



Extending

Mathematical

Understanding



‘Hard thinking’ questions you can ask to encourage mathematical thinking:

- Why?
- How do you know?
- What is the pattern?
- Can you prove it?
- How would you explain/convince a Martian?
- Is there another way?
- Is there a more efficient way?
- Is there a quicker way?
- What’s another way you know?
- How do you visualise it (picture it in your mind)?
- How many if there are ____ more?
- How many if there are ____ less?
- What if ...

By repeatedly asking these questions, your child expects to have to answer them and it becomes part of their ‘self- talk’ and mathematical thinking.

(We gratefully acknowledge St Mary’s Toukley for allowing us to use many of the ideas in this booklet)

Handfuls



You will need: Counters (or another counting object), a flat area.

How to play:

Players take (or are given) a ‘handful’ of counters. They estimate (a good guess, not supposed to be perfect) how many they think are in their hands. They are asked to arrange the counters so that they can easily ‘count’ them (not 1, 2, 3...). Can they be arranged in a different way, too?

An adult might ask: “How many do you have?” “What is one more?” “What is one less?” “Who has the most?” “Who has the least?”

Optional – find your number on a tape measure / number line / hundred and twenty chart

Optional – write your number on a calculator

What’s the Mathematics?

- Subitising – recognising dots
- Number conservation – total is the same regardless of arrangement

Change the game slightly:

- A counter can be worth 2, 5, 10, 25, 50, 100, 3, 0.5, 2.5 etc.
- When you run out of counters, how can you still keep track of how many you have?
- Discuss how many groups of a certain amount and relate it to multiplication.

3-in-a-Row Bingo



You will need: 2 or more players,
a measuring tape or empty number line,
a dice or digit cards, paper clips

How to play:

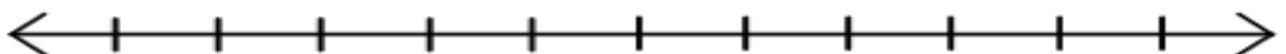
The winner is the player who places the 3rd number in a row on a number line. Player 1 rolls the dice twice and creates a number (a roll of 2 and 7 makes the number 27 or 72). Once deciding on a number, the player marks the spot on a number line with a texta or if using the measuring tape, a paper clip. Player 2 then has a turn. As soon as a player makes 3 numbers in a row (using any marker, not just the numbers they have made themselves), that student wins.

What's the Mathematics?

- Ordering numbers
- Difference between numbers

Change the game slightly:

- Use an empty number line
- Roll three times and the numbers can be from 0-999
- Roll twice but make the numbers all in a particular hundreds.
- Use a 1-6 dice and a 0-9 dice, and make decimal numbers from 1-6 eg 2.7, 6.8



Tug-of-War

You will need: 2 players, one bead string, one dice (1-6),



How to play:

Split the beads in half – 10 each side. The first player rolls the dice and takes that number of beads from their partner. **After moving the beads they say (without counting) how many beads they have. Their partner then says how many they have left.** Take turns rolling the dice and taking beads from each other's total. The winner is the person with 20 beads.

What's the Mathematics?

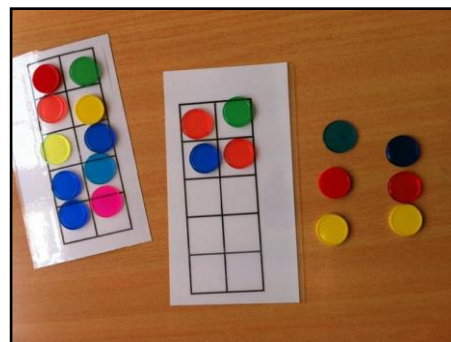
- Subitising – recognising groups as total
- Visualising numbers – counting beads in groups other than one by one
- Counting on – “How many more do you need?”
- Partialising numbers – recognising 20 can be made up of many different combinations
- Facts to ten, facts to five – building on knowledge of 4 and 1 is 5; 3 and 2 is 5 etc

Change the game slightly:

- Beads can be worth various quantities e.g. 1 bead can be worth 2, 5, 10, 25, 50, 100, 3, 0.5, 2.5 etc.
- Make your own bead kebab or bead string with 10, 50 or 120 beads. Beads can always be worth more than 1.

Race to 20

You will need: 2-4 players, 20 counters each, 2 ten frames each, 1 dice (1-6)



How to play:

The aim of the game is to ‘race to 20’. Each player has 2 ten frames and twenty counters. Players take it in turns to roll the dice. On a player’s roll, take that number of counters and place them on the tens frame.

An adult would ask something such as “How many do you have?” “How do you know? Can you prove it?” “How many more do you need to race to 20?”

The winner is the first player with 20.

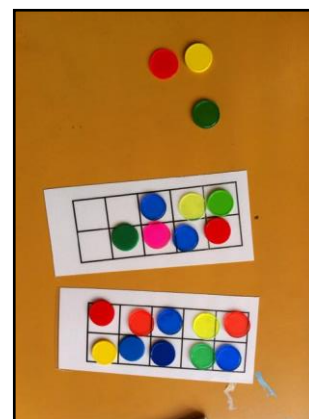
(☺ You must roll the exact number to get to 20 to win – for example if you have 17 and need 3 more but you roll a 4.....too many! You need to roll a 3, 2, or 1)

What’s the Mathematics?

- Counting total up to 20 in different ways.
- Recognising numbers can be arranged in tens to help ‘count’
- Place value
- Building to 10 – ‘Friends of 10’
- “Ten and three more is thirteen” etc

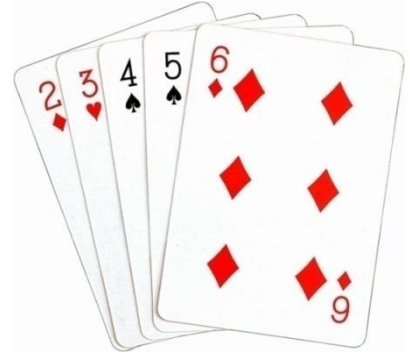
Change the game slightly:

- Race to 10
- Race to 50



Friends-of-Ten Snap

You will need: Playing cards (ace-9),
2-3 players.



How to play:

The aim of the game is to win the most/all of the cards. Shuffle the cards ace-9 and distribute them equally amongst players, leaving none left over. There are two piles created next to each other, one of the red cards and one of the black cards. Players take it in turns to place a card on a pile (depending on the colour). When the cards on top of each pile together make 10, player ‘snaps’ and takes all of the cards. The game continues until there is a winner.

What’s the Mathematics?

- Building to 10 – ‘Friends of 10’

Change the game slightly:

- make your own cards with the dice patterns rather than numbers
- play friends of 5 snap instead and just use cards ace-4 (possibly using 2 or 3 decks together so the game is not too short)
- Add the cards as each is placed on the pile

Number Busting



You will need: pencil and paper

How to play:

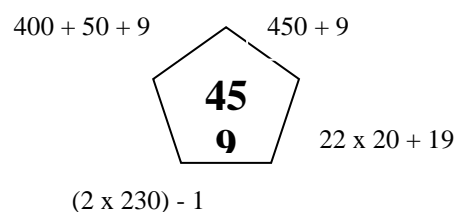
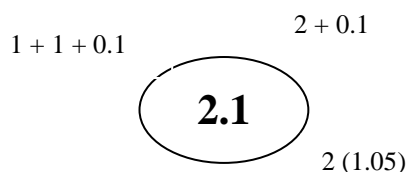
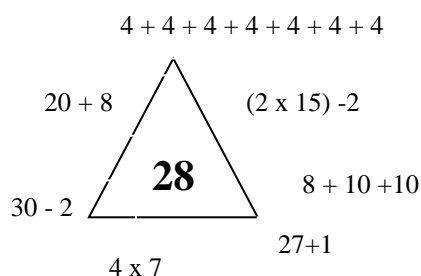
Players pick a number (each with a different number or everyone uses the same number. Perhaps picked from a range, Eg between 30 and 50). Players try to find all the ways they can represent the number (words, pictures, symbols) within a time limit (2 minutes).

What's the Mathematics?

- Counting
- Number conservation – total is the same regardless of arrangement

Change the game slightly:

- K and 1, start by using numbers that are less than 30 and then use counters to show the amount and ways they broke the numbers



Round the Track

You will need: 2-4 players, round the track board, 1 pack of playing cards (ace - 9 only), some blank cards with a '0' on them, 1 dice (1-6).

Optional – Place Value chart.

How to play:

Players gets a certain amount of cards (generally, the same amount of cards as their grade) and make a number with. Players take it in turns to roll the dice and move their counter on the board. Players then alter their own number according to what they landed on. You can negotiate if the winner has the highest number, lowest number etc.

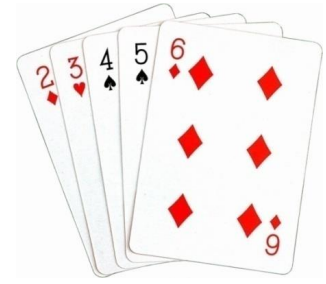
What's the Mathematics?

- Knowing more and less than a number
- Place value

Change the game slightly:

- use less or more cards
- use decimals
- change the numbers on the game board
 - 1 or 2 cards: +1, -1, +2, -2, +5, -5, +10, -10
 - 3 or 4 cards: +10, -10, +5, -5, + 20, - 20, +100, -100
 - 5 or 6 cards: + or – 1, 5, 10, 100, 50, 500, 1000, 4, 7
 - More difficult: + or – 3, 8, 45, 650, 0.5 etc.

Number Fun



You will need: Playing cards (ace-9), calculator, 2 or more players.

How to play: Student 1 randomly chooses 3 cards, creating the largest number possible, e.g. 862. The student reads and writes the number. Student 2 does the same. Student 1 repeats the process, this time adding their first number (862) to their second number (e.g. 653). They record their answer (1515), reading and writing it. Student 2 repeats the process. Both players continue the game until each have had x number of turns (e.g. 6). The student with the highest points wins. How to earn points: 1 point for reading the number correctly, 1 point for writing the number correctly, 2 points for adding the number correctly, 5 points for the highest score after x number of turns.

What's the Mathematics?

- Reading numbers
- Adding (subtracting) numbers

Change the game slightly:

- You can play the game by using 1 card only, 2 cards, 3 cards (as above), 4 cards, 5 cards, 6 cards or more
- Start at a given number (e.g. 9 566) and using a similar process of selecting, reading and writing numbers but this time subtracting them.

Race the Clock

You will need: A timer, a dice, different counting materials

How to play:

Roll the dice and start the timer. Make as many groups of this size as possible before the timer goes!

Ask questions such as;

“How many collections did we make?”

“Are all the collections the same size?”

“How many ‘things’ do we have altogether?”

What’s the Mathematics?

- Counting
- Total correspondence
- Number conservation – total is the same regardless of arrangement

Change the game slightly:

- Use a 0-9 dice
- Make the time shorter or longer
- Make ‘things’ worth more than 1

How many? (*Similar to Handfuls*)



You will need: 2 players, counters, 2 dice (1-6 or 0-9), timer

How to play:

Players compete against each other to collect and arrange the most counters within a set timeframe (eg. 2 minutes). The timer starts and the players roll their dice and collect that many counters. As they collect, they should arrange the counters so that without counting (1, 2, 3...) they and another person will be able to look at the counters and work out how many there are.

An adult may then ask: How many if I take one (or one group) away? How many if I added another one (or one group)? What's half? Double? How do you know without counting? Can you arrange it in a different way?

What's the Mathematics?

- Visualising more and less
- Knowing that the last number spoken when counting is the 'cardinal number' (quantity) of the group / total
- Subitising – recognising dots on the dice as total
- Number conservation – total is the same regardless of arrangement

Change the game slightly:

- Place the numbers onto a number line
- Can the counters represent more than 1?

Golden Beans

You will need: Golden beans (or anything about that size that have a variety of colours), plastic cups, ten frames (optional)

How to play:

Each student is given a small collection of beans (or other small object such as marbles) in a cup. Student shakes the beans and tips some out. How many golden beans can you see? How many (white) beans? How many altogether? Each player answers these questions and then take it in turns to ask another player “How do you know?”, “What is one (five/ten/100 etc) more?”, “What is one (five/ten/100 etc) less?”, “Who has the most beans?”

What's the Maths?

- Counting total correspondence
- Number conservation – total is the same regardless of arrangement
- Knowing that the last number spoken when counting is the ‘cardinal number’ (quantity) of the group / total

Change the game slightly:

- Players arrange the beans on to the ten frame and discuss the way they have arranged them
- Place the numbers on a number line (could this then be kept for next time you play?)
- Order the different bean collection in order from smallest to largest

Rows and Columns - Arrays



You will need: Objects to arrange/count, a dice (1-6 easier, 0-9 harder. If you roll a 0 you will have to roll again as it won't work).

How to play:

The aim of the game is to beat the other student by getting the most counters in an array. Each student rolls the dice once and places that many counters in a row in front of them. They then each roll a second time and make sure that each column has that many items in it. Without counting 1, 2, 3 etc, players work out how many counters they have.

An adult may ask: Who has the most? By how many? How many more would the other person need to win? How many if there was one more/ less row? How many if there was one more/ less column? Could the items be grouped in another way with none left over? Is there a smaller array in your array? Is there anything interesting about your number? Could you write/say a problem for this array?

What's the Maths?

- Visualising more and less
- Smaller groups make up one whole 'thing'



Change the game slightly:

- Start with the number (hint, it needs to be the answer to a multiplication) and make an array to show a possible solution.

Fill in the Blanks

36		45			86	
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You will need: Playing cards (ace-9), a blank row of squares (at least 7, up to 30, with some of the spots filled in with numbers)

How to play:

The student to finish the number sequence correctly is the winner. Players turn over 2 cards and use those to make a number (4 and 2 makes 42 or 24). Players take turns to put a number in. If they are not able to go, the next person takes two cards

What's the Maths?

- Counting
- Ordering numbers
- Difference between numbers

Change the game slightly:

- Use a dice (0-9) instead
- Choose three cards and make the numbers in the hundreds
- Choose four cards and make the numbers in the thousands
- Choose one card and make numbers less than 10
- Biggest to smallest
- Decimals

Other Games to Play

Secret Number: Think of a number. Players try to guess the number by asking questions such as: *“Is it more than....? Is it less than...? Is it an even number? Is it an odd number?”*

Snakes and Ladders: Players predict where they will land before moving their playing piece. *Adaptation: double the roll before moving*

Roll and Add: Roll two dice and add the numbers together.