

#### MASTERS FOR PHOTOCOPYING

# **Masters for Photocopying**

Except where indicated, these Masters are designed to produce single-sided, reusable worksheets. Masters for consumable sheets are labelled (c). Masters for double-sided sheets are labelled \*.

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Name of the game		
-illed in by		·····
While you are playing, write down	n some good and bad features of it.	
Good points	Bad points	
lay the game a few times.		
Play the game a few times. Make a note of the result on the H About how long did each game ta	back of this sheet.	
Play the game a few times. Make a note of the result on the H About how long did each game ta After you have played, say how y	back of this sheet. ake? minutes rou could improve the game.	
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## Looking at other games

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Filled in by\_\_\_\_\_

#### Think of a board game that you like.

What is it called?

Why do you like it?

Is there anything you would change?

#### Think of a board game you don't like.

What is it called?

Why don't you like it?

What could you do to improve it?

### The Great Horse Race

Turn to pages 4 and 5 of your Student's Booklet.

The 'Great Horse Race' is being played.

The scores on the first six throws of the dice are shown below:



- 2. Suppose you want to win the game.
  - (a) Which horse would you not choose? Explain your answer.
  - (b) Which horse would you choose? Explain your answer.
  - (c) Do you think the game is fair? Explain your answer.

### Blank grids for 'The Great Horse Race'

\*\*\*









7



8

1 2 3 4

5 6 9 10 11 12

#### DESIGN A BOARD GAME © Shell Centre for Mathematical Education/Joint Matriculation Board 1987

## **Snakes and Ladders**

Read the following description of a game, and answer the questions which follow.

This is a game for 2 players. You will need a coin and two counters.

#### Rules

Take it in turns to toss the coin. If it is heads, move your counter 2 places forward.

If it is tails, move your counter 1 place forward.

If you reach the foot of a ladder, you must go up it.

If you reach the head of a snake, you *must* go down it.

The winner is the first player to reach 'FINISH'.



- 1. Suppose you start by tossing a head, then a tail, then a head. Where is your counter now?
- 2. List and describe all the *faults* you notice with the *board*.
- 3. Using 3 snakes and 3 ladders, design a good game on a copy of this blank board.

FINISH	14	13	12
8	9	10	11
7	6	5	4
START	1	2	3

## Blank boards for 'Snakes and Ladders'

FINISH	14	13	12
8	9	10	11
7	6	5	4
START	1	2	3

FINISH	14	13	12
8	9	10	11
7	6	5	4
START	1	2	3

FINISH	14	13	12
8	9	10	11
7	6	5	4
START	1	2	3

FINISH	14	13	12
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7	6	5	4
START	1	2	3

FINISH	14	13	12
8	9	10	11
7	6	5	4
START	1	2	3

FINISH	14	13	12
8	9	10	11
7	6	5	4
START	1	2	3

STAGE 2	Brainstorming sheet	Filled in by	What could the theme be? Your game could be about many things.	A trip round the world A murder	A school day (A shopping spree)						M7
STAGE 2	What aim could your game have?	Here are some ideas:	To score the most To collect the To reach the top of points most most money the mountain first	Write down some ideas for different aims.		Whee shorts foot the second state of the secon	Your game could have something that makes it just that bit special.	Maybe it could have	A spinner instead Cards which Counters with of a dice	Write down some different ideas of your own.	

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STAGE 2

What could the board look like? . . .

Brainstorming sheet (continued)



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DESIGN A BOARD GAME

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# Rough plan

Names	
Our game is called	
Who it's for	What you need in order to play
What it's about	Aims of the game

Rules		
How to start		
How to make a move		
Other rules		

# Deep Sea Diving

One group have been discussing their plans for a board game.

Here are some of the things they have decided:



### Treasure

The board drawn below was designed by a group of students, but they haven't written any rules.



### **Answer sheet for 'Treasure'**

Fill in the 'Rough Plan' sheet shown below, so that a young child could understand how to play this game.

Rough plan	
Our game is called	
Who it's for	What you need in order to play
What it's about	Aims of the game
Rules How to start How to make a move	
<i>Other rules</i> Make sure you explain what ha	appens if you land on a gun or a ship.

### **Chasing Packs**

Here is part of a rough plan for a game called 'Chasing Packs'.



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## **Chasing Packs**

Two students are about to make this game.

- 1. How many counters will be needed altogether?
- 2. They are going to make a full-size version of the board. Work out how big the large cardboard base should be, (use the measurements on the rough plan).

The students have found this scrap of black paper



 They could cut out the black squares on the board from it and then paste them on. How many 2 cm by 2 cm squares can be cut from this piece? (Find the *largest* number you can make).



### **Evaluating your own game**

\_\_\_\_\_

Name of the game \_\_\_\_\_

Filled in by\_\_\_\_\_

Read through the **Comments** sheets.

1. What did other people say about your game?

Tick the points you agree with.

2. These are the good points of the game:

3. These are weak points of the game:

Turn over

#### Evaluating your own game (continued)

4. I could improve it by changing the rules like this . . . .

5. I could improve it by changing the board like this ....

6. Next time I design a board game, I will . . . .

7. If a friend asked my advice about designing a board game, I'd say . . . .

#### 8. Space for further points

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## How to . . . draw a spiral

You will need: Pencil, ruler, compasses, scissors, glue, rubber.

1. Draw some concentric semi-circles, with diameters of 2, 4, 6, 8 . . . units.



2. Now draw some more, with diameters of 3, 5, 7, 9 . . . units.



3. Now join the two halves together:





- Write down your new rules
- Play your new version.
- 4. Suppose you keep all the rules the same as on page 9, apart from the rule which says:

'If you have the higher value, move the ball *one* step towards your opponent's goal.

Change this rule to

'If your card is *one* higher than your opponent's, move the ball *one* step towards his/her goal; If your card is *two* higher, move the ball *two* steps . . . and so on'

- Play the game using this new rule.
- What final scores are possible now?
- Describe a game which ends in a score of 6–3.
- 5. Make up some similar questions of your own, which refer to your own rules for question 3. Give them to a friend to solve.

### 'Honeycomb' problems

(See pages 12 and 13 in Stage 1)



- 1. This diagram shows how the board looked after 8 moves in one game.
  - (a) Imagine that you are playing 'Drones' in this game. It is your turn. Where would you put your next Drone counter? Explain why you would do this.
  - (b) Using the same board, now imagine that you are playing 'Workers'. It is your turn. Where would you put your next Worker counter? Explain why you would do this.
- Do you think that the game of 'Honeycomb' is fair? Does it make any difference who goes first? Explain your answers as fully as you can.
- 3. If you start first, and you are playing 'Workers', where would be bad places to go? Explain why. If 'Drones' were to start first, where would be a bad move for them?
- 4. Can the game of 'Honeycomb' ever end in a draw?
  Either: show how the game can end in a draw
  or : explain why the game can never end in a draw.
- 5. Try changing the rules to 'Honeycomb' and play your new version of the game.

## Making and playing board games

Choose a game from those described below. Draw the board, full size, as accurately as you can. Play the game with a friend and comment on it. Now try changing the rules . . .

Ashi – a game for 2 players from Ghana. What you need: 8 counters, 4 of one colour, 4 of another. Aim of the game: To get 3 counters of your colour in a straight line, before your opponent does. How to play Take turns to put a counter on the board, like Noughts and Crosses. When all the counters are on the board, take turns to move a counter to a neighbouring empty position along the lines. (You can only move a counter of your own colour). Drawing the board Draw the circle with a diameter of 18 cm. Lau-Kati-Kata – a game for 2 players from Bengal. What you need: 12 counters, 6 of one colour,

6 of another. Aim of the game: To 'take' all your opponent's counters. How to start: Put your 6 counters on the dots to the left of the centre. Your opponent puts her counters on the dots to the right. The central dot is left empty. How to play Drawing the board Take turns to move a counter to a neighbouring Make all dots 4 cm apart empty dot along a line. (measured along the straight lines) You capture a counter by hopping over it to an empty All the angles are 45° or 90° position beyond. (This is a bit like 'Draughts'). As in 'Draughts', you can make more than one hop in a move. If you can hop over one of your opponent's counters, then you must do so.

#### Making and playing board games (*continued*)

Mu-Torere – a game for 2 players from New Zealand.

What you need: 4 black counters and 4 white counters.

Aim of the game: To block your opponent's counters so that he cannot move.

**How to start:** Each player puts his pieces on four neighbouring points of the star.

#### How to play

Black starts, and players take it in turns to move their counters.

There are 3 kinds of move.

- (a) A counter may be moved to the centre circle if one or both of the neighbouring points on the star are occupied.
- (b) A counter may move from one point to a neighbouring point if it is empty.
- (c) A counter may move from the centre circle to a point.

Only one piece is allowed on each point or in the centre circle.

Jumping is not allowed.





## Looking for winning strategies

Make one of the following games and play it.

In each game, one player can make sure that he or she always wins.

- Try to find this winning strategy
- Try changing the rules, and see what happens

Now try playing a different game.

#### **The Spiral Game**

This is a game for 2 players.

Place a counter on the dot marked '  $\downarrow$  S'.

Take it in turns to move the counter inwards, along the spiral.

On your turn you can only move the counter 1, 2, 3, 4, 5 or 6 dots.

The first player to reach the dot marked '  $\ddagger$  F' wins.



#### Pin them down!

A game for 2 players.

Place the counters on the board as shown.

The players take it in turns to slide one of their counters up or down the board *any* number of spaces.

No jumping is allowed.

The aim is to stop your opponent from being able to move, by pinning all her counters to the wall.



#### Looking for winning strategies (continued)

#### First one home

This game is for 2 players.

Place the counter on any square of the grid.

Now take it in turns to slide the counter any number of squares due West, South or Southwest (like the dotted arrows).

The winner is the player who moves the counter to "Finish".



#### **Domino square**

This is a game for 2 players.

You will need a supply of 8 dominoes or 8 paper rectangles.

Each player in turn, places a domino on the square grid, so that it covers two squares.

After a domino has been placed, it cannot be moved.

If you cannot place a domino on the grid, you lose the game.

#### For example:

This board shows the first five moves in one game.

It is the second player's turn. How can she win with her next move?



## **Games and probability**

Read through the games described below.

Before you play a game, try to answer the following questions:

- Is the game fair?
- If the game is played a lot of times, who would you expect to win most often? Who do you expect to come second, third, ... last? Explain your reasoning.

Now play the game and see if your predictions are correct! Try to explain what you notice.

Double-toss – a game for 3 players.	FINISH
What you need: 3 counters, 2 coins and a large copy of the board.	
Aim of the game: To be the first to get your counter past the finishing line.	
How to start	
Place the 3 counters on their starting squares, labelled 0, 1, and 2.	
Each player chooses a different counter.	
How to play	
Toss the coins.	
If you toss 0 heads, then move counter number 0 one square forward	
1 head, then move counter number 1 <i>one</i> square forward	
2 heads, then move counter number 2 <i>one</i> square forward.	
Keep tossing until one counter wins.	START

<b>Take-away</b> $= a$ dame for 2 or 3 players		<u> </u>	FIN	ISH		
rake-away – a game for 2 of 5 players.						
What you need: 5 counters, 2 dice and a large copy of the board.						
Aim of the game: To be the first to get your counter past the finishing line.						
How to start						
Place the 6 counters on their starting squares, labelled 0 to 5.						
Each player chooses 2 or 3 counters (depending on the number of players).						
How to play						
Roll the dice.				ļ		
<ul> <li>Find the <i>difference</i> between the numbers you roll.</li> <li>(e.g. :: • gives a difference of 3)</li> </ul>	1					
Move the counter which is labelled with this difference, one square forward.						
(e.g. :: • would mean that you move counter number 3	0	1	2	3	4	5
one square forward)	L	•	ST	ART	d	

### **Record sheet**

#### **Criteria satisfied**

		Stage	e 1		Stage	∋2			Stage	3		Stage 4
Name	A student has shown that he or she can:	<ul><li>follow a set of rules.</li></ul>	<ul> <li>evaluate a design and identify faults in it.</li> </ul>	(iii) devise and evaluate improvements to a design.	(iv) list alternative ideas for design features.	<ul> <li>(v) devise a satisfactory rough plan, including spatial layout and instructions.</li> </ul>	(vi) sketch a design to fit given conditions.	(vii) devise rules to fit given conditions.	viii) estimate the materials needed to make a final product.	<ul> <li>(ix) draw a design accurately, following geometric and other specifications.</li> </ul>	<ul><li>(x) take an active part in the production process.</li></ul>	(xi) take part in testing and evaluating their product.
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## Overtaking

Here is the description of a game called 'Overtaking'. Read it through and answer the questions which follow.



#### What it is about

Each player has a counter.

Players take it in turn to throw a dice.

Each player moves his or her counter around the track the number of squares shown on the dice, in the direction of the arrows.

#### How to win

The first player to complete the circuit back to their 'home' square is the winner.

#### Rules

- 1. Red starts first, then Yellow, then Green, then Blue.
- 2. If a counter lands on the same square as another, both counters are removed and those two players are out of the game.

The remaining players continue to play in the same order as before.

## Overtaking

Using counters if you wish, become familiar with the game.

Then answer the questions.

The first 4 throws of the dice give these numbers:



1. On a copy of the diagram, show the position of each counter after the matching moves.

The next three throws give



- 2. Show the *final* positions of the counters after all the moves.
- 3. Which counter has moved the furthest round the track?
- 'Now look what's happened! No-one can win this game!' Explain how this situation could happen in the next move.
- 5. Change one of the rules so that there will always be a winner. Write down the changed rule.

### Arcade

This is the rough plan of a board for the game of 'Arcade'.



Rough plan	
Dur game is called Arcade	
Who it's for 2-4 players	What you need in order to play a counter for each player, a dice
What it's about going round an amusement arcade	Aims of the game
Rules How to start	
How to make a move	
<i>Other rules</i> (make sure you explain what I	happens at the $\blacksquare$ and the $\swarrow$ )

## Nsolo

Nsolo is a game for 2 players. Many versions of the game are found in parts of Africa and India with different names.

A small picture of part of the board is shown here, with a row of 3 equal-sized circles inside a rectangle.



### Star

The diagram below shows a small board design for playing a game called 'Star'.



## **Build a Pyramid**

This is a game for 2 players

### Aim

The first player to build a pyramid with 15 counters, wins the game.

#### Equipment

One board for each player 15 counters for each player 2 dice, one black and one white.



### Preparation

Each player fills her board with numbers. A number from the set  $\{1, 2, 3, 4, 5\}$  must be written in each square. A player can choose to place some or all of these numbers in any position. For example, here are three possible ways:



#### Rules

- Decide which player will be 'BLACK' and which will be 'WHITE'.
- Throw the two dice.
- If the number on the black dice is greater than the number on the white dice, then BLACK calculates the *difference* between the two numbers on the dice and covers any correspondingly numbered square on her board with a counter.



- Similarly, if the number on the white dice is greater than the number on the black dice, then WHITE calculates the difference and covers a corresponding square on her board.
- If both numbers on the dice are equal, neither player covers a number.
- The first player to cover all 15 squares and complete the pyramid wins the game.

## **Build a Pyramid**

Suppose that the two boards are filled in like this:



- (a) Show how you would number your board to give the best chance of winning.
- (b) Explain *why* you think this would give you the best chance of winning.
- 4. Suppose that the game is to be adapted for 3 players using 3 dice and 3 boards. Describe how you would adapt the rules, so that the game will still work.



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### Underground

A group is making up a game for 2 players. It is about travelling on the London Underground. The group want to make up rules so that the winner is the first person to travel through or change trains at every station on the map. Make up a complete workable set of instructions for their game. You can put extra details on the board if you wish.

Who it's for	What you need in order to play
What it's about	Aims of the game

Rules
How to start
How to make a move
Other rules