

Grade 5 checklist

94 skills. Tick each one when you can do it. For grade 5 you need the skills for the grades below it too.

Number

- ☐ **Find HCF and LCM using prime factors** HCF: primes in both numbers with the lower power; LCM: every prime with the higher power (or use a Venn diagram). (Primes, factors, HCF and LCM)

- ☐ **Solve HCF and LCM word problems** Sharing into equal groups or the largest size means HCF; things happening together again means LCM. (Primes, factors, HCF and LCM)

- ☐ **Calculate with mixed numbers** Change mixed numbers to improper fractions first, e.g. $2\frac{1}{3} = \frac{7}{3}$, then add, subtract, multiply or divide. (Fractions and mixed numbers)

- ☐ **Solve multi-step fraction problems** E.g. find a fraction of what is left, or find the whole amount from a fraction of it. (Fractions and mixed numbers)

- ☐ **Use zero and negative indices** $a^0 = 1$ and $a^{-n} = \frac{1}{a^n}$, e.g. $2^{-3} = \frac{1}{8}$. (Indices and roots)

- ☐ **Multiply and divide in standard form** Deal with the numbers and the powers of 10 separately, then adjust: $12 \times 10^9 = 1.2 \times 10^{10}$. (Standard form)

- ☐ **Add and subtract in standard form** Change to ordinary numbers first: $3.2 \times 10^4 + 5 \times 10^3 = 32,000 + 5,000 = 3.7 \times 10^4$. (Standard form)

- ☐ **Write error intervals for rounded values** 7.3 to 1 decimal place means $7.25 \leq x < 7.35$. (Rounding, estimation and error intervals)

- ☐ **Write error intervals for truncated values** 7.3 truncated to 1 decimal place means $7.3 \leq x < 7.4$. (Rounding, estimation and error intervals)

- ☐ **Use the product rule for several choices** E.g. 3 letters then 2 digits: $26 \times 26 \times 26 \times 10 \times 10 = 1,757,600$ codes. (Listing and the product rule)

Algebra

- ☐ **Use the identity symbol correctly** Write $\equiv$ when both sides are equal for every value of the letter, e.g. $2(x + 3) \equiv 2x + 6$. (Algebraic notation, substitution and identities)

- ☐ **Expand the product of two binomials** Multiply each term in the first bracket by each term in the second, e.g. $(x + 3)(x - 7) = x^2 - 4x - 21$. (Expanding brackets)

- ☐ **Expand a squared bracket** Write it out twice: $(x - 4)^2 = (x - 4)(x - 4) = x^2 - 8x + 16$. (Expanding brackets)

- ☐ **Factorise fully using the HCF** Take out the highest common factor of the numbers and letters, e.g. $8x^2y - 12xy = 4xy(2x - 3)$. (Factorising)

- ☐ **Factorise quadratics with x^2 coefficient 1** Find two numbers that multiply to c and add to b, e.g. $x^2 + 2x - 15 = (x + 5)(x - 3)$. (Factorising)

- ☐ **Factorise a difference of two squares** Use $a^2 - b^2 = (a + b)(a - b)$, e.g. $x^2 - 49 = (x + 7)(x - 7)$. (Factorising)

- ☐ **Raise a power to a power** Multiply the indices: $(x^3)^5 = x^{15}$. (Laws of indices in algebra)
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- ☐ **Simplify terms with numbers and letters** Deal with the numbers and each letter separately, e.g. $4a^2b \times 3ab^5 = 12a^3b^6$. (Laws of indices in algebra)
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- ☐ **Raise a whole term to a power** The number is raised to the power too: $(3x^4)^2 = 9x^8$. (Laws of indices in algebra)
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- ☐ **Use zero and negative indices** $x^0 = 1$ and $x^{-n} = \frac{1}{x^n}$, e.g. $x^{-2} = \frac{1}{x^2}$. (Laws of indices in algebra)
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- ☐ **Rearrange formulae with brackets or fractions** Clear the fraction or bracket first, e.g. $P = \frac{a+b}{2}$ gives $a = 2P - b$. (Changing the subject)
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- ☐ **Rearrange formulae with squares or square roots** Undo a square with a square root and a square root by squaring, e.g. $A = \pi r^2$ gives $r = \sqrt{\frac{A}{\pi}}$. (Changing the subject)
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- ☐ **Solve equations with a fraction** Multiply both sides by the denominator, e.g. $\frac{x+4}{3} = 5$ gives $x = 11$. (Linear equations)
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- ☐ **Form and solve an equation from context** Write an equation for an angle sum, perimeter, age or cost problem, solve it and answer the question. (Linear equations)
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- ☐ **Solve simple quadratics by factorising** Factorise, then set each bracket equal to 0, e.g. $(x-3)(x+7) = 0$ gives $x = 3$ or $x = -7$. (Solving quadratic equations)
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- ☐ **Solve quadratics with a missing term** $x^2 = 49$ gives $x = \pm 7$; $x^2 - 5x = 0$ gives $x(x-5) = 0$, so $x = 0$ or $x = 5$. (Solving quadratic equations)
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- ☐ **Solve linear simultaneous equations by elimination** Make the coefficients of one letter the same, then add or subtract the equations. (Simultaneous equations)
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- ☐ **Form and solve simultaneous equations in context** e.g. 3 teas and 2 coffees cost £8.10 gives $3t + 2c = 810$ (in pence). (Simultaneous equations)
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- ☐ **Solve a double inequality** Do the same to all three parts, e.g. $-3 \leq 2x + 1 < 9$ gives $-2 \leq x < 4$. (Inequalities)
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- ☐ **Reverse the sign when dividing by a negative** e.g. $-2x > -4$ gives $x < 2$. (Inequalities)
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- ☐ **Decide if a number is in a sequence** Set the nth term equal to the number and check whether n is a positive whole number. (Sequences and the nth term)
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- ☐ **Continue Fibonacci-type and geometric sequences** Fibonacci-type: add the previous two terms. Geometric: multiply by the same number each time. (Sequences and the nth term)
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- ☐ **Find the equation of a line** Work out m, then substitute a point to find c, e.g. through (2, 7) and (4, 11) gives $y = 2x + 3$. (Straight-line graphs)
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- ☐ **Identify and find parallel lines** Parallel lines have equal gradients: $y = 3x + 1$ is parallel to $y = 3x - 4$. (Straight-line graphs)
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- ☐ **Rearrange an equation to find the gradient** Make y the subject, e.g. $2y + 6x = 5$ gives $y = -3x + 2.5$, so the gradient is -3. (Straight-line graphs)
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- ☐ **Interpret gradient and intercept in context** e.g. in $C = 45d + 30$, 45 is the cost per day and 30 is a fixed charge. (Straight-line graphs)
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- ☐ **Read roots and turning points from graphs** Roots are where the curve crosses the x-axis; the turning point is the minimum or maximum point. (Graphs of functions)
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- ☐ **Solve equations using a graph** Draw a horizontal line such as $y = 3$ and read the x-coordinates where it meets the curve. (Graphs of functions)
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Ratio, proportion and rates of change

- ☐ **Combine two ratios with a shared quantity** Make the shared quantity's parts equal, e.g. $a : b = 1 : 2$ and $b : c = 3 : 4$ give $a : b : c = 3 : 6 : 8$. (Ratio)
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- ☐ **Work out percentage change, profit and loss** Divide the change by the original amount and multiply by 100. (Percentages and reverse percentages)
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- ☐ **Find the original amount (reverse percentages)** Divide the new amount by the multiplier, e.g. £68 after a 15% reduction was $68 \div 0.85 = \text{£}80$. (Percentages and reverse percentages)
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- ☐ **Use a multiplier raised to a power** Value after n years = start $\times$ multiplier ^{n} , e.g. £2500 at 3% for 4 years is 2500×1.03^4 . (Compound interest, growth and decay)
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- ☐ **Calculate depreciation and decay** Use a multiplier less than 1, e.g. $\times 0.85^n$ for a 15% fall each year. (Compound interest, growth and decay)
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- ☐ **Find when a value first passes a target** Work out the value year by year and show the values either side of the target. (Compound interest, growth and decay)
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- ☐ **Recognise direct and inverse proportion graphs** Direct proportion is a straight line through the origin; inverse proportion is a curve that gets closer and closer to both axes. (Direct and inverse proportion)
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- ☐ **Calculate pressure, force or area** Use pressure = force $\div$ area, with the area in m^2 for a pressure in N/m^2 . (Speed, density and pressure)
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- ☐ **Convert compound units such as km/h to m/s** Convert one unit at a time, e.g. $72 \text{ km/h} = 72\,000 \text{ m per hour} = 72\,000 \div 3600 = 20 \text{ m/s}$. (Speed, density and pressure)
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- ☐ **Find the average speed for a whole journey** Divide the total distance by the total time, including any stops. (Speed, density and pressure)
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- ☐ **Use density with volumes of 3D shapes** Find the volume of the solid first, then multiply by the density to get the mass. (Speed, density and pressure)
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- ☐ **Convert area and volume units** Square or cube the length factor, e.g. $1 \text{ m}^2 = 100 \times 100 = 10\,000 \text{ cm}^2$. (Converting units)
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- ☐ **Convert between volume and capacity** Use $1 \text{ cm}^3 = 1 \text{ ml}$ and $1000 \text{ cm}^3 = 1 \text{ litre}$. (Converting units)
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Geometry and measures

- ☐ **Give a geometric reason for every step** Write the angle fact in words each time you use it, e.g. 'alternate angles are equal'. (Angles, parallel lines and polygons)
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- ☐ **Form and solve equations from angle facts** When angles are given in terms of x , use an angle fact to write an equation, solve it, then find the angle. (Angles, parallel lines and polygons)
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- ☐ **Use Pythagoras in problems and on coordinates** Spot right-angled triangles in rectangles, isosceles triangles and on grids, e.g. the distance between two points. (Pythagoras' theorem (incl. 3D))

- ☐ **Test whether a triangle is right-angled** Check whether the square of the longest side equals the sum of the squares of the other two sides. (Pythagoras' theorem (incl. 3D))

- ☐ **Find a missing side using SOH CAH TOA** Choose the ratio from the side you know and the side you want, then rearrange, e.g. $x = 12 \times \sin 40^\circ$. (Right-angled trigonometry)

- ☐ **Find a missing angle using inverse trig** Use $\sin^{-1}$, $\cos^{-1}$ or $\tan^{-1}$ on your calculator, e.g. $\theta = \tan^{-1}(5 \div 8)$. (Right-angled trigonometry)

- ☐ **Recall exact trig values** Know $\sin$ and $\cos$ of 0° , 30° , 45° , 60° and 90° , and $\tan$ of 0° , 30° , 45° and 60° , without a calculator. (Right-angled trigonometry)

- ☐ **Solve angle of elevation and depression problems** Draw the right-angled triangle with the angle measured from the horizontal. (Right-angled trigonometry)

- ☐ **Calculate the length of an arc** Arc length = $\frac{\theta}{360} \times 2\pi r$, a fraction of the circumference. (Arcs and sectors)

- ☐ **Calculate the area of a sector** Sector area = $\frac{\theta}{360} \times \pi r^2$, a fraction of the area of the circle. (Arcs and sectors)

- ☐ **Find the perimeter of a sector** Add the two radii to the arc length. (Arcs and sectors)

- ☐ **Give answers in terms of π** Leave π as a symbol and simplify, e.g. $\frac{40}{360} \times \pi \times 9^2 = 9\pi$. (Arcs and sectors)

- ☐ **Solve area problems in context and backwards** e.g. work out the cost of turf for a lawn, or the radius of a circle from its area. (Area and perimeter)

- ☐ **Find the surface area of a cylinder** Two circles plus the curved surface: $2\pi r^2 + 2\pi rh$. (Volume and surface area)

- ☐ **Use formulas for pyramids, cones and spheres** Substitute into the formula, e.g. volume of a cone = $\frac{1}{3}\pi r^2 h$. (Volume and surface area)

- ☐ **Work out a solid from its views** Combine the plan and elevations to sketch the solid, then use it, e.g. to find its volume. (Plans and elevations)

- ☐ **Find missing lengths in similar shapes** Multiply or divide a length by the scale factor. (Similar shapes (length, area, volume))

- ☐ **Use similar triangles made by parallel lines** Parallel lines give equal corresponding or alternate angles, so the triangles are similar. (Similar shapes (length, area, volume))

- ☐ **Know the four congruence conditions** SSS, SAS, ASA (or AAS) and RHS; three equal angles is not enough. (Congruence and geometric proof)

- ☐ **Choose the condition for two triangles** Match the equal sides and angles, then name the condition that applies. (Congruence and geometric proof)

- ☐ **Describe a single transformation fully** Give the type and every detail, e.g. rotation 90° clockwise about $(1, 2)$. (Transformations)

- ☐ **Enlarge by a fractional scale factor** A scale factor between 0 and 1 makes the shape smaller, still measured from the centre. (Transformations)

- ☐ **Carry out and describe combined transformations** Do one transformation then the next, then describe the single transformation that has the same effect. (Transformations)

- ☐ **Multiply by a scalar and combine vectors** Multiply both numbers by the scalar, e.g. work out $2\mathbf{a} - 3\mathbf{b}$ as a column vector. (Vectors)

- ☐ **Write a vector path using $\mathbf{a}$ and $\mathbf{b}$** Go along known vectors, e.g. $\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$. (Vectors)

- ☐ **Find a back bearing** Add or subtract 180° : if B is on a bearing of 070° from A, then A is on a bearing of 250° from B. (Bearings and scale drawings)

- ☐ **Calculate bearings and angles using angle facts** Use parallel north lines with co-interior and alternate angles. (Bearings and scale drawings)

- ☐ **Use right-angled trigonometry in bearing problems** Use Pythagoras and SOH CAH TOA when the journey makes a right-angled triangle. (Bearings and scale drawings)

- ☐ **Construct perpendiculars from and at a point** Construct the perpendicular from a point to a line, or at a point on a line, with compasses. (Constructions and loci)

- ☐ **Draw loci and shade the required region** Combine loci such as 'within 3 cm of A' and 'closer to B than to C', then shade where all are true. (Constructions and loci)

- ☐ **Solve loci problems on scale drawings** e.g. show where a tree can be planted in a garden, using a scale drawing and constructions. (Constructions and loci)

Probability

- ☐ **Find probabilities written in terms of x** Add the expressions, set the total equal to 1, solve, then substitute to find the probability asked for. (Probability and relative frequency)

- ☐ **Judge fairness and reliability from experiments** Compare relative frequency with the theoretical probability, and explain that more trials give a more reliable estimate. (Probability and relative frequency)

- ☐ **Multiply for 'and', add for 'or'** Multiply along each path, then add the probabilities of all the paths that give the result you want. (Tree diagrams and combined events)

- ☐ **Use tree diagrams without replacement** For the second pick the total goes down by 1, and so does the count of the colour already taken. (Tree diagrams and combined events)

- ☐ **Complete a Venn diagram from given totals** Start with the overlap, subtract it from each set's total to get the 'only' regions, then work out the number outside. (Venn diagrams and set notation)

- ☐ **Use complements such as A' in set notation** A' is everything not in A , so $A' \cap B$ is the part of B outside A . (Venn diagrams and set notation)

Statistics

- ☐ **Compare pie charts and criticise misleading diagrams** Work out actual numbers when the totals are different, and spot axes that do not start at 0 or scales that are uneven. (Charts, diagrams and time series)

- ☐ **Estimate the mean of grouped data** Use the midpoint of each class as the value of every item in that class. (Averages and spread)

- ☐ **Solve problems with totals and combined means** Use total = mean $\times$ number of values to find a missing value or the mean of two groups together. (Averages and spread)

- ☐ **Make estimates using a line of best fit** Read from the line inside the range of the data; estimates outside it (extrapolation) are unreliable. (Scatter graphs and correlation)

 - ☐ **Explain why correlation does not prove causation** Two variables can be correlated because both depend on something else. (Scatter graphs and correlation)

 - ☐ **Estimate a population using capture–recapture** Assume the proportion marked in the second sample equals the proportion marked in the whole population. (Sampling and capture–recapture)
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