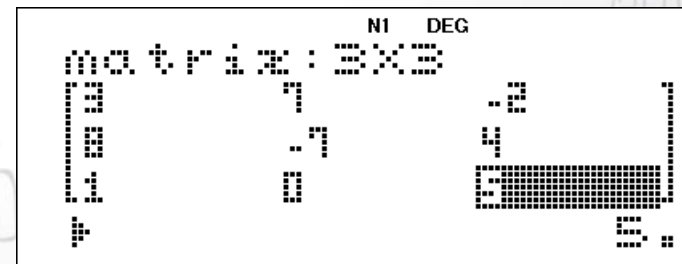
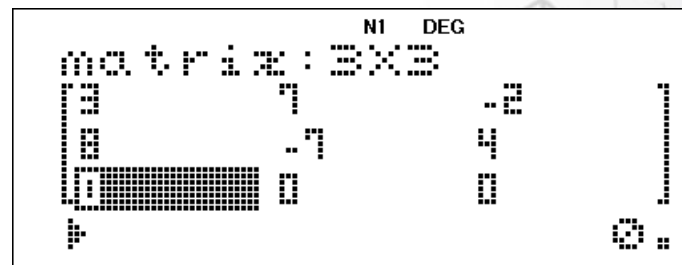
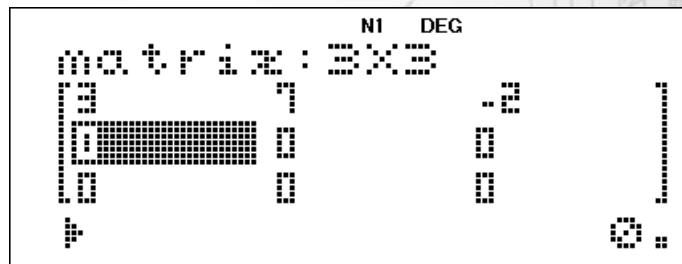
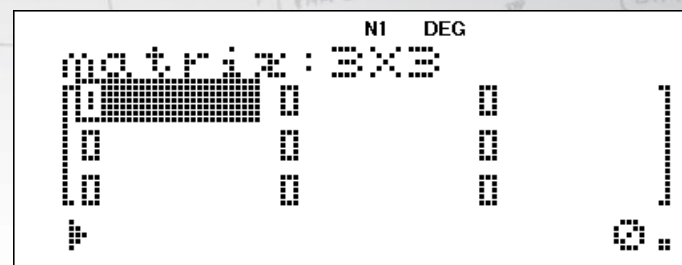
- Type in the size of the matrix first by pressing **3**

**3**

**=**



- Press **3** **=**
- 7** **=** **(-)** **2**
- =** **8** **=**
- (-)** **7** **=** **4**
- =** **1** **=**
- =** **5** **=**



- Now store the matrix

- Press **OFF**  
**ON/C**

**MATH**

**3**

**0**

NI DEG

MATRIX MODE

0.

NI DEG

<MATH> 1/2

MATRIX EDIT  
 PRECALL STORE  
 Edet Etrans

NI DEG

<<STORE>>

MatA MatB  
 MatC MatD

NI DEG

STORED!

# Handy Hints

- You can store the name of the matrix into any of the D-keys to save you time when working with the matrix.

- Press **STO** **D1** **MATH** **0** **0**

- Now we can use this for calculations.

- E.g. Find  $A^2$

- Press **D1**  **$x^2$**  **=**

NI DEG  
STORING D1  
SELECT FUNCTION

NI DEG  
<MATH> 1/2  
MATRIX  
det trans

NI DEG  
<<MATRIX>>  
matA matB  
matC matD

NI DEG  
STORED!

NI DEG  
matA\_

NI DEG  
matA^2\_

NI DEG  
matrix: 3x3  
102 51  
60 100 92  
75 86 42  
29.

# Inverse of Matrix

- Find the inverse of matrix we stored in Matrix A:

- Press **D1**

**2ndF**  $x^{-1}$  **C**  
 **$x^2$**

**=**

N1 DEG  
matA\_

N1 DEG  
matA<sup>-1</sup>\_

N1 DEG  
Matrix: 3x3  
| 0.09433 -0.03777 |  
| 0.09703 -0.0458 0.07547 |  
| -0.0188 -0.0188 0.20754 |  
| 0.094339622

# Determinant of a Matrix

- Find the determinant of the matrix we stored in Matrix A:

- Press **MATH**

**4**

**D1**

**=**

```

NI DEG
<MATH> 1/2
MATRIX MEDIT
RRECALL BSTORE
Bdet Btrans
↓
    
```

```

NI DEG
det...
    
```

```

NI DEG
detmatA...
    
```

```

NI DEG
detmatA=
-371.
    
```

• Finding the transpose of the matrix:

- Press **MATH**
- 5**
- MATH** **0**
- 0**
- =**

```

NI DEG
<MATH> 1/2
[MATRIX] [EDIT]
[RECALL] [STORE]
[det] [trans]

```

```

NI DEG
trans...

```

```

NI DEG
<<MATRIX>>
[matA] [matB]
[matC] [matD]

```

```

NI DEG
transmatA_

```

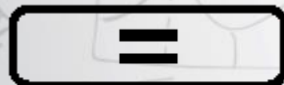
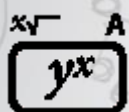
```

NI DEG
matrix: 3x3
[ 1  2  3 ]
[ 4  5  6 ]
[ 7  8  9 ]

```



- Row Echelon Form:
- Press **MATH**



```

NI DEG
<MATH> 1/2
[MATRIX] [EDIT]
[R]ECALL [S]TORE
[DE]T [T]RANS
↓
  
```

```

NI DEG
<MATH> 2/2
[I]DENTITY [D]IM(
[R]11( [R]AND.MAT(
[R]EF( [R]REF(
  
```

```

NI DEG
ref(
  
```

```

NI DEG
ref(matA
  
```

```

NI DEG
matrix: 3x3
|-----|
| 0.075 0.5 |
| 1 -0.3836 |
| 0 1 |
|-----|
| 1 0 1 |
|-----|
  
```

# Reduced Row Echelon Form

• To find the reduced row echelon form of a matrix we first need to create a matrix

- E.g.  $\begin{bmatrix} 3 & 6 & -2 \\ 1 & 7 & 8 \end{bmatrix}$

• Press **MATH** **1** **2** **3** **=**

**3** **=** **6** **=** **(-)** **2**

**=** **1** **=** **7** **=**

**8** **=**

- Now we store the matrix into B, press **ON/C** **MATH** **3** **1**

```

NI DEG
<MATH> 1/2
[MATRIX] [EDIT]
[RECALL] [STORE]
[det] [trans]
    
```

```

NI DEG
matrix: 2x3
[1] [-.875] [0.5]
[0] [1] [-.3636]
    
```

```

NI DEG
matrix: 2x3
[1] [-.875] [0.5]
[0] [1] [-.3636]
    
```

```

NI DEG
matrix: 2x3
[1] [-.875] [0.5]
[0] [1] [-.3636]
    
```

```

NI DEG
matrix: 2x3
[3] [6] [-.2]
[0] [1] [-.3636]
    
```

```

NI DEG
matrix: 2x3
[3] [6] [-.2]
[1] [7] [0]
    
```

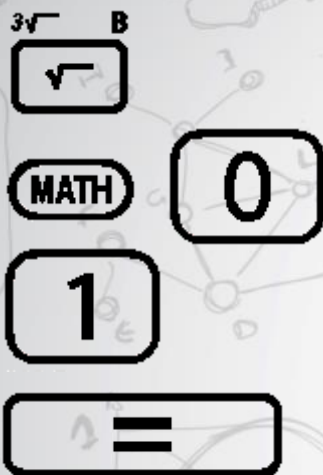
```

NI DEG
<MATH> 1/2
[MATRIX] [EDIT]
[RECALL] [STORE]
[det] [trans]
    
```

```

NI DEG
<<STORE>>
[matA] [matB]
[matC] [matD]
    
```

- Now we press **MATH**



```

NI DEG
<MATH> 1/2
MATRIX MEDIT
RECALL ESTORE
det trans
  
```

```

NI DEG
<MATH> 2/2
Identity dim<
fill< Brand.mat<
ref< Rref<
  
```

```

NI DEG
rref<_
  
```

```

NI DEG
<<MATRIX>>
matA matB
matC matD
  
```

```

NI DEG
rref(matB_
  
```

```

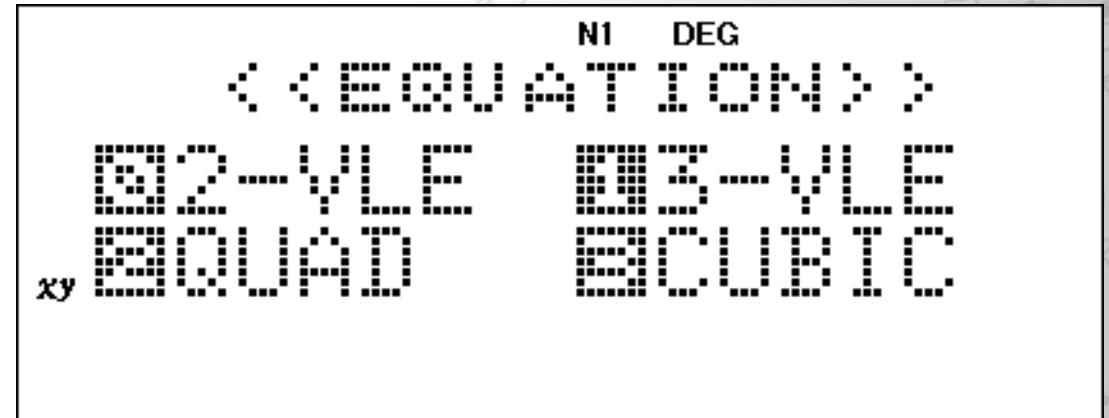
NI DEG
matrix: 2x3
[ ] 0 .4.133331
[ ] 1 1.733331
  
```

# Equation Mode

- You can solve 4 different types of equations in equation mode.

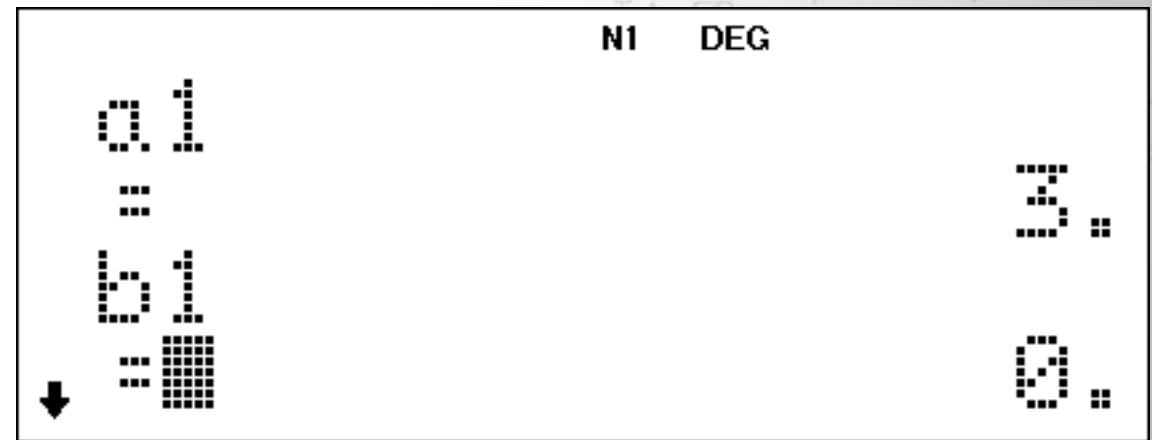
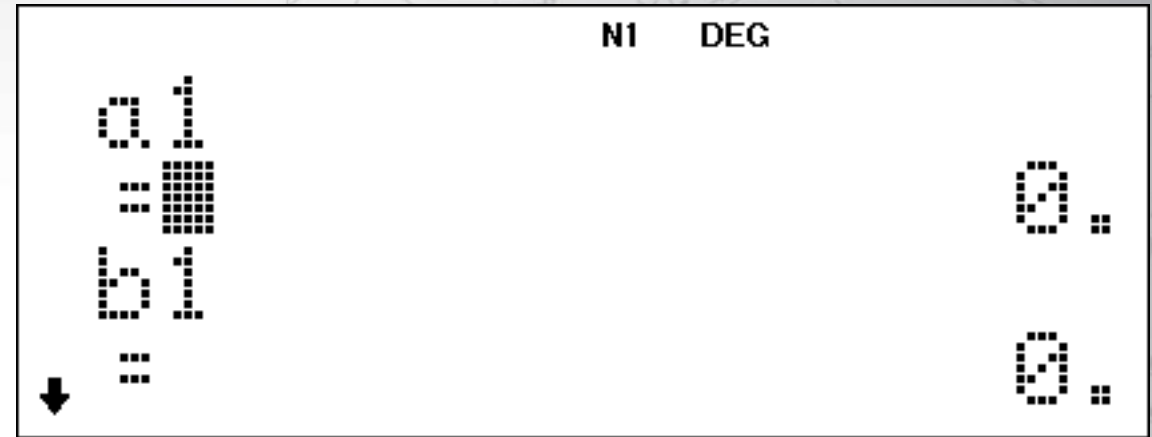
Press **CA MODE** **4**

- 0: 2-VLE
  - 2 variable linear equation
- 1: 3-VLE
  - 3 variable linear equation
- 2: QUAD
  - Quadratic equation
- 3: CUBIC
  - Cubic equation



# 2 Variable Linear Equation

- Press **MODE** **4** **0**
- This mode allows you to solve for 2 variables in 2 linear equations:
  - $a_1x + b_1y = c_1$  and
  - $a_2x + b_2y = c_2$
- E.g. Find x and y if
  - $3x + 7y = 9$  and
  - $-4x + 12y = 5$
- Press **3** **=**



- Then **7** **=**
- 9** **=**
- abs**  
**(-)** **4** **=**
- 1** **2** **=**
- 5** **=**

- The determinant is also given

↑ NI DEG  
c1 = 0.  
↓

↑ NI DEG  
a2 = 0.  
b2 = 0.  
↓ =

↑ NI DEG  
a2 = -4.  
b2 = 0.  
↓ =

↑ NI DEG  
c2 = 0.  
↓

NI DEG  
X: 1.140625  
Y: 0.796875  
D: 64.

# Cubic Equation

- We are able to solve cubic equations in the form

$$ax^3 + bx^2 + cx + d$$

- Press **MODE** **4** **3**

- E.g. Solve for x:

- $7x^3 - 3x^2 + 8x - 12 = 0$

- Press **7** **=**

abs

**(-)** **3** **=**

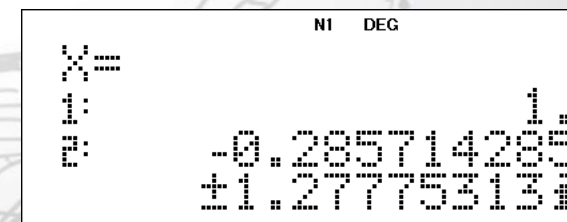
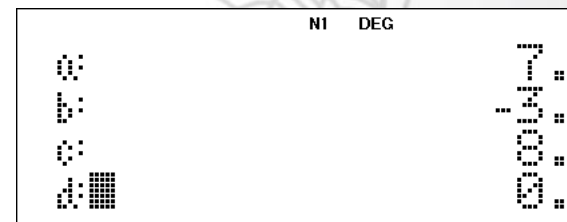
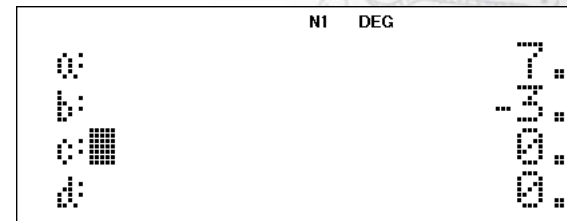
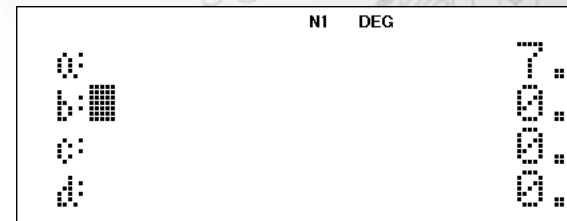
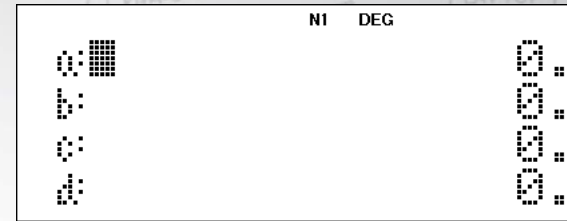
└─NEG─┘

**8** **=**

abs

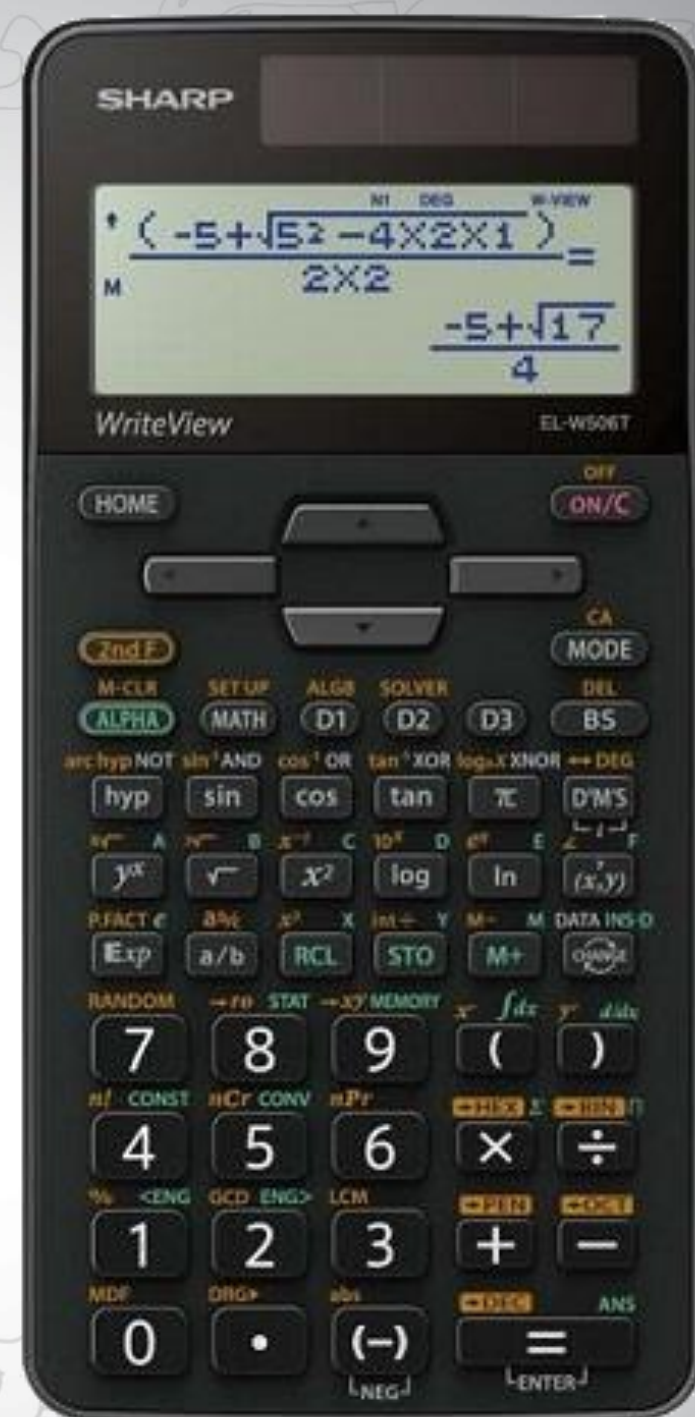
**(-)** **1** **2** **=**

└─NEG─┘



# Comments

- EL-W506T is the perfect calculator for AP and IEB maths curriculum
- Can be ordered in bulk from SMD directly at better than retail pricing.
- Available at Takealot, PNA, Loot, Makro and more!





# Junior Calculator

- EL-W535SA – cheaper and 422 functions
  - Ideal for grade 7 – 9 students
- 500 000 calculators given to No-Fee school students in Gauteng by the department of education
  - With a 40% improvement between the pre- and post-tests after training.



# Thank you for your valuable time!

Free worksheets and simulator:

[www.mathsatsharp.co.za](http://www.mathsatsharp.co.za)

