# Pure Mathematics 1

A-Level Mathematics · Vocabulary in context

| Word | Example |
|---|---|
| **Pure Mathematics** /pjʊə ˌmæθɪ'mætɪks/ | **Pure Mathematics** studies numbers, shapes and patterns for their own sake. |
| **quadratic** /kwɒ'drætɪk/ | $x^2 + 3x - 4$ is a **quadratic** expression.<br>$x^2 + 3x - 4$ |
| **complete the square** /kəm'pli:t ðə skweə/ | To **complete the square**, write $x^2 + 6x$ as $(x + 3)^2 - 9$.<br>$x^2 + 6x$ $(x + 3)^2 - 9$ |
| **vertex** /'vɜ:teks/ | The **vertex** of $y = (x - 2)^2 + 3$ is $(2, 3)$.<br>$y = (x - 2)^2 + 3$ $(2, 3)$ |
| **discriminant** /dɪ'skrɪmɪnənt/ | A positive **discriminant** gives two distinct real roots. |
| **real roots** /rɪəl ru:ts/ | $x^2 = 4$ has two **real roots**: 2 and $-2$.<br>$x^2 = 4$ $2$ $-2$ |
| **distinct** /dɪ'stɪŋkt/ | The equation has two **distinct** roots, so the roots are different. |
| **quadratic equation** /kwɒ'drætɪk ɪ'kweɪʒn/ | $x^2 - 5x + 6 = 0$ is a **quadratic equation**.<br>$x^2 - 5x + 6 = 0$ |
| **quadratic inequality** /kwɒ'drætɪk ɪni:'kwɒlɪti/ | $x^2 - 4 < 0$ is a **quadratic inequality**.<br>$x^2 - 4 < 0$ |
| **simultaneous equations** /ˌsɪməl'teɪnɪəs ɪ'kweɪʒnz/ | Solve the **simultaneous equations** to find both x and y.<br>x y |
| **substitution** /ˌsʌbstɪ'tju:ʃn/ | Use **substitution**: put $y = 2x$ into the second equation.<br>$y = 2x$ |
| **function** /'fʌŋkʃn/ | A **function** returns a value. |



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| **composition of functions** /ˌkɒmpəˈzɪʃn ɒv ˈfʌŋkʃnz/ | In a **composition of functions** fg(x), do g first and then f.<br>fg(x) g f |
| **domain** /dəˈmeɪn/ | Leave zero out of the **domain** when x is on the bottom of a fraction.<br>x |
| **range** /reɪndʒ/ | The **range** of $f(x) = x^2$ is all values greater than or equal to zero.<br>$f(x) = x^2$ |
| **one-one** /wʌn wʌn/ | A **one-one** function never gives the same output for two inputs. |
| **inverse function** /ɪnˈvɜːs ˈfʌŋkʃn/ | The **inverse function** undoes the original function. |
| **composition** /ˌkɒmpəˈzɪʃn/ | The **composition** fg(x) means apply g, then f.<br>fg(x) g f |
| **reflection** /rɪˈflekʃn/ | **Reflection** in a mirror lets you see yourself. |
| **transformations** /trænsfɔːˈmeɪʃnz/ | Translations and reflections are **transformations** of a graph. |
| **translation** /træn'sleɪʃn/ | A **translation** moves every point two units to the left. |
| **stretch** /stretʃ/ | A **stretch** by factor 2 parallel to the y-axis doubles every y-value.<br>y 2 y |
| **Coordinate geometry** /kəʊˈɔːdɪnət dʒiˈɒmətri/ | **Coordinate geometry** uses x and y to study lines and circles.<br>x y |
| **gradient** /ˈgreɪdɪənt/ | The **gradient** of a distance-time graph gives the speed.<br>– |
| **equation of a straight line** /ɪˈkweɪʒn əvə streɪt laɪn/ | $y = 2x + 1$ is the **equation of a straight line**.<br>$y = 2x + 1$ |



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|---|---|
| = **parallel** /'pærəlel/ | **Parallel** lines have equal gradients and never meet. |
| + **perpendicular** /ˌpɜ:pən'dɪkjʊlə/ | The wall is **perpendicular** to the floor. |
| ○ **circle** /'sɜ:kl/ | Every point on a **circle** is equally far from its centre. |
| • **centre** /'sentə/ | The **centre** of a circle is the same distance from every point on it. |
| ↗ **radius** /'reɪdɪəs/ | The **radius** of a circle is the distance from the centre to the edge. |
| ↗ **tangent** /'tændʒənt/ | Draw a **tangent** to the curve to find the gradient at one point. |
| — **diameter** /daɪ'æmɪtə/ | Measure the **diameter** of the wire with a micrometer. |
| ⊙ **radian** /'reɪdɪən/ | One full turn is an angle of $2\pi$ **radians**. |
| ⌒ **arc** /ɑ:k/ | The **arc** is part of the edge of a circle. |
| ↻ **degrees** /dɪ'gri:z/ | Set the calculator to **degrees** before entering a degree angle. |
| ◔ **sector** /'sektə/ | A **sector** is a slice of a circle, like a piece of pizza. |
| — **chord** /kɔ:d/ | A **chord** is a straight line joining two points on a circle. |
| ⊘ **circular segment** /'sɜ:kjələ 'segmənt/ | A **circular segment** lies between a chord and its arc. |
| ∿ **sine** /saɪn/ | **Sine** is opposite divided by hypotenuse. |

$$2\pi$$



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| Word | Example |
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| **cosine** /ˈkəʊsaɪn/ | **Cosine** is adjacent divided by hypotenuse. |
| **tangent function** /ˈtændʒənt ˈfʌŋkʃn/ | The **tangent function** tan x equals sin x divided by cos x. tan x sin x cos x |
| **principal value** /ˈprɪnsɪpl ˈvæljuː/ | A calculator gives only the **principal value**, such as $\sin^{-1}(0.5) = 30°$. $\sin^{-1}(0.5) = 30°$ |
| **identity** /aɪˈdentɪti/ | $2(x + 1) = 2x + 2$ is an **identity**: it is true for every x. $2(x + 1) = 2x + 2$ x |
| **trigonometric equation** /ˌtrɪgənəʊˈmetrɪk ɪˈkweɪʒn/ | Solve the **trigonometric equation** $\sin x = 0.5$. $\sin x = 0.5$ |
| **binomial expansion** /baɪˈnəʊmɪəl ekˈspænʃn/ | The **binomial expansion** writes $(1 + x)^n$ as a sum of terms. $(1 + x)^n$ |
| **binomial coefficient** /baɪˈnəʊmɪəl ˌkəʊɪˈfɪʃənt/ | The **binomial coefficient** ${}^5C_2$ equals 10. ${}^5C_2$ 10 |
| **progression** /prəˈgreʃn/ | 2, 5, 8, 11 is an arithmetic **progression**. 2, 5, 8, 11 |
| **arithmetic progression** /əˈrɪθmətɪk prəˈgreʃn/ | An **arithmetic progression** adds the same amount at each step. |
| **common difference** /ˈkɒmən ˈdɪfrəns/ | In the sequence 3, 7, 11, 15, the **common difference** is 4. 3, 7, 11, 15 4 |
| **term** /tɜːm/ | In $3x + 2$, $3x$ is a **term**. $3x + 2$ $3x$ |
| **geometric progression** /ˌdʒiːəʊˈmetrɪk prəˈgreʃn/ | A **geometric progression** multiplies by the same factor each step. |
| **common ratio** /ˈkɒmən ˈreɪʃɪəʊ/ | In the sequence 2, 6, 18, 54, the **common ratio** is 3. 2, 6, 18, 54 3 |



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| **converges** /kən'vɜ:dʒɪz/ | The series 1 + ½ + ¼ + … **converges** to 2.<br>1 + ½ + ¼ + … 2 |
| **sum to infinity** /sʌm tʊ ɪn'fɪnɪti/ | The **sum to infinity** of 1 + ½ + ¼ + … is 2.<br>1 + ½ + ¼ + … 2 |
| **Differentiation** /ˌdɪfəˌrenʃɪ'eɪʃn/ | **Differentiation** finds the gradient of a curve. |
| **gradient of a curve** /'greɪdɪənt əvə kɜ:v/ | The **gradient of a curve** changes from point to point. |
| **limit** /'lɪmɪt/ | The terms of 1, ½, ¼, … get closer and closer to a **limit** of 0.<br>1, ½, ¼, … 0 |
| **derivative** /dɪ'rɪvətɪv/ | Use the **derivative** to find the curve's slope at this point. |
| **chain rule** /tʃeɪn ru:l/ | Use the **chain rule** for a function inside another function. |
| **second derivative** /'sekənd dɪ'rɪvətɪv/ | The **second derivative** tells us how the gradient changes. |
| **normal** /'nɔ:ml/ | The **normal** is a line at 90° to the surface.<br>90° |
| **increasing function** /ɪn'kri:sɪŋ 'fʌŋkʃn/ | y = 2x + 1 is an **increasing function**: y goes up as x goes up.<br>y = 2x + 1 x y |
| **decreasing function** /'di:kri:sɪŋ 'fʌŋkʃn/ | y = −x is a **decreasing function**: y goes down as x goes up.<br>y = −x x y |
| **rate of change** /reɪt ɒv tʃeɪndʒ/ | The **rate of change** is 5 metres per second.<br>5 metres per second |
| **stationary point** /'steɪʃənəri pɔɪnt/ | The tangent is horizontal at a **stationary point**. |
| **minimum point** /'mɪnɪməm pɔɪnt/ | The curve y = x$^2$ has a **minimum point** at (0, 0).<br>y = x$^2$ (0, 0) |



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| Word | Example |
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| ^ **maximum point** /ˈmæksɪməm pɔɪnt/ | The curve $y = -x^2$ has a **maximum point** at (0, 0).<br>$y = -x^2$ (0, 0) |
| ∑ **Integration** /ˌɪntɪˈgreɪʃn/ | **Integration** finds the total change. |
| + **constant of integration** /ˈkɒnstənt ɒv ˌɪntɪˈgreɪʃn/ | The **constant of integration** c is there because every curve $y = x^2 + c$ has the same gradient 2x.<br>$y = x^2 + c$ 2x<br>c |
| [ ] **definite integral** /ˈdefɪnət ˈɪntɪgrəl/ | A **definite integral** has limits and gives a number, such as an area. |
| ⬚ **region** /ˈriːdʒn/ | The inequality $y > x^2$ describes a **region** above the curve.<br>$y > x^2$ |
| ∞ **improper integral** /ɪmˈprɒpə ˈɪntɪgrəl/ | The integral of $1/x^2$ from 1 to infinity is an **improper integral**.<br>$1/x^2$ 1 |
| ⌭ **volume of revolution** /ˈvɒljuːm ɒv ˌrevəˈluːʃn/ | Find the **volume of revolution** by rotating this region about an axis. |
| (×) **algebra** /ˈældʒɪbrə/ | In **algebra**, letters stand for numbers. |
| ∞ **calculus** /ˈkælkjʊləs/ | **Calculus** includes differentiation and integration. |
| × **coefficient** /ˌkəʊɪˈfɪʃənt/ | The number in front of the letter is the **coefficient**. |
| ⌒ **parabola** /pəˈræbələ/ | A thrown ball follows a **parabola**. |
| • **midpoint** /ˈmɪdpɔɪnt/ | The **midpoint** of (0, 0) and (4, 6) is (2, 3).<br>(0, 0) (4, 6) (2, 3) |
| ↖↗ **perpendicular bisector** /ˌpɜːpənˈdɪkjʊlə baɪˈsektə/ | Every point on the **perpendicular bisector** is the same distance from both ends. |



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| Word | Example |
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| **arc length** /ɑːk leŋθ/ | Measure the **arc length** along the curved edge. |
| **reference angle** /ˈrefrəns ˈæŋgl/ | Find the **reference angle** before choosing the sign of sine. |
| **amplitude** /ˈæmplɪtjuːd/ | Loud sounds have a large **amplitude**. |
| **period** /ˈpɪərɪəd/ | The **period** of the wave is 0.02 s.<br>0.02 s |



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