

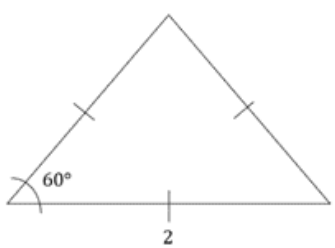
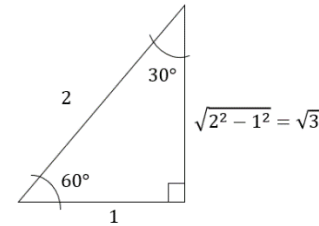
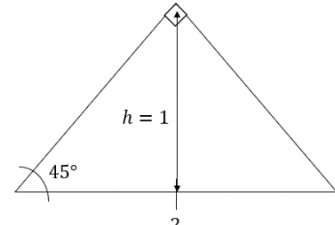
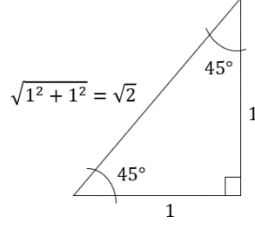
Mathematical Methods
CA & CF help

Calculator Free

1. Solving quadratic equation
(a) By factorising
<p>Example:</p> $x^2 + 2x = 0$ $x^2 + 2x = 0$ $x(x + 2) = 0$ $x = 0 \text{ or } x = 2$
(b) Using formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
<p>Example:</p> $2x^2 - 7x + 3 = 0$ $a = 2, \quad b = -7, \quad c = 3$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(3)}}{2(2)}$ $= \frac{7 \pm \sqrt{49 - 24}}{4}$ $= \frac{7 \pm 5}{4}$ $x = \frac{7 + 5}{4} \qquad x = \frac{7 - 5}{4}$ $= \frac{12}{4} \qquad = \frac{2}{4}$ $= 3 \qquad = \frac{1}{2}$

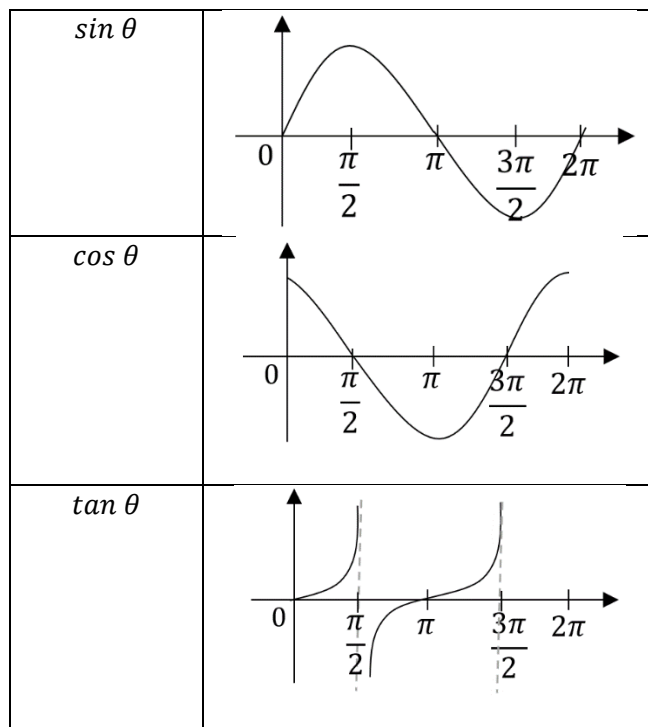
2. Determining exact values for trigonometry

Remember the triangles:

<p>Equilateral triangle of sides 2 units</p> 		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td></td> <td>30°</td> <td>60°</td> </tr> <tr> <td><i>tan</i></td> <td>$\frac{1}{\sqrt{3}}$</td> <td>$\sqrt{3}$</td> </tr> <tr> <td><i>sin</i></td> <td>$\frac{1}{2}$</td> <td>$\frac{\sqrt{3}}{2}$</td> </tr> <tr> <td><i>cos</i></td> <td>$\frac{\sqrt{3}}{2}$</td> <td>$\frac{1}{2}$</td> </tr> </table> <p>Note: $\tan 30^\circ = \frac{\sqrt{3}}{3}$ (from calc.) as well</p>		30°	60°	<i>tan</i>	$\frac{1}{\sqrt{3}}$	$\sqrt{3}$	<i>sin</i>	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	<i>cos</i>	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
	30°	60°												
<i>tan</i>	$\frac{1}{\sqrt{3}}$	$\sqrt{3}$												
<i>sin</i>	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$												
<i>cos</i>	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$												
<p>Triangle with base =2 and height =1</p> 		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td></td> <td>45°</td> </tr> <tr> <td><i>tan</i></td> <td>$\frac{1}{\sqrt{3}}$</td> </tr> <tr> <td><i>sin</i></td> <td>$\frac{1}{2}$</td> </tr> <tr> <td><i>cos</i></td> <td>$\frac{\sqrt{3}}{2}$</td> </tr> </table>		45°	<i>tan</i>	$\frac{1}{\sqrt{3}}$	<i>sin</i>	$\frac{1}{2}$	<i>cos</i>	$\frac{\sqrt{3}}{2}$				
	45°													
<i>tan</i>	$\frac{1}{\sqrt{3}}$													
<i>sin</i>	$\frac{1}{2}$													
<i>cos</i>	$\frac{\sqrt{3}}{2}$													

and

Remember the graph:



3. Solve ${}^n C_r$

Remember the pascal triangle

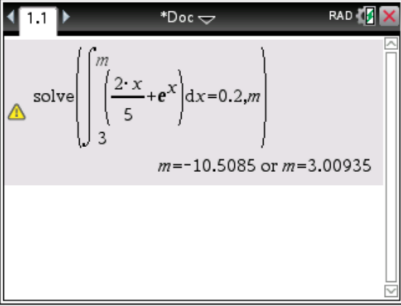
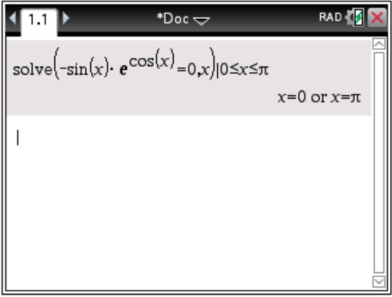
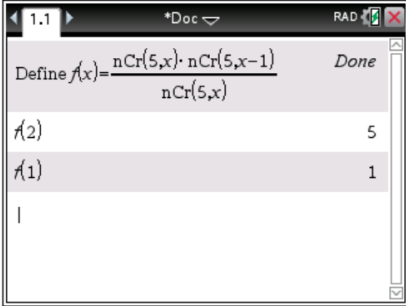
$\binom{0}{0}$ $\binom{1}{0} \quad \binom{1}{1}$ $\binom{2}{0} \quad \binom{2}{1} \quad \binom{2}{2}$ $\binom{3}{0} \quad \binom{3}{1} \quad \binom{3}{2} \quad \binom{3}{3}$ $\binom{4}{0} \quad \binom{4}{1} \quad \binom{4}{2} \quad \binom{4}{3} \quad \binom{4}{4}$ $\binom{5}{0} \quad \binom{5}{1} \quad \binom{5}{2} \quad \binom{5}{3} \quad \binom{5}{4} \quad \binom{5}{5}$	1 $1 \quad 1$ $1 \quad 2 \quad 1$ $1 \quad 3 \quad 3 \quad 1$ $1 \quad 4 \quad 6 \quad 4 \quad 1$ $1 \quad 5 \quad 10 \quad 10 \quad 5 \quad 1$
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Example:

.....
 ${}^5 C_4$

$${}^5 C_4 = 5$$

Calculator assumed

<p>1. Solve function</p>	<p>Without range</p> $\text{solve}(\text{---} = \text{---}, x)$  <p>With range (for trigonometric)</p> $\text{solve}(\text{---} = \text{---}, x) \text{---} < x < \text{---}$ 
<p>2. Substituting values into a general function</p>	<p>1. Define $f(x) = \text{---}$ 2. $f(\text{---})$</p> 

3. Solving simultaneous equation

Menu → 3: Algebra → 7: Solve system of equations → 2: Solve system of linear equations....

linSolve $\left\{ \begin{array}{l} \frac{42.4-x}{y} = -1.03643 \\ \frac{55.9-x}{y} = 0.841621 \end{array} \right\}, \{x,y\}$

"Error: Argument Error"

linSolve $\left\{ \begin{array}{l} 42.4-x = -1.03643 \cdot y \\ 55.9-x = 0.841621 \cdot y \end{array} \right\}, \{x,y\}$

$\{49.8502, 7.1883\}$

**Equations must be in linear form or else error will occur*

4. Sum to the power of n

Example:

$\sum_{x=1}^k (x^4) = \frac{k(k+1)(6k^3+9k^2+k-1)}{30}$

$\sum_{x=1}^k (x^3) = \frac{k^2 \cdot (k+1)^2}{4}$

5. Determine the exact value of

Example:

$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{2 \cdot x} \right)^x = \frac{1}{e^2}$

6. Discrete Probability Mean, Variance, Standard Deviation

1. Define the values of x and $P(X = x)$

$$\left\{ \begin{array}{l} \{ \quad \} \rightarrow x \\ \{ \quad \} \rightarrow \text{prob} \end{array} \right.$$

2. Menu → 6: Statistics → 1: Stat calculations → 1: One variable statistics... → select number of list

The top screenshot shows the TI-84 Plus calculator interface with the following data and results:

```
{-20000,-10000,5000,20000,50000} →x  
{-20000,-10000,5000,20000,50000}  
  
{0.01,0.5,0.2,0.27,0.02} →prob  
{0.01,0.5,0.2,0.27,0.02}
```

OneVar x,prob: stat.results

"Title"	"One-Variable Statistics"
" \bar{x} "	2200.
" Σx "	2200.
" Σx^2 "	2.17E8

The bottom screenshot shows the One-Variable Statistics dialog box with the following settings:

- X1 List: x
- Frequency List: prob
- Category List: (empty)
- Include Categories: (empty)

Buttons: OK, Cancel

END