

# **Pigskin Patrol Code Breaker Edition**



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## 1. Code Breaking

**Equipment:** Paper, pencil, eraser

**Time:** 45 minutes

### Numeric Code

Code doesn't always have to be letters. Another easy way to create coded messages at home is substituting numbers for letters.

A = 0	I = 8	Q = 16	Y = 24
B = 1	J = 9	R = 17	Z = 25
C = 2	K = 10	S = 18	
D = 3	L = 11	T = 19	
E = 4	M = 12	U = 20	
F = 5	N = 13	V = 21	
G = 6	O = 14	W = 22	
H = 7	P = 15	X = 23	

SECRET  
CODES

Using the handy chart above try your hand at deciphering the following message:

2 17 4 0 19 8 13 6 2 14 3 4 3 12 4 18 18 0 6 4 18 2 0 13 1 4 5 20 13 3 14 13 19 24 14 20 0 6 17  
4 4

Make your own to share with the others - several hours, email it through, then come back & report.

## Symbolic Code

Alien message:

1    $\blacksquare \infty$     $\otimes \equiv \infty$     $\therefore \equiv \# \blacksquare$     $\otimes$

$+\otimes ? \otimes \diamond \square$     $\therefore \otimes \equiv$     $\otimes \blacksquare \otimes \square$

2    $\blacksquare \infty$     $\otimes \equiv \infty$     $\therefore \equiv \nabla \infty \approx \times ? \square$

3    $\cap ? \infty \otimes \Lambda \infty$     $\leftarrow \infty ??$     $* \Lambda$     $\otimes \emptyset \# * \leftarrow$

$\square \# * \equiv$     $\cap ? \otimes \approx \infty \leftarrow$

Alien code

a	b	c	d	e	f	g
$\otimes$	$\emptyset$	$\diamond$	$\times$	$\infty$	$\therefore$	$+$
h	i	j	k	l	m	n
$*$	$\nabla$	$\blacklozenge$	$\star$	$?$	$\blacksquare$	$\approx$
o	p	q	r	s	t	u
$\#$	$\cap$	$\perp$	$\equiv$	$\Lambda$	$\leftarrow$	$*$
v	w	x	y	z		
$\odot$	$\blacksquare$	$\diamond$	$\square$	$\blacklozenge$		

## 2. Invisible ink

Making invisible ink is a lot of fun, you can pretend you are a secret agent as you keep all your secret codes and messages hidden from others. All you need is some basic household objects and the hidden power of lemon juice.

**Equipment:** As follows

**Time:** 45 minutes

# INVISIBLE INK

SCIENCE  
CHALLENGE

22

Designed by Jack,  
Design engineer at Dyson

### The brief

Write your own secret message in an invisible ink solution.

### The method

1. Squeeze lemon juice into the bowl and add a few drops of water. Stir with the spoon.
2. Dip the paint brush into the juice mixture and write a message on the paper.
3. Allow the paper to dry completely. Your message should become invisible.
4. Hold the paper very close to the light bulb to heat up the message area (adult supervision required). Watch your message appear.

### Materials

A lemon  
A bowl  
Water  
A spoon  
A paint brush  
A lamp, or other light bulb



### How does it work?

The lemon juice is an organic substance which reacts with oxygen in the surrounding air, oxidizes and turns brown. By placing the paper right next to the lamp we speed up the oxidation process. The heat from the lamp causes the chemical bonds to break down.

### Did you know?

Oxidation affects lots of different surfaces, from metal to living tissue. A freshly-cut apple that turns brown, a bicycle that becomes rusty or a copper penny that turns green. Not all oxidation is bad – but think about choosing the right materials when designing a product for a particular use.



More detailed instructions here: <https://www.sciencekids.co.nz/experiments/invisibleink.html>

### 3. Make a Paper Helicopter - NASA

**Equipment:** Paper, scissors, paper clips

**Time:** 45 minutes

Details instructions and videos here:

<https://www.jpl.nasa.gov/edu/learn/project/make-a-paper-mars-helicopter/>

Also see James Dyson workbook: Engineering Activity **12 - Design & Build a Helicopter**.

## DESIGN AND BUILD A HELICOPTER

### ENGINEERING CHALLENGE 12

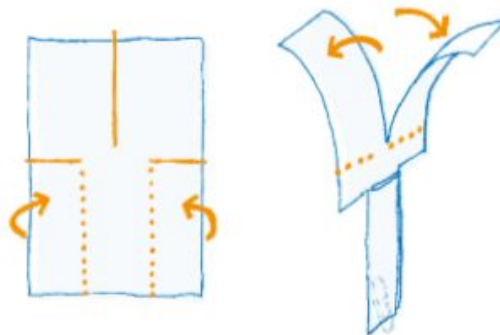
Designed by Ahmed,  
Design engineer at Dyson

#### The brief

Design and build a helicopter  
using only paper and paper clips.

#### The method

1. Take a piece of paper and make three cuts as shown in the illustration. Then fold the paper in on itself at the bottom half – use a paper clip to keep the sides together.
2. Fold the two halves of the remaining paper away from each other, to form the helicopter blades.
3. Stand carefully on a chair and drop your helicopter, making sure it stays upright as you let go!



#### Materials

A sheet of paper  
Paper clips  
Scissors  
(with adult supervision)

#### Design icons



Juan de la Cierva's Cierva C.8.



Leonardo da Vinci's Aerial Screw.

#### 4. Meisha's choice

##### **Puzzle me this?**

**Can you open a 3 digit combination lock using the following clues?**

492 one digit right, in the wrong place.

561 one digit right, and in the right place.

209 all digits wrong.

451 two digits right, both in the wrong place.

843 one digit right, but in the wrong place.

**A second lock needs to be opened and the clues have changed. Can you open this one?**

682: One digit is right and in its place

614: One digit is right but in the wrong place

206: Two digits are right but both are in the wrong place

738: All digits are wrong

380: One digit is right but in the wrong place

Inside is a puzzle that will take a tribe to answer. Can you help everyone come to the right answer?

##### **Einstein's Riddle**

Here's the setup: There are five houses, each painted a different color. In each house lives a person with a different nationality. These five owners drink a certain type of beverage, smoke a certain brand of cigar, and keep a certain pet. No owners have the same pet, smoke the same cigar, or drink the same beverage.

The question is, **who owns the fish?**

Here are the clues:

- The Brit lives in the red house
- The Swede keeps dogs as pets
- The Dane drinks tea
- The green house is on the left of the white house
- The green house's owner drinks coffee
- The person who smokes Pall Mall rears birds
- The owner of the yellow house smokes Dunhill
- The man living in the center house drinks milk
- The Norwegian lives in the first house
- The man who smokes blends lives next to the one who keeps cats
- The man who keeps horses lives next to the man who smokes Dunhill
- The owner who smokes BlueMaster drinks beer
- The German smokes Prince
- The Norwegian lives next to the blue house
- The man who smokes blend has a neighbor who drinks water

Take some time and think it over. Draw out each house. Make a chart for each category, if you want to get really detailed. (Trust us, you do.)

