

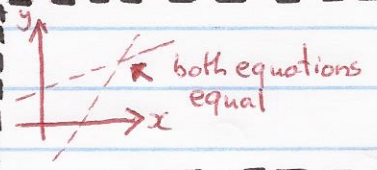
# ① Linear equations

$y = x^2 \Leftrightarrow f(x) = x^2$  (same)

$y = mx + c$   
 y-intercept  $\uparrow$   
 gradient  $\downarrow$

$y - b = m(x - a)$   
 $m \rightarrow$  gradient  
 $(a, b) \rightarrow$  point given

$5x + 3 = x + 7$   
 same  $\rightarrow -3$   
 $\rightarrow -x$



**Substitution**  
 $y = 2x + 1$   
 $5x - 2y = 6$   
 $\Rightarrow 5x - 2(2x + 1) = 6$

**Eliminate**  
 $2x + 3y = 7$   
 $3x + 2y = 4$   
 • multiply to make same coefficient  
 •  $\pm$  to remove letter  
 • solve  
 • substitute into question to find other  
 • check

- Solve for 1
- check

changing the subject  
 BODMAS  $+ \leftrightarrow -$   
 $x \leftrightarrow \div$   
 $a^2 \leftrightarrow \sqrt{\quad}$

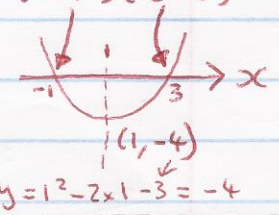
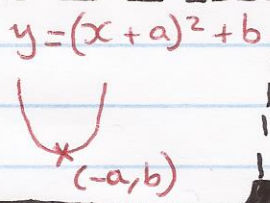
# ② Quadratic graphs & equations

Solve/find roots  
 $x^2 - 2x - 3 = 0$   
 $(+)$   $(-)$   
 $1 \times -3 = -3$   
 $1 + -3 = -2$   
 $x + 1 = 0$   $x - 3 = 0$   
 roots are  $x = -1$  or  $3$

Solving harder ones  
 $ax^2 + bx + c = 0$   
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 Discriminant  
 $b^2 - 4ac > 0$  2 roots  
 $b^2 - 4ac = 0$  1 root  
 $b^2 - 4ac < 0$  no real roots

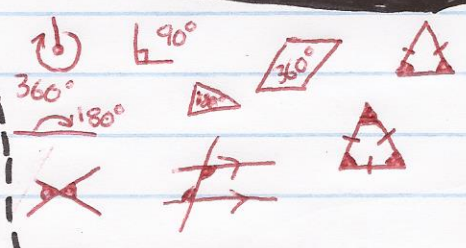
$y = kx^2$   
 • substitute in a point  $(x, y)$   
 • solve for k

$y = x^2 - 2x - 3$   
 $= (x + 1)(x - 3)$

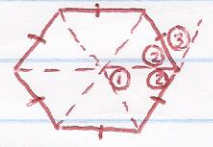


# ④ lengths, angles & similarity

$a^2 = b^2 + c^2$   
 long side =  $\sqrt{b^2 + c^2}$   
 short side =  $\sqrt{a^2 - c^2}$

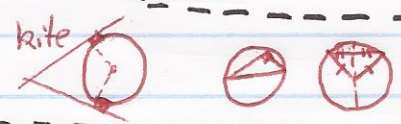


irregular polygon =  $180 \times 3$   
 Regular polygon



2  $\Rightarrow$  interior angle  
 3  $\Rightarrow$  exterior angle

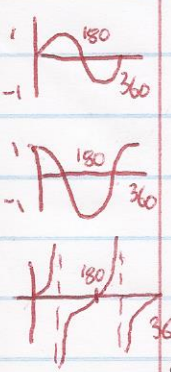
3D coordinates  $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$   
 Prove right angle  $b^2 + c^2 = \dots = a^2$



Scale factor  
 • split shapes  
 • linear SF  
 • Area SF ( $x^2$ )  
 or Volume SF ( $x^3$ )

# ⑤ trig

Soh Cah Toa

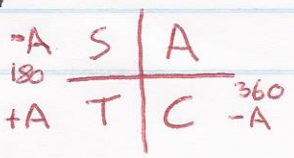


$\sin x = 0$   
 $x = 0^\circ, 180^\circ, 360^\circ$

$\cos x = 1$   
 $x = 0^\circ, 360^\circ$

$y = a \sin(bx + c) + d$   
 $a > 0$   $b > 0$   $\uparrow$   $\uparrow$   $\uparrow$   $\uparrow$   
 $\downarrow$   $\leftarrow$   $\leftarrow$   $\leftarrow$   $\leftarrow$   
 $a < 0$   $b < 0$   $\downarrow$   $\downarrow$   $\downarrow$   $\downarrow$   
 if  $a = -ve$ , flip graph

$\cos^2 x + \sin^2 x = 1$



$5 \sin x + 1 = 0$

$5 \sin x = -1$   
 $\sin x = -\frac{1}{5}$   
 $x = \sin^{-1}(1/5) = 11.5^\circ$

	Sin	Cos	Tan
30°	1/2	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45°	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60°	$\frac{\sqrt{3}}{2}$	1/2	$\sqrt{3}$