

quadratics, radicals and rational equations, and the roots that are not really there

Three families, one habit

- quadratic**: everything ends up as $ax^2+bx+c=0$. Factor it if the numbers are friendly, use the formula if they are not
- radical**: the unknown sits under a root sign. Isolate the root, square both sides, and then CHECK every candidate in the original equation
- rational**: the unknown sits in a denominator. Multiply through to clear the fractions, and then reject anything that made a denominator zero
- the habit both of the last two need is the same: squaring and multiplying up can invent solutions that the original equation never had. Substituting back is not optional here
- at 95 seconds a question on average across the 44-question, 70-minute Math section, a quadratic you cannot factor within about fifteen seconds should go straight to the graph or to the formula

the graphing calculator is available for the whole Math section. Typing the equation in and reading where the curve meets the x-axis is often faster and safer than factoring under time pressure

The lines that solve most of these *

if a product is zero, $(x-p)(x-q)=0 \Rightarrow x=p$ or $x=q$
one factor is zero

the quadratic formula, always available $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

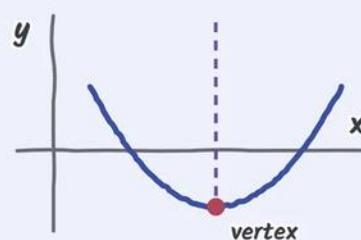
the discriminant decides how many real solutions $D = b^2 - 4ac$

the axis of symmetry, and the vertex $x = \frac{-b}{2a}$

sum and product of the two solutions $p+q = -\frac{b}{a}$, $pq = \frac{c}{a}$

D greater than 0 gives two real solutions, D equal to 0 gives exactly one, and D less than 0 gives none. A question asking how many solutions is usually asking only for the sign of D

Every quadratic is symmetric *



the dashed line through the vertex is the axis of symmetry: the two arms are mirror images of each other in it

that symmetry is why the two solutions sit the same distance either side of $x = -b/(2a)$, and why knowing one solution and the vertex hands you the other