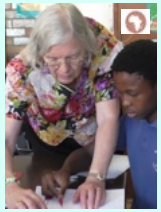
RULES OF THE GAMES
PLAY FOR FUN – THINK TO WIN – PLAY TO LEARN



Toni Beardon

Caroline Ainslie

The book has 36 collections of games with hints, ideas about strategies and the related mathematics, and a brief history of the game. You can download packs of learning resources for all the games from the AIMING HIGH website.

1

LET'S PLAY MATHEMATICALLY AND LEARN

Order from AMAZON or TARQUIN https://www.tarquingroup.com/products/aiming-high-lets-play-mathematically

Play Mathematically
- to develop a love for mathematics
- to unlock knowledge and understanding
- to improve numeracy and visualisation skills
- to practise mathematical procedures
- to motivate concentration and critical thinking
- to boost confidence in mathematical ability.

This **first book** in this AIMING HIGH series provides 36 games that are easy to learn and enjoyable to play for any age. Each comes with reflective questions and materials designed to bring out mathematical thinking and provide a deeper understanding of the topic that underlies the game. Even for the youngest players, this can be transformational.

The **second book** offers suggestions for teachers for using games and puzzles in lessons to teach the regular curriculum with different ideas for different age groups.. It is due to be published in mid 2026.

2

FIFTEEN GAME

2 players or teams

Nine numbered cards or just pencil and paper

Take it in turns to choose one of the numbers 1 to 9 until all the numbers are taken.

It is now your number and your opponent cannot choose it.

Each number can be chosen only once.

To win, be the first to pick 3 numbers that add up to 15.

Write down all the winning combinations of 3 numbers that add up to 15

1 + 9 + 5
1 + 8 + 6
2 + 9 + 4
2 + 8 + 5
2 + 7 + 6
3 + 8 + 4
3 + 7 + 5
4 + 6 + 5

3

ROCK PAPER SCISSORS GAMES

KEEP YOUR BALANCE OR YOU LOSE

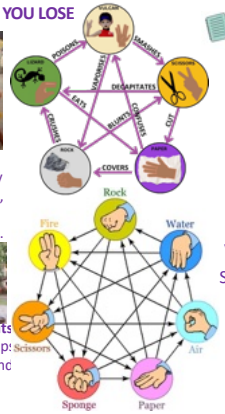
Rules: You can play with 3, 5 or 7 actions.
For 3 actions:
Scissors beats Paper,
Paper beats Rock,
Rock beats Scissors.

GAME FOR TWO: Each player makes one of the signs.

GROUP GAME: Everyone plays against the leader who, on each round, randomly signals scissors, paper or rock but otherwise does not take part in the game.

In the **Side-splits game** winners stay still for that round, losers step to one side with one foot.

In the **Forward-splits game** the loser keeps his back foot still and steps forward with the other foot.



Copies of the networks help players with the 5 action and 7 action games.

7 ACTION GAME

Paper covers Rock.
Rock crushes Lizard.
Lizard poisons Vulcan .
Vulcan smashes Scissors.
Scissors decapitate Lizard.
Lizard eats Paper.
Paper disproves Vulcan.
Vulcan vaporizes Rock.
Rock crushes Scissors.
Scissors cut Paper.

4

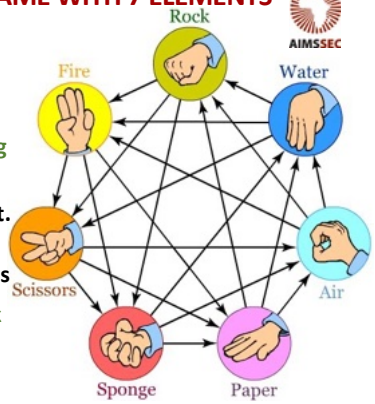
ROCK PAPER SCISSORS GAME WITH 7 ELEMENTS

WHOLE CLASS GAME FOR 2 TEAMS DIRECTED BY TEACHER

Each player chooses an element.
Do they have an equal chance of winning or losing at each turn?

Lines join each point to every other point.
Arrows show which element wins.
Rock > Scissors means Rock beats Scissors

Rock > Scissors > Sponge > Water > Rock is a 4-cycle.
Can you find 3, 4, 5, 6 and 7 cycles in this diagram?



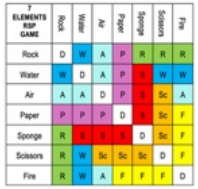
5

ROCK PAPER SCISSORS GAME WITH 7 ELEMENTS

Is the Rock Paper Scissors game a fair game?
Is the 7-element game a fair game?

Two-way tables show all possible events and give winners and draws. They show that each player has the same chance of winning, so the games are fair.

Cycles are a fundamental and important idea in Mathematics.
Can you spot 3, 4, 5, 6 and 7 cycles?



3-cycle: Rock > Scissors > Paper > Rock
4-cycle: Rock > Scissors > Sponge > Water > Rock
5-cycle: Rock > Sponge > Paper > Air > Water > Rock
6-cycle: Rock > Fire > Sponge > Paper > Air > Water > Rock
7-cycle: Rock > Fire > Scissors > Sponge > Paper > Air > Water > Rock

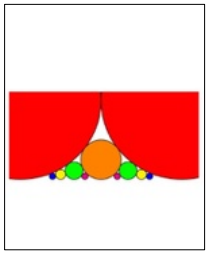
6

DRAW AND TALK GAME

Download the pack of 30 playing cards from AIMING HIGH

This is a game for any number of players and not a competitive game.
Drawing is to get everyone to think about the picture and what it depicts.
Shuffle the cards. The first player takes the top card and describes the image giving clear instructions for the other players to draw the image. Take care to avoid showing either side of the card to the others (there are descriptions on the backs). Players can ask questions which the narrator must answer.
When you decide to stop drawing and talk, show the card to everyone.

FAMILY OF FORD CIRCLES
These circles touch their neighbours. They all touch the horizontal axis (an infinite circle) at rational points:
red circles at integer points,
orange circles at $\frac{1}{2}$,
green circles at $\frac{1}{3}$ and $\frac{2}{3}$,
yellow circles at $\frac{1}{4}$ and $\frac{3}{4}$ etc.



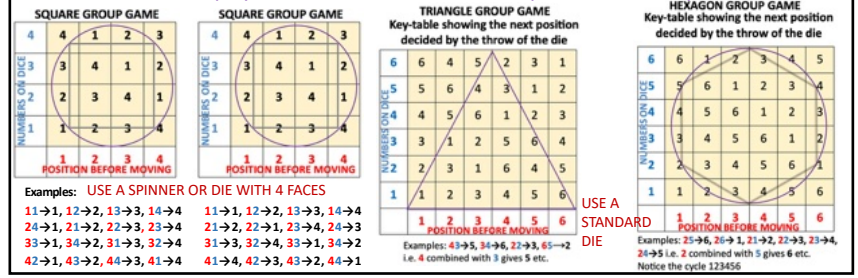
All the players then show their drawings and talk about the patterns, shapes and mathematical ideas that they see in the picture.

7

GROUPS GAMES – up to 6 players

You need counters and strips with 4 squares or 6 squares.

In all the four games players move their counter along a strip and record their first visit to the squares on the strip. Players throw the die in turn and use one of the Game Key-tables below to find where to go next on the strip. For example, if they are on **square 3** and **throw a 4** they go to square 2. They may visit the same square many times, but the first player to record a visit to all the squares on the strip is the winner.



Examples: USE A SPINNER OR DIE WITH 4 FACES

11→1, 12→2, 13→3, 14→4
24→1, 21→2, 22→3, 23→4
33→1, 34→2, 31→3, 32→4
42→1, 43→2, 44→3, 41→4

11→1, 12→2, 13→3, 14→4
21→2, 22→1, 23→4, 24→3
31→3, 32→4, 33→1, 34→2
41→4, 42→3, 43→2, 44→1

USE A STANDARD DIE

Examples: 43→5, 34→6, 22→3, 65→2 i.e. 4 combined with 3 gives 5 etc.

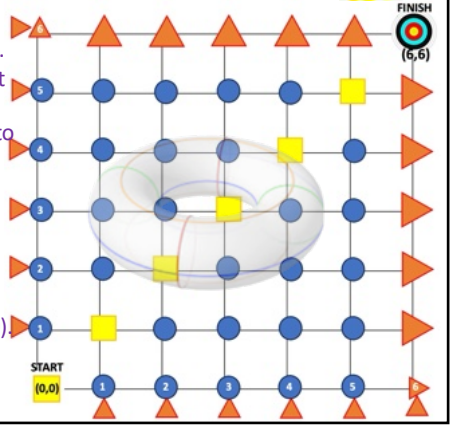
Examples: 25→6, 26→1, 21→2, 22→3, 23→4, 24→5 i.e. 2 combined with 5 gives 6 etc. Notice the cycle 123456

8

VECTORS GAME - up to 4 players

Counters and gameboard.

Start at (0 , 0). Take turns to throw 2 dice. Move your counter from one lattice point to another. Choose one of the numbers for the number of steps across from left to right, and the other number for the number of steps up. If the move would take your counter over the right-hand edge or over the top, it re-enters the board on the left or at the bottom. If it lands on a point occupied by another player, that player starts again from (0 , 0). The first player to land on (6 , 6) wins the round and scores a point. The first player to score 3 points is the winner.



9

SPIN HIGH SPIN LOW

any number of players

Spinner, paper and pencil.

In Spin High the objective is to get the highest 4-digit number. Draw your own 4 square grid. One person spins the spinner to decide the digit. Choose one of the four boxes and write that digit in it. It's more fun if someone says NOW and then everyone shows the group where they have written the digit. Repeat 3 more times and each time everyone writes the digit in one of their empty boxes. Players with the highest number win a point. The winner of the game is the first to score 10 points.

SPIN AND SCORE BY DIFFERENCES GAME

Instead of scoring a point for getting the highest number, play 5 rounds. For each round, work out the highest possible number. Players works out the difference between the 4-digit number they wrote and the highest possible number and keep a record of the total of the differences. The winner of the game, after 5 rounds, is the player with the smallest total of the 5 differences from the best possible numbers.

10

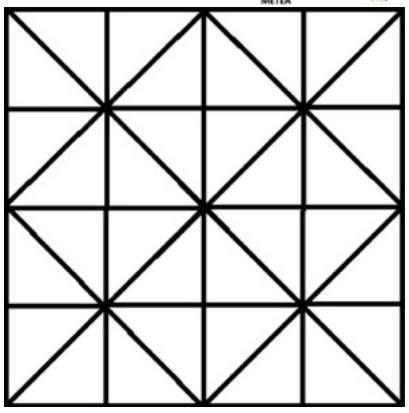
FIVE IN A LINE GAME

2 players or teams

5 counters for each player and gameboard.

Take turns to place one counter at a lattice point. When 10 counters are on the board, take turns to move one of your counters to an adjacent empty space in one of the compass directions (eight possible directions from the central points).

The winner is the first player to get 5 counters in a line.



11

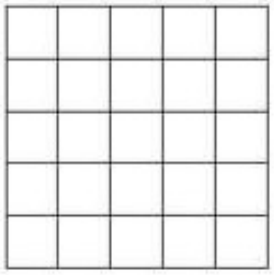
FIVE IN A LINE BINGO

any number of players

Pencil, paper. Cards numbered 1 to 10 and a bag.

The first player to make a row of 5 wins.

Players make their own gameboard by drawing a grid and writing any 25 numbers numbers between 1 and 100 on their board, without repeating any numbers. They cannot change the numbers once they are written on their board. Each round the caller draws 2 cards at random from a bag, replacing the first card before drawing the second. Players try to make some of the numbers on their board by combining the two numbers using one of the operations +, -, × or ÷ e.g. 5 and 10 make 15, 5, 50 and 2. Players mark the numbers they can make on their boards and call BINGO when they get 5 numbers in a row.



12

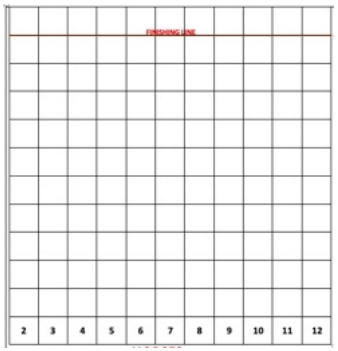
HORSE RACE GAME

up to 11 players or teams

2 dice, 11 counters and 11 cards numbered 1 to 11 in a bag.

Players draw cards from the bag giving them each a horse. If there are fewer than 11 players they take turns to throw a die and pick another horse when they get a six.

To play the game, one player throws two fair dice and adds the numbers to decide which horse goes forward. On each throw, move the counter to show one horse going one square forward or mark an 'x' in the next box. The winner is the first to move 11 times to cross the finishing line.



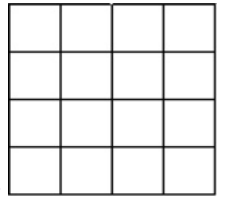
13

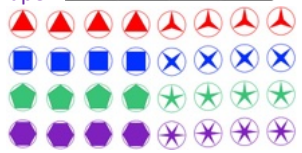
POLYSTARS PUZZLE AND GAME

2 players or teams

32 cards with 4 copies of each polygon and 4 copies of each star in different colours.

Treat this as a puzzle at first. Only play the game when you have solved the puzzle. Before putting the pieces on the board, match the polygons with stars so that each polygon-star pair has a different shape combination and a different colour combination to all the others. Place the polygon-star pairs on the board so that no row, column or diagonal has two polygons or two stars of the same shape - the winning layout. Start the game with an empty board. Take turns to put the polygon-star pairs on the board. When all the pairs are on the board take turns to exchange the positions of two polygon-star pairs until a winning layout is achieved.





14

SQUARES GAME

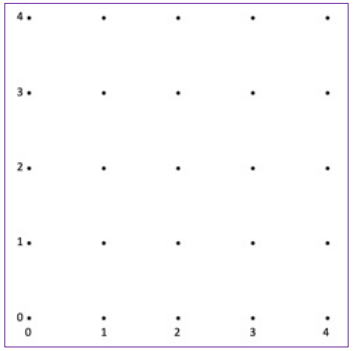
2 players or teams

Counters in two colours or coloured pens.
Draw your own grids

Take turns to claim a dot on the grid by marking it with your colour or placing one of your coloured counters over it.

The winner is the first to complete a square with their colour at the 4 vertices.

The game can be played on the phone (or blindfold) if players tell each other their moves by naming the coordinates of the dot that they are claiming.



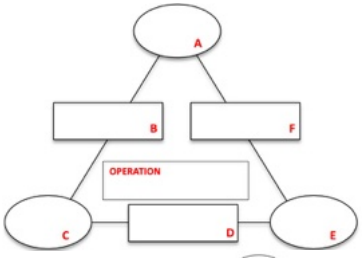
15

CHECKIT

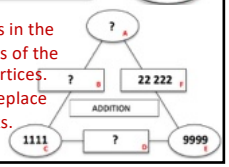
2 players or teams

Pencil and paper.

The entries at the vertices are combined to give the entries in the rectangular boxes.
Agree on the types of entry and the rules.
Each player draws a Checkit frame and creates a puzzle with 6 entries, draws it again removing 3 entries leaving 3 blanks, and gives it as a puzzle to the other player. Both solve the puzzle created by their opponent trying to complete all the entries in the agreed time.
Check solutions, score points for each correct entry and lose points for mistakes.
The winner is the first to get 10 points.



Example: Numbers in the boxes are the sums of the numbers at the vertices. Find numbers to replace the question marks.

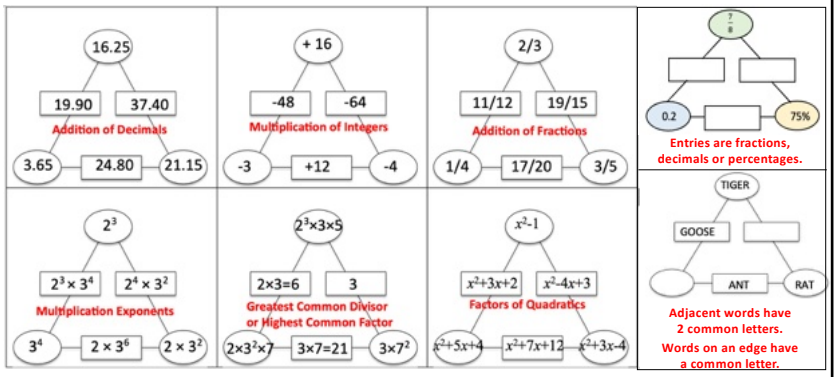


16

Pencil and paper.

CHECKIT

2 players or 2 teams



17

3 by 3 grid and cards numbered 1 to 9

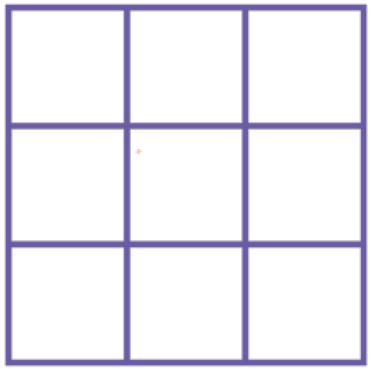
MAGIC SQUARE GAME

2 players or 2 teams

Stage 1: Play the game with a set of cards numbered 1 to 9 and a 3-by-3 gameboard. Take turns either to put one of the 9 cards into an empty square, or to move one of the cards that has already been placed to an adjacent empty square.

Stage 2: Take turns to swap 2 numbers.

The winner is the first player to make a line of 3 cards adding up to 15 (across, up and down or diagonally).



18

Cards in a bag.

FRACTION WALL GAME

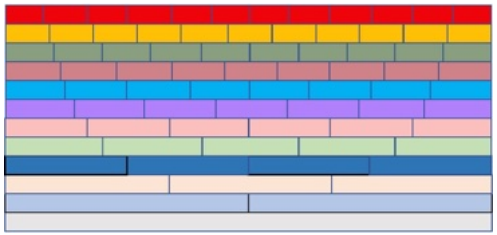
DOUBLE SIX VERSION

2 players or 2 teams

Throw 2 dice or use a spinner. Make a fraction with the numbers on the dice.

Put the smaller number on top, e.g. a 2 and a 3 make $\frac{2}{3}$.

The largest fraction scores a point. Use the Fraction Wall to compare fractions.



ADD THREE FRACTIONS VERSION

Pick 3 cards at random from a bag containing fraction cards 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{12}$.

Replace the cards. Add the 3 fractions using the fraction wall to check answers. The largest fraction scores a point.

19

ODDS AND COLOURS GAMES

2 players or 2 teams

Cards numbered 1 to 9. Other cards coloured red and blue.

Decide how many cards (or balls) of each type are put in the bag.

CARDS FOR 3 ODDS GAMES

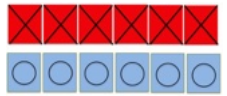
ODDS GAME

Place your chosen cards in the bag.

Draw two cards at random, not replacing the first one. Replace both cards before the next draw. Score points according to whether the numbers on the two cards add up to an odd or even number.

COLOURS GAME

CARDS FOR 5 IN 10 COLOURS GAME



Place your chosen red and blue cards in the bag.

Draw two cards at random, not replacing the first one. Replace them both before the next draw.

Score points according to whether the cards are the same or different colours.

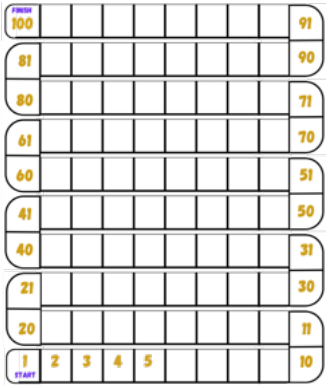
20

Spinner or 2 dice.
Optional: 2 counters for each player and a gameboard.

PIG GAMES

Up to 6 players

Start with zero points. Take turns to throw two dice as many times as you like until you decide to hold, or until you throw a one. Add your score for that turn to your running total. If you throw one 1, you score zero for that turn. If you throw a double 1, your total score becomes zero ***and*** you start all over again. The winner is the first player to land exactly on 100. Once you pass 88, count moves up to 100 then back 99, 98,... etc.
If you use a gameboard to keep score, use one counter to mark the starting square for each turn and, at the end of the turn, put both counters on the same square.



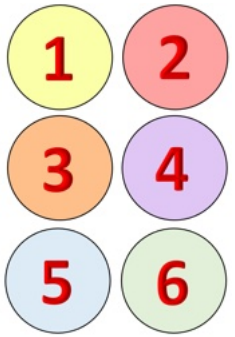
21

LUCKY NUMBERS GAME

Any number of players

A standard die. Cards numbered 1 to 6 in a bag.

THREE IN SIX LUCKY NUMBERS GAME.
This lays the foundation for future deep thinking about assessment of risk. In each round, each player chooses 3 numbers from 1 to 6 and writes them on a piece of paper making a ticket for the lottery. Then 3 numbers are chosen randomly to be the lucky numbers for that round. Players score 10 points if they have chosen 3 lucky numbers, 2 points for 2 lucky numbers and 1 point for 1 lucky number. The first player to get a total of 15 points is the winner.



22

Gameboard. 5 counters (red or gold) for each player. 4 stick dice.

SENET

2 players or 2 teams

This is the starting position. In turn, throw the 4 sticks to determine the number of squares to move. You can jump over other pieces. If you land on one of the opponent's pieces, move it back to the start and take over that square.
If they are blocked in and cannot move, they lose a turn. Always make a move if you can.
To win you must get all 5 pieces off the board at the end of the last row, past square 30.

Square 15. **House of Rebirth** A safe space. You get a bonus throw if you land here.
Square 26. **House of Happiness** A safe space. You cannot go past it without stopping on it.
Square 27. **House of Water** You drown in the River Nile and go back to the House of Rebirth. You don't get a bonus throw.
Square 28. **House of Three Truths** A safe space. You get a bonus throw. Throw a 3 to move.
Square 29.**House of Ra Atum** A safe space. You get a bonus throw. Throw a 2 to move.
Square 30. **House of Ra Horakhty** A safe space. You get a bonus throw. Throw a 1 to move.

1 white side up: move 1 house. Toss again. **2 white sides up**: move 2 houses. Lose a turn.
3 white sides up: move 3 houses. Lose a turn. **4 white sides up**: move 4 houses. Toss again.
4 black sides up: move 5 houses. Toss again.

23

Standard pack of 52 cards.

RED OR BLACK GAME

2 players or 2 teams

Shuffle the cards. One player is dealer and turns the cards face up one at a time.
Before seeing the card, the other player must say 'red' or 'black' and wins the card if the guess is correct, otherwise the dealer wins the card. The winner is the player with the most cards at the end.
To vary the game, 5 cards are removed at the start and put aside, and nobody knows what they are. Otherwise, the game is played in the same way.
To add spice to the game, include jokers. When a joker is dealt the player with the most cards gives the other player 5 cards.

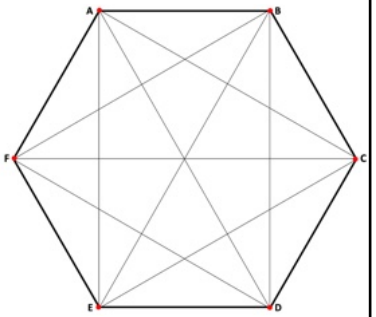
24

Pencil and paper.
Colouring pens.

MYSTIC ROSE GAMES

2 players or 2 teams

Take turns to colour an uncoloured line joining two of the six points A, B, C,… so that it avoids the creation of a triangle with all its edges in your colour.
Only triangles with vertices at three of the points A, B, C, D, E and F are included, intersection points are not relevant.
You must colour a line when it's your turn.
You lose if you complete one of the forbidden triangles, either by mistake or because there is no other move to make.



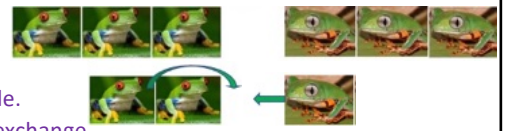
25

Chairs for People Maths.
Counters. Pencil and paper.

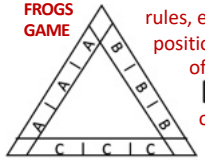
FROGS PUZZLE

2 players or 2 teams

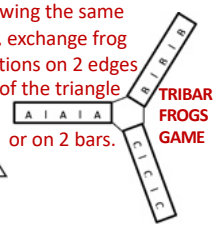
Start with 3 frogs on each side.
You need 7 chairs and 3 people from each team on each side with an empty chair in the middle.
To solve the frogs puzzle teams exchange positions. Hop over one frog or slide to an adjacent space. Red eyes move to the right and orange bellies move to the left.
If the players get blocked, start again.
Then vary the numbers of frogs in the teams.
If you can't do this with people, do the same puzzle with counters.



TRIANGLE FROGS GAME



Following the same rules, exchange frog positions on 2 edges of the triangle or on 2 bars.



TRIBAR FROGS GAME

26

Pencil and paper.

PAT THE PIG GAME

2 players or 2 teams

The winner is the first to get all 3 occurrences of the same letter.

Take it in turns to choose one of the 9 words.
Aim to collect 3 words that contain the same letter and to stop your opponent from doing so. Continue until someone wins or all the words are taken.
Words can only be used once.

CARDS FOR PAT THE PIG GAME

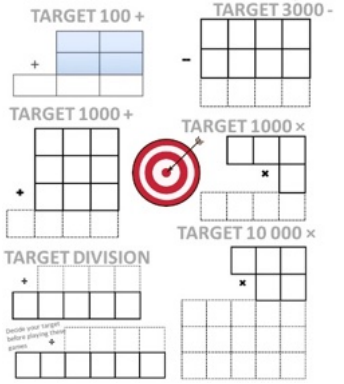
27

TARGET GAME COLLECTION

Spinner or 10-sided die.
Pencil and paper.

Any number of players

The player with an answer closest to the target wins. Target games are played by a small number of players who each spin the spinner to get digits to put in the boxes, or by many players who all use the same set of random digits generated by the group leader. Each version has its game-frame of boxes to fill in, a calculation to do and a target number. As each digit comes up, players write it in one of their empty boxes and can't subsequently change its position. When complete do the calculation.



28

TARGET GAME WITH INTEGERS

Cards as shown.
Pencil and paper.

any number of players

FOR UP TO 6 PLAYERS: Each player picks up a different pair of number cards and tries to hit the same target. You need to agree between yourselves on the best answer at the end of each round.

Examples: Target -10 with (-3) and (-5) Nearest (-3) + (-5) = (-8)
Target -60 with (-6) and (+9) Nearest (-6) × (+9) = (-54)
Target +45 with (-5) and (-9) Nearest (-5) × (-9) = (+45)
MINIMUM number with (-9) and (+2) is (-9) - (+2) = (-11)

FOR A LARGE GROUP: All the players use the same two numbers and choose an operation to combine them to get as near to the target as possible.

0	+1	+2	+3	+4
+5	+6	+7	+8	+9
-1	-2	-3	-4	-5
-6	-7	-8	-9	MINIMUM
NEAREST TO -10	NEAREST TO +75	NEAREST TO 0	NEAREST TO -7	MAXIMUM
NEAREST TO -35	NEAREST TO -60	NEAREST TO +15	NEAREST TO +45	NEAREST TO +8

29

SUM DIFFERENCE GAME

Dice. Pencil and paper

2 players or teams

One of these is a fair game, the other is not, find out which is which.

EVEN ODD GAME Take turns to roll the dice, add up the numbers on the two RED dice and then subtract the number on the WHITE. One player wins by rolling an even score, the other by rolling an odd score, e.g. if the Odd player rolls 6 and 1 on the red dice and 4 on the white, the result is 3 and wins a point because 3 is an odd number. The first player to win 5 rounds wins the game.

ZERO SIX GAME One player throws the dice and the other keeps score. No matter who throws the dice, one player wins the round with a 6 and the other player with a 0. With some throws nobody wins. If the numbers on the red dice are 6 and 1, and the number on the white is 4 the result is 3, there is no winner because this is neither a zero nor a six. Use the 3 dice and choose any 2 of the 4 operations + - × ÷ for a more challenging game.

30

MATHOPIA LOTTERY GAME

49 balls or cards numbered 1 to 49 in a bag.

any number of players

Six different winning numbers are chosen by drawing 6 balls (or cards) at random from the bag containing 49 balls numbered 1 to 49, without replacing any of the balls. Each lottery ticket has 6 numbers. You win a top prize if your 6 numbers match the 6 numbers chosen that week.

Your chance of winning is **1 in 13 983 816 million**.
If you get tired of this game because you never win, then play the Lucky Numbers Game which is more fun.

Investigate the National Lottery in your country.
What is the chance of winning if you buy one ticket?

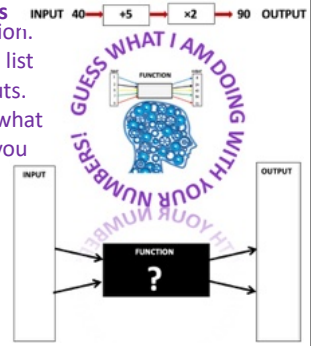
31

FUNCTION GAME

Pencil and paper.

any number of players

One player leads for each round and thinks of a function. Other players suggest inputs. The lead player writes a list for all to see of their inputs with corresponding outputs. ***Otherwise, the game is played in silence.*** Work out what the function does to the input numbers. If you think you have guessed the function put up a hand. You will be told an input. Give the output. If it is correct it is written in the list. The game continues until most players have guessed the function. Talk about the function. The function shown is **add 5 and double**. Another player takes the lead for the next round.



INVERSE FUNCTION GAME Sometimes use the suggested number as an input, sometimes use it as an output. Otherwise play the game in the same way.

32

PELMATHISM

One of 2 sets of cards as shown.

up to 4 players

Shuffle the cards. Place them face down on a table, either in rows and columns or just spread out. Take turns to turn over 2 cards. When the cards match, keep the pair and have another turn. If they don't match, turn them face down in the same positions and the next player has a turn. The player with the most pairs at the end wins the game.

$\frac{1}{2}$	70%	$\frac{5}{3}$	$0.\overline{22}$	120%	$1.\overline{666}$
$0.8\overline{3}$	$\frac{2}{9}$	$\frac{5}{4}$	$\frac{3}{4}$	62.5%	0.7
$\frac{5}{8}$	50%	37.5%	$\frac{7}{8}$	150%	0.6
$\frac{4}{5}$	$83\frac{1}{3}\%$	0.8	125%	$66\frac{2}{3}\%$	$0.\overline{666}$
$\frac{6}{5}$	75%	$\frac{3}{8}$	$\frac{3}{2}$	60%	0.875

	70%	$\frac{5}{3}$	$0.\overline{22}$	120%	$1.\overline{666}$
$0.8\overline{3}$	$\frac{2}{9}$	$\frac{5}{4}$		62.5%	0.7
	50%		$\frac{7}{8}$	150%	0.6
$\frac{4}{5}$	$83\frac{1}{3}\%$	0.8	125%	75%	$0.\overline{666}$
$\frac{6}{5}$		$\frac{3}{8}$	$\frac{3}{2}$	60%	0.875

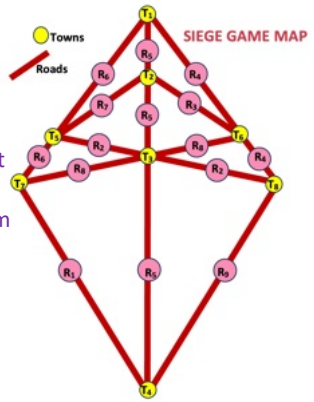
33

SIEGE GAME

Copy of map.
Counters or coloured pens.

2 players or teams

The roadmap shows 9 straight lines representing roads R_1, R_2, R_3, … R_9 and 8 towns T_1, T_2, T_3, …T_8, shown in yellow. The roads go to, or through, the towns. Some roads connect 2 towns, some connect 3 towns, and one road connects 4 towns, but all towns lie on exactly 3 roads. Take it in turns to claim and block one of the 9 straight roads by marking it with your colour or putting a counter on the board, closing the whole road even though it may pass through several towns. The first player to capture three roads going to, or through, the same town, and put it under siege, is the winner.



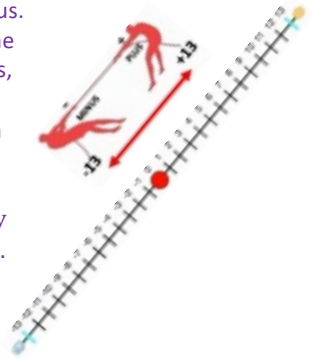
34

TUG OF WAR GAME

2 dice. A counter to mark the position.

2 players or teams

One player or team is called Plus , the other Minus. Place the counter on zero. Take turns to throw the dice, add the scores. Using that number of places, move the counter on the number line in your direction. If you throw a double, you get an extra throw. If your score would overshoot, then you don't move at all. No calculators allowed.
For Minus to win the counter must land exactly on -13 and for Plus it must land exactly on +13.
TUG MUCH HARDER GAME Choose whether to add, subtract, multiply or divide the 2 scores (in either order). The answer must be a whole number.



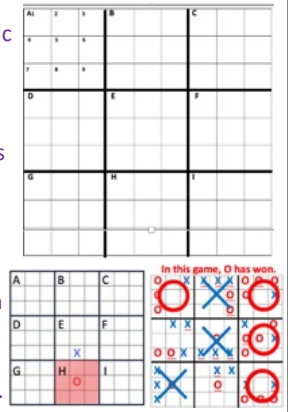
35

ULTIMATE TIC TAC TOE

Red and blue counters.
Draw your own game-board.

2 players or teams

Two players (X and O) play 9 simultaneous games of Tic Tac Toe on a 9 by 9 mega-board taking turns to put their mark on one of the 81 squares. X starts. The position chosen by a player on the 3 by 3 mini-board forces the next player to play on the mini-board that is in the same relative position on the mega-board. See the example. When players win any one of the 9 mini-games, they claim that board and close it down by marking it with a large X or O. If a player has been forced to make the next move on a closed board, then they have a free choice for that move of any position on any other board. To win a player must win 3 games on the small mini-boards, in a line on the mega-board.



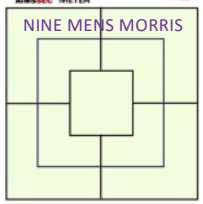
36

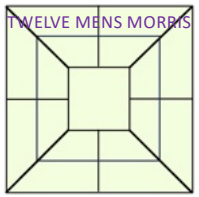
NINE MENS MORRIS

Board as shown.
Counters for each player.

2 players or teams

Stage 1 PLACEMENT: For NINE MENS MORRIS take turns to place one of your 9 counters on any one of the 24 intersection points on the empty board. If you get 3 in a line, remove one of your opponent's counters from play.
Stage 2 MOVING: Take turns to move one of your counters to an adjacent point. No jumps are allowed. If you get 3 in a line, remove one of your opponent's counters.
Stage 3 FLYING: (optional) When a player is reduced to 3 counters they can 'fly' to any vacant point. You lose if you are reduced to 2 counters or have no legal moves.
VARIATIONS include Three, Six, Ten and Twelve Mens Morris played similarly with the corresponding number of counters.





37

L GAME

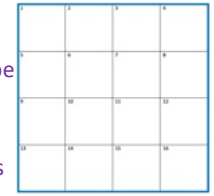
4 by 4 board.
2 L pieces and 2 counters

2 players or teams

You win by blocking in your opponent's L shape so the opponent cannot move. Pieces cannot overlap but they can be turned over. The L shape must be moved before the counter.

From this starting position, the first player chooses an L shape and moves it on the board, then chooses whether or not to move one of the counters.
The second player moves the other L shape, then after that one of the counters if they wish. Players can only move their own L shape, but they can move either counter.

The squares are numbered for play blindfolded or on the phone.



In these positions blue has won.
Aim to force your opponent to move into a corner.

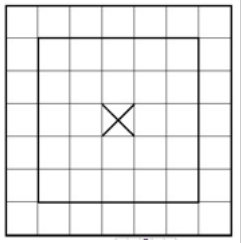
38

SEEGA

Board as shown.
24 counters for each player.

2 players

To win you must capture all your opponent's men.
STAGE 1: Until all the men (counters) have been placed, in turn, players put 2 of their men in squares on the board but not on the centre square,
STAGE 2: Start Stage 2 by Player 1 moving one of his men to the centre square. If unable to do so, he can remove one of his opponent's men. In turn, players move one of their men horizontally or vertically, not diagonally. They cannot jump over other men.
To capture a man, a player places 2 of his men, one on either side of one of his opponent's men (horizontally or vertically). If a player puts a man between two opponent's men, nothing happens. After a capture, the player can move again if that results in another capture.



Cream can capture a purple counter.

Purple can capture 3 cream counters.

39

MEAN MEDIAN MODE GAME

Pencil and paper.

any number of players

A game for people who want to get to grips with the different averages and want to develop the skill of working systematically. One player thinks of any 5 positive numbers and tells the group their mean, median and mode (which could all be fairly small whole numbers to keep it simple). Players are given 2 minutes to find sets of 5 numbers with the given mean, median & mode. After 2 minutes players score a point for each solution that they have found. Repeat for different choices of mean, median and mode. The first player to get to 20 points is the winner.

For mean 4, median 3 and mode 3 the solutions are:

1, 2, 3, 3, 11	3, 3, 3, 3, 8
1, 3, 3, 3, 10	3, 3, 3, 4, 7
1, 3, 3, 4, 9	3, 3, 3, 5, 6
1, 3, 3, 5, 8	
1, 3, 3, 6, 7	**Bi-modal**
2, 3, 3, 3, 9	1, 1, 3, 3, 12
2, 3, 3, 4, 8	2, 2, 3, 3, 10
2, 3, 3, 5, 7	2, 3, 3, 6, 6

For mean 7, median 6 and mode 5 the solutions are:
5, 5, 6, 7, 12
5, 5, 6, 8, 11
5, 5, 6, 9, 10
and 5, 5, 6, 6, 13

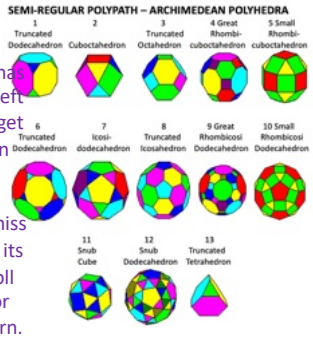
40

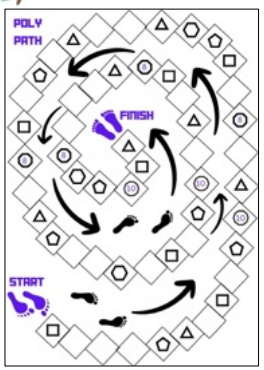
SEMI-REGULAR POLYPATH GAME

up to 6 players

Board as shown. Counters.

In turn roll the die and move your counter that number of spaces. When you land on a shape, imagine that a regular 3D solid shape (polyhedron) has 'walked' along the track and left a 2D footprint (polygon). You get a point for naming the polygon and an extra point for each polyhedron you name. If you can't name the polygon you miss a turn, return your counter to its previous position. You must roll the correct number to finish or stay where you are for that turn.





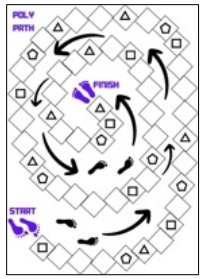
41

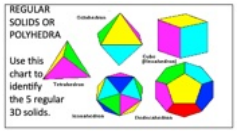
REGULAR POLYPATH GAME

Board as shown. Counters.

up to 6 players

REGULAR POLYPATH GAME In turn roll the die and move your counter that number of spaces. When you land on a shape, you must imagine that a regular 3D solid shape (polyhedron) has 'walked' along the track and left a 2D footprint (polygon). What solid could it be? When you land on a shape, you get a point for naming the polygon and an extra point for each polyhedron you name. If you can't name the polygon you miss a turn, returning your counter to its previous position. You must roll the correct number to finish or stay where you are for that turn.





42

DIVISIBILITY GAME

Ladder. Counters. Pencil and paper.

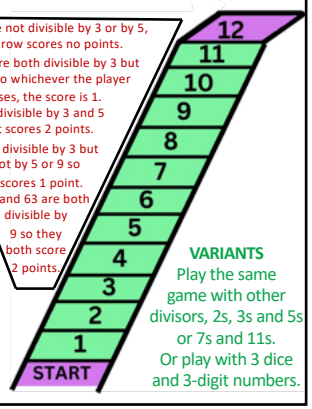
any number of players

THREES AND FIVES In turn, throw 2 dice to determine 2 digits and make a choice between two 2-digit numbers (unless you throw a double). Players score:

1 point if the number is divisible by 3 or 5,
2 points if it is divisible by the square of 3 or 5,
and 3 points if it is divisible by the cube of 3 or 5.

Use the ladder to record the score, e.g. for a 4 and a 6, you can make the number 46 or the number 64. Claim your points and explain how you got them from the divisors. If you make a false claim, stay on the same step. One counter can go past another, but it is blocked by a step with 2 counters on it.

64 and 46 are not divisible by 3 or by 5, so this throw scores no points.
12 and 21 are both divisible by 3 but not by 5, so whichever the player chooses, the score is 1.
15 is divisible by 3 and 5 so it scores 2 points.
51 is divisible by 3 but not by 5 or 9 so it scores 1 point.
36 and 63 are both divisible by 9 so they both score 2 points.

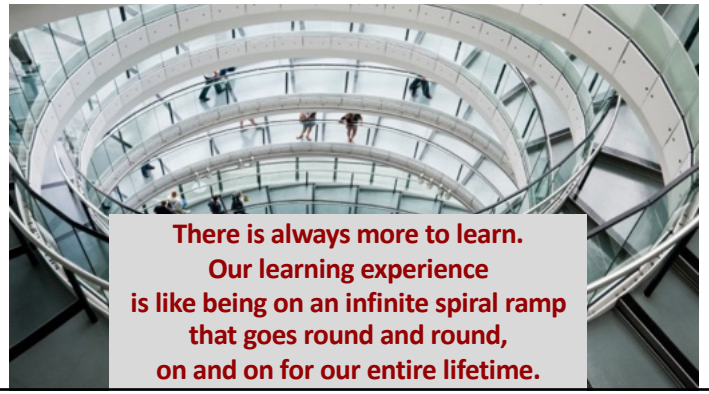


VARIANTS
Play the same game with other divisors, 2s, 3s and 5s or 7s and 11s.
Or play with 3 dice and 3-digit numbers.

43

LIFELONG LEARNING

Build skills and understanding on a spiral path



44

AIMSSEC

AIMS | African Institute for Mathematical Sciences
SCHOOLS ENRICHMENT CENTRE
6 MELROSE RD, MUIZENBERG 7975
CAPE TOWN, SOUTH AFRICA
T: +27 (0) 21 787 9326

GTEN

AN AIMING HIGH LEARNING PACK IS A WEBPAGE CONTAINING

A learning activity with links to:

a. PDF of the worksheet
b. Templates and instructions for making resources
c. Videos
d. Notes for Teachers with
   - solutions
   - curriculum links and learning objectives
   - diagnostic quizzes
   - suggestions for teaching
   - key questions to guide learning
   - follow up ideas and links

https://aiminghigh.aimssec.ac.za/

e. Inclusion Guides for School and Home Learning with
   - a starter activity for a mixed–age group to do together
   - a collection of learning activities to suit all ages from 4 to 18+
   - Solutions with suggestions for teaching and assessment.

45

Links for learning packs on the AIMING HIGH website

1. Fifteen Game Collection	https://aiminghigh.aimssec.ac.za/fifteen-game-collection/
2. Rock Scissors Paper Games	https://aiminghigh.aimssec.ac.za/rock-scissors-paper-game/
3. Draw and Talk	https://aiminghigh.aimssec.ac.za/draw-and-talk-game/
4. Groups Game	https://aiminghigh.aimssec.ac.za/groups-games/
5. Vectors Game	https://aiminghigh.aimssec.ac.za/vectors-game/
6. Spin High Spin Low	https://aiminghigh.aimssec.ac.za/spin-high-or-low-game/
7. Five in a Line Game and Bingo	https://aiminghigh.aimssec.ac.za/five-in-a-line-game/
8. Horse Race Game	https://aiminghigh.aimssec.ac.za/the-horse-race-game/
9. Polystars Puzzle and Game	https://aiminghigh.aimssec.ac.za/polystars-game/
10. Squares Game	https://aiminghigh.aimssec.ac.za/squares-game/
11. Checkit Collection	https://aiminghigh.aimssec.ac.za/checkit-challenge/
12. Magic Square Game	https://aiminghigh.aimssec.ac.za/magic-square-game/
13. Fraction Wall Games	https://aiminghigh.aimssec.ac.za/?s=fraction+wall
14. Odds and Colours Games	https://aiminghigh.aimssec.ac.za/odds-and-colours-games/
15. Pig Games	https://aiminghigh.aimssec.ac.za/game-of-pig/
16. Lucky Numbers Game	https://aiminghigh.aimssec.ac.za/lucky-numbers-game/
17. Senet	https://aiminghigh.aimssec.ac.za/senet/
18. Red or Black Game	https://aiminghigh.aimssec.ac.za/red-or-black-game/

46

Links for learning packs on the AIMING HIGH website

19. Nim Games	https://aiminghigh.aimssec.ac.za/one-three-five-seven-game/
20. Mystic Rose Game	https://aiminghigh.aimssec.ac.za/mystic-rose-game/
21. Frogs Puzzle and Game	https://aiminghigh.aimssec.ac.za/frogs-puzzle-and-game/
22. Pat the Pig Game	https://aiminghigh.aimssec.ac.za/pat-the-pig/
23. Target Games Collection	https://aiminghigh.aimssec.ac.za/target-game-with-integers/
https://aiminghigh.aimssec.ac.za/target-games-collection-suitable-for-all-ages/	
24. Sum Difference Game	https://aiminghigh.aimssec.ac.za/sum-difference-game/
25. Mathopia Lottery	https://aiminghigh.aimssec.ac.za/mathopia-lottery-game/
26. Function Game	https://aiminghigh.aimssec.ac.za/function-game/
27. Pelmathism	https://aiminghigh.aimssec.ac.za/pelmathism/
28. Siege	https://aiminghigh.aimssec.ac.za/the-siege-game/
29. Tug of War Game	https://aiminghigh.aimssec.ac.za/tug-of-war-game/
30. Ultimate Tic Tac Toe	https://aiminghigh.aimssec.ac.za/ultimate-tic-tac-toe/
31. Nine Mens Morris	https://aiminghigh.aimssec.ac.za/?s=Nine+Men
32. L Game	https://aiminghigh.aimssec.ac.za/the-l-game/
33. Seega	https://aiminghigh.aimssec.ac.za/?s=seega
34. Mean Median Mode Game	https://aiminghigh.aimssec.ac.za/m-m-and-m-game/
35. Polypath Game	https://aiminghigh.aimssec.ac.za/polypath-game/
36. Divisibility	https://aiminghigh.aimssec.ac.za/divisibility-game/

47