KNOW YOUR NUMBERS

Formulas cheat sheet

Every formula this site uses, with its source and the date it was last checked. Generated from the site's verified data, so it cannot drift out of step.

Estimated average glucose (ADAG / Nathan)

`eAG (mg/dL) = 28.7 x A1C - 46.7`

Nathan DM, Kuenen J, Borg R, Zheng H, Schoenfeld D, Heine RJ, for the A1c-Derived Average Glucose (ADAG) Study Group. Translating the A1C Assay Into Estimated Average Glucose Values. Diabetes Care. 2008;31(8):1473-1478.
Reported error: A population regression: in the ADAG study, individuals at the same A1C had meaningfully different mean glucose. The A1C assay itself carries about +/- 0.5 percentage points under NGSP certification.
Last checked 2026-07-30

Glucose Management Indicator (GMI)

`GMI (%) = 3.31 + 0.02392 x mean glucose (mg/dL)`

Bergenstal RM, Beck RW, Close KL, Grunberger G, Sacks DB, Kowalski A, Brown AS, Heinemann L, Aleppo G, Ryan DB, Riddlesworth TD, Cefalu WT. Glucose Management Indicator (GMI): A New Term for Estimating A1C From Continuous Glucose Monitoring. Diabetes Care. 2018;41(11):2275-2280.
Reported error: GMI and a laboratory A1C commonly differ in the same person; the paper reports that difference is often substantial and is itself informative rather than an error.
Last checked 2026-07-30

NGSP percent to IFCC mmol/mol

`IFCC (mmol/mol) = (NGSP % - 2.15) x 10.929`

National Glycohemoglobin Standardization Program. IFCC standardization of HbA1c and the NGSP-IFCC master equation. NGSP, accessed 2026.
Reported error: The master equation is periodically re-derived from network comparison data; treat converted values as approximate.
Last checked 2026-07-30

A1C assay tolerance (NGSP certification)

`certified assays agree with the reference method within about +/- 0.5 percentage points`

National Glycohemoglobin Standardization Program. Certification criteria for hemoglobin A1c methods. NGSP, accessed 2026.
Reported error: This is the certification limit for the method, not a confidence interval for one person's result.
Last checked 2026-07-30

Resting energy expenditure (Mifflin-St Jeor)

`BMR (kcal/day) = 10 x weight(kg) + 6.25 x height(cm) - 5 x age(y) + 5 (male) or - 161 (female)`

Mifflin MD, St Jeor ST, Hill LA, Scott BJ, Daugherty SA, Koh YO. A new predictive equation for resting energy expenditure in healthy individuals. Am J Clin Nutr. 1990;51(2):241-247.
Reported error: Derived from 498 healthy adults aged 19 to 78. It landed within 10% of measured resting metabolic rate for more people than any other equation in the Frankenfield 2005 review, which also means it missed by more than 10% for some of them.
Last checked 2026-07-30

Resting metabolic rate from fat-free mass (Katch-McArdle / Cunningham)

`RMR (kcal/day) = 370 + 21.6 x fat-free mass (kg)`

Cunningham JJ. Body composition as a determinant of energy expenditure: a synthetic review and a proposed general prediction equation. Am J Clin Nutr. 1991;54(6):963-969.
Reported error: Only as good as the fat-free-mass figure it is given: a body-composition estimate carries its own error, and this equation multiplies it by 21.6.
Last checked 2026-07-30

Harris-Benedict, revised (Roza and Shizgal)

`BMR = 88.362 + 13.397 x kg + 4.799 x cm - 5.677 x age (male); 447.593 + 9.247 x kg + 3.098 x cm - 4.330 x age (female)`

Roza AM, Shizgal HM. The Harris Benedict equation reevaluated: resting energy requirements and the body cell mass. Am J Clin Nutr. 1984;40:168-182.
Reported error: The paper reports these equations estimate one person's resting energy expenditure to a precision of about 14%.
Last checked 2026-07-30

Accuracy of resting-metabolic-rate equations

`the review's accuracy criterion was a prediction within 10% of measured RMR`

Frankenfield D, Roth-Yousey L, Compher C. Comparison of predictive equations for resting metabolic rate in healthy nonobese and obese adults: a systematic review. J Am Diet Assoc. 2005;105(5):775-789.
Reported error: This describes how often an equation lands within 10% across groups of people. It is not a confidence interval for one person's result.
Last checked 2026-07-30

Activity multipliers for total daily energy expenditure

`TDEE = BMR x activity multiplier (1.2, 1.375, 1.55, 1.725 or 1.9)`

FAO/WHO/UNU Expert Consultation. Human energy requirements: report of a joint FAO/WHO/UNU expert consultation. FAO Food and Nutrition Technical Report Series 1. Rome: FAO; 2004.
Reported error: No primary source publishes this ladder and no error term was ever attached to it. Choosing one rung rather than its neighbour moves the answer by roughly 200 to 300 kcal/day, which makes it the largest single source of disagreement between two calculators given the same body.
Last checked 2026-07-30 · field convention

Physical activity level (PAL) bands

`PAL = total energy expenditure / BMR; 1.40-1.69 sedentary or light, 1.70-1.99 active or moderately active, 2.00-2.40 vigorously active`

FAO/WHO/UNU Expert Consultation. Human energy requirements: report of a joint FAO/WHO/UNU expert consultation. FAO Food and Nutrition Technical Report Series 1. Rome: FAO; 2004. Chapter 5: Energy requirements of adults.
Reported error: Bands describe habitual lifestyles across populations; an individual's measured PAL can sit between them or outside them.
Last checked 2026-07-30

The 3,500 kcal per pound rule (Wishnofsky)

`1 lb of body weight = 3,500 kcal, or about 7,716 kcal per kg`

Wishnofsky M. Caloric equivalents of gained or lost weight. Am J Clin Nutr. 1958;6(5):542-546.
Reported error: Rests on the tissue lost being mostly fat of constant composition, and on energy needs staying the same at a lighter weight. Hall 2008 and Hall 2011 show both assumptions fail, so a straight-line figure is a ceiling rather than a forecast.
Last checked 2026-07-30

Required energy deficit per unit weight loss (Hall)

`the energy density of lost weight is not constant: more initial body fat means a larger cumulative deficit per kg lost`

Hall KD. What is the required energy deficit per unit weight loss? Int J Obes (Lond). 2008;32(3):573-576.
Reported error: A modelling result checked against published weight-loss data in lean and obese subjects. The 3,500 kcal per pound rule approximately matched only above roughly 30 kg of initial body fat, and overestimated the deficit required below that.
Last checked 2026-07-30

Eventual weight change per sustained change in intake (Hall)

`about 1 kg of eventual change per 100 kJ/day, or 10 kcal/day per pound; about half of it within 1 year and about 95% within 3 years`

Hall KD, Sacks G, Chandramohan D, Chow CC, Wang YC, Gortmaker SL, Swinburn BA. Quantification of the effect of energy imbalance on bodyweight. Lancet. 2011;378(9793):826-837.
Reported error: A rule of thumb for an average overweight adult, not a personal trajectory. This site interpolates linearly between the published 1-year and 3-year anchors and holds at 95% beyond three years rather than extrapolating past what was published.
Last checked 2026-07-30

Acceptable Macronutrient Distribution Ranges (AMDR)

`adults: protein 10-35%, carbohydrate 45-65%, fat 20-35% of total energy`

Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: The National Academies Press; 2005.
Reported error: A range for populations, expressed as a share of energy. The committee set no single optimum inside it, so a split being inside the range is not a score.
Last checked 2026-07-30

Atwater general factors (energy per gram)

`protein 4 kcal/g, total carbohydrate 4 kcal/g, total fat 9 kcal/g`

Merrill AL, Watt BK. Energy Value of Foods: Basis and Derivation. Agriculture Handbook No. 74. Washington, DC: US Department of Agriculture; 1955 (revised 1973).
Reported error: General factors, rounded for practical use. Specific Atwater factors differ by food, so whole-gram targets will not reconcile to a calorie figure exactly - the residue is shown rather than hidden.
Last checked 2026-07-30

Protein RDA for adults

`0.8 g protein per kg body weight per day`

Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: The National Academies Press; 2005.

Reported error: The RDA is the intake judged sufficient to meet the requirement of nearly all healthy adults. It is a floor for adequacy, not an optimum, and the same report's AMDR runs to 35% of energy.

Last checked 2026-07-30

Protein for athletes and active adults

`1.2 to 2.0 g protein per kg body weight per day`

Thomas DT, Erdman KA, Burke LM. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance. J Acad Nutr Diet. 2016;116(3):501-528; published concurrently in Med Sci Sports Exerc. 2016;48(3):543-568.

Reported error: A range, not a target: the statement notes higher intakes may apply for short periods of intensified training or reduced energy intake.

Last checked 2026-07-30

Protein for building or maintaining muscle (ISSN)

`1.4 to 2.0 g/kg/day; per meal 0.25 g/kg or an absolute 20-40 g, distributed every 3-4 hours`

Jager R, Kerksick CM, Campbell BI, et al. International Society of Sports Nutrition Position Stand: protein and exercise. J Int Soc Sports Nutr. 2017;14:20.

Reported error: The stand describes what is sufficient for most exercising individuals, and separately notes 2.3 to 3.1 g/kg/day may apply while in an energy deficit to help preserve lean mass.

Last checked 2026-07-30

Protein for healthy older adults (PROT-AGE)

`at least 1.0 to 1.2 g protein per kg body weight per day for healthy people over 65`

Bauer J, Biolo G, Cederholm T, et al. Evidence-based recommendations for optimal dietary protein intake in older people: a position paper from the PROT-AGE Study Group. J Am Med Dir Assoc. 2013;14(8):542-559.

Reported error: The paper advises 1.2 g/kg/day or more for older people who are exercising or otherwise active, and 1.2 to 1.5 g/kg/day where acute or chronic illness is involved, so the healthy-adult range is a floor rather than a ceiling.

Last checked 2026-07-30

Adequate Intake for total water

`total water 3.7 L/day (men) and 2.7 L/day (women), about 80% of it from beverages; 3.0 L/day in pregnancy and 3.8 L/day during lactation`

Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. Washington, DC: The National Academies Press; 2004.

Reported error: An Adequate Intake set from what healthy, adequately hydrated people were observed to consume - not a requirement, and not a daily target to hit. It covers water from food as well as drink.

Last checked 2026-07-30

Water per calorie expended

`1 to 1.5 mL of water per kcal of energy expenditure`

National Research Council (US) Subcommittee on the Tenth Edition of the Recommended Dietary Allowances. Recommended Dietary Allowances, 10th Edition. Chapter: Water and Electrolytes. Washington, DC: National Academy Press; 1989.

Reported error: A practical convention for adults under average conditions, raised toward 1.5 mL/kcal to cover variation in activity, sweating and solute load.

Last checked 2026-07-30 · field convention

Water per kilogram of body weight

`30 mL of fluid per kg body weight per day, with a floor of about 1.5 L`

Masot O, Miranda J, Lavedan Santamaria A, Paraiso Pueyo E, Pascual A, Botigue T. Fluid Intake Recommendation Considering the Physiological Adaptations of Adults Over 65 Years: A Critical Review. Nutrients. 2020;12(11):3383.

Reported error: A weight-based clinical convention used mainly for older adults. The review that documents it notes it fails for very thin or very heavy people and prefers the guideline route instead.

Last checked 2026-07-30 · field convention

The eight-glasses rule, examined

`no scientific evidence was found for 8 x 8 fl oz per day, which is about 1.9 L of drinking water`

Valtin H. "Drink at least eight glasses of water a day." Really? Is there scientific evidence for "8 x 8"? Am J Physiol Regul Integr Comp Physiol. 2002;283(5):R993-R1004.

Reported error: The review found no evidence for the rule as a universal instruction. It does not argue that drinking water is unimportant, and it excludes people with specific medical conditions from its scope.
Last checked 2026-07-30

Maximum heart rate (Fox, 220 - age)

`HRmax (bpm) = 220 - age`

Fox SM 3rd, Naughton JP, Haskell WL. Physical activity and the prevention of coronary heart disease. Ann Clin Res. 1971;3(6):404-432. History and provenance documented in: Robergs RA, Landwehr R. The surprising history of the HRmax=220-age equation. Journal of Exercise Physiology Online. 2002;5(2):1-10.
Reported error: There is no published regression behind this equation. Robergs and Landwehr traced it to a line drawn by observation through raw and mean data compiled from roughly eleven sources in 1971, and report a standard error of estimate of 7-11 bpm across two decades of HRmax prediction research. It also underestimates maximum heart rate in older adults, which is the finding Tanaka 2001 was written to report.
Last checked 2026-07-30 · field convention

Maximum heart rate (Tanaka, 208 - 0.7 x age)

`HRmax (bpm) = 208 - 0.7 x age`

Tanaka H, Monahan KD, Seals DR. Age-predicted maximal heart rate revisited. J Am Coll Cardiol. 2001;37(1):153-156.
Reported error: Derived by meta-analysis of 351 studies (492 groups, 18,712 subjects, r = -0.90 with age) and cross-validated in 514 more; sex and physical activity level did not shift the regression line. It remains a population regression: individual maximum heart rates at any given age scatter around it, and prediction error for age-based equations is reported at 7-11 bpm. This site therefore renders every predicted HRmax inside a +/-10 bpm band.
Last checked 2026-07-30

Maximum heart rate in women (Gulati, 206 - 0.88 x age)

`HRmax (bpm) = 206 - 0.88 x age`

Gulati M, Shaw LJ, Thisted RA, Black HR, Bairey Merz CN, Arnsdorf MF. Heart rate response to exercise stress testing in asymptomatic women: the St James Women Take Heart Project. Circulation. 2010;122(2):130-137.
Reported error: Derived in 5,437 asymptomatic women (mean age 52 +/- 11) followed for a mean of 15.9 years, with a reported standard error of about 9 bpm. The paper's central finding for this purpose is that the male-derived equations overestimate peak heart rate for women of the same age.
Last checked 2026-07-30

Prediction error of age-based HRmax equations

`standard error of estimate = 7 to 11 bpm; this site renders +/-10 bpm`

Robergs RA, Landwehr R. The surprising history of the HRmax=220-age equation. Journal of Exercise Physiology Online. 2002;5(2):1-10.
Reported error: This is the spread of measured maximum heart rates around an age-based prediction in study populations. It is not a confidence interval for one person: your own maximum can sit outside the band, and only a supervised maximal test measures it.
Last checked 2026-07-30

Target heart rate (Karvonen, heart-rate reserve)

`THR (bpm) = (HRmax - HRrest) x intensity + HRrest`

Karvonen MJ, Kentala E, Mustala O. The effects of training on heart rate; a longitudinal study. Ann Med Exp Biol Fenn. 1957;35(3):307-315.
Reported error: Inherits every bit of uncertainty in the HRmax estimate it is built on, plus the accuracy of the resting rate you measured. A resting heart rate taken after coffee or on waking from a bad night can move the answer by several beats.
Last checked 2026-07-30

Five-zone heart-rate bands (50-60-70-80-90-100% of HRmax)

`Z1 50-60%, Z2 60-70%, Z3 70-80%, Z4 80-90%, Z5 90-100% of HRmax`

Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, Nieman DC, Swain DP; American College of Sports Medicine. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011;43(7):1334-1359. doi:10.1249/MSS.0b013e318213fefb
Reported error: The ten-point band edges are a training-industry convention, not a published finding. No paper derives 50/60/70/80/90/100, and platforms disagree: some anchor zones to heart-rate reserve instead of maximum heart rate, some to lactate or threshold heart rate. Two watches can put the same run in different zones and both be following a defensible chart.
Last checked 2026-07-30 · field convention

ACSM relative intensity classification (% of maximum heart rate)

`very light <57%, light 57-63%, moderate 64-76%, vigorous 77-95%, near-maximal to maximal >=96% of HRmax`

Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, Nieman DC, Swain DP; American College of Sports Medicine. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011;43(7):1334-1359. doi:10.1249/MSS.0b013e318213fefb

Reported error: A classification of intensity, not a prescription for an individual, and it sits on top of whatever HRmax estimate you used - so it carries the same 7-11 bpm prediction error underneath.
Last checked 2026-07-30

Equivalent race time (Riegel)

`T2 = T1 x (D2 / D1)^1.06`

Riegel PS. Athletic records and human endurance. American Scientist. 1981;69(3):285-290.
Reported error: The 1.06 exponent was fitted to world-record performances from 100 m to 100 miles, and Riegel found it close to constant across events and across groups of runners. It assumes you are equally trained for both distances, and it is most optimistic exactly where it is most used: predicting a marathon from a short race, where the limit is fuelling and durability rather than speed. The tool therefore shows the prediction at 1.06 alongside 1.08 and 1.10 so it reads as a spread.
Last checked 2026-07-30

Mile to kilometre conversion

`1 mile = 1.609344 km (exact, by definition)`

Thompson A, Taylor BN. Guide for the Use of the International System of Units (SI). NIST Special Publication 811, 2008 edition. National Institute of Standards and Technology.
Reported error: None - the international mile is defined as exactly 1609.344 metres, so this conversion is exact and every rounding you see is ours, at the display edge only.
Last checked 2026-07-30

Calories burned from METs

`kcal/min = MET x 3.5 x body mass (kg) / 200`

Herrmann SD, Willis EA, Ainsworth BE, Barreira TV, Hastert M, Kracht CL, Schuna JM Jr, Cai Z, Quan M, Tudor-Locke C, Whitt-Glover MC, Jacobs DR. 2024 Adult Compendium of Physical Activities: A third update of the energy costs of human activities. J Sport Health Sci. 2024;13(1):6-12. doi:10.1016/j.jshs.2023.10.010
Reported error: Three separate approximations stack here. Each MET value is a population mean measured in a lab on other people, and the Compendium publishes no per-row error term. The equation is GROSS: it includes the calories you would have spent at rest over the same minutes, which is why the tool also shows the net figure. And 1 MET = 3.5 mL O2/kg/min is itself a convention anchored to a reference adult, so it runs slightly high for heavier and older bodies.
Last checked 2026-07-30

Lean body mass (Boer)

`men: LBM (kg) = 0.407 x weight(kg) + 0.267 x height(cm) - 19.2; women: LBM = 0.252 x weight + 0.473 x height - 48.3`

Boer P. Estimated lean body mass as an index for normalization of body fluid volumes in humans. Am J Physiol. 1984;247(4 Pt 2):F632-F636.
Reported error: Derived to normalise body-fluid volumes, not to assess athletes. It knows only your height, weight and sex, so it cannot tell a heavily muscled body from a heavier one of the same dimensions - two people at the same height and weight get the same answer regardless of how that mass is distributed.
Last checked 2026-07-30

Lean body mass (James)

`men: LBM (kg) = 1.10 x weight(kg) - 128 x (weight(kg) / height(cm))^2; women: LBM = 1.07 x weight - 148 x (weight / height)^2`

James WPT. Research on Obesity: A Report of the DHSS/MRC Group. London: Her Majesty's Stationery Office; 1976. Equation as reproduced in: Comparison of ten predictive equations for estimating lean body mass with dual-energy X-ray absorptiometry in older patients. Br J Radiol. 2022;95(1133):20210378.
Reported error: The only one of the three with a non-linear shape term, so it diverges fastest from the others at the extremes of height and weight. The originating document is a 1976 government report rather than a journal paper, so the equation is verified here against its reproduction in a peer-reviewed comparison study, not against the report itself.
Last checked 2026-07-30

Lean body mass (Hume)

`men: LBM (kg) = 0.32810 x weight(kg) + 0.33929 x height(cm) - 29.5336; women: LBM = 0.29569 x weight + 0.41813 x height - 43.2933`

Hume R. Prediction of lean body mass from height and weight. J Clin Pathol. 1966;19(4):389-391. doi:10.1136/jcp.19.4.389
Reported error: The earliest of the three and derived against total body water in a mid-1960s cohort, which is the likeliest reason it reads consistently lower than Boer and James at the same height and weight.
Last checked 2026-07-30

Disagreement between published lean-mass equations

`spread across Boer, James and Hume at the same height, weight and sex: commonly 2-5 kg`

Comparison of ten predictive equations for estimating lean body mass with dual-energy X-ray absorptiometry in older patients. Br J Radiol. 2022;95(1133):20210378.

Reported error: The spread between equations is a floor on the uncertainty, not the whole of it: all three share the same blindness to how mass is distributed, so they can agree with each other and still be some distance from a scan.

Last checked 2026-07-30

Body fat from circumferences (Hodgdon & Beckett, the tape method)

`men: %BF = 86.010 x log10(abdomen - neck) - 70.041 x log10(height) + 36.76; women: %BF = 163.205 x log10(waist + hip - neck) - 97.684 x log10(height) - 78.387 (all measurements in inches)`

Hodgdon JA, Beckett MB. Prediction of percent body fat for U.S. Navy men from body circumferences and height. San Diego, CA: Naval Health Research Center; 1984. Report No. 84-11. Hodgdon JA, Beckett MB. Prediction of percent body fat for U.S. Navy women from body circumferences and height. San Diego, CA: Naval Health Research Center; 1984. Report No. 84-29.

Reported error: This site shows a +/-4 percentage-point band. // VERIFY: that figure is taken from secondary summaries reporting the method agrees with hydrostatic weighing to within roughly 3-4 points, deliberately using the wider edge; the Naval Health Research Center reports state their own standard error and the DTIC scans were not machine-readable when this pack was built. Read reports 84-11 and 84-29 and replace it with the published figure. Do not narrow it from memory. Separately, the method is sensitive to tape placement: a centimetre of drift at the abdomen moves the answer by close to a full point.

Last checked 2026-07-30

Body fat from BMI (Deurenberg)

`%BF = 1.20 x BMI + 0.23 x age - 10.8 x sex - 5.4 (sex: male 1, female 0)`

Deurenberg P, Weststrate JA, Seidell JC. Body mass index as a measure of body fatness: age- and sex-specific prediction formulas. Br J Nutr. 1991;65(2):105-114.

Reported error: The paper reports $R^2 = 0.79$ and a standard error of estimate of 4.1 percentage points in 1229 adults aged 7-83 with BMI 13.9-40.9. Four points is wide: at an estimate of 22% it means the honest reading is roughly 18-26%. Because the input is BMI, the equation cannot distinguish muscle from fat at all, so it reads high for heavily muscled bodies and low for lightly muscled ones.

Last checked 2026-07-30

Waist-to-height ratio bands (NICE)

`waist / height: 0.4 to 0.49 healthy central adiposity, 0.5 to 0.59 increased central adiposity, 0.6 or more high central adiposity`

National Institute for Health and Care Excellence. Overweight and obesity management. NICE guideline NG246. Section: Identifying and assessing overweight, obesity and central adiposity. NICE, accessed 2026-07-30.

Reported error: NICE states these bands apply to adults with a BMI under 35 kg/m2, of both sexes and all ethnicities, including adults with high muscle mass. Above a BMI of 35 the ratio adds little. NICE does not define a category below 0.4, so neither does this site - the tool says the ratio is below the range NICE groups as healthy rather than inventing a label for it.

Last checked 2026-07-30

One-rep max (Epley)

`1RM = weight x (1 + reps / 30)`

Epley B. Poundage Chart. In: Boyd Epley Workout. Lincoln, NE: Body Enterprises; 1985. Independently validated in: LeSuer DA, McCormick JH, Mayhew JL, Wasserstein RL, Arnold MD. The accuracy of prediction equations for estimating 1-RM performance in the bench press, squat, and deadlift. J Strength Cond Res. 1997;11(4):211-213.

Reported error: The original source is a 1985 coaching chart, not a journal paper - there is no published derivation, only the equation and decades of independent testing of it. LeSuer and colleagues found mean prediction error within about 3% between 2 and 10 reps. Above 10 reps no published accuracy figure covers it, and Epley and Brzycki pull apart quickly: at 15 reps they differ by roughly 9% of the midpoint.

Last checked 2026-07-30 · field convention

One-rep max (Brzycki)

`1RM = weight x 36 / (37 - reps), equivalently weight / (1.0278 - 0.0278 x reps)`

Brzycki M. Strength testing - predicting a one-rep max from reps-to-fatigue. Journal of Physical Education, Recreation & Dance. 1993;64(1):88-90. doi:10.1080/07303084.1993.10606684

Reported error: Validated by LeSuer and colleagues in 1997 to within about 3% mean error at 2-10 reps. The equation has a hard mathematical limit: the denominator reaches zero at 37 reps, so the predicted max climbs towards infinity as rep counts get high, and it should not be read at all above roughly 12-15 reps. src/lib/health/strength.ts returns no value rather than a number once reps reach 37.

Last checked 2026-07-30

One-rep-max prediction accuracy

`mean prediction error within about 3% at 2-10 repetitions; no published figure above 10`

LeSuer DA, McCormick JH, Mayhew JL, Wasserstein RL, Arnold MD. The accuracy of prediction equations for estimating 1-RM performance in the bench press, squat, and deadlift. J Strength Cond Res. 1997;11(4):211-213.

Reported error: The 3% figure is a mean across a study population on three barbell lifts; your own error on an unfamiliar movement, or on a set that stopped short of true failure, can be larger. Above 10 reps the validation simply does not reach, which is why the tool widens its language rather than quoting a number it does not have.

Last checked 2026-07-30

Warm-up loading ladder

`40% x 8, 55% x 5, 70% x 3, 85% x 2, 95% x 1 of the working weight`

Percentages are a widely used training convention with no primary source. The rep-to-percentage relationship they lean on is Brzycki M. Strength testing - predicting a one-rep max from reps-to-fatigue. Journal of Physical Education, Recreation & Dance. 1993;64(1):88-90.

Reported error: No study prescribes these particular percentages, and the site says so on the page. What the ladder is genuinely good for is arithmetic: five percentages of your working weight, rounded to a load you can actually build on a bar with the plates most gyms stock. The only part of the pattern every strength text agrees on is that reps descend as load climbs.

Last checked 2026-07-30 · field convention

Estimated due date from the last menstrual period

`EDD = first day of LMP + 280 days`

American College of Obstetricians and Gynecologists. Committee Opinion No. 700: Methods for Estimating the Due Date. Obstet Gynecol. 2017;129(5):e150-e154.

Reported error: ACOG states this convention assumes a regular 28-day cycle with ovulation on day 14, and does not account for inaccurate recall of the last period, irregular cycle length, or variation in when ovulation actually happened. ACOG treats a first-trimester ultrasound as the most accurate way to establish gestational age, and reports that about half of women recall their last period accurately.

Last checked 2026-07-30

Cycle-length adjustment to the due date

`EDD = LMP + 280 days + (cycle length - 28)`

American College of Obstetricians and Gynecologists. Committee Opinion No. 700: Methods for Estimating the Due Date. Obstet Gynecol. 2017;129(5):e150-e154. The 28-day cycle and day-14 ovulation assumption is stated in the opinion; the arithmetic shift for a different cycle length is derived from it.

Reported error: A derived adjustment, not an ACOG recommendation. It assumes the whole difference in cycle length falls in the follicular phase, which is where Bull 2019 found most of the variation, but the luteal phase varies too.

Last checked 2026-07-30 · field convention

Estimated conception date from the due date

`conception date = EDD - 266 days`

American College of Obstetricians and Gynecologists. Committee Opinion No. 700: Methods for Estimating the Due Date. Obstet Gynecol. 2017;129(5):e150-e154. 266 days follows from the opinion's stated 280-day convention and its day-14 ovulation assumption (280 - 14).

Reported error: The result is a window, not a day. Sperm can survive several days in the reproductive tract, so intercourse days earlier can produce a conception dated here, and ovulation timing itself varies.

Last checked 2026-07-30 · field convention

Gestational age in weeks and days

`gestational age (days) = 280 - days until EDD`

American College of Obstetricians and Gynecologists. Committee Opinion No. 700: Methods for Estimating the Due Date. Obstet Gynecol. 2017;129(5):e150-e154.

Reported error: Inherits every uncertainty of the due date it is measured from. Trimester boundaries (13w6d and 27w6d) are a widely used convention rather than a finding.

Last checked 2026-07-30 · field convention

Estimated ovulation day, anchored to the luteal phase

`ovulation day of cycle = cycle length - 14`

American College of Obstetricians and Gynecologists. Fertility Awareness-Based Methods of Family Planning. ACOG patient FAQ, accessed 2026. States that in an average 28-day menstrual cycle, ovulation occurs about 14 days before the start of the next menstrual period.

Reported error: Counted back from the next expected period rather than forward from the last one, because the follicular phase is what varies. The NHS puts ovulation at 10 to 16 days before the next period, and Bull 2019 measured a mean luteal phase of 12.4 days with a 95% interval of 7 to 17 days, so this is a midpoint of a week-wide window.

Last checked 2026-07-30 · field convention

Fertile window (ACOG patient guidance)

`fertile window = ovulation - 5 days through ovulation + 1 day`

American College of Obstetricians and Gynecologists. Fertility Awareness-Based Methods of Family Planning. ACOG patient FAQ, accessed 2026. States that pregnancy can result from sex anywhere from 5 days before ovulation until 1 day after ovulation.

Reported error: The window is drawn around an estimated ovulation date, so it is only as good as that estimate. Widening it is the honest response to an uncertain ovulation date; narrowing it is not.

Last checked 2026-07-30

The six-day conception window

`conceptions occurred only from intercourse in the 6 days ending on the day of ovulation`

Wilcox AJ, Weinberg CR, Baird DD. Timing of sexual intercourse in relation to ovulation. Effects on the probability of conception, survival of the pregnancy, and sex of the baby. N Engl J Med. 1995;333(23):1517-1521.

Reported error: 221 women, 625 cycles. Per-day probability of conception ranged from about 0.10 five days before ovulation to about 0.33 on the day of ovulation itself, so days inside the window are not equivalent to each other.

Last checked 2026-07-30

Implantation window after ovulation

`implantation occurred 6 to 12 days after ovulation; 84% on day 8, 9 or 10`

Wilcox AJ, Baird DD, Weinberg CR. Time of implantation of the conceptus and loss of pregnancy. N Engl J Med. 1999;340(23):1796-1799.

Reported error: Implantation was dated by the first appearance of chorionic gonadotropin in daily urine samples, in 189 pregnancies. It is a hormone measurement, not a sensation, and the study reports nothing about symptoms.

Last checked 2026-07-30

hCG doubling time

`doubling time = (hours between draws x ln 2) / ln(second value / first value)`

Barnhart KT, Sammel MD, Rinaudo PF, Zhou L, Hummel AC, Guo W. Symptomatic patients with an early viable intrauterine pregnancy: HCG curves redefined. Obstet Gynecol. 2004;104(1):50-55. The arithmetic is the exponential-growth identity; this citation is for the clinical framing the calculator uses.

Reported error: The identity assumes a constant rate of change between the two draws. Real hCG rises more slowly as the level gets higher, so a doubling time measured at 1,200 mIU/mL is not comparable to one measured at 120. Assay-to-assay variation also means two values should ideally come from the same laboratory.

Last checked 2026-07-30 · field convention

Slowest hCG rise seen with a viable intrauterine pregnancy

`minimum rise: 24% at 1 day, 53% at 2 days`

Barnhart KT, Sammel MD, Rinaudo PF, Zhou L, Hummel AC, Guo W. Symptomatic patients with an early viable intrauterine pregnancy: HCG curves redefined. Obstet Gynecol. 2004;104(1):50-55.

Reported error: Derived from 287 symptomatic women (pain or bleeding, non-diagnostic ultrasound) who went on to have a viable intrauterine pregnancy. It is the slowest rise observed in that group, not a threshold anyone passes or fails, and it does not apply in reverse.

Last checked 2026-07-30

Real-world cycle and luteal phase variation

`mean cycle 29.3 days; 13% of cycles exactly 28 days; mean luteal phase 12.4 days (95% CI 7-17)`

Bull JR, Rowland SP, Scherwitzl EB, Scherwitzl R, Danielsson KG, Harper J. Real-world menstrual cycle characteristics of more than 600,000 menstrual cycles. NPJ Digit Med. 2019;2:83.

Reported error: 612,613 cycles from 124,648 users of a fertility app, so the population self-selects towards people tracking closely. The direction of the finding -- that the textbook 28-day cycle is a minority -- is not in doubt.

Last checked 2026-07-30

Gestational weight gain ranges (IOM 2009)

`total gain by pre-pregnancy BMI: 12.5-18 kg, 11.5-16 kg, 7-11.5 kg, 5-9 kg`

Institute of Medicine and National Research Council. Weight Gain During Pregnancy: Reexamining the Guidelines. Washington, DC: The National Academies Press; 2009. Table S-1, New recommendations for total and rate of weight gain during pregnancy, by prepregnancy BMI.

Reported error: Population ranges for a pregnancy overall, not a target for any individual week. The report's own rate calculations assume a first-trimester gain of 0.5-2 kg (1.1-4.4 lb). The twin ranges are described by the report as provisional, and the report gives no range at all for a twin pregnancy beginning underweight.

Last checked 2026-07-30

Mid-parental (target) height

`boys: ((mother + 13) + father) / 2 cm; girls: ((father - 13) + mother) / 2 cm`

Tanner JM, Goldstein H, Whitehouse RH. Standards for children's height at ages 2-9 years allowing for heights of parents. Arch Dis Child. 1970;45(244):755-762.

Reported error: Tanner's band of +/- 8.5 cm around the estimate spans the 3rd to 97th centile of expected adult height, so the honest answer is a 17 cm range. Later work widened the band further, to about +/- 9 cm for girls and +/- 10 cm for boys. The estimate also assumes a population like the one it was derived from and takes no account of the child's own measured growth, nutrition or health.

Last checked 2026-07-30

LMS z-score (Cole)

`Z = ((X / M)^L - 1) / (L x S), and Z = ln(X / M) / S when L = 0`

Cole TJ. The LMS method for constructing normalized growth standards. Eur J Clin Nutr. 1990;44(1):45-60.

Reported error: The z-score is exact arithmetic given L, M and S; all of the uncertainty lives in the reference table those three come from, and in whether that table describes the child in front of you.

Last checked 2026-07-30

Centile from a z-score

`centile = 100 x standard normal CDF of Z`

Cole TJ. The LMS method for constructing normalized growth standards. Eur J Clin Nutr. 1990;44(1):45-60. The LMS transformation is designed so that the transformed measurement is standard normal, which is what makes the centile the normal CDF of the z-score.

Reported error: The normal CDF is evaluated with the Zelen and Severo rational approximation (Abramowitz and Stegun 26.2.17, absolute error under 7.5e-8) and inverted with Acklam's approximation (relative error under 1.15e-9). Both are far more precise than the tenth of a centile anything here displays.

Last checked 2026-07-30 · field convention

Name popularity rank and count (ONS)

`rank and count per name, per sex, per year, exactly as the ONS publishes them`

Office for National Statistics. Baby names in England and Wales: from 1996 (1996 to 2025). Table 1, names for baby girls; Table 2, names for baby boys. Contains public sector information licensed under the Open Government Licence v3.0.

Reported error: England and Wales only. The ONS publishes names with a count of three or more, so rarer names are absent from the source itself. A rank is a position in one jurisdiction in one year and says nothing about a name anywhere else.

Last checked 2026-07-30

Name style tags, derived from published ranks

`top-100: rank <= 100 now; popular: 101-500; uncommon: 501+; rising/falling: rank moved 100+ places over 5 years with both ranks inside the top 1000; enduring: top 200 in both 1996 and now; revival: outside the top 500 in 1996 and inside the top 200 now; vintage: top 100 in 1996 and outside the top 500 now`

Derived arithmetically from Office for National Statistics, Baby names in England and Wales: from 1996 (1996 to 2025). The rules are arithmetic on published ranks, not editorial judgements, and each rule is printed in public/data/names/index.json so any name can be checked against the ONS table.

Reported error: These are labels for movements in a popularity table, not descriptions of what a name is like. A name can be tagged rising because a hundred more families chose it, which is a fact about a year rather than a quality of the name.

Last checked 2026-07-30 · field convention

First-year cost, summed from published figures

`total = sum of the published annual figures selected, each shown with the year its money is expressed in`

Child Care Aware of America. Child Care in America: 2025 Price and Supply. Published May 2026. The summation itself is arithmetic; every input is a published figure stored in src/data/packs/baby-costs.json with its own source and currency year.

Reported error: A sum of national averages is not a forecast of a household. Child care prices in particular vary by a factor of three across US states, and figures from different years are not made comparable by adding them - this tool shows each currency year rather than converting them into a common one.

Last checked 2026-07-30 · field convention

US child care prices, 2025 (Child Care Aware of America)

`infant, center $15,636/yr; infant, family child care home $11,673/yr; national average across ages and settings $13,184/yr`

Child Care Aware of America. Child Care in America: 2025 Price and Supply. Published May 2026. National average calculated by averaging three methods across the 47 states for which CCAoA had price data; the infant and four-year-old figures quoted here are from the Average of Averages method.

Reported error: National averages across 47 states. CCAoA's own state tables for 2024 run from roughly $8,600 to over $26,000 a

year for infant center care, so the national figure describes the country and not a county. CCAoA publishes no toddler figure in the 2025 national tables, so none is shown or interpolated.
Last checked 2026-07-30

USDA expenditures on a child aged 0 to 2 (2015 dollars)

`middle-income married-couple family, two children: $12,680 a year at age 0-2; $9,690 lowest income group, $19,770 highest`

Lino M, Kuczynski K, Rodriguez N, Schap T. Expenditures on Children by Families, 2015. US Department of Agriculture, Center for Nutrition Policy and Promotion. Miscellaneous Report No. 1528-2015, January 2017, revised March 2017. Table 1, estimated annual expenditures on a child by married-couple families, overall United States.
Reported error: Expressed in 2015 dollars and not adjusted forward here. USDA's own page states that the most recent version of the report was published in 2017 and estimates the cost of raising children born in 2015, and that USDA is evaluating the methods used to inform the report; there has been no newer edition since.
Last checked 2026-07-30

Time-restricted eating window (clock arithmetic)

`window opens = last meal + fasting hours; window closes = opens + eating hours`

de Cabo R, Mattson MP. Effects of Intermittent Fasting on Health, Aging, and Disease. N Engl J Med. 2019;381(26):2541-2551. doi:10.1056/NEJMra1905136
Reported error: There is no uncertainty in the arithmetic - it is addition on a clock. The uncertainty is entirely in what a schedule does for any individual, which this calculator does not estimate and does not claim.
Last checked 2026-07-30 · field convention

Lifestyle life-expectancy differences, summed (this site's construction)

`estimate = chronological age - sum of published life-expectancy differences, clamped to +/- 12 years`

Terms: Jha P, et al. N Engl J Med. 2013;368(4):341-350 (smoking). Moore SC, et al. PLoS Med. 2012;9(11):e1001335 (physical activity). Fadnes LT, et al. PLoS Med. 2022;19(2):e1003889 (diet). Wood AM, et al. Lancet. 2018;391(10129):1513-1523 (alcohol). Prospective Studies Collaboration. Lancet. 2009;373(9669):1083-1096 (body-mass index).
Reported error: Large, and structural rather than statistical. Each term is a life-expectancy difference its own study published in years, but the terms come from different cohorts with different reference groups and different starting ages, and their effects overlap heavily through shared cardiovascular and metabolic pathways. Adding them therefore overstates the combined difference by an amount no publication quantifies. The result is reported as a range, clamped to plus or minus 12 years, and always shown broken down by term.
Last checked 2026-07-30 · field convention