

# Higher Maths formula sheet (SQA)

Scotland: what is on the SQA formulae list and what to learn · Checked 21 October 2026

An original MathsDaily revision sheet for SQA Higher Mathematics in Scotland, not the official formulae list. SQA prints a short formulae list in both question papers. Each formula below is labelled to show whether it is on that list or one you must learn.

On the SQA list: Printed on the formulae list in both Higher Mathematics question papers.

Learn: not on the list: Not printed in the exam. You are expected to know it.

## Straight lines

### Gradient

LEARN: NOT ON THE LIST

$$m = (y_2 - y_1) / (x_2 - x_1); m = \tan \theta$$

$\theta$  is the angle the line makes with the positive direction of the x-axis.

### Equation of a line

LEARN: NOT ON THE LIST

$$y - b = m(x - a)$$

Through the point (a, b) with gradient m. Also  $y = mx + c$  and  $ax + by + c = 0$ .

### Parallel and perpendicular lines

LEARN: NOT ON THE LIST

Parallel:  $m_1 = m_2$ ; perpendicular:  $m_1 \times m_2 = -1$

### Distance and midpoint

LEARN: NOT ON THE LIST

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}; \text{midpoint} = ((x_1 + x_2)/2, (y_1 + y_2)/2)$$

Use the midpoint and perpendicular gradient for perpendicular bisectors; a median joins a vertex to the midpoint of the opposite side; an altitude is perpendicular to the opposite side.

## Circles

### Circle, general form

On the SQA list

$x^2 + y^2 + 2gx + 2fy + c = 0$  represents a circle with centre  $(-g, -f)$  and radius  $\sqrt{g^2 + f^2 - c}$

### Circle, centre and radius form

On the SQA list

$(x - a)^2 + (y - b)^2 = r^2$  represents a circle with centre (a, b) and radius r

### Tangents and intersections

LEARN: NOT ON THE LIST

A tangent is perpendicular to the radius at the point of contact. Substitute the line into the circle:  
discriminant = 0  $\Rightarrow$  tangent;  $> 0 \Rightarrow$  two points;  $< 0 \Rightarrow$  no intersection

## Vectors

### Scalar product

On the SQA list

$a \cdot b = |a||b| \cos \theta$ , where  $\theta$  is the angle between a and b  
or  $a \cdot b = a_1b_1 + a_2b_2 + a_3b_3$

### Magnitude and unit vectors

LEARN: NOT ON THE LIST

$|a| = \sqrt{a_1^2 + a_2^2 + a_3^2}$ ; a unit vector has magnitude 1

**Perpendicular vectors****LEARN: NOT ON THE LIST** $a \cdot b = 0 \Leftrightarrow a$  and  $b$  are perpendicular ( $a, b$  non-zero)**Collinearity and section formula****LEARN: NOT ON THE LIST**

$A, B$  and  $C$  are collinear if  $AB = k \cdot BC$  with  $B$  a common point; if  $P$  divides  $AB$  in the ratio  $m : n$ , then  $p = (n \cdot a + m \cdot b) / (m + n)$

Bold letters are position vectors.

## Algebra, functions and sequences

**Discriminant and nature of roots****LEARN: NOT ON THE LIST**

For  $ax^2 + bx + c = 0$ :  $b^2 - 4ac > 0$  two real roots;  $= 0$  equal roots;  $< 0$  no real roots

**Factor and remainder theorems****LEARN: NOT ON THE LIST**

If  $f(a) = 0$  then  $(x - a)$  is a factor of  $f(x)$ ; the remainder when  $f(x)$  is divided by  $(x - a)$  is  $f(a)$

Use synthetic division to find  $f(a)$  and the quotient together.

**Laws of logarithms****LEARN: NOT ON THE LIST**

$\log_a xy = \log_a x + \log_a y$ ;  $\log_a (x/y) = \log_a x - \log_a y$ ;  $\log_a x^n = n \log_a x$   
 $\log_a 1 = 0$ ;  $\log_a a = 1$ ;  $y = a^x \Leftrightarrow x = \log_a y$

In  $x = \log_e x$ . Use logs to find  $a$  and  $b$  from straight-line graphs of  $y = ab^x$  or  $y = ax^b$ .

**Recurrence relations****LEARN: NOT ON THE LIST**

$u_{n+1} = au_n + b$ ; limit  $L = b / (1 - a)$ , which exists when  $-1 < a < 1$

## Trigonometry

**Addition formulae****On the SQA list** $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$  $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ **Double-angle formulae****On the SQA list** $\sin 2A = 2 \sin A \cos A$  $\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$ **Identities and radians****LEARN: NOT ON THE LIST** $\sin^2 x + \cos^2 x = 1$ ;  $\tan x = \sin x / \cos x$ ;  $\pi$  radians  $= 180^\circ$ **Exact values****LEARN: NOT ON THE LIST**

$\sin 30^\circ = \frac{1}{2}$ ,  $\cos 30^\circ = \frac{\sqrt{3}}{2}$ ,  $\tan 30^\circ = \frac{1}{\sqrt{3}}$ ;  $\sin 45^\circ = \cos 45^\circ = \frac{1}{\sqrt{2}}$ ,  $\tan 45^\circ = 1$ ;  $\sin 60^\circ = \frac{\sqrt{3}}{2}$ ,  $\cos 60^\circ = \frac{1}{2}$ ,  $\tan 60^\circ = \sqrt{3}$

Learn them in radians too:  $\pi/6$ ,  $\pi/4$  and  $\pi/3$ .

**Wave function****LEARN: NOT ON THE LIST**

$$a \cos x + b \sin x = k \cos(x - \alpha), \text{ where } k = \sqrt{a^2 + b^2}$$

Expand  $k \cos(x - \alpha) = k \cos x \cos \alpha + k \sin x \sin \alpha$ , compare coefficients, then use the signs of  $k \cos \alpha$  and  $k \sin \alpha$  to find the quadrant of  $\alpha$ . The same method works for  $k \sin(x \pm \alpha)$  and  $k \cos(x + \alpha)$ .

**Calculus****Standard derivatives****On the SQA list**

$$f(x) = \sin ax \Rightarrow f'(x) = a \cos ax; f(x) = \cos ax \Rightarrow f'(x) = -a \sin ax$$

**Standard integrals****On the SQA list**

$$\int \sin ax \, dx = -(1/a) \cos ax + c; \int \cos ax \, dx = (1/a) \sin ax + c$$

**Differentiating powers and the chain rule****LEARN: NOT ON THE LIST**

$$d/dx (x^n) = nx^{n-1}; d/dx [f(g(x))] = f'(g(x)) \times g'(x)$$

Write roots and fractions as powers first, for example  $1/\sqrt{x} = x^{-1/2}$ .

**Integrating powers****LEARN: NOT ON THE LIST**

$$\int x^n \, dx = x^{n+1}/(n+1) + c \quad (n \neq -1); \int (ax + b)^n \, dx = (ax + b)^{n+1} / (a(n+1)) + c$$

**Tangents and stationary points****LEARN: NOT ON THE LIST**

Gradient of the tangent at  $x = a$  is  $f'(a)$ ; stationary points where  $f'(x) = 0$ , then use a nature table

**Area****LEARN: NOT ON THE LIST**

$$\text{Area between curves} = \int_a^b (\text{upper} - \text{lower}) \, dx$$

Area below the x-axis gives a negative integral: split the limits and take the size of each part.

## Checklist: formulae to learn

None of these is on the SQA formulae list. Tick each one when you can write it from memory.

### Straight lines

- ☐ Gradient
- ☐ Equation of a line
- ☐ Parallel and perpendicular lines
- ☐ Distance and midpoint

### Circles

- ☐ Tangents and intersections

### Vectors

- ☐ Magnitude and unit vectors
- ☐ Perpendicular vectors
- ☐ Collinearity and section formula

### Algebra, functions and sequences

- ☐ Discriminant and nature of roots
- ☐ Factor and remainder theorems
- ☐ Laws of logarithms
- ☐ Recurrence relations

### Trigonometry

- ☐ Identities and radians
- ☐ Exact values
- ☐ Wave function

### Calculus

- ☐ Differentiating powers and the chain rule
- ☐ Integrating powers
- ☐ Tangents and stationary points
- ☐ Area

## Official sources

[SQA: Higher Mathematics Paper 1 formulae list \(X847/76/11, 2022\)](#)

[SQA: Mathematics Paper 2 formulae list, 2026](#)

[SQA: Higher Mathematics specimen question paper 1](#)

Always check the formulae list printed in a recent SQA Higher Mathematics past paper.