# CHALLENGE

## Round 1 (Snap)

**One point per question**

(1) What is $8 \times 7$?
(2) What is $6 \times 9$?
(3) What is $3 \times 3 \times 5$?
(4) What is $2 \times 4 \times 6$?
(5) What is $72 \div 8$?
(6) What is $63 \div 9$?

## Round 2 (Snap)

**One point per question**

(1) The nuclear submarine Dreadnought is 266 feet long, whereas a submarine of the older Porpoise class was 295 feet long. What is the difference in length between the two?
(2) A DC-10 aircraft can carry 380 passengers whilst a DC-9 can only carry 139. How many more can the DC-10 carry than the DC-9?
(3) Everton first won the FA cup in 1906 and next won it in 1933. How many intervening years are there between these two years?
(4) The first European cup competition took place in 1958 and it has been held each year since then. What number is the 1981 competition?
(5) A gardener's wife sets about filling a 92 litre water tank using a 4 litre bucket. How many bucketfuls will she need?
(6) The gardener, meanwhile, is in the kitchen baking. He is measuring out a cupful of sugar using a teaspoon which holds 8 g at a time. If the cup holds 200 g, how many teaspoonfuls does he need?

## Round 3 (Disc)

**Three points for a correct answer**

Alison, Bill and Chris share a bag of sweets. Alison, who gets first go, takes one more than half the number in the bag, and Bill then takes two-thirds of what is left, leaving only four for Chris.
(a) How many sweets does Alison take?
(b) How many were there altogether?
(Teams have three minutes and may confer. They do not know which of the two questions is the one that they will have to answer until the three minutes is up.)

## Round 4 (Buzz)

**Two points if correct — one to other side if wrong**

(1) Work began on the Ironbridge over the Severn at Coalbrookdale early in November 1777 and the bridge, the first large iron bridge in the world, was finally opened on New Year's Day, 1781. How many months did the work take?
(2) The total cost of erection of the bridge amounted to very nearly £2 750, compared with a mere £550 allowed for the purpose in the original estimate. How many *times* more was the actual figure than the estimate?
(3) The Pennine Way is 270 miles long. How many days would it take to cover the distance, at an average of 15 miles a day?
(4) How many days would it take to cover the 270 miles at an average of 18 miles a day?
(5) When John Merrill walked the coast of Britain in 1977 his pedometer registered a distance of 4 129 miles round England and Wales and a distance of 2 695 miles round Scotland. What was his total distance?
(6) During the walk he ate 1 511 bars of chocolate. At eight squares a bar, how many squares of chocolate was that?

## Round 5 (Humdinger)

**Four points for a correct answer, written down**

I have a number of wooden cubes, all of the same size, and pots of red and blue paint (shades of Liverpool and Everton!). Each face of each cube is to be painted either red or blue. How many cubes can I produce that are distinguishable from one another?
(The pre-elected contestants have three minutes to answer. *No conferring* is allowed.)

## Round 6 (Snap)

**One point per question**

(1) The River Thames is 210 km long. How long is the River Mersey which is one-third the length of the Thames?
(2) The River Mersey, we've just heard, is 70 km long. How long is the River Clyde which is half as long again as the Mersey?
(3) The Middle East is said to begin at longitude 60° east and end at longitude 100° east. What fraction of the total 360° of longitude is that?
(4) The Far East is said to begin at longitude 100° east and end at longitude 160° east. What fraction of the total 360° is that?
(5) According to the published Bills of Mortality, during one week of the Plague in London in 1665 there were 5 319 deaths altogether, 3 880 of them from the plague. How many of the deaths were from other causes?
(6) Of these other causes 190 were listed as spotted fever and purples and 74 as griping in the guts. How many more unfortunates died from the first of these ailments than from the second?

## Round 7 (Disc)

**Three points for a correct answer**

A dealer buys and sells two motorbikes. He makes a 20% profit on one of the machines but a 20% loss on the other. In fact each of them is sold for £600, the best price he can get for either of them.
(a) What was the total purchase price of the two machines?
(b) How much profit or loss did the dealer make on the deal?
(Teams have three minutes. Either team may be asked either question.)

## Round 8 (Buzz)

**Two points each, *but* a penalty point to the other side if the answer is wrong**

(1) If it takes 25 min to travel 30 km, travelling at a steady rate, how many kilometres will be covered in 30 min?
(2) The lamp posts in my road are 25 of my paces apart. How many paces is it from the first lamp post to the ninth?
(3) Mum has organised three members of the family to slice up marmalade oranges — she says it will only take them a few minutes! In fact it takes the three of them 10 min to do the first half after which one of them has to go off. How long should it take the other two to finish the job?
(4) A set of newly issued stamps consists of the denominations 10p, 11½p, 13p and 15p. How much does it cost for two sets?
(5) In the Isle of Man an unfortunate holiday maker confused the Manx £1 coin with a 5p piece. For a 30p souvenir he offered two 10p pieces *and* two £1 coins. If the assistant had not corrected him how much would he have lost?
(6) In an ice-skating competition the eight judges each give a mark out of six. What would the average score be for someone who got one mark of 5.9, six of 5.8 and one of 5.7?

# CHALLENGE 2

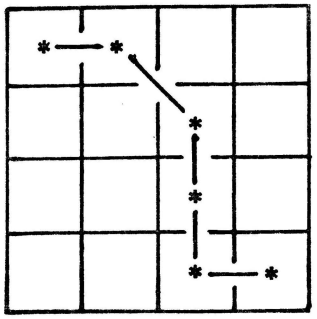
## Genesis

When I say two numbers, Adam adds them and Eve multiplies them. If Adam's answer is 10 and Eve's is 16, what are the two numbers? If Adam's answer is 15 and Eve's is 56, what are the two numbers? Finally, what are the two numbers if Adam says 31 and Eve says 210?

## Across the Board

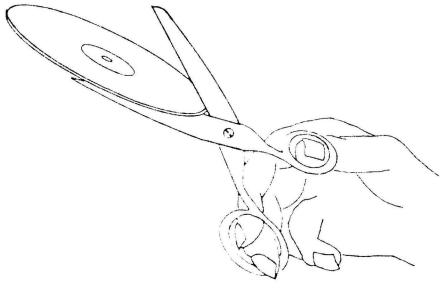
The diagram shows one way of going from top left to bottom right of a 4×4 board, each move being one square → or ↓ or ↘.

**How many ways are there altogether?**



## Slipped Disc

A gramophone record has a spiral groove which winds anticlockwise from the edge to the label in the centre. The record is cut straight across, along a diameter, and,



keeping the record flat, one half is moved by the width of the groove. What happens to the spiral? What happens if the displacement is by twice the width of the groove? (Experiment by drawing a diagram rather than by cutting an actual record in half!)

## Short Hops

Each island in a certain archipelago has an airstrip, no two of the airstrips being the same distance apart. From each airstrip a plane takes off for the nearest neighbouring airstrip. Prove that no airstrip has to cope with the arrival of more than five planes.

## A Cracker

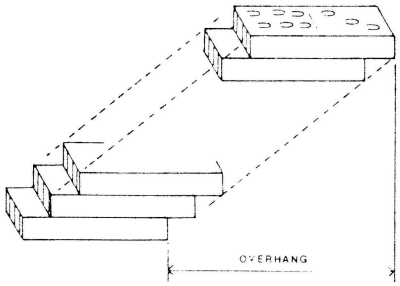
A code is such that each digit represents another one. Break it, given that each of the following is true in ordinary base 10 arithmetic:

$8+7=62$; $5+3=5$; $12+8=23$;
$50+9=54$; $11\times 1=55$; $0-9=1$

Give some indication of how you got your first three or four digits.

## Cliffhanger

You have 10 dominoes each of length 2




inches. They are stacked lengthways overlapping each other as shown. The amount of overlap between each domino and the one above it may vary as you go up the stack. What is the greatest possible size of the "overhang"?

Explain how you found your answer and why you think it is correct.

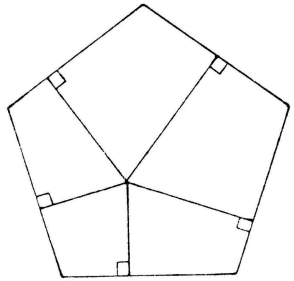
## Dombey and Nephew

Mr Dombey noticed the other day that each of the three numbers 291363, 425308 and 693109 when divided by his

age in years, left the same remainder, which was equal to his nephew's age in years. How old were Mr Dombey and his nephew at the time?

## Penthouse

In the pentagonal house whose plan is given here the five exterior walls are all



of the same length and the internal partitions are all at right angles to the exterior walls on which they abut. Show that the sum of the lengths of the partition walls is independent of the position of the point at which they all meet.

# CHALLENGE

## Answers to Questions

**Genesis** 2 and 8; 7 and 8; 10 and 21.

**Across the Board** 63 ways.

**Slipped Disc** It depends on which direction the half is moved. Keep the left-hand half fixed and move the right-hand half. If it moves up one groove one gets a single clockwise spiral; up two grooves one gets three clockwise spirals; down one groove one gets three anticlockwise spirals; down two grooves one gets five anticlockwise spirals.

**A Cracker**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| code digit: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| equivalent: | 5 | 3 | 4 | 0 | 7 | 9 | 1 | 8 | 6 | 2 |

**Cliffhanger** If the dominoes are each two inches long the maximum overhang is $(1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{9})'' = 2.829''$.

**Dombey and Nephew** Mr Dombey is 89 and his nephew is 66.

**Penthouse** Sum the areas of the triangles each with base one of the five sides and vertex the point at which the partitions all meet.

**Short Hops** The angle between the flight paths of any two arriving planes has (until the planes turn to land) to be greater than 60°.

**Round 1** 56; 54; 45; 48; 9; 7.

**Round 2** 29 ft; 241; 26, not 27; 24th, not 23rd; 23; 25.

**Round 3** (a) Alison takes 14 sweets. (b) There were 26 altogether.

**Round 4** 38 months; 5 times; 18; 15; 6 824 miles; 12 088.

**Round 5** 10. Two of the cubes are each of one colour only, two have one face of one colour and the other five of the other, four have two faces of one colour and the other four of the other, and the remaining two cubes have three faces of each colour.

**Round 6** 70 km; 105 km; $\frac{1}{9}$; $\frac{1}{6}$; 1 439; 116.

**Round 7** (a) £1 250 (b) £50 loss. The first machine was bought for £500 and the second one for £750.

**Round 8** 36 km; 200 paces; 15 min; 99p; £1.90; 5.8.