Codes and Ciphers	**UNIT 13** *Semaphore* Lesson Plan 1	
Activity		***Notes***
		T: Teacher P: Pupil Ex.B: Exercise Book
1	**Introduction**	
	T: Who can tell us anything about semaphore? *(Ps give ideas)*	Interactive discussion on the problems of sending messages before the advent of modern technology.
	T: For this method of signalling we use two flags, one held in each hand. Each flag can be held in any of 8 positions – down, low, out, high and up, on the left or right hand side.	T shows **OS 13.1** on OHP or shows a drawing prepared previously on board. Even better, use real flags and get Ps to illustrate the positions (Ps could demonstrate by holding a book in each hand.)
	T: If the RH flag is in the up position, where can the LH flag be? *(down, low, out, high, across high, across out, across low: Ps may suggest 'up' ...)*	
	... T: Can the LH flag be in the up position? If not, why not? *(Because it would be in the same position as the RH flag and would give a confusing signal)*	
	T: So how many positions could the LH flag be in? *(7)*	**OS 13.2** is shown on OHP; Ps complete the table on the OS.
	T: Come and put this on our grid.	
	T: Next – if the RH flag is in the high position, where can the LH flag be? *(down, low, out, high, up, across out, across low)*	
	T: Well done, but just think about the last one – that is RH high, LH up . Have we had this position before? *(Yes, LH high, RH across high would give the same signal)*	These can be illustrated by two Ps holding flags (or e.g. books) to show these positions.
	T: Yes, this is essentially the same signal so we will not count it again. How many different signals now? *(7 + 6 = 13)*	
	T: I'll give you one minute to determine the total number of available signals.	Ps work in pairs for no longer than 1 minute. T monitors their work.
	T: Who has the answer? Come and show us your working.	
	P (on board): $7 + 6 + 5 + 4 + 3 + 2 + 1 = 28$	Volunteer P writes answer on board. Other Ps agree/disagree. Discuss errors.
	T: Well done.	T praises.
	20 mins	
2	**Design**	
	T: Work in pairs to calculate how many different signals there are with a) 6 positions b) 16 positions for each flag.	Ps work on in pairs on this activity with T monitoring and intervening as necessary. Ps have about 5 minutes to solve the problems.
	T: Who can show us their solutions?	
	P_1 (on board): a) $5 + 4 + 3 + 2 + 1 = 15$	T could ask class if they know a quick way to do this calculation, i.e. using $1 + 2 + ... + n = \frac{n(n-1)}{2}$.
	P_2 (on board): b) $15 + 14 + 12 + 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 120$	
	T: So why do we use 8 positions? *(Easy to see from a distance, patterns for letters)*	Interactive discussion; could lead to working out angles needed for each position, e.g. (a) $120°$, (b) $22\frac{1}{2}°$
	30 mins	

Codes and Ciphers	**UNIT 13** *Semaphore* Lesson Plan 1	*Coding and Decoding*
Activity		***Notes***
3	**Practice** T: Here is the semaphore alphabet and numbers. What do you notice? *(Numbers and letters are coded)* T: How are signals for numbers sent? *(Numerical sign is sent first)* T: And then? *(Zero is K, 1 is A 2 is B, etc.)* T: And when the signaller wants to go back to sending letters ..? *(The signal for J indicates that letter signals will follow)* T: Now try Exercise 1. T: What are the problems with using this system? *(Need to know the code or have it available;* *receiver needs to be able to see signaller clearly,* *easy to make mistakes;* *messages can be easily intercepted, etc.)* *45 mins*	T shows **OS 13.3** and gives each P a copy of this or the Appendix. T should encourage discussion on the type of messages to be sent and whether numbers might be needed – yes, for directions and time, etc. Part a) could be done individually with T monitoring Ps' work and then a review, and then part b) it could be tackled by the whole class.
	Homework Decipher the messages given on **OS 13.4**. (Each P is given a copy.) Find out about Morse Code for the next lesson (Unit 14).	