## Codes and Ciphers

### UNIT 13 Semaphore  
#### Lesson Plan 1

#### Activity 1

**Introduction**

T: Who can tell us anything about semaphore?  
*(Ps give ideas)*

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: 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)*

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*

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.

T: Who has the answer? Come and show us your working.

P (on board):  
\[ 7 + 6 + 5 + 4 + 3 + 2 + 1 = 28 \]

T: Well done.  

#### Notes

- Interactive discussion on the problems of sending messages before the advent of modern technology.
- 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.)

#### OS 13.2 is shown on OHP. Ps complete the table on the OS.

These can be illustrated by two Ps holding flags (or e.g. books) to show these positions.

- Ps work in pairs for no longer than 1 minute. T monitors their work.
- Volunteer P writes answer on board. Other Ps agree/disagree. Discuss errors.
- T praises.

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 could ask class if they know a quick way to do this calculation, i.e. using  
\[ 1 + 2 + \ldots + n = \frac{n(n-1)}{2} \]

Interactive discussion; could lead to working out angles needed for each position, e.g. (a) 120°, (b) 22 1/2°

### Activity 2

**Design**

T: Work in pairs to calculate how many different signals there are with  

- a) 6 positions  
- b) 16 positions

for each flag.

T: Who can show us their solutions?

P₁ (on board):  
\[ 5 + 4 + 3 + 2 + 1 = 15 \]

P₂ (on board):  
\[ 15 + 14 + 12 + 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 120 \]

T: So why do we use 8 positions?  
*(Easy to see from a distance, patterns for letters)*

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#### Activity

**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.)*

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**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).

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### Coding and Decoding

#### Notes

- 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.