

**CHOOSE
MATHS**

AN **AMSI** SCHOOLS PROJECT

AMSI Presents

CHOOSE MATHS

BHP Foundation

**Activity
Booklet
2020**

DELIVERED BY



INFORMATION

The following games, activities and challenges have been used during various **CHOOSEMATHS** Family Nights and Games Days with students, teachers and parents across the last five years of the **CHOOSEMATHS** project.

These activities are designed to not only engage students with mathematics but also provide students with the opportunities to practice key mathematical skills including counting, addition, multiplicative thinking, problem solving and reasoning.

We encourage all families to have a look at the activities, follow the instructions and play them together. Although winning is fun, we encourage you to discuss the strategies being used during each activity and consider ways the activity could be modified so it might be used as a challenge for your whole family.

Please visit the **AMSI Schools Calculate** website to discover more games and activities you may wish to try: <https://calculate.org.au/games/>

Also, on Twitter, checkout the @AMSISchools #MathsTalk hashtag for regular updates and tips about learning mathematics.

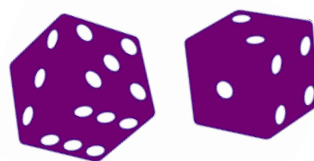
TIPS

Many of the activities use common classroom materials such as dice, counters or playing cards. If you do not currently have access to these materials, consider using these alternatives:

- Use blocks, pebbles, matchsticks, coins, beads or pasta for counters
- Create cards or counters using paper or post-it notes
- Use chalk to draw games outside or use pen and paper to recreate gameboards
- Download a free dice app for your phone or access a dice program online, such as <https://www.random.org/dice/>

Enjoy the challenges!

AMSI Schools Outreach Team 😊



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ACTIVITY 1: TRAFFIC LIGHTS

Traffic Lights is a game for two players that is based around the traditional noughts and crosses (or Tic Tac Toe) style game.

Object

To be the first player to have 3 counters of the same colour in a line (row, column or diagonal).

Materials:

9 **red**, 9 **yellow**
and 9 **green**
counters

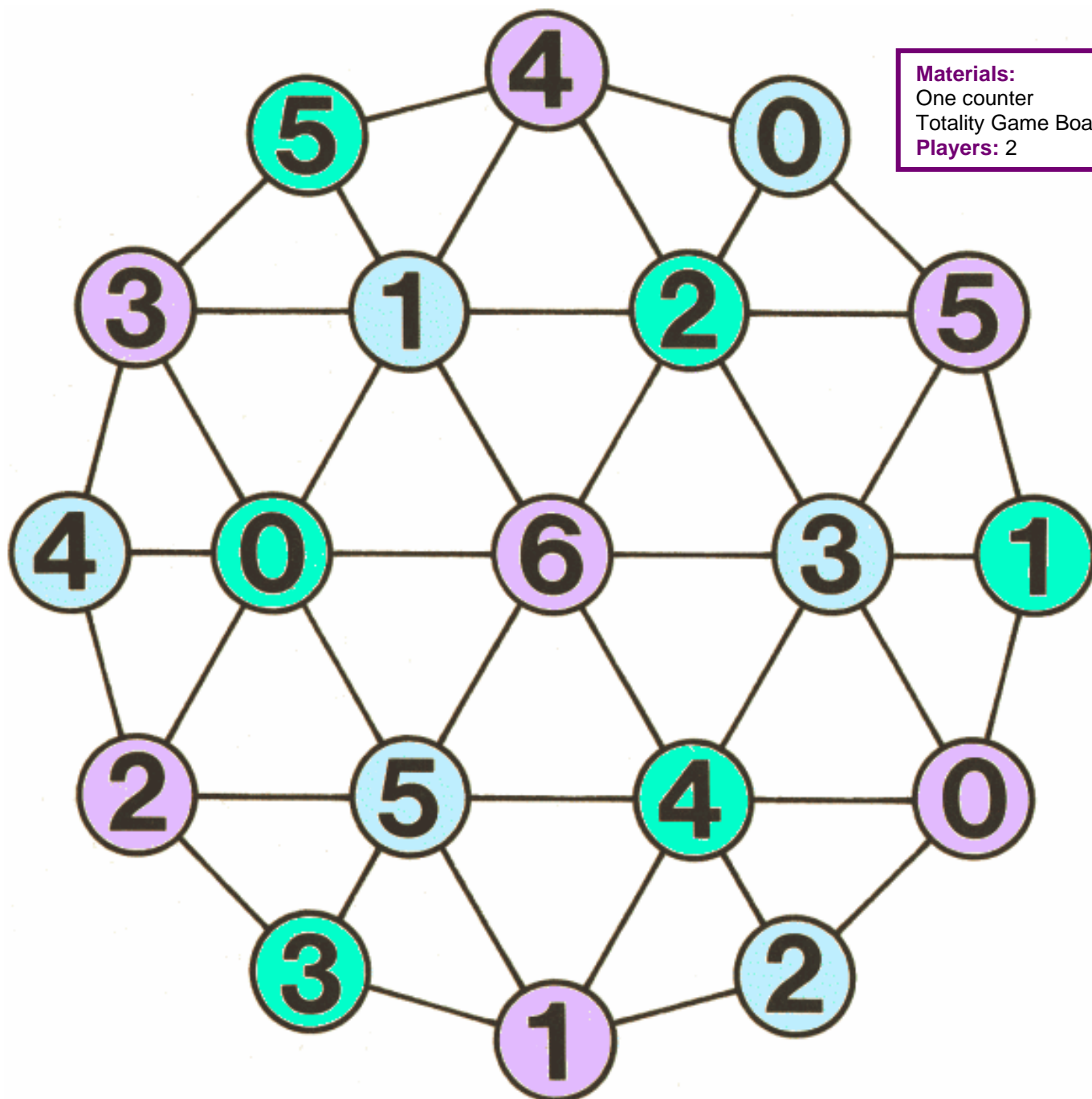
Players: 2

Instructions

1. At the start of the game the board is empty
2. The players take turns to play
3. On your turn a player may:
 - Place a **red** counter in an empty square, or
 - Place a **yellow** counter on top of a **red** counter, or
 - Place a **green** counter on top of a **yellow** counter
4. You win by completing a line (row, column, or diagonal) of three counters **all the same colour** (Note: It doesn't matter who placed the first counter(s) in the line - it's the third counter of the line which determines the winner).

Source: Traffic Lights <https://nrich.maths.org/1181>

ACTIVITY 2: TOTALITY



Materials:
One counter
Totality Game Board
Players: 2

Instructions

- Player 1 chooses the overall total, for example 20, this is the total both players are trying to reach
- Player 2 places the counter on the game board – this number begins the count
- Player 1 moves the counter in any direction along a line segment to a neighbouring number and announces the total of the two numbers
- Players take it in turns to slide the counter to cover a neighbouring number and to add that number to the 'running' total
- Players must move when it is their turn and no 'jumping' is allowed
- The winner is the player who reaches the total or forces the other player to 'bust'

Source: NRICH – Totality Game <https://nrich.maths.org/1216>

ACTIVITY 3: ROWCO

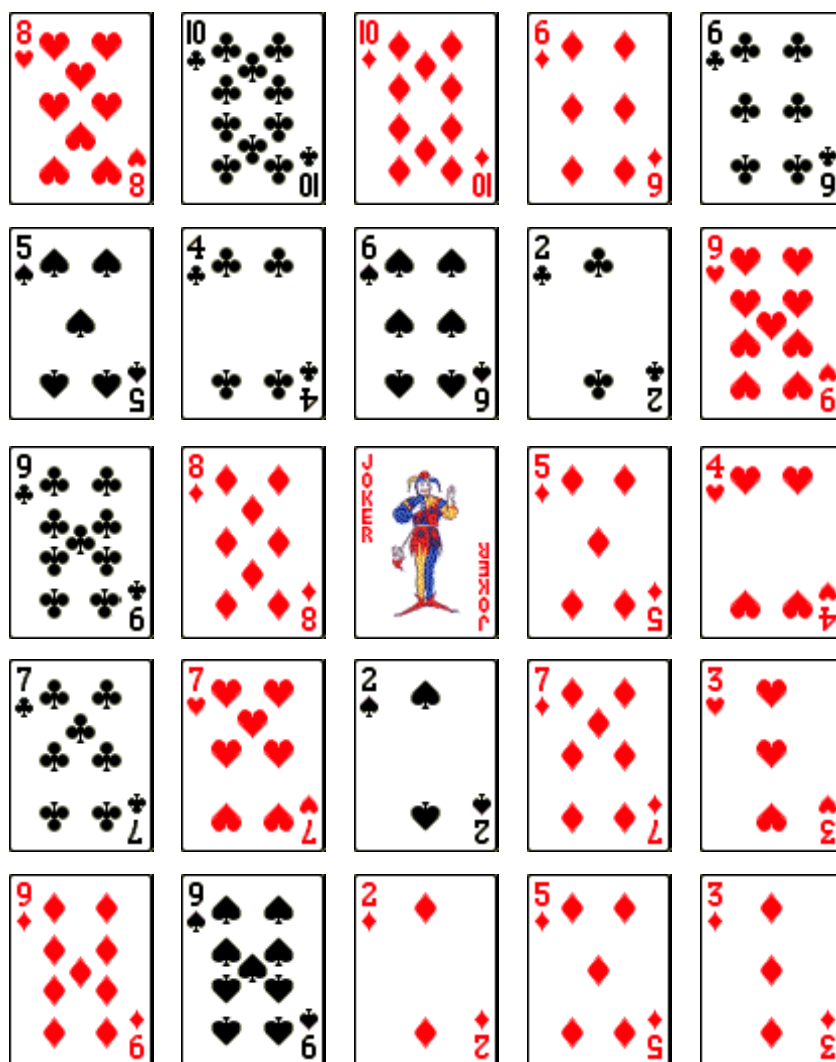
Materials:

Deck of cards (Picture cards removed – keep one Joker card)
Aces represent 1

Players: 2

Instructions

- The object of this game is to collect the highest combined total
- After removing the Picture cards place the remaining cards in a 5 x 5 grid with the Joker in the centre
- Player 1 chooses whether he wants to be Rows or Columns, here Player 1 has chosen Rows
- Player 2 will play as Columns – she begins by moving the Joker from the centre and selecting the 10 of Diamonds which is the highest card in the Joker's Column
- She places the 10 of Diamonds in her pile and leaves the Joker in the now empty space
- Player 1 will now move the Joker to the highest remaining card in this Row – here it will be the 10 of Clubs
- Play continues until players are unable to choose from the row or column that contains the Joker
- Players then add up the cards in their collection pile
- The winner is the player with the highest total



Challenge

- For a challenge – use the black cards as positive numbers and the red cards as negative numbers
- Play the game the same but remember that choosing red cards will decrease a player's total score

Source: This activity has been adapted from the RowCo game developed by Dr Paul Swan <http://www.drpaulswan.com.au/>

ACTIVITY 4: FLIP TEN

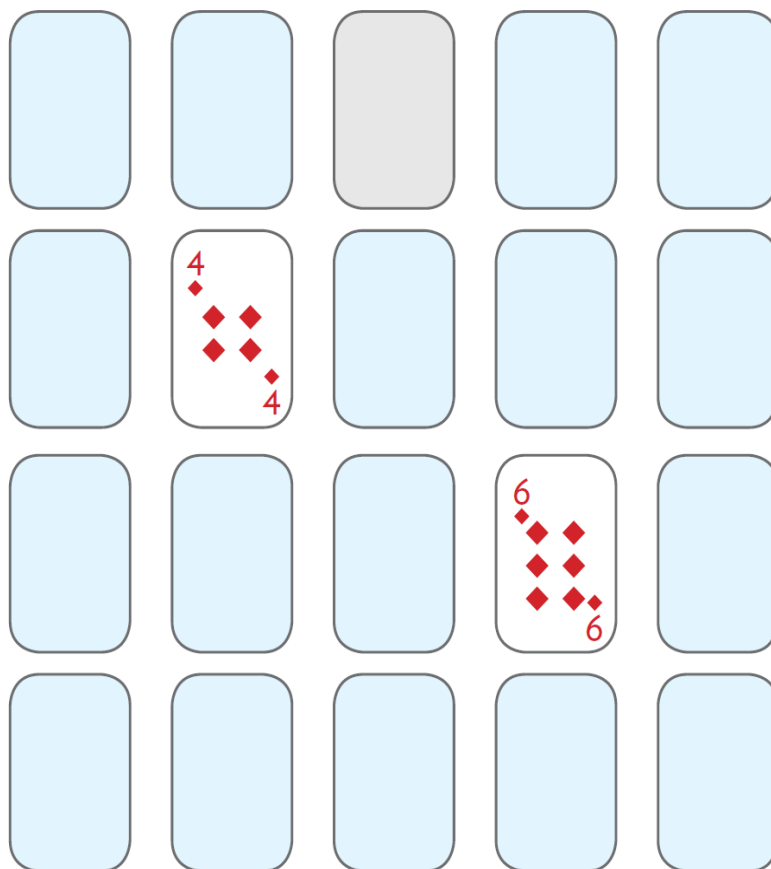
Instructions

- Arrange the playing cards face down in a 4 x 5 array (see below)
- Each player takes it in turn to flip over two cards
- To form a match the cards must add to 10
- If there is no match the cards are returned to their location
- If the cards do form a match they are removed from the array and replaced with any remaining cards from the deck
- The game ends when no further matches can be made
- The winner is the player who has the most matches

Materials:

Deck of cards
(Picture cards & 10s removed)
Aces represent 1

Players: 2



Source: Mathematical Association of Victoria. (2016). *Family maths night: Schools support resource*. MAV: Brunswick, Victoria.

ACTIVITY 5: SNAP!

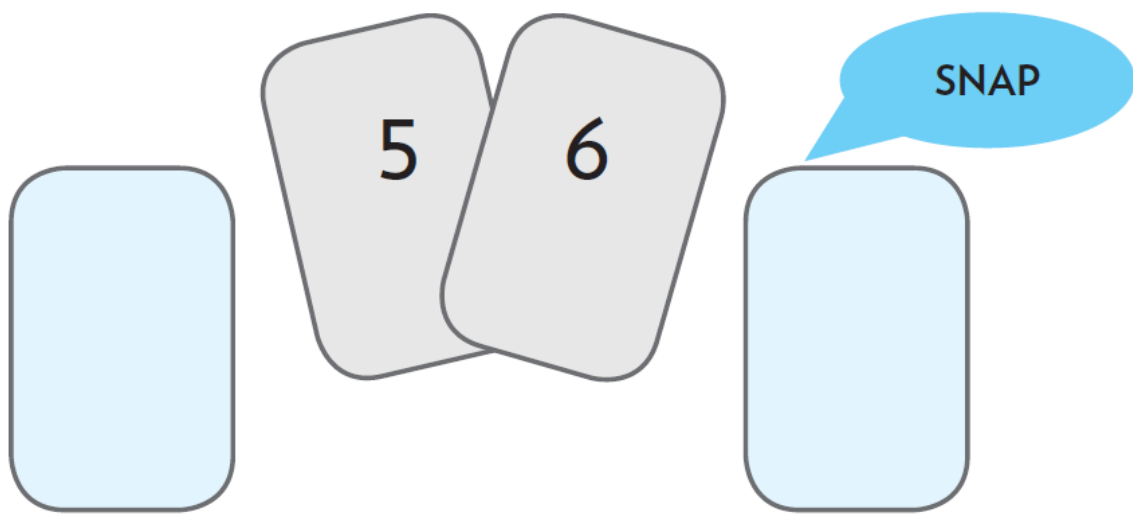
Snap is a common card game played across the world. Traditionally when the cards turned over match 'Snap' is called and if correct the caller collects all the cards. Here are some alternatives. The object of the game is to win all the cards in the deck.

Materials:

Deck of cards
(Picture cards removed)
Aces represent 1

Players: 2

- Call "Snap" when the difference between the cards is one
- Call 'Snap' when one card is a multiple of the other, e.g. 2 and 6 or 3 and 9



Source: Mathematical Association of Victoria. (2016). *Family maths night: Schools support resource*. MAV: Brunswick, Victoria.

ACTIVITY 6: THREE PILE NIM

Materials:

12 Counters

Players: 2

Objective

Be the player to remove the final counter, without leaving any stacks.



Instructions

- To begin, make three stacks; one with 3 counters, one with 4 counters and one with 5 counters
- Players take turns at removing counters from stacks
- During their turn, players can take one or more counters, but only from one stack at a time
- The winner is the player who takes the last counter(s), leaving no stacks

Source: AAMT – https://www.literacyandnumeracy.gov.au/sites/nlnw2015/files/downloads/three-pile-nim_2017.pdf

ACTIVITY 7: KANGAROO HOP

Materials:

12 small counters
Kangaroo Hop Gameboard

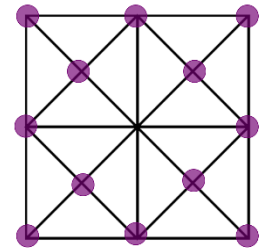


Objective

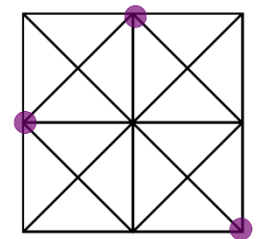
The aim of the game is to remove all the counters except one.

Instructions

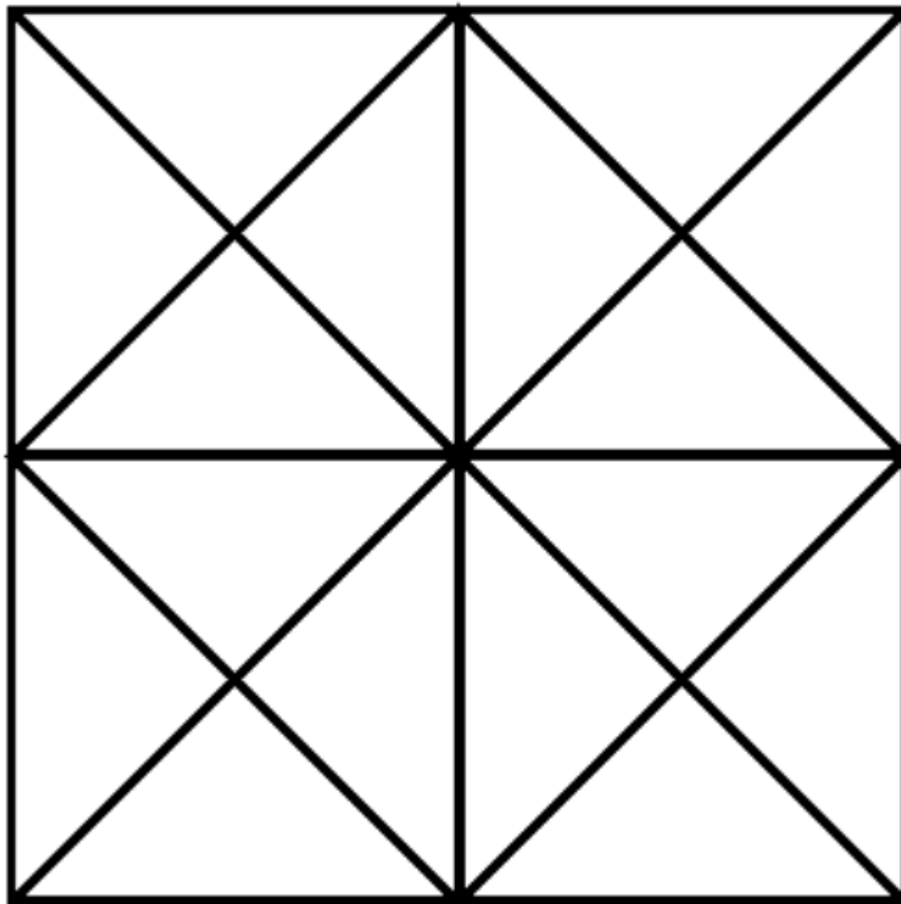
- Begin by placing a counter on every place that the lines cross, except the very centre.
- Remove a counter by jumping over it, along any line (including diagonals), and landing in a spare spot.
- This is the only way you can move a counter (and remove counters).
- The aim is to remove all the counters except one.
- For an additional challenge, try and have the final counter finish in the centre spot



Initial game set-up



The player in this game is unable to make any further moves.



Source: Adapted from the NRICH Stage 2 game *Jumping Reindeer*: <https://nrich.maths.org/1191>

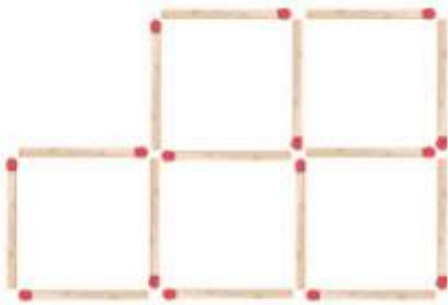
ACTIVITY 8: MATCHSTICKS

Instructions

- Use the matchsticks to create the design show
- Follow the instructions to **move or remove** the sticks to create the new design

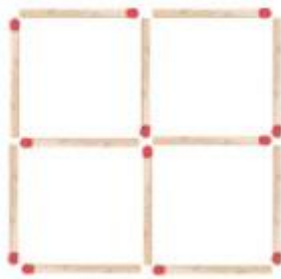
Materials:
Matchsticks
Puzzle cards

Note: Only **REMOVE** the sticks when asked – otherwise simply **move** them to a different position



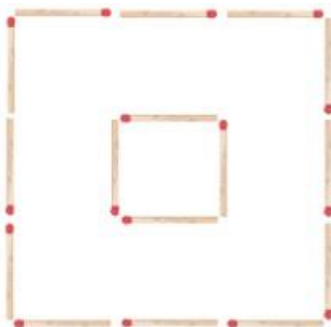
PUZZLE 1

**Remove 3 sticks and
leave only 3 squares**



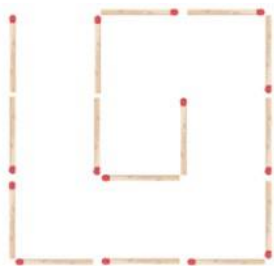
PUZZLE 2

**Remove 2 sticks and
leave only 2 squares**



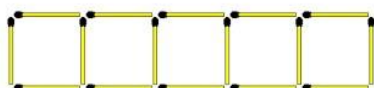
PUZZLE 3

**Move 4 sticks to make 3
squares**



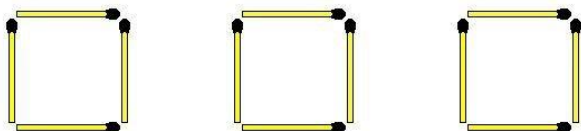
PUZZLE 4

Move 3 sticks to make 2 squares



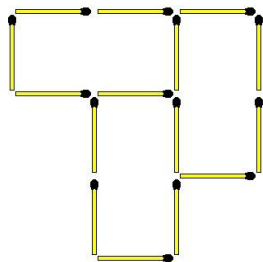
PUZZLE 5

Remove 4 sticks to leave only 4 squares



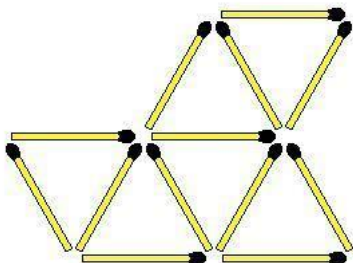
PUZZLE 6

Remove 1 stick and move 2 sticks to show the answer one



PUZZLE 7

Move 3 sticks to show 6 squares



PUZZLE 8

Remove 3 sticks to leave only 3 triangles

Source: Matchstick Puzzles <http://matchstickpuzzles.blogspot.com/>

ACTIVITY 9: AREA DICE GAME

Instructions

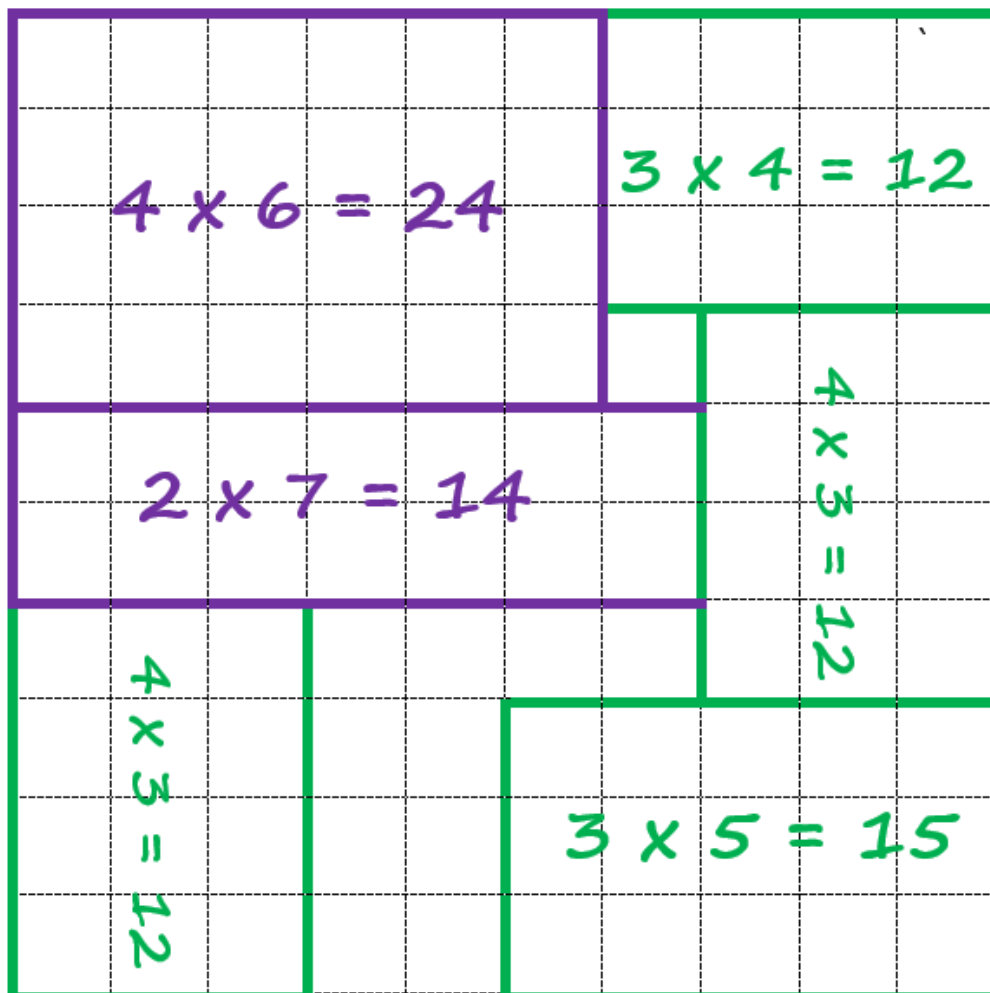
- Each player chooses a coloured marker (texta)
- Players take turns rolling both dice, using the numbers that they rolled to draw the perimeter of a rectangle or square, for example, if they roll a 4 and 6 they can create a rectangle that is 4 x 6 or 6 x 4
- Players should record the equation in the middle of their rectangle, for example, 4 x 6 = 24
- The game ends when players run out of room to draw their rectangles
- The winner is the player who has covered the largest total area

Materials:

- 1 cm grid paper
- 2 dice
- Coloured markers

Players: 2-4

Note: Below is an example of a completed game board



[illegible]

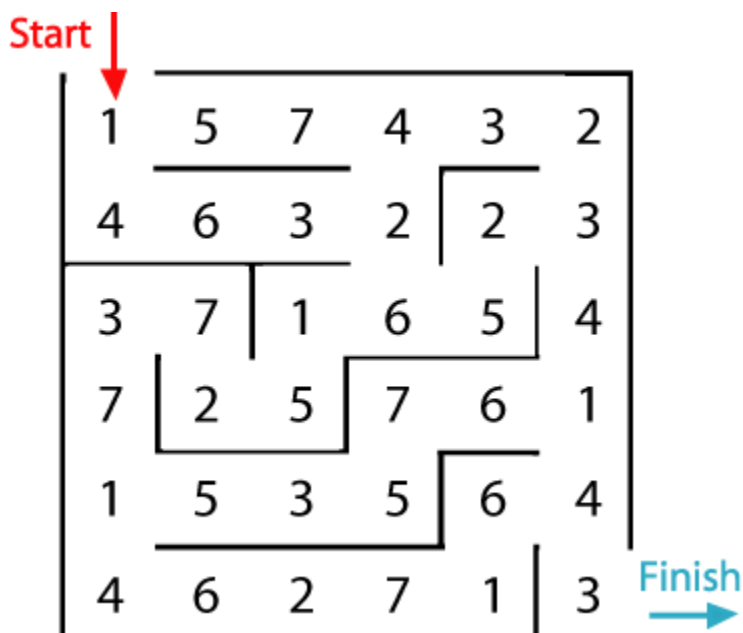
ACTIVITY 10: MAZE 100

Materials:

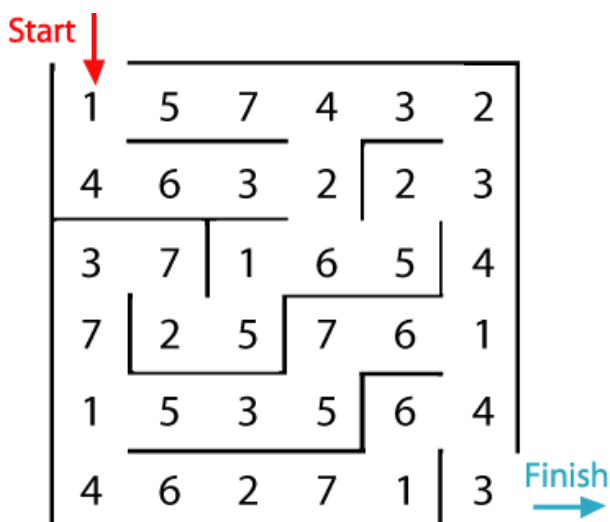
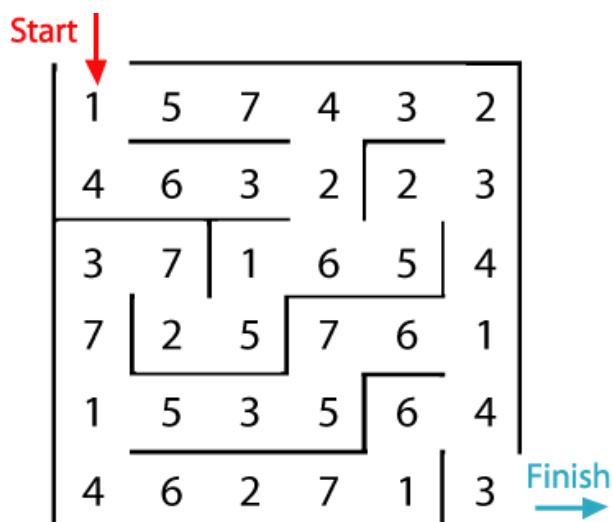
Recording sheet and pencil

Instructions

In this maze there are numbers in each of the cells. You go through adding all the numbers that you pass. You may not go through any cell more than once.

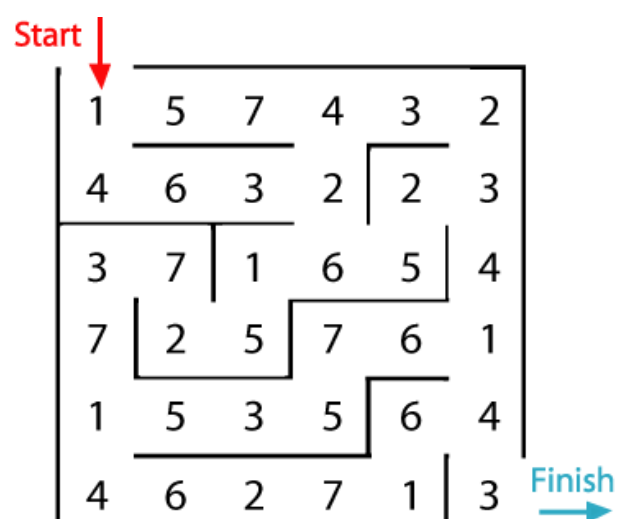
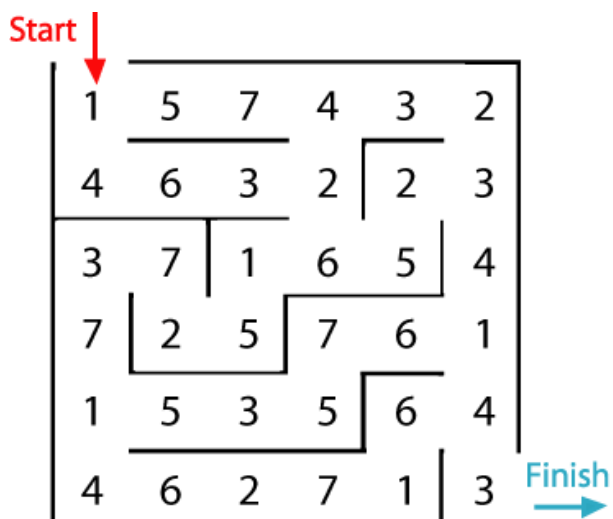
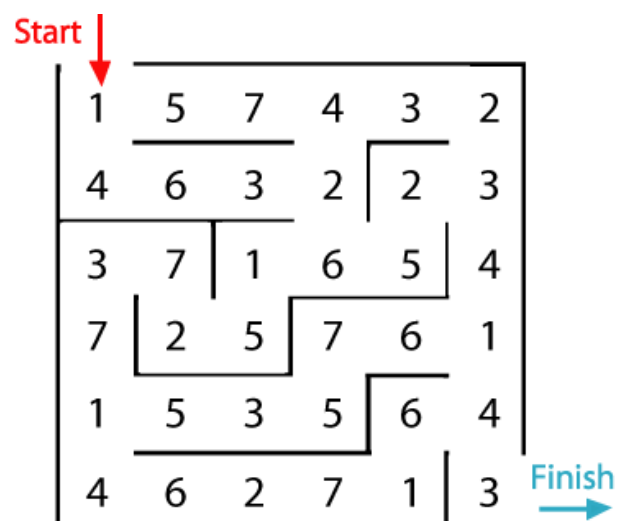
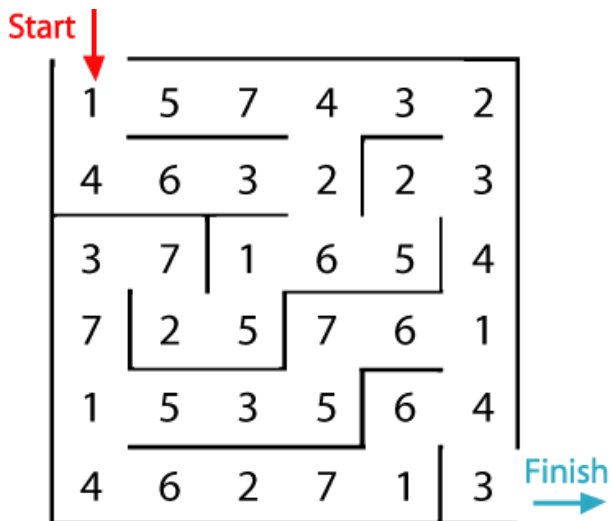
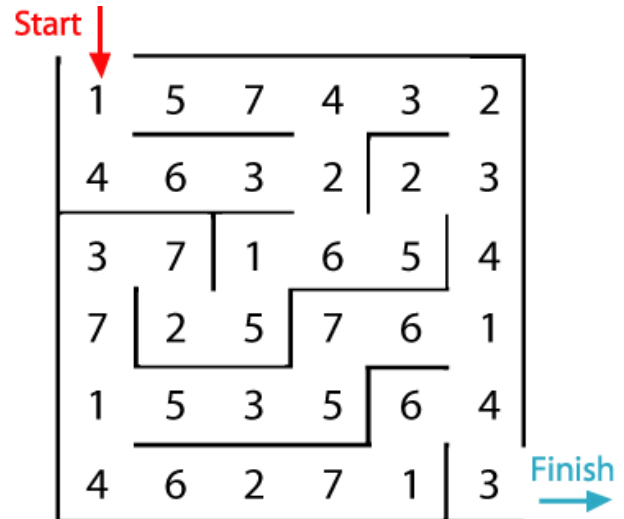
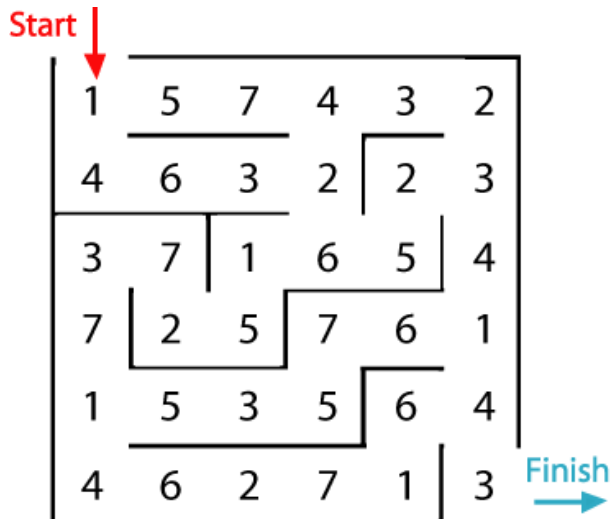


- Can you find a way through in which the numbers add to exactly 100?
- What is the lowest number you can make going through the maze?
- What is the highest number you can make going through the maze?



Source: This activity has been adapted from the Maze 100 task from NRICH: <https://nrich.maths.org/91>

MAZE 100 GAMEBOARDS



ACTIVITY 11: RELEASE THE PRISONERS

Materials:

- 12 Counters, e.g. 6 red and 6 blue
- 2 x 6-sided dice
- Prison Cell Grid (below)

Players: 2

Objective

Be the first player to release all their prisoners

Instructions

- Players place their 6 prisoners (counters) into the Prison Cell grid. They can choose to place any number of prisoners in each cell.
- All 12 counters need to be placed on the board, for example, Player A may have 2 prisoners on cell 3, 2 on cell 4 and another 2 on cell 5. Player B may place all their prisoners on cell 0.
- Player A rolls the dice and finds the difference between the two numbers. If they have prisoners on that number, they may release one prisoner from that cell.
- The first player to release all their prisoners wins the game.

PRISON CELLS

0	1	2	3	4	5
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ACTIVITY 12: COINS

Instructions

Materials:

Coins

Pens and Paper

Cassandra has 5 coins in her pocket

- She can make 17 different amounts using her coins
- The amounts she can make end with one of two possible digits
- She cannot make 45 cents
- She cannot afford to buy an item that cost \$1

Given these clues can you work out what coins Cassandra had in her pocket.

Is there only one possible combination of coins?

Source: This activity has been adapted from the Coins task from NRICH: <https://nrich.maths.org/5917>

ACTIVITY 13: MAKE A DOLLAR

Objective

Collect coins to get as close as you can to \$1 (without going over).

Materials:

One 6-sided dice
20 5 cent coins
20 10 cent coins

Instructions

- Place all the coins in the centre of the playing area
- Players take turns to roll the dice and take that many coins
- For example, if you roll a 4 you can take four coins from the collection. It is up to you whether you take 5 or 10 cent coins.
- The amounts are added as you do and the aim to be the player who gets as close to \$1 (without going over).
- Play continues until someone busts (i.e. goes over \$1).

Variations

- Each player has 6 rolls to reach \$1
- 2 dice are used per roll



Source: Mathematical Association of Victoria. (2016). *Family maths night: Schools support resource*. MAV: Brunswick, Victoria.

ACTIVITY 14: PURE TAC

Instructions

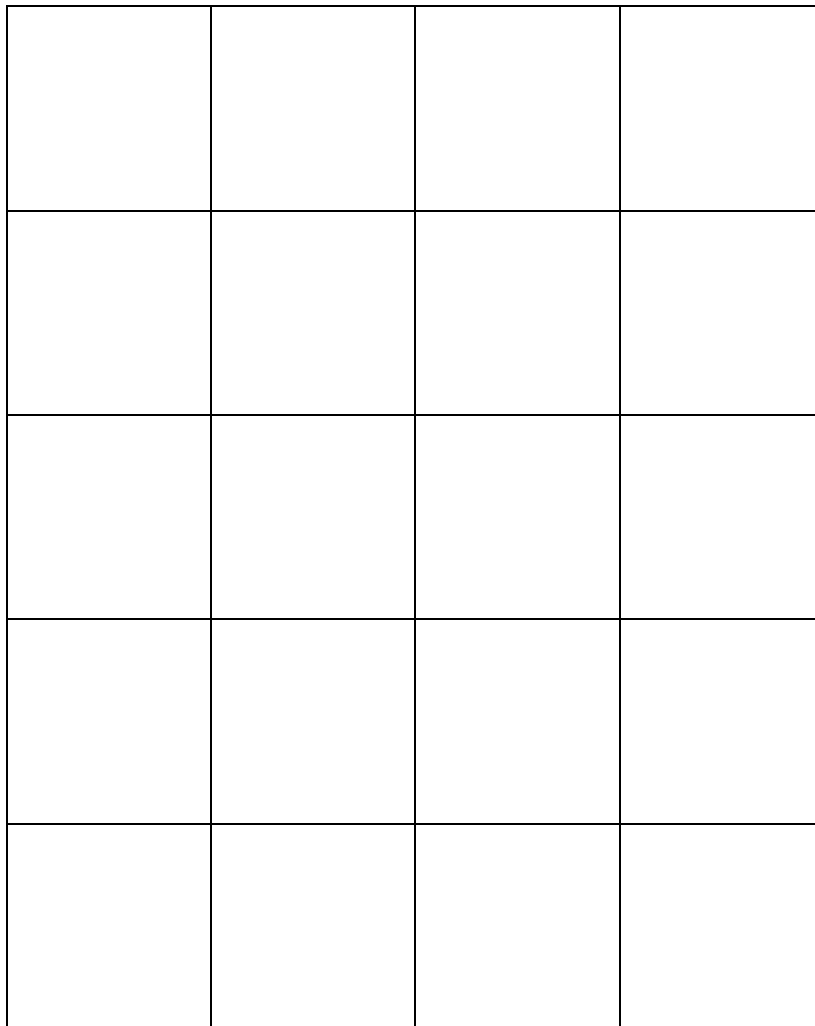
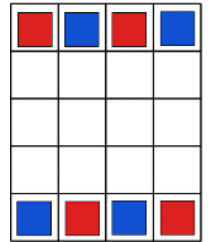
- The game starts with the 4 red and 4 blue pieces arranged on a 5 by 4 board as shown.
- A move consists of moving one piece to an adjacent empty square, up, down or sideways but not diagonally. There is no jumping or capturing in this game.
- The objective is to get 3 pieces in a line, vertically, horizontally or diagonally with no empty spaces intervening.
- The first player to get 3 in a line is the winner.

Materials:

Gameboard

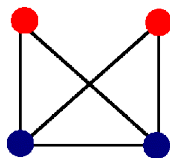
4 x red counters

4 x blue counters



Source: This activity has been adapted from the Tack-tickle task from NRICH: <https://nrich.maths.org/1240>

ACTIVITY 15: TWO STONES



Materials:

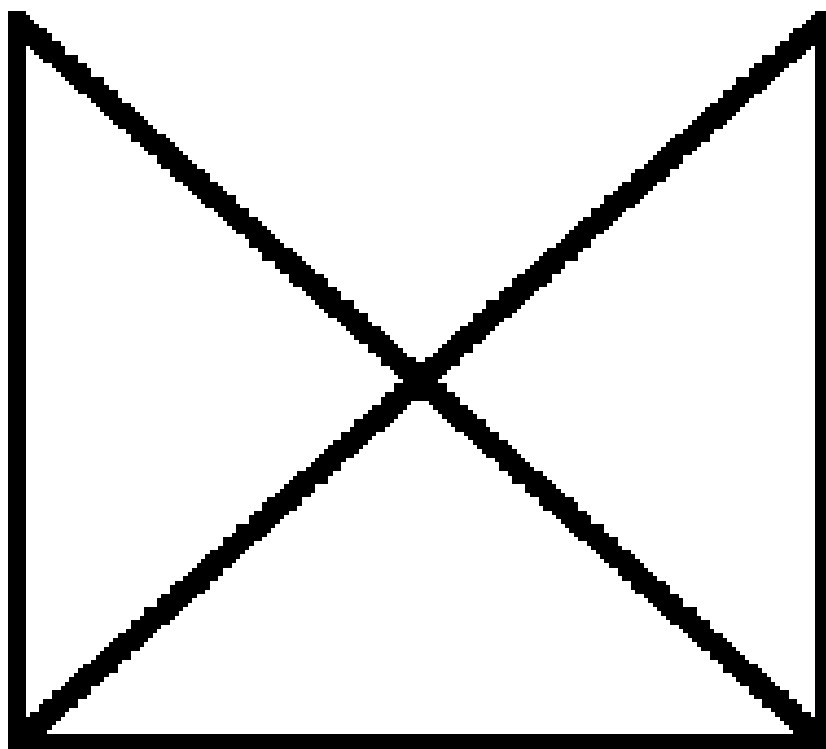
Gameboard

4 counters (2 of each colour)

Players: 2

Instructions

- Place the two counters at the top and two at the bottom as shown above
- Take turns to slide one counter along a line to an empty spot
- The first move will be to the middle.
- **To win:** block your opponent so that they cannot move.
- Next time you play swap start positions on the board with your opponent.



Source: This activity has been adapted from the Two Stones task from NRICH: <https://nrich.maths.org/1195>

ACTIVITY 16: CATCH 22

Materials:

- 16 Counters, e.g. 6 red and 6 blue
- Catch 22 Grid (below)

Players: 2

Objective

Be the first player to reach a total of 22 or force your opponent to go over 22 (bust)

Instructions

- Player 1 places a counter on one square on the grid and says the total, e.g. 4
- Player 2 places a counter on a different square on the grid, adds this number the first number and says the new total, e.g. if Player 2 chooses number 3 the new total will be $4 + 3$ or 7
- The winner is the first player to reach 22 or the player who forces their opponent to go over a total of 22 (bust)

1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4

Source: AAMT – https://www.literacyandnumeracy.gov.au/sites/nlnw2015/files/downloads/catch-22_2017.pdf

ACTIVITY 17: PILE OF CUBES

Materials:

20 cubes

Objective

Follow the instructions below to correctly arrange the cubes



Instructions A

- Select 14 cubes
- Make four piles so that the first pile contains:
 - (i) Three more cubes than the second pile
 - (ii) The second pile contains one cube less than the third pile
 - (iii) The fourth pile contains twice as many as the second pile
- How many cubes are in each pile?

Instructions B

- Select 20 cubes
- Make four piles so that the first pile contains:
 - (i) Three more cubes than the second pile
 - (ii) The second pile contains five less than the third pile
 - (iii) The fourth pile contains three times as many as the second pile
- How many cubes are in each pile?

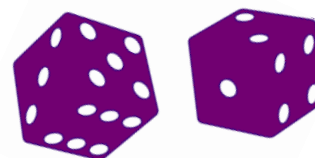
Source: DAPMA – <http://www.dapma.com.au/wp-content/uploads/2016/02/Block-problem.compressed.pdf>

ACTIVITY 18: SHUT THE BOX

Materials:

- Cards numbered 1 – 12
- 2 x 6-sided dice

Players: 2 or more



Objective

To be the player with the lowest overall total

Instructions

- Place the cards 1 to 12 face up on the table
- Player 1 rolls both dice
- On each roll of the dice the player can;
 - Turn over the corresponding cards, e.g. if the player rolls 5 and 2, they turn over 5 and 2, or
 - Add both dice and turn over that card, e.g. if the player rolls 5 and 2, they would turn over 7, i.e. $5 + 2 = 7$, or
 - Find the difference between the numbers and turn over that card, e.g. if the player rolls 5 and 2, they would turn over 3, i.e. $5 - 2 = 3$.
- Player 1 continues to roll the dice until they either roll a double (both dice show the same number) or they are unable to turn over any more cards
- Player 1 then adds together all the cards that are still face up



- In the example above, Player would add: $4 + 8 + 9 + 10 + 12 = 43$
- The next player returns all the cards to the starting position and begins by rolling the dice
- Once all players have completed their turn, the winner is the player with the lowest overall total

Source: NRICH Shut the Box – <https://nrich.maths.org/6074>

ACTIVITY 19: FEMTO

FEMTO is a game for two players. A FEMTO pack consists of 9 cards numbered 2, 3, 4, 5, 6, 7, 8, 9, 10.

Object

The winner is the player with the greatest total value of cards in front of them at the end of the game.

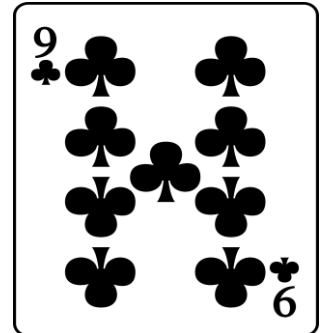
Materials:

One set of cards that includes a 2, 3, 4, 5, 6, 7, 8, 9, 10.

Players: 2

Instructions

- Shuffle the cards and deal each player 4 cards.
- The remaining card is placed to the side.
- In each round of play each player puts out one card, face down. The two cards are then turned face up.
- The round is won by the higher value card, unless the higher card is **more than twice** the value of the lower, in which case the lower card wins. e.g. 10 beats 8, 6 beats 5, 3 beats 10, 10 beats 5, ...
- Whoever played the winning card chooses one of the two cards and puts it, face up, on the table in front of him/her. The player of the losing card takes the remaining card and puts it back into his/her hand.
- More rounds are played until one player has no cards left.
- The winner is the player with the greater total value of cards in front of them at the end of the hand.



Source: Adapted from game FEMTO <https://nrich.maths.org/1179>

ACTIVITY 20: CROCOGATOR

Object

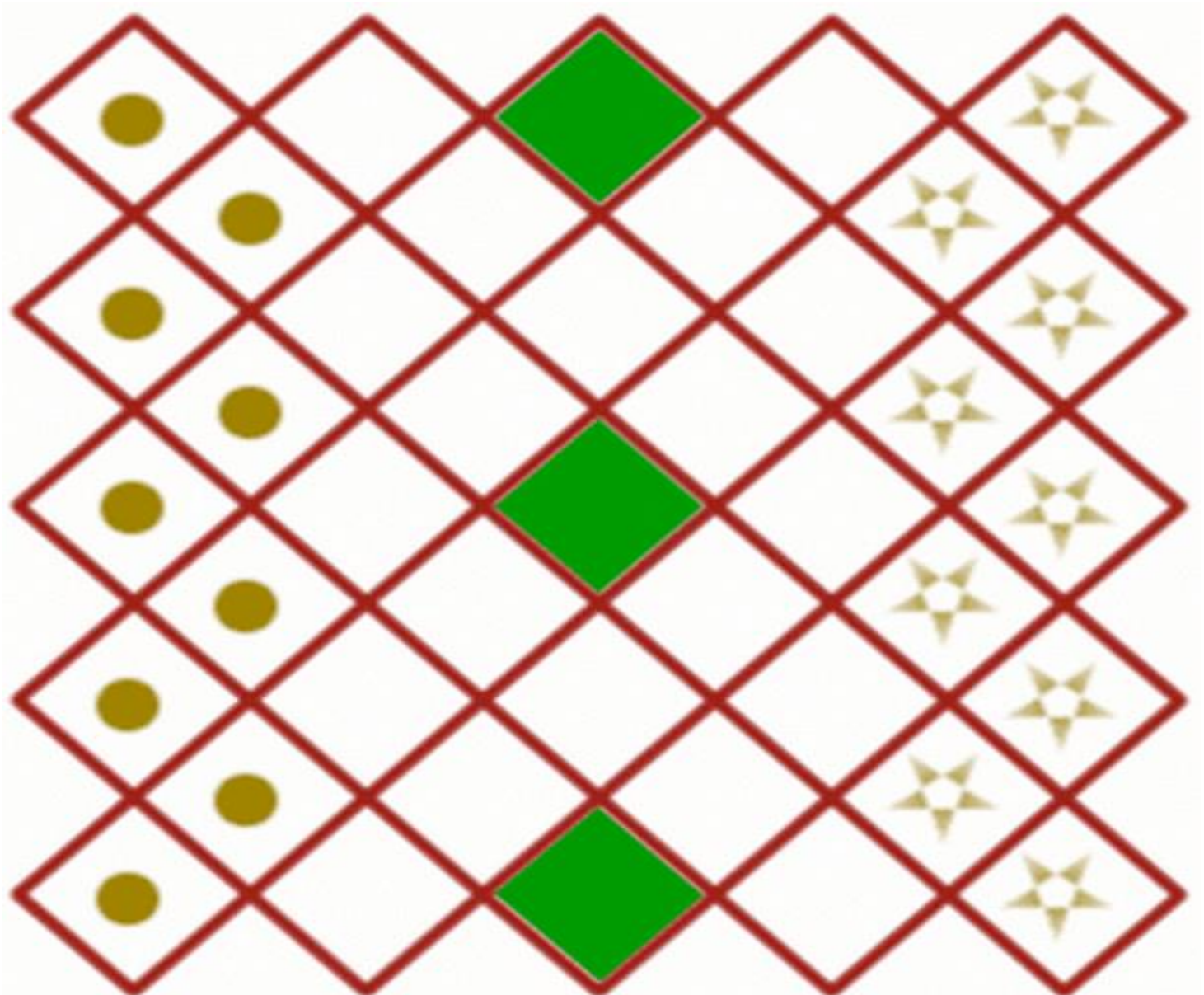
The object of the game is for a player to be the first to get a counter on each of the three islands (green squares).

Materials:

9 red and 9 blue counters
Game board

Instructions

1. Player 1 has **9 crocodiles** on the spots and crocodiles can move **one square** at a time in any direction, including horizontally or vertically through the corners of the squares.
2. Player 2 has **9 alligators** on the stars. Alligators can move **1 or 2 squares** at a time but only diagonally.
3. Players take turns moving their counters. Only one counter is allowed in any square. If one counter lands on another, then the counter landed on is removed. **There is no jumping.** These rules apply in the green squares as well.
4. The winner is the first player to get one of their counters on each of the three islands



Source: Crocogator <https://nrich.maths.org/1215>

ACTIVITY 21: FACTORS AND MULTIPLES GAME

Instructions

- This is a game for two players
- The first player chooses a number between 1 and 100, and covers it with a counter (or crosses it out)
- The second player chooses a number to cover. The number must be a factor or multiple of the first number
- Players continue to take it in turns to cover numbers, at each stage choosing a number that is a factor or multiple of the number just covered by the other player
- The first person who is unable to cover a number loses

Materials:

1-100 Number Chart
Counters or Markers

Players: 2

Alternative

- Rather than trying to stop your opponent from being able to cover a number, work as a team and see how many numbers in total you can cover

Source: This activity has been adapted from the Factors and Multiples task from NRICH: <https://NRICH.maths.org/5468>

FACTORS AND MULTIPLES GAMEBOARD

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

ACTIVITY 22: MAKING SQUARES

Use all 24 matchsticks (or Paddle Pop sticks or pencils, etc.,) to discover if it is possible to make the following groups of squares:

- 1 square
- 2 squares
- 3 squares
- 4 squares
- 5 squares
- 6 squares
- 12 squares

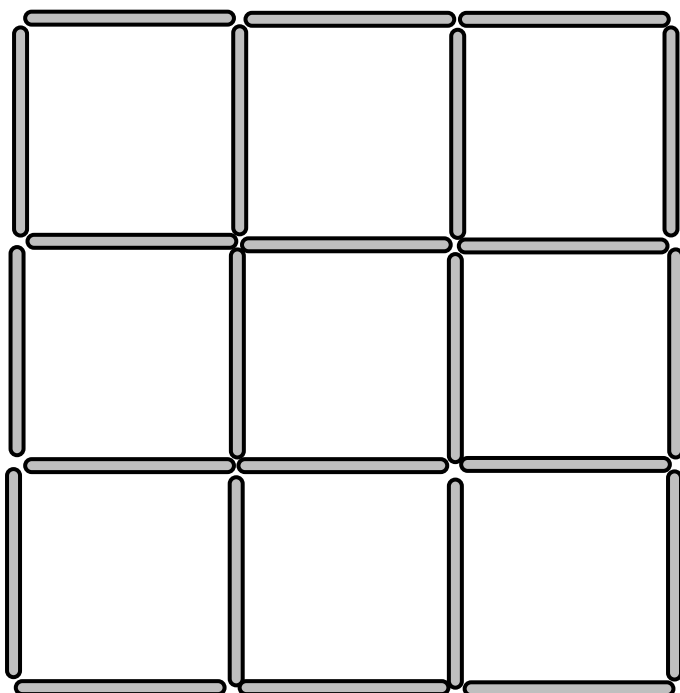
Remember – a square is a type of rectangle with **4 equal sides**

Think About



Here is an example someone created.

- How many squares do you see?
- What is the greatest number of squares that you can make from 24 sticks?



Source: Mathematical Association of Victoria.
(2016). *Family maths night: Schools support resource*. MAV: Brunswick, Victoria.

ACTIVITY 23: DUCK IN A BUCKET

This game encourages children to use adding and subtracting skills using single digit numbers to make larger numbers, and to begin to play flexibly with ‘friends to 20’.

People play in pairs or two teams. The objective is to **minimise** your point score!

A 20-sided dice is rolled to provide the ‘target number’ for each round (e.g. Team A rolls a ‘16’ on the 20-sided dice – this is their target number).

The team then need to work out what combination of 5 (or 6) scores they need to throw into the ‘1’, ‘3’ or ‘5’ buckets, to get as close as possible to their target number.

Set a fair distance between the ‘thrower’ and the line of scoring buckets and take turns to throw the ducks into the bucket to achieve as closely as possible to the target score.

Of course, not all the ducks will land in the correct bucket – or in any bucket at all!

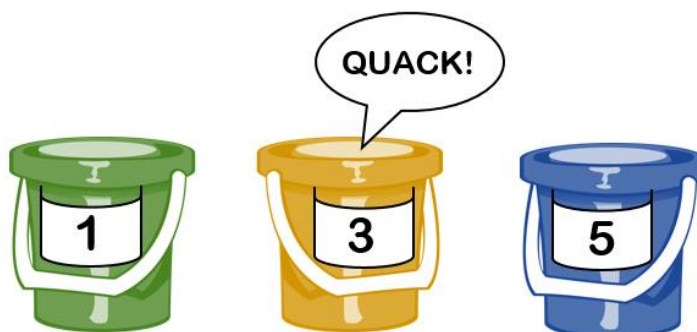
The number scored is the target score minus the added value of the ducks that have made it into buckets! So, if the target score was ‘16’ and a person threw two 3s, a 5 and two 1s (total 13), the final score in that round for the person (or team) would be: $16 - 13 = 3$.

Play 5 rounds each to determine a winner – remember, *lowest* total score wins!

Materials:

- 5 or 6 small rubber ducks (or objects)
- 3 buckets (or circles or hoops) labelled with the numbers 1, 3 and 5
- 1 20-sided dice (or a random number generator set to the value range 1 to 20 or cards with the numbers 1 to 20)

Players: 2 (or 2 teams)



Source: Duck in a Bucket Game AMSI Calculate: <https://calculate.org.au/2018/09/26/duck-in-a-bucket/>

ACTIVITY 24: SALUTE

Organise players into threes. Two players each select a card at random from the card deck and without looking hold them to their foreheads, standing back-to-back. The third player says,

Materials: Deck/s of playing cards with 10s, Jacks, Queens and Kings removed (or use Uno cards)

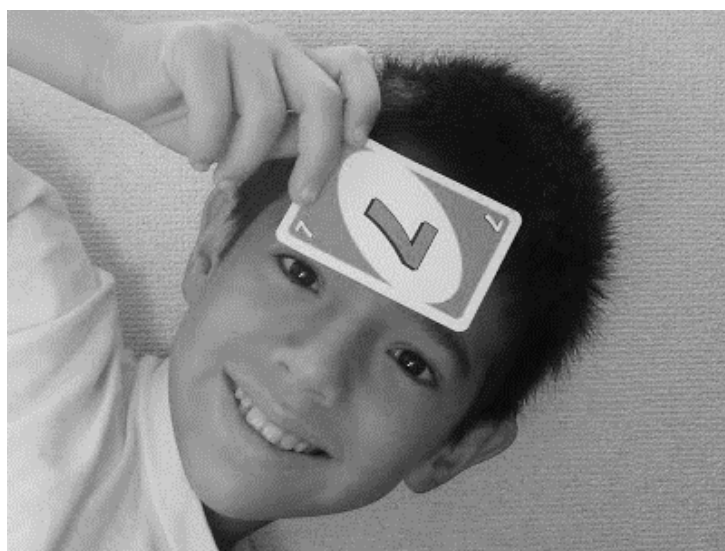
“The sum is $[A + B]$ ”, ‘A’ and ‘B’ being the numerals on the cards. For example, if the two cards were a 4 and a 7, the third player would say, “The sum is 11”.

The first two players take turns to guess one of the numbers – “Is my number...”?

Once one has correctly guessed their own number, the next student must correctly state the matching number for the sum. If they do so, they get a point.

For a more challenging game, use factors and multiples.

For example, with the two numbers ‘4’ and ‘7’ above, the third player would state “The product is 28”. As above, the first two players take turns to guess one of the numbers – “Is my number...”? Once one has correctly guessed their own number, the next student must correctly state the matching factor. If they do so, they get a point.



For a much harder version of the game, try three guessing players, e.g. “3, 6, 5” “The sum is 14” or “The product is 90.”

Source: Salute Game AMSI Schools Calculate: <https://calculate.org.au/2017/11/07/salute/>

ACTIVITY 25: CHALK MATHS

There are several great activities that students can complete outside using chalk. Chalk encourages students to 'have a go' at tasks as they are less worried about making mistakes.

Materials:

Chalk
Dice



NUMBER TRAIL

Note: Prior to this activity student leaders will have marked out a course for students to follow.

Instructions

1. Players begin in the starting square
2. Each player takes turns at rolling the dice and steps forward that many squares along the trail
3. The player to reach the end square first is the winner

CHALK SHAPES

Instructions

1. All players are given a piece of chalk
2. A leader calls out the name of a shape and all players must draw it on the ground
3. Leaders should ask players to explain how they know the shape they have drawn is correct
4. After 4 or 5 shapes are drawn – the chalk is returned to the box
5. A leader now calls out the name of a shape and all players must run to stand on the correct shape, again explaining how they know their shape is correct if asked



BONUS ACTIVITY: HOOP GLIDERS

Materials:

- Paper Straws
- Strips of card
- Tape
- Ruler
- Scissors



Instructions

- Use the paper strips and tape to create two hoops (one small and one large)
- Place the open hoops to the straw before taping them shut
- Tape the hoops to the straw (one at each end)
- Test your Hoop Glider on the test-track
- How far did your hoop glider fly?

Challenge

- Can you modify your glider so it will fly farther?
- Think about changing the...
 - size of the hoops
 - location of the hoops on the straw
 - amount of hoops
 - number of straws

Source: Hoop Glider <https://sciencebob.com/the-incredible-hoop-glider/>

CHOOSE MATHS

AN **AMSI** SCHOOLS PROJECT

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