Renfrewshire Attainment Challenge

Literacy, Numeracy, Health & Wellbeing

Numeracy Starters

Renfrewshire Council

What's my Number

- Teacher (or pupil) chooses a number (decimal or negative)
- Children have to ask strategic questions to figure out the number
- Use large 100 square (or a set of integers I.e. -20 to 20) and cross off numbers as they discount them

Countdown

<u>As a class</u>

- Teacher/Lead pupil
  - Chose 3, 4 or 5 numbers
  - Chose a target number to aim for
- Class
  - Come up with a solution using +, -, x and ÷
  - If different solutions compare methods used

<u>As a pair/trio/small group</u>

- Partner 1
  - Pupils chose 3 or 4 numbers (within a set range or free choice)
  - Chose a target number
- Partner 2/3
  - Come up with a solution using +, -, x and ÷
  - If different solutions compare methods used

Three down

- Children start with 3 x 3 digit numbers on whiteboard
- Teacher rolls a dice – if a 4 is rolled children can either subtract 4, 40 or 400 from one of their numbers
- The idea is to get down to zero
- You cannot miss a turn

Numbers on a chair

- The teacher gives out numbers between 1 and 100 (or decimals to 2 dp between 1 and 2) at random around the class
- “Stand up if your number is odd”.
- “Stand up if you have a square number”.
- “Put up your left hand if your number is divisible by three”.
- “Put up your right hand if your number fits the statement ‘n squared + 2’ ”

- Put up your left hand if <20.
- Right hand if >30 but <50.
- Put the **cards** on your table in order. Quickest?
- Put the **cards** so that odd no’s on one table even on other, with two tables working together.
- Multiple of ten.
- Largest on your table.
- Factor of another number…if you can multiply your number by something to get another number on your table

Make five numbers

Take ten cards numbered 0 to 9.

Each time use all ten cards.

Arrange the cards to make:

a. five numbers that are multiples of 3

b. five numbers that are multiples of 7

c. five prime numbers

Make up more problems to use all ten cards to make five special numbers.

Extend to work with decimals, i.e.

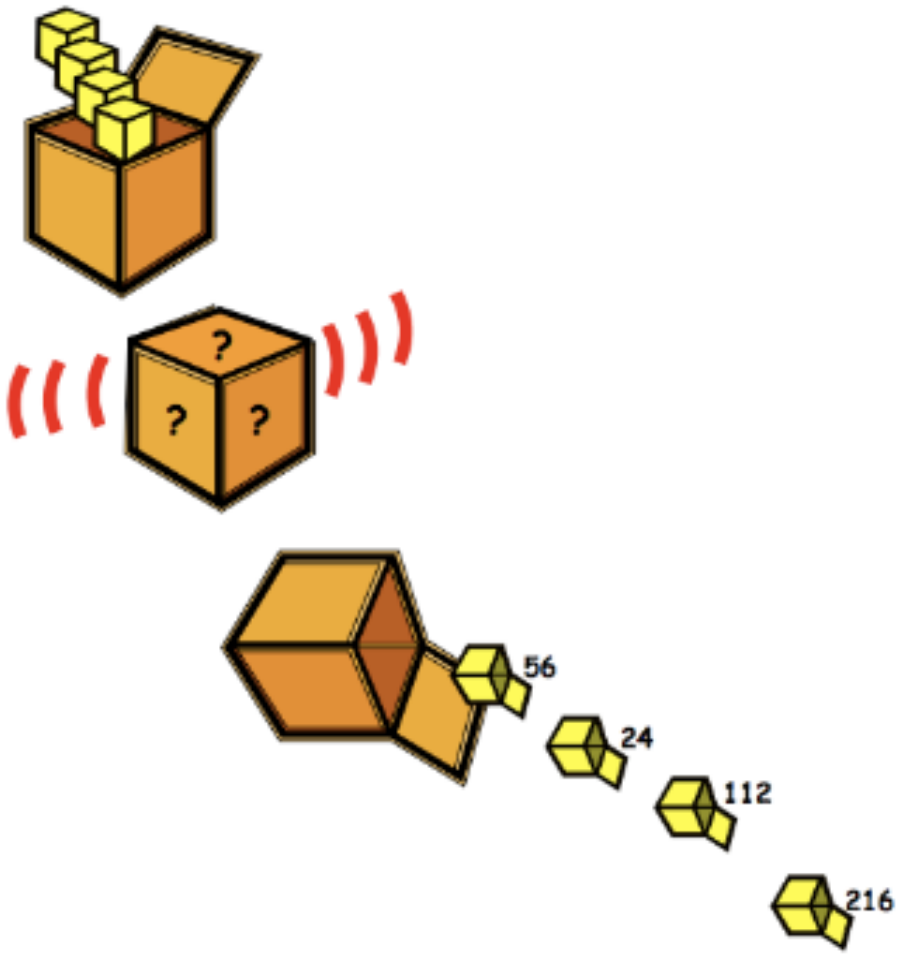
- make a decimal number within a range
- make a decimal number divisible by 6

Find the Fib

- Put a fact on the board with possible truths and fibs (a bit like Call My Bluff)
- Challenge: ask pairs/groups to create their own, using common wrong answers as the fibs.

What's in the box?

Four numbers in little boxes are put into a special big box that does a multiplication, then four new numbers come out at the end:



We only used whole numbers to go in, so, what multiplication might have gone on in the big box to get the answers in the picture above?

What was the largest number that could have been used to multiply by, in that big box?

What's in the box? continued…

Imagine four new boxes now (with new numbers in) and the large box multiplying by a different number this time. The numbers that come out are these:

What would be the number that the big box is multiplying by?
How are you working these out?
Discuss with others and see if there are different ways that you found the answers.

Fractions

Show my understanding

Use a variety of concrete materials to show fractions. E.g. A bag of various pasta shapes, Starburst, counters..... Children sort into groups and display as a fraction. Can develop to show decimal fractions/percentages. Good to show fraction of a quantity as well as fraction of a whole thing (pizza, cake, bar of chocolate, etc)

Understanding value of fractions

- In groups, children fold/cut up e.g. One A4 sheet of paper into so many equal parts e.g. 2, four, eight, ten ...
- Take one cut out and place them in order of size.
- Identify the fraction value of each 'cut out'.
- They then make the rule, identify that 1/5 is smaller than 1/3.

Matching Activity

- Matching a given fraction to a shaded illustration.
- Challenge: pupils could create a 'snap' like game

Prove It!

- In pairs, pupil have to prove e.g. ¼ of 24 = 6 using different strategies including:

  arrays

- 4 groups of 6 (of whatever they choose to draw!)
- Fact Family e.g. 4 x 6 = 24, 6 x 4 = 24, …

  ½ of 24 = 12, ½ of 12 = 6

Fraction of a quantity

- Using the Interactive 100 Square, pupils find a fraction of a quantity through their links with

  division e.g.1/3 of 24

- Challenge: pupils create more challenging question based on facts they know e.g.

  1/3 of 240 = 24 tens ÷ 3 = 8 tens = 80

  1/3 of 2.4 = 24 tenths ÷ 3 = 8 tenths = 0.8

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100
11	11	22	33	44	55	66	77	88	99	110

Lego fractions

Use lego bricks to demonstrate equivalent fractions.

INSERT PHOTO FROM NADIA

Decimals

Ordering decimals

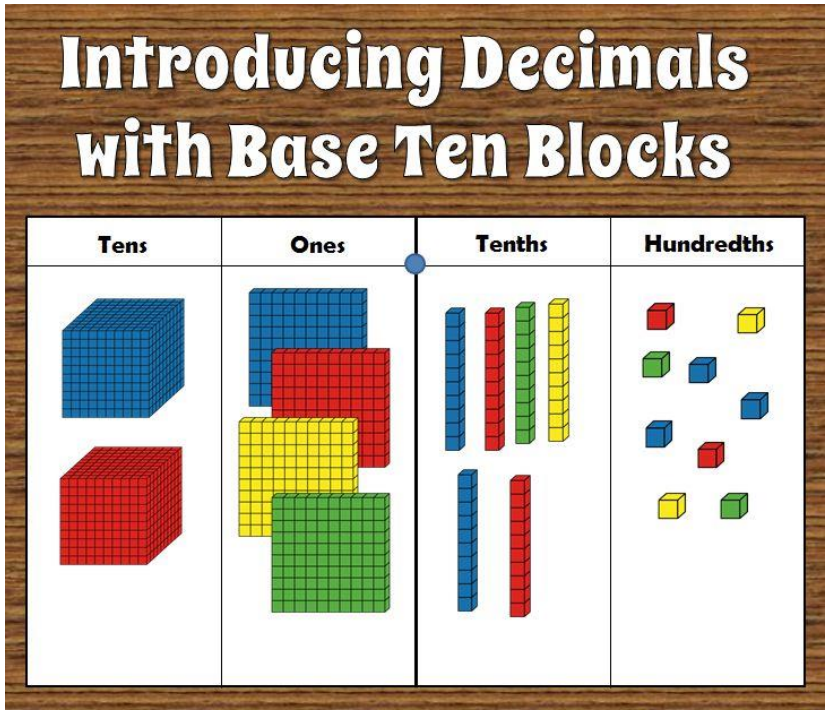
- Human number line.
- On individual whiteboards children write a number within given parameters E.G. A number between 5 and 6 with two decimal places.
- Children organise themselves into order. This can be made more difficult or simpler by increasing/reducing decimal places.
- Can be done in groups/whole class. Can be used for fractions , ordering large numbers etc.

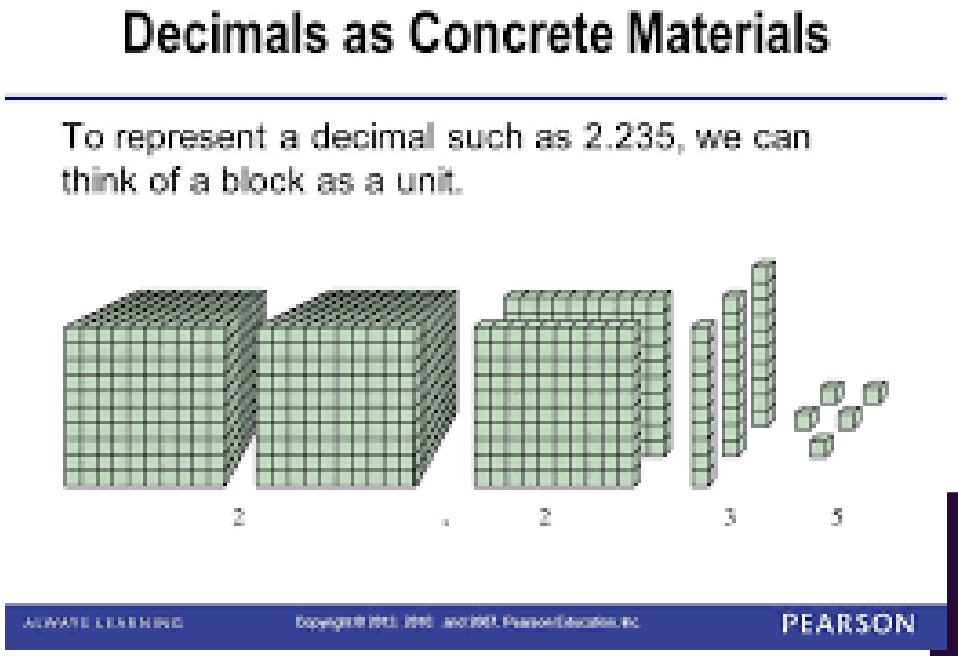
Guess My Number

- Pairs/Groups.
- Child writes number with decimal on post-it and puts on forehead.
- Partner asks questions that can only be answered with yes/no.
- Reinforcing vocabulary/terminology.

NB – Can adapt for fractions to reinforce terminology e.g. numerator, denominator, proper fraction, improper fraction....

Using Concrete Materials when Introducing Materials

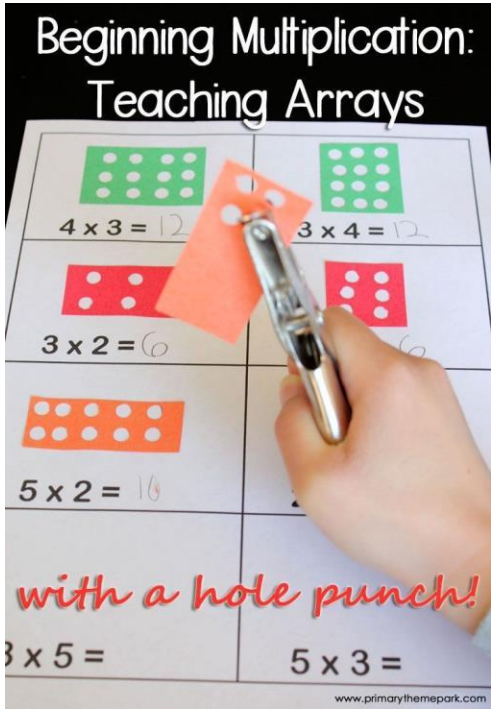


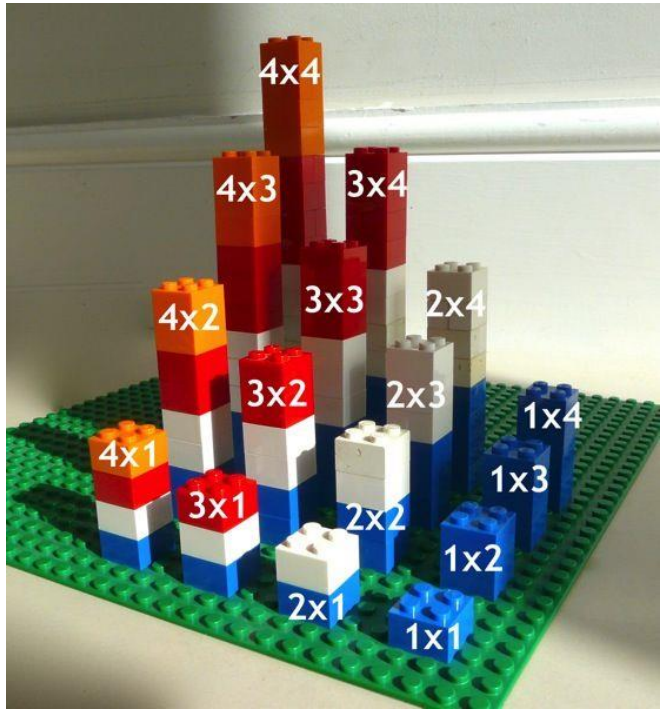


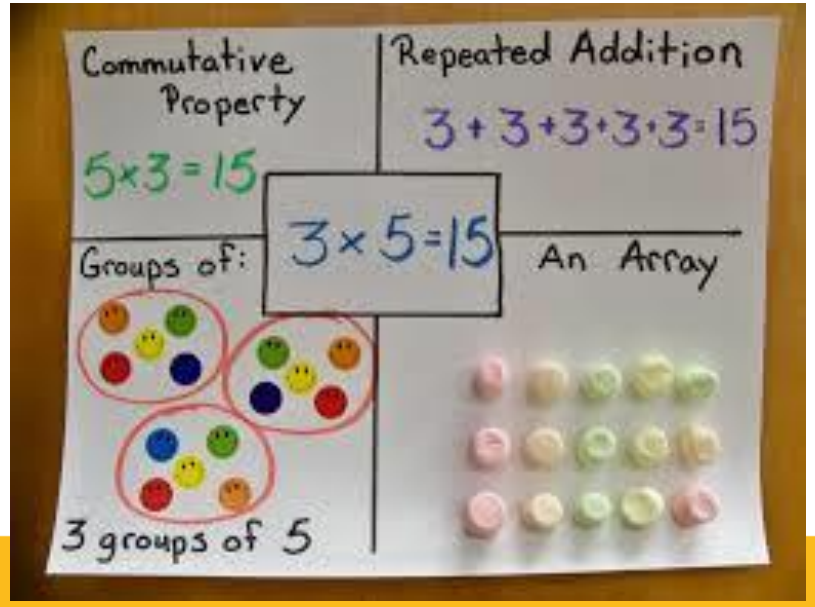
Decimal counters

Demonstrate decimal place value using decimal counters.

Times Tables


Beginning Multiplication:
Teaching Arrays
4 x 3 = 12
3 x 4 = 12
3 x 2 = 6
5 x 2 = 10
with a hole punch!
5 x 3 =
www.primarythemepark.com

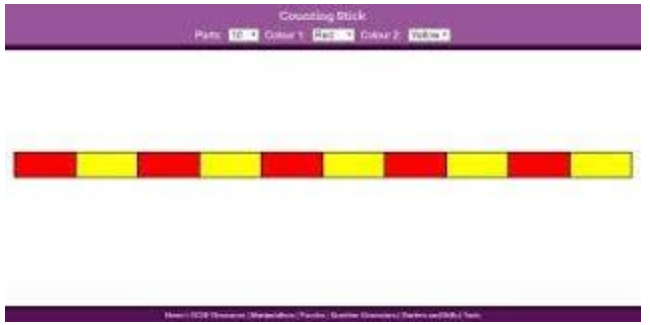

4x4
4x3
3x4
4x2
3x3
2x4
3x2
2x3
1x4
4x1
1x3
3x1
2x2
1x2
2x1
1x1


Commutative Property
5×3=15
Repeated Addition
3+3+3+3+3=15
3×5=15
Groups of:
An Array
3 groups of 5

Dice Roll

- In pairs, children take turns to roll 2 die.
- Use the strategies on the previous slide to prove that when these digits are multiplied together they will equal to … (This will obviously only work up to 6 x 6 but could be extended)

The Counting Stick



- Can be used for counting up/down in 'stations'of the tables.
- Variations can be 'hush'. E.g. 6,12,18 ssh, 24 etc
- Boomerang e.g. 4,8,12,16,12,8, 12,16,20,16,12...

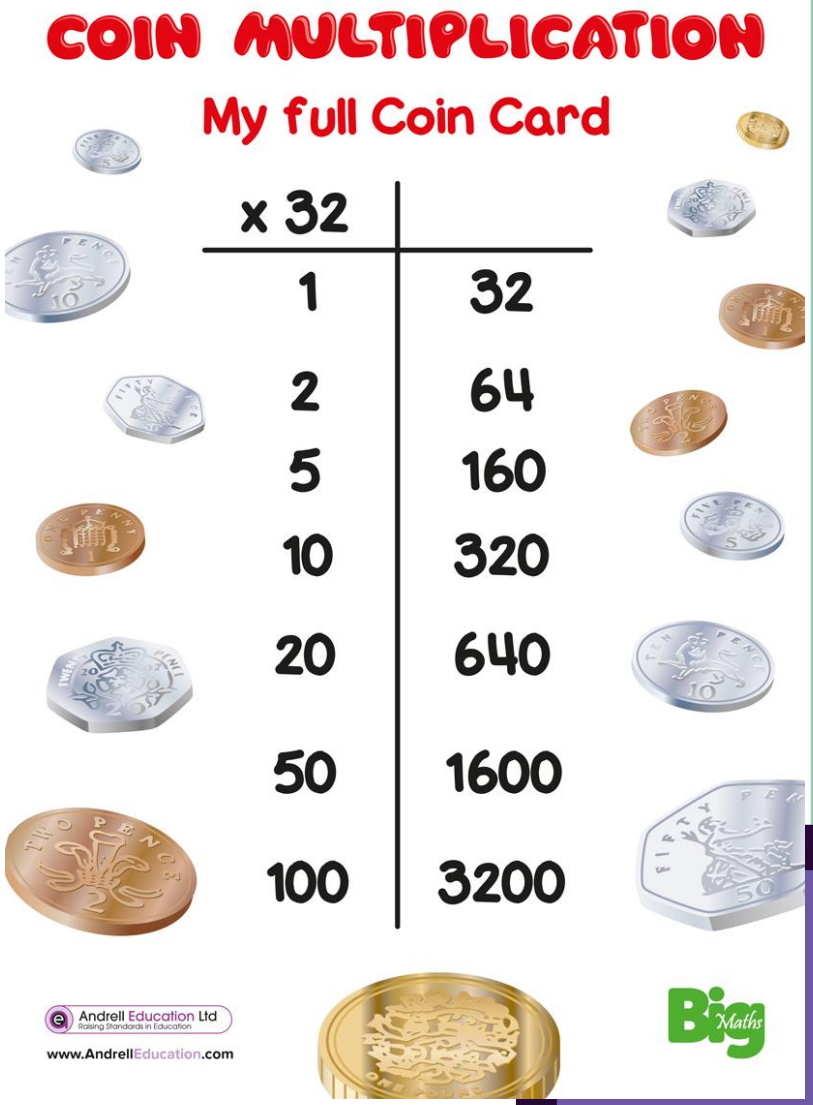
- Can be used as a number line for decimals, decimal fractions, percentages negative numbers.....
- Use in groups with post it notes to label intervals given. 'Show Me' what you can do...../How you can use this to teach.....
- Use a metre stick which has been made into a counting stick

Coin Multiplication

- Multiplying a 2 digit number using the value of British coins.
  (children can very quickly learn to draw this template out)

- Start with x1, x10, x100
- 2, 20: Double the answer to x1, x10
- 5, 50: Half the answer to x10, x100

- Discussion when pupils are ready on how to calculate
  e.g. 32 x 24 or 32 x 17



Place Value

Human Number Line

- Human number line. Each group has laminated numbers 0-9 (or could use whiteboards) Call out number and children sort themselves in order to create that number. Good for larger numbers and the common problem of 0(zero) being placed incorrectly.

Number of the Day

- Have a 2 digit number written on the board.
- Individually, pupils write down and illustrate as many facts as they can about this number.
- Reminders:
    - X and ÷ by 10/100/1,000
    - X and ÷ by multiples of 10/100/1,000
    - Double it / half it
    - Is it odd or even?
    - A multiple of …
    - It's factors are … (is it or isn't it a prime or square number?)
    - 1/3, 2/3, 1/5, 4/5, etc...
    - Measure e.g. … metres = ? Centimetres
    - This list is endless!!

What's your squiggle worth?

- This is from Big Maths but I think we could tweak the idea to make it our own? It was a free poster on the Andrell Education website.
- Reinforces our place value number system of hundreds, tens and … of units, thousands, millions, etc...
- i.e. if you can read/write a 3 digit number, you can read/write a 6 or 9 or 12 digit number e.g.

  123 ~ 123,000 ~ 123,000,000

Negative Numbers

Concept of Negative Numbers

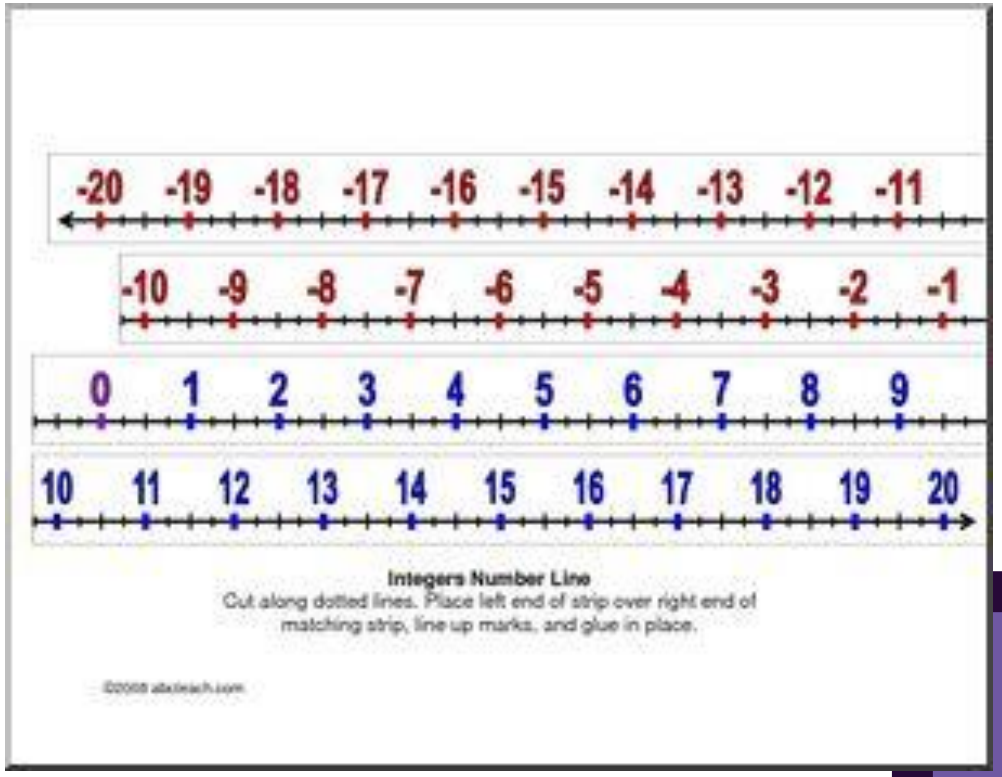
- Twig video clip (access through GLOW)
- Pupils to create their own number line in Numeracy jotters.
- Pupils to create a class number line including negative numbers (be good to have horizontal and vertical if space)
- Blank negative number lines - pupils to identify intervals then fill in blanks (reinforcing negative numbers as a continuation of what they already know - e.g. if we can count in multiples of 2 using positive numbers , it's the same pattern for negative numbers

Place value of Negative Numbers

- Human Number line to place numbers in order of value (could incorporate this with temperatures too e.g. sunshine at positive sides, snowflake at negative, link in with cities around the World)

What's my Number?

- Teacher (or pupil) chooses an integer.
- Children have to ask strategic questions to figure out the number.
- Set a range of integers (i.e. -20 to 20) and cross off numbers as they discount them.



Adding and Subtracting negative numbers

- Demonstrate addition and subtraction on a Human Number Line:
  - Pupils hold A4 cards e.g. from -5 to +5.
  - Questions such as -4 + 5.
  - One pupil has to be directed by the class to walk 5 places from –4.
  - Discussion should take place when deciding which way to move and why I.e. increasing a value, move to the right, when subtracting, we move to the left.

Individual number lines (laminated) will support calculations. (free on Twinkl)

This could be done during P.E. time where there will be more space and more opportunities for group discussion. Could also be done in groups and compare results.

Adding and Subtracting negative numbers

- Individual number lines (laminated) will support calculations (free on Twinkl)

  ~ in pairs, take turn to throw 2 dice (add then subtract from each other)

  ~ physically move counters along the line

- Loop cards

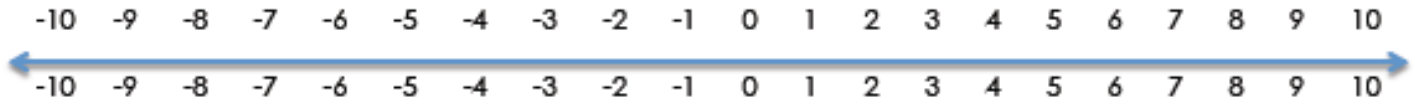
- Dominoes

Adding and Subtracting negative numbers

- Demonstrate your understanding by showing addition and subtraction calculations in a variety of ways
  - Numberline
  - Double sided counters/algebra tiles

Integer Tug of War

☆ Negative Ninjas



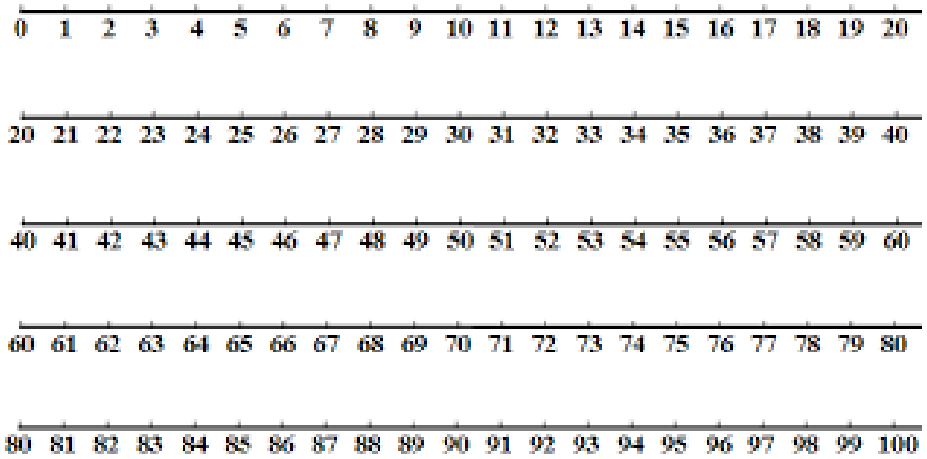
Powerful Positives ☆

Directions: Each player needs two colored counters. Place one counter on your team name. (For example, you might place a red counter on Negative Ninjas, and a blue counter on Powerful Positives.) This will remind you of the direction you are "tugging" during the game. Players begin with their counters on zero. Take turns rolling the two game dice. Move your piece the appropriate number of spaces depending on the dice roll. The first player to reach 10 on his/her side of the number line wins. If you reach ten on your opponent's side, reset your game piece to zero and continue playing.

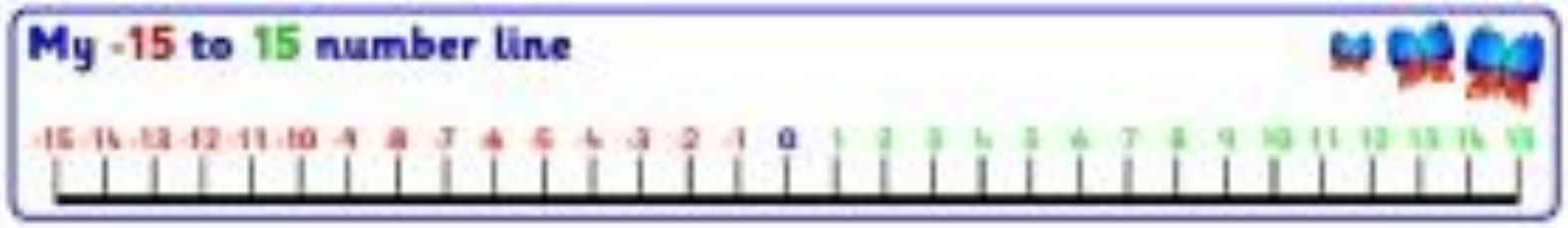
Example: The red player is on -4. She rolls +6. She moves her game piece to +2.

Number Line Activities

Next to, Far away

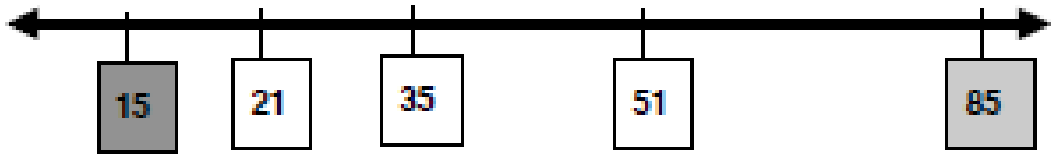


- Display a number line at the front of the classroom (vertical and horizontal)
- Teacher or pupil choses a number
- On a whiteboard, pupils write down the two numbers next to and the two numbers furthest away
- If there are differences in answers then pupils can defend their answers and reach a decision about which is right.



Next to, Far away continued…

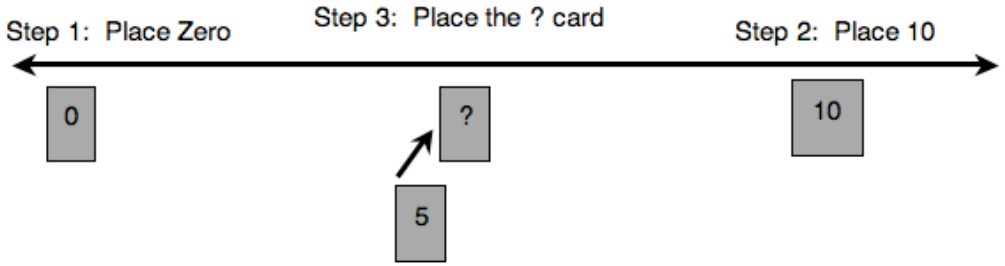
Display a physical numberline at the front of the classroom, it can start at any number



Ask questions to allow pupils to examine the relationship between numbers and demonstrate their number knowledge. Extend to decimal numbers depending on level/stage.

- Which two of the white cards are closest to each other?
- How close are they?
- Which is a greater distance: from 21 to 85? Or from 51 to 15?
- Is 51 closer to 35, or is it closer to 85?
- What number is exactly halfway between 35 and 85?
- Is 35 closer to 21 or 51? How much closer to each number?

Finding the Middle (Halving)



You will need a life sized number line, and various number cards, including zero, 3, 5, 6, 10, and 12. (Others are appropriate as well, including larger and decimal numbers for more advanced students.) You should also include an empty box number card.

• Step 1: Begin by placing zero on the number line.

• Step 2: Next, ask students where to place the number 10. Given their input, place 10, leaving ample distance between zero and ten.

• Step 3: Next, ask for a student volunteer to place an empty number card at the point of the rope that looks to be exactly halfway between the zero and the 10 number

cards.

• Ask students what number would go in the empty box halfway between zero and 10.

- Replace the empty box with the number 5.
- While leaving the existing cards on the number line (zero, 5, 10), repeat the activity
- with a new set of numbers. Ask the students where they should put the number 12 on the line. Then, ask them to place the number 6 on the number line in the correct place. It is important to listen to their justifications.
- Ask the children to describe their thinking: How do you know where to place the number 6?
- Some students may note that 6 is right next to 5. Others will use the halving strategy, working off the number 12. In either case, make sure that students discuss both methods for determining the middle of the number line.

Doubles (linear sequences)

You may wish to use contexts to motivate conceptual understanding of doubles. For

example:

“There are four children sitting at each of your tables. Without looking down, how many shoes would you find under your table?”

• You might build on this context by constructing a table that extends the context. Have children help you complete the table. It is not necessary to go in sequence (from 1-10, for example, on the top row). Rather, vary the order of the children so that they are encouraged to think in terms of doubling and halving.

Number of Children at your table

1 2 3 6 5 10

Number of Shoes under the table

2 4 6

- As you are working through the table, you might model the pairs of numbers on the demonstration number line. It is important that children can solve the problem both by making visual estimates of where the “doubles” will fall on the number line, and also by counting equal intervals on the number line.
- It is important to begin with zero labeled on the number line so that the students can determine a reasonable visual scale for doubling.
- Begin by placing the 2 on the number line. Ask students: “If 4 is the double of 2, where should we place the 4 card?” After the cards have been placed, take a piece of string and measure from zero to 2. Ask: “How can we use this string to know if we put the 4 card in exactly the right place?”
- Listen for students to articulate that the distance between zero and 2 must be the same as the distance between 2 and 4.

What's in the Box

Begin with the large-scale number line strung across the front of the room. Prepare

various number cards appropriate for your students, including several number cards

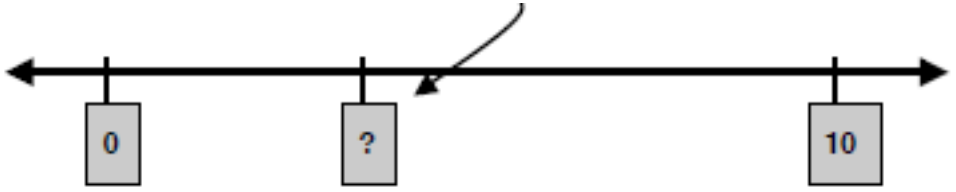
that are blank (or have a question mark inside). Teachers of younger children might

wish to focus on numbers between zero and 10. More experienced children can be

asked to focus on larger numbers (e.g., up to 100), and also a larger number range

(e.g., numbers between 35 and 95).

- Place zero (or some other starting value) on the number line. Next, hold up an empty
- number card. Ask: **"Where should I place this empty number box on the number**
- **line?"** Encourage students to think about the fact that the empty number card can go
- anywhere on the line as the number line is open, and the card could represent any
- number on the line. Place the card on the number line.
- • Next, take a second card with a number on it (e.g., 10). Place it on the number line to
- the right of the empty card. Ask: **"Now, do we have some idea of what the value**
- **of the empty number box might be?"**



0 – 100, 0 – 10, 0 - 1

Prepare three sets of cards: {0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100}
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
{1/10, 2/10. 3/10, 4/10, 5/10, 6/10, 7/10, 8/10, 9/10, 1}

Using different colors for each set of number cards will be helpful.

Begin by soliciting the help of the children in **placing the first set of cards** on the life-sized number line. Start with zero and 100 at the respective ends of the line, and then ask students how they know where to place the remaining cards. For example…

- Ask: *"Which of the remaining cards would be the easiest to place?"*
- Listen for students to use informal reasoning (e.g., "50 is in the middle.").

After all the cards in the first set have been placed on the number line appropriately and with student input, **change the endpoint of the number line from 100 to 10.** Do this by putting the 10 card directly on top of the 100 card.

Ask: *"Ok… I just changed the endpoint from 100 to 10. Now… all the other cards on the number line are out of place. How can we fix this by using the second set of cards?"*

Use this opportunity to help students make the connection between the decades that exist between zero and 100 (10, 20, 30, etc.), and whole numbers between zero and 10 (1, 2, 3, etc.). As students place the new set of number cards on the number line, have them place them directly on top of the previous correlated number (e.g., 3 is placed on top of 30). Continue to solicit informal reasoning from the students that reinforces the links between the two number lines (e.g., "Since 40 is halfway to 80, then I know 4 is halfway to 8.").

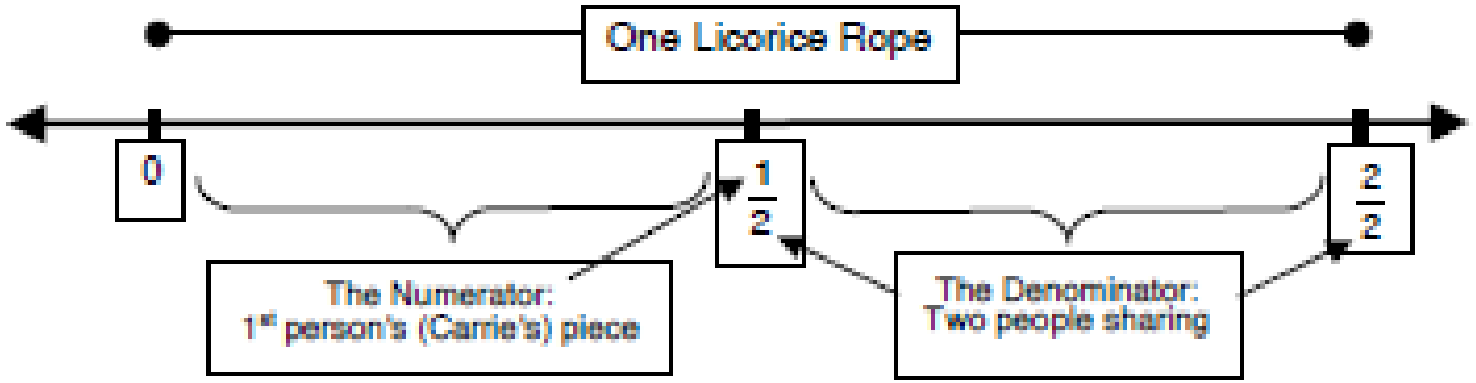
Benchmark Fractions and Decimals

- Begin by preparing the following sets of number cards (preferably in different colors):
  - $\{0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}\}$
  - $\{0, \frac{1}{3}, \frac{2}{3}, \frac{3}{3}\}$
  - $\{0, \frac{1}{2}, \frac{2}{2}\}$
- Place two cards on the life-sized number line – zero and 1. Leave plenty of space between the two cards.
- The notion of a "fair share" is a very helpful tool in generating understanding about fractional pieces. Toward that end, the following context might be helpful with your students as you begin this lesson. If possible, bring in several long licorice ropes as visual models and helpful motivators.

> *"Imagine that you have a long rope of licorice. The zero on our number line represents the beginning of the licorice rope, and the 1 represents the end. Now... suppose you were going to share that licorice rope with one friend. What would be a fair share for each of you?"*

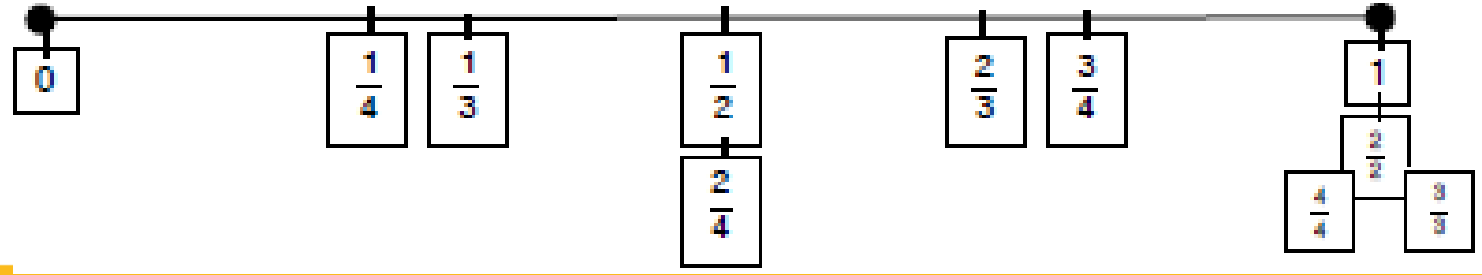
Cont

- Next, have a student place the ½ number card in the appropriate place. Be sure to emphasize the meaning of the action with respect to the fraction: "***We have split the licorice (as represented by the number line) into two equal pieces, to be shared by Carrie and Josh. Our fraction helps us understand: The bottom number (denominator) tells us, in this case, how many people want to share the licorice. The top (numerator) number shows us how many pieces we have given out so far.***" Next, place the second card, $\frac{2}{2}$, on the line, pinning it to the existing card (the number one). Ask students to similarly articulate the meaning of the second card: "The licorice was split fairly between two people, and this marks the end of the second piece of licorice."



Cont

- Continue the lesson with thirds. Ask: ***"We know how much Carrie and Josh got. They each got ½ of the licorice. Now, we have another piece of licorice. This time three people want to share it equally. How would we divide that licorice evenly between Ale, Carlos, and Paul?"*** Distribute the set of thirds fraction number cards. Before asking students to place the thirds on the number line, ask: *"Who will get the most licorice – Carrie (the first group), or Ale (the second group?"*
- Students may now place the next three cards on the number line: $\{\frac{1}{3}, \frac{2}{3}, \frac{3}{3}\}$.
- Continue the lesson in this fashion, next splitting the number line into fourths. If you use a large number line, students will be able to see clearly the difference between the thirds, quarters, and halves. By the end of the activity, the completed number line (see below) will be a great context to generate meaningful discussion. Some of these important discussion questions might include:
  - Which group (halves, thirds, fourths) got the largest piece of licorice? (halves)
  - Which group split the licorice rope into the most pieces? (quarters)
  - Which is larger, $\frac{1}{4}$ or $\frac{1}{3}$? (one-third)
  - How many quarters do you need to make a whole licorice rope? (four)
  - How many thirds do you need to make a whole? (three)
  - What if we had a group of five friends who wanted to split the licorice evenly?



Number Lines Interactive Games

https://www.topmarks.co.uk/Flash.aspx?f=NumberLinev5

http://www.ictgames.com/numberlineJumpMaker/index.html

http://www.ictgames.com/button%20only.html

http://www.ictgames.com/missingnumbers.html

https://www.topmarks.co.uk/Search.aspx?q=fractions+number+line&p=1

Fractions Number Line

https://www.khanacademy.org/math/arithmetic/fraction-arithmetic/arith-review-fractions-on-the-number-line/e/fractions_on_the_number_line_1

Visual Fractions

https://www.mathplayground.com/puzzle_pics_fractions.html