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NATIONAL 5 MATHEMATICS

FORMULA, METHODS & EXACT-VALUE CENTRE

Official formulae list + required unsupplied relationships | selection guidance | worked checks

Course	National 5 Mathematics
Course code	C847 75
Course assessment code	X847 75
Level / total marks	SCQF Level 5 | 90 marks

INDEPENDENT PUBLICATION NOTICE

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What is actually supplied

The official National 5 Mathematics formulae list supplies: the quadratic formula; sine rule; cosine rule; area of a triangle using 1/2 ab sin C; volumes of a sphere, cone and pyramid; and two equivalent forms of sample standard deviation. Other relationships required by the course - such as Pythagoras, gradient, arc length/sector area, trig identities, scale factors and percentage models - remain part of the knowledge and method students must be able to use.

Source basis: FORM; SPEC

01. Quadratic formula

Relationship	$x = (-b \pm \sqrt{(b^2-4ac)})/(2a)$
When / conditions	For $ax^2+bx+c=0$. Identify signed values of a,b,c first.
Worked check	Solve $2x^2-5x-3=0$: discriminant 49, so $x=(5\pm7)/4$ giving 3 and -1/2.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

02. Discriminant

Relationship	$\Delta = b^2 - 4ac$
When / conditions	$\Delta>0$: two real distinct roots; $\Delta=0$: repeated real root; $\Delta<0$: no real roots.
Worked check	For $x^2+4x+5=0$, $\Delta=16-20=-4$ so there are no real roots.
Exam status	Not separately supplied as a named formula but embedded in quadratic formula; explicitly

	required.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

03. Gradient

Relationship	$m = (y_2-y_1)/(x_2-x_1)$
When / conditions	Use the same point order top and bottom.
Worked check	Through (2,3) and (8,15): m=12/6=2.
Exam status	Expected course knowledge.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

04. Point-gradient line

Relationship	y-b = m(x-a)
When / conditions	Use one known point (a,b) and gradient m; rearrange if required.
Worked check	Gradient 2 through (3,7): y-7=2(x-3), so y=2x+1.

Exam status	Specification gives this form or equivalent.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

05. Pythagoras

Relationship	$a^2+b^2=c^2$
When / conditions	Right-angled triangles only; c is hypotenuse.
Worked check	Legs 5 and 12 give c=13.
Exam status	Expected course knowledge; not on formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

06. Vector magnitude

Relationship	$\|v\| = \sqrt{(x^2+y^2)}$ (or add z^2 in 3D)
When / conditions	Square components; negative signs disappear

	after squaring.
Worked check	v=(-5,7): |v|=√74.
Exam status	Derived from Pythagoras; required by specification.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

07. Arc length

Relationship	$L = (\theta/360)\cdot 2\pi r$
When / conditions	θ is central angle in degrees.
Worked check	$r=6$, $\theta=120°$ gives $L=4\pi$.
Exam status	Expected course knowledge.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

08. Sector area

Relationship	$A = (\theta/360)\cdot \pi r^2$

When / conditions	Use central angle in degrees.
Worked check	r=9, θ=80° gives A=18π.
Exam status	Expected course knowledge.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

09. Triangle area with sine

Relationship	A = 1/2 ab sin C
When / conditions	C must be included angle between sides a and b.
Worked check	a=8,b=11,C=40° gives A≈28.3 square units.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

10. Sine rule

Relationship	$a/\sin A = b/\sin B = c/\sin C$
When / conditions	Match each side with its opposite angle.
Worked check	$a=7$, $A=35°$, $B=80°$: $b=7\sin 80°/\sin 35° \approx 12.0$.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

11. Cosine rule - side

Relationship	$a^2=b^2+c^2-2bc\cos A$
When / conditions	Use when two sides and included angle are known.
Worked check	$b=8, c=10, A=60°$ gives $a=\sqrt{84} \approx 9.17$.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

12. Cosine rule - angle

Relationship	$\cos A=(b^2+c^2-a^2)/(2bc)$
When / conditions	Use when all three sides are known.
Worked check	$a=7, b=8, c=10$ gives $A\approx44.0°$.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

13. Trig identity

Relationship	$\sin^2x + \cos^2x = 1$
When / conditions	Useful for identities and converting between sine/cosine squares.
Worked check	If $\sin x=3/5$ in a suitable quadrant, $\cos^2x=16/25$.
Exam status	Explicit course requirement.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

14. Tangent identity

Relationship	$\tan x = \sin x / \cos x$
When / conditions	Use in identities and relation questions.
Worked check	If $\sin x=0.6$ and $\cos x=0.8$, $\tan x=0.75$.
Exam status	Explicit course requirement.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

15. Volume of sphere

Relationship	$V = 4/3\ \pi r^3$
When / conditions	Radius, not diameter.
Worked check	$r=4$ gives $V=256\pi/3\approx268.1$.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

16. Volume of cone

Relationship	$V = 1/3\ \pi r^2 h$
When / conditions	h is perpendicular height.
Worked check	r=3,h=10 gives $V=30\pi\approx94.2$.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

17. Volume of pyramid

Relationship	$V = 1/3\ Ah$
When / conditions	A is base area; h perpendicular height.
Worked check	Base area 24, h=9 gives V=72.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

18. Standard deviation

Relationship	$s = \sqrt{(\Sigma(x-\bar{x})^2/(n-1))}$
When / conditions	Sample standard deviation; official list also gives an equivalent computational form.
Worked check	Use calculator/statistics mode or table method; interpret smaller s as less spread.
Exam status	Supplied on official formula list.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	FORM; SPEC

19. Compound appreciation

Relationship	Final = Initial(1+r)^n
When / conditions	r as decimal.
Worked check	£800 at 4% for 3 years: 800(1.04)^3≈£899.89.
Exam status	Expected method from course content.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

20. Depreciation

Relationship	Final = Initial(1-r)^n
When / conditions	Use remaining-value multiplier.
Worked check	£22,600 depreciating 28% annually for 3 years: 22600(0.72)^3.
Exam status	Expected method from course content.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

21. Reverse percentage

Relationship	Original = Final / multiplier
When / conditions	Multiplier is the remaining/final percentage as a decimal.
Worked check	After 20% reduction, £72 represents 0.8 of original, so original £90.
Exam status	Expected method from course content.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship

	when practical.
Source	SPEC

22. Linear/area/volume scale factors

Relationship	Area factor=k^2; volume factor=k^3
When / conditions	Use when similar figures/solids have linear factor k.
Worked check	Linear factor 3 gives area factor 9 and volume factor 27.
Exam status	Explicit course requirement.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

23. Interquartile range

Relationship	IQR = Q3 - Q1
When / conditions	Measure of spread used for comparisons.
Worked check	Q1=12, Q3=27 gives IQR=15.
Exam status	Explicit course requirement.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets,

	keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

24. Scientific notation

Relationship	a×10^n with 1≤|a|<10
When / conditions	Normalize coefficient after calculations.
Worked check	(3×10^5)(4×10^-2)=1.2×10^4.
Exam status	Explicit course requirement.
Common trap	Choosing a formula because it looks familiar rather than because the givens satisfy its conditions; substituting rounded intermediate values; losing units or exact form.
Verification	Estimate size/sign first, substitute with brackets, keep exact values where possible, and substitute the result back into the original relationship when practical.
Source	SPEC

Formula-selection decision tree

Right-angled triangle?

Select	Use Pythagoras or SOHCAHTOA depending on whether sides or angles are required.

Non-right triangle with an opposite side-angle pair?

Select	Sine rule is usually the natural route.

Non-right triangle with two sides and included angle, or all three sides?

Select	Cosine rule.

Two sides and included angle, asking for area?

Select	1/2 ab sin C.

Quadratic cannot be factorised conveniently?

Select	Use quadratic formula; check discriminant and contextual admissibility.

Similar figures/solids?

Select	Find linear factor k, then use k^2 for area or k^3 for volume.

Compare spread?

Select	Use IQR or standard deviation according to the question/data given; state the contextual meaning.

Non-calculator exact-value discipline

- Keep surds exact unless a decimal is requested.
- Use fractions instead of unnecessary decimal conversion.
- Simplify factors before multiplication where helpful.
- Use exact trigonometric identities algebraically rather than rounding.
- Check signs and quadrants before finalising trigonometric solutions.

References and evidence base

The resource is independently written. Source documents are used to verify course scope, assessment structure, grade boundaries, formula provision and published observations about candidate performance. The wording below is bibliographic rather than a reproduction of assessment material.

- **[FORM]** SQA, Mathematics National 5 Formulae List. https://www.sqa.org.uk/files_ccc/MathsSQPN5FormList.pdf
- **[SPEC]** Qualifications Scotland / SQA, National 5 Mathematics Course Specification, May 2023, version 3.0. https://www.sqa.org.uk/files_ccc/n5-course-spec-mathematics.pdf
- **[CR22]** SQA, National 5 Mathematics Course Report 2022. https://www.sqa.org.uk/files_ccc/2022-n5-course-report-mathematics.pdf
- **[CR25]** SQA, National 5 Mathematics Course Report 2025. https://www.sqa.org.uk/files_ccc/2025-n5-course-report-mathematics.pdf
- **[CR26]** Qualifications Scotland, National 5 Mathematics Course Report 2026. https://www.sqa.org.uk/sqa/files_ccc/2026-n5-course-report-mathematics.pdf

Publication note

On 1 February 2026, Qualifications Scotland replaced SQA as Scotland's national awarding body. Qualifications Scotland states that legacy SQA documents on the National 5 Mathematics subject page remain current until updated. This resource therefore cites both names where historically appropriate.