



SCHOOL OF CIPHER

Signals

Sending a message by flag, lamp, drum, dot and dash

BOOKLET 2 OF 5

Free to copy for home and classroom use
schoolofcipher.com

Morse code	3
Braille	4
Semaphore	5
Resistor bands	6
Binary and hexadecimal	7
Codes that resemble	8
Answers	9
About this booklet	10



Morse code

Two sounds, and you can say anything. A dash lasts three times as long as a dot. The gap inside a letter is one dot, between letters three, between words seven.

A . -	N - .
B - . . .	O - - -
C - . - .	P . - - .
D - . . .	Q - - . -
E .	R . - .
F	S . . .
G - - .	T -
H	U . . -
I . .	V . . . -
J . - - -	W . - -
K - . -	X - . . -
L	Y - . - -
M - -	Z - - . .

Write your name

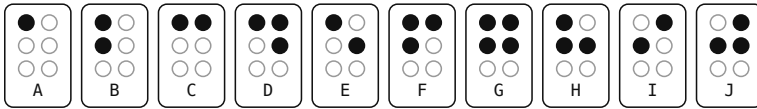
Read this back

... - - - . . . / - - - / - . - - . . . - - .

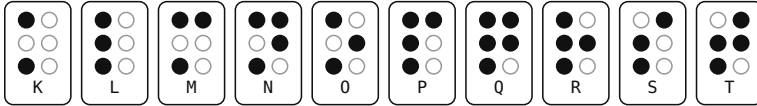
Cut this sheet out and keep it in a pocket. Then go and use a torch across a dark garden with somebody who has the other copy.

Six dots in a cell, two across and three down, read with a fingertip. It is not twenty six shapes to learn: it is ten shapes used three times.

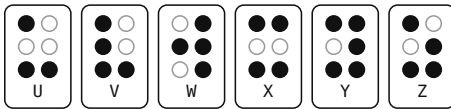
A to J use the top four dots only



K to T are the same ten with the bottom left dot added



U to Z add the bottom right dot as well, except W



W breaks the pattern because French has no W, and Louis Braille was French. It was added later as an afterthought.

Each arm points in one of eight directions, forty five degrees apart. Both arms down is rest.

Draw the arms for each letter

The circles are the signaller seen from the front. Draw two lines out from the middle for each letter, using the chart on schoolofcipher.com.

A: right arm low	B: right arm out	C: right arm high	D: right arm up
E: left arm high	F: left arm out	G: left arm low	H: left across low, right out
I: left across low, right up	J: left out, right up	K: left up, right low	L: left high, right low
M: left out, right low	N: left low, right low	O: left across high, right out	P: left up, right out
Q: left high, right out	R: left out, right out	S: left low, right out	T: left up, right high
U: left high, right high	V: left low, right up	W: left out, right across high	X: left low, right across high
Y: left out, right high	Z: left out, right across low	Both arms straight down: rest, and the gap between letters	

Hold each letter still for two seconds. Semaphore is read when the flags stop, not while they are moving.



Resistor bands

Three coloured stripes on a part too small to print a number on. The first two are digits, the third is how many zeros to add.

black 0	brown 1	red 2	orange 3	yellow 4
green 5	blue 6	violet 7	grey 8	white 9

What are these worth?

brown, black, red

yellow, violet, orange

green, blue, brown

Go and find a real one

Inside almost any old radio, toy or broken gadget there are resistors with these bands. Read one before you look it up.

This code hides nothing. It exists because the part is too small for a number and gets fitted at any angle, by people who may not read the language it was made in. Some codes exist to save space, not to keep secrets.

Binary and hexadecimal

Inside a computer every letter is a number, and every number is a row of switches. Eight switches make one letter.

A 65	B 66	C 67	D 68	E 69	F 70
G 71	H 72	I 73	J 74	K 75	L 76
M 77	N 78	O 79	P 80	Q 81	R 82
S 83	T 84	U 85	V 86	W 87	X 88
Y 89	Z 90	space 32	To write a number in binary, keep halving and note the remainders.		

Decode these switches

01001000 01001001 01000100 01000101

Now write your initials the same way

Hexadecimal is the short way to write the same thing. One hex character stands for four switches, so two of them cover a whole letter: 72 is 48, and 01001000 is 48 as well.



Codes that resemble

Not every code has to be agreed. Some records are simply the same shape as the thing they record.

Sort these into two piles

a sundial's shadow	morse code	a thermometer
a footprint	a resistor band	a record groove
braille	a seismograph line	semaphore

Pile one: **resembles the thing**, and a stranger could work it out with no help.

Pile two: **agreed in advance**, and useless unless you were told the rule.

Only the second pile can keep a secret. If a code resembles its subject, anybody who notices the resemblance can read it. That is the line between signals and ciphers.

**Sheet 1, morse**

The message reads SOS SHIP SINKING.

Sheet 4, resistor bands

brown, black, red = 1, 0, then two zeros = 1,000 ohms, usually written 1k.

yellow, violet, orange = 4, 7, then three zeros = 47,000 ohms, or 47k.

green, blue, brown = 5, 6, then one zero = 560 ohms.

Sheet 5, binary

01001000 01001001 01000100 01000101 is 72, 73, 68, 69, which spells HIDE.

Sheet 6, sorting

Resembles the thing: a sundial's shadow, a thermometer, a footprint, a record groove, a seismograph line.

Agreed in advance: morse, braille, semaphore, a resistor band.

A resistor band is worth arguing about. The colours were agreed, so it belongs in pile two, but it is not trying to keep anything secret. If a child puts it in the wrong pile for a good reason, that is a better outcome than putting it in the right one for none.



About this booklet

School of Cipher is a free set of lessons, animations and worksheets about codes, ciphers, signals and hiding messages, for code-breakers roughly aged seven to eleven.

How this was made. The writing, worksheets, diagrams and animations in this booklet were produced by **Claude**, an AI assistant made by Anthropic, working from a person's prompting, direction and curation. A human chose what the project should be, what belonged in it, what to cut, what was wrong, and what to keep. The AI did the drafting and the building.

Facts have been checked where checking was possible, and where a source could not be confirmed the claim was left out rather than guessed at. If you find a mistake, it is worth telling us: on a site about code-breaking, being corrected is the point.

Sources and further reading

Codes, Ciphers and Secret Writing by Martin Gardner is where this project started, and several of the earliest ciphers here follow his explanations.

Historical details have been drawn from public reference sources, museum material and the published records of the organisations named in the text.

Using this booklet

- Print at **100 per cent**, not fit to page, or any template will come out the wrong size.
- Photocopy freely for a class, a club or a family. No permission needed.
- Every sheet works on its own. There is no need to go in order.

schoolofcipher.com · free forever · no accounts, no tracking, no ads