

Number Lines Galore

An activity on using the number-line with attention to size of number.

Pupils recognise the need for a scale and reference points on any number line. They explore the enlargement and reduction of number lines as a visual way to handle multiplicative relations. They handle proportionality and estimation in the process.

The emphasis here is on intuitive visual sense-making of number size. This is distinct from mental or written calculations, which cause diversions into procedures.

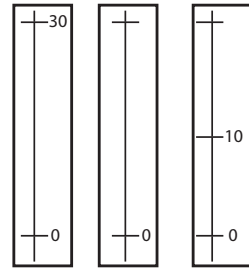
RESOURCES

Worksheets 1-4

EPISODE 1

Same length number-lines with different scales

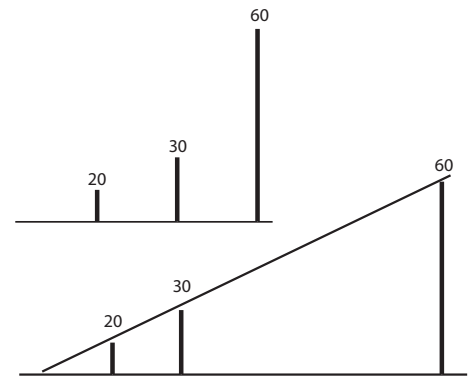
Pupils sequentially work on three strips with number lines of the same length but different scale. They are to find 15, 8, and 24. On the first strip they address ways of halving an interval and estimating the size of the unit. With the second strip they should recognise the need for at least two reference numbers, and can choose a convenient number as they wish. The third strip leads to extensions of the number line beyond the visible.



EPISODE 2

Same scale number-lines with different lengths

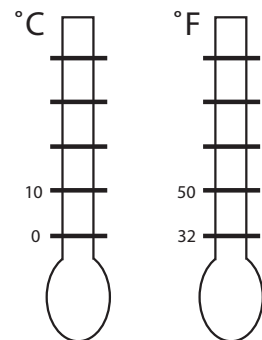
Pupils work on worksheet 2 with three lines 20, 30 and 60 units high respectively. Where in each line is the number 15, 8 and 24? What is common between the three lines of same length in episode 1 and the three lines of the different lengths in episode 2? How do they describe the families of lines joining the same number on the different number lines? What about joining the top, the middle, and the quarter marks of each line?



EPISODE 3

Temperature scales

Pupils work on two number strips, representing thermometers on the Fahrenheit and Celsius scales. How can they find different temperatures on each scale, for example 70 and 24 degrees on each? What happens on each scale when the temperature rises by 6 degrees and drops by 16 degrees?



REFLECTION QUESTIONS

How different are these uses of the number line?

What image of the number line is more useful to hold in your head?

EPISODE 1

Same length number-lines with different scales

RESOURCES: Card strips A, B and C on Worksheet 1

Whole class preparation

For younger classes start briskly with questions about “lucky and unlucky numbers for you”, “numbers you like”, and “easy numbers”. Focus attention on the 10s and 5s, posing a question like “What is special or useful about these?” Switch to how these useful numbers are useful in the number line, or rulers.

For other classes start with a question on “how do you imagine numbers organised in our mind?”. This would focus pupils’ attention on how different people have different images of the number line. These images may be influenced by special groups of numbers, like the ‘teens’, which are pronounced differently from the others, and 10s and 100s etc.

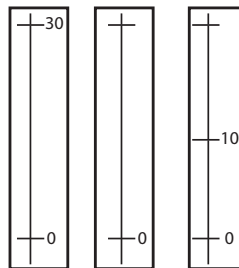
Another possible starter is to ask the class to imagine a number line starting from zero or ground level going up to the ceiling, and what number it would be. This should lead to discussion on scale, and to extending the line above the ceiling, and below the floor.

Paired/group work

In short rounds, each of about 5-6 minutes, the pupils work in pairs and groups. Give out the first card strip showing a 0-30 number line. Ask the pupils to find 15, 8, and 24. In discussion pupils share their ways of finding the halfway point, e.g. by folding, or using fingers etc. They talk of ways of estimating positions, and possibly finding the size of the unit scale.

Give out the second card-strip with the same length of line but only a zero at the bottom asking “What number could the other end of the line be?”. After discussion, ask the class to choose a sensible number for it, e.g. 100 or 60 etc, and ask children why they chose their number. Now ask them to find the same three numbers on it now as before.

Give out the third card-strip and ask them again to work out which number goes at the top, and then to find the three numbers again.



Commentary

Different classes need a different starter for this, avoiding mental calculations.

Warm-up should lead to the main activity on the size of numbers on the number line.

Halving methods.

Visual estimation

The need for two reference points on a number line to find the scale and therefore any other number.

WHOLE CLASS REFLECTION

Ask the class how would they find any number on any number line.

What is the minimal requirement, and how would they go about it?

The number-line is of infinite extension in the mind.