The long and the short of it

Support materials for teachers
These Year 6 activities start with an item that was included in the 2014 National Numeracy Tests (Reasoning). They continue with two linked activities, in which learners play different games.

**Activity 1**

**The long and the short of it**

Learners use their numerical skills to work out who will win a race.

- Teachers’ script
- PowerPoint presentation
- The long and the short of it questions
- Markscheme

**Activity 2**

**The race**

They interpret a graph of the race, completing a ‘newspaper’ report, then create a graph of their own race for others to interpret.

- Explain and question – instructions for teachers
- Resource sheet – Mick and Sam’s race
- Resource sheet – The race report

**Activity 3**

**A different race**

They play a game using positive and negative numbers, then create their own game.

- Explain and question – instructions for teachers
- Whiteboard – Two-dice game
- Resource sheet – Our game board

**Reasoning skills required**

<table>
<thead>
<tr>
<th>Identify</th>
<th>Communicate</th>
<th>Review</th>
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<tbody>
<tr>
<td>Learners choose their own methods, using a range of numerical skills.</td>
<td>They explain their approach, in writing and verbally.</td>
<td>They reflect on their findings, considering different outcomes.</td>
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</tbody>
</table>

**Procedural skills**

- Multiplication and division
- Graphs
- Negative numbers

**Numerical language**

- Solution
- Graph
- Represent
- Horizontal/vertical
- x-axis, y-axis
- Coordinates
- Intersection
- Steeper
- Total
- Negative number
Activity 1

The long and the short of it
Activity 1 – The long and the short of it

Outline

In this Year 6 activity, learners use their numerical skills to work out the positions of Mick and Sam during a race. They decide who has won the race, giving reasons for their decision.

You will need

- Teachers’ script
- PowerPoint presentation
- The long and the short of it questions
  Two pages for each learner, must not be printed double-sided
- Markscheme
**Presentation to be shown to learners before they work on The long and the short of it**

The text in the right-hand boxes (but not italics) should be read to learners. You can use your own words, or provide additional explanation of contexts, if necessary. However, if you are using this as an assessment item, no help must be given with the numeracy that is to be assessed.

<table>
<thead>
<tr>
<th>Slide 1</th>
<th>(Keep this slide on the screen until you are ready to start the presentation.)</th>
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<tbody>
<tr>
<td><strong>Slide 2</strong></td>
<td>This is Mick.</td>
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<tr>
<td><img src="image1" alt="Mick" /></td>
<td>Mick</td>
</tr>
<tr>
<td><strong>Slide 3</strong></td>
<td>And this is Sam.</td>
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<tr>
<td><img src="image2" alt="Sam" /></td>
<td>Sam</td>
</tr>
<tr>
<td>Slide 4</td>
<td>Here they are together, and you can see that Mick has much longer legs than Sam.</td>
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<tr>
<td>![Image](Mick and Sam)</td>
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<table>
<thead>
<tr>
<th>Slide 5</th>
<th>Mick and Sam are best friends. Their favourite game is jumping. They start together and then at the same time both boys do one jump.</th>
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<tr>
<td>![Image](Mick and Sam)</td>
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</table>

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<tr>
<th>Slide 6</th>
<th>The footprints show where they land. Mick lands on 5 but Sam’s legs are much shorter than Mick’s so he doesn’t jump as far. Where does Sam land? That’s right, on 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image](Mick and Sam)</td>
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<table>
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<tr>
<th>Slide 7</th>
<th>Then, at the same time, they both do another jump. Now they have each jumped twice. Where is Mick? (10) When Mick is on 10, where is Sam? (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image](Mick and Sam)</td>
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</tbody>
</table>
They jump again. Now they have each jumped three times. Where is Sam? (6)

When Sam is on 6, where is Mick? You can’t see it, but can you work it out? Yes, he is on 15 because 10 add another 5 is 15

Tell me about Sam’s jumps. How far does he jump each time? Yes, he jumps forward in twos like this . . . (point to 2, 4, 6 but do not continue counting in twos beyond 6).

Now tell me about Mick’s jumps. How far does he jump each time? Yes, he jumps forward in fives like this . . . (point to 5 and 10 and say 15, but do not continue counting in fives beyond 15).

You are going to answer some questions about Mick and Sam and how they jump together.

Remember to show your working so that someone else can understand what you are doing and why.

(If you are using this item for assessment purposes, you may wish to limit the time available, e.g. 10 minutes.)
When **Mick** is on **20**, where is Sam?

When **Sam** is on **14**, where is Mick?
Mick and Sam start again.

They decide to race.

I will start on 0

Your jumps are smaller so you start on 50

Who gets to 100 first?

Show how you work it out.
### Activity 1 – The long and the short of it – Markscheme

<table>
<thead>
<tr>
<th>Q</th>
<th>Marks</th>
<th>Answer</th>
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<tbody>
<tr>
<td>i</td>
<td>1m</td>
<td>8</td>
</tr>
<tr>
<td>ii</td>
<td>2m</td>
<td>35</td>
</tr>
<tr>
<td>Or 1m</td>
<td>Shows the value 7</td>
<td></td>
</tr>
<tr>
<td>Or</td>
<td>Links 25 to 10 and 30 to 12</td>
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<tr>
<td>Or 2m</td>
<td>As for 3m, but gives a wrong or no conclusion</td>
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<tr>
<td>Or</td>
<td>Links M to 20 (accept 20 × 5)</td>
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<tr>
<td>Or</td>
<td>Links S to 25 (accept 25 × 2)</td>
<td></td>
</tr>
<tr>
<td>Or 1m</td>
<td>Makes a list for S that goes up in 2’s, starting at 50 or 52 and ending at 100, even if there are errors</td>
<td></td>
</tr>
<tr>
<td>Or</td>
<td>Makes a list for M that goes up in 5’s, starting at 0 or 5 and ending at 100, even if there are errors</td>
<td></td>
</tr>
<tr>
<td>Or</td>
<td>Links 5 to 52, 10 to 54, 15 to 56, and 20 to 58</td>
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</table>
**Activity 1 – The long and the short of it – Exemplars**

**Part ii**

When Sam is on 14, where is Mick?

The pairs 10, 25 and 12, 30 are shown; **1 mark**
- The learner has continued the number patterns but stopped, perhaps because the diagram extends only as far as 12

**Part iii**

Who gets to 100 first?

Shows that M takes 20 jumps, S takes 25 jumps and M wins; **3 marks**

Links M to 20 and S to 25 but there is no conclusion; **2 marks**
- Although repeated addition is a correct method, it is inefficient. This learner may not be confident with multiplication and division.

Shows 5, 52 then 10, 54 then 15, 56 then 20, 58; **1 mark**
- This method would lead to a correct solution but, perhaps because the pairs of numbers are not written systematically, the learner has become confused.
Activity 2

The race
Activity 2 – The race

Outline

This activity continues the theme of a race as introduced in Activity 1 – The long and the short of it. Learners use a graph of the race to complete a report and solve a related problem. Then they create a graph of their own race and write a report, leaving elements of it for other groups to complete.

You will need

- Resource sheet – Mick and Sam’s race
- Resource sheet – The race report
- Squared or graph paper
Activity 2 – The race

Give each group/pair a copy of the resource sheet Mick and Sam’s race and also a copy of the resource sheet The race report. Remind learners of Mick and Sam from Activity 1 – The long and the short of it, and how they jump together, then ask them to use the graph to complete the report.

(Solutions, in order: 0, 5; 50, 2; 30, 62; 10, 50; 17th; 20; 25)

Bring the class together to discuss the solutions, then say that as the boys are good friends, in their next race they would like to finish together. If Mick starts at 0, where should Sam start? Ask learners to work in their groups/pairs to find the solution and draw the graph of the race. (This could be drawn on the graph on the resource sheet.)

(As Mick takes 20 jumps to get from 0 to 100, Sam must also take 20 jumps. Each of his jumps is 2 squares, so he must travel 20 × 2 = 40, therefore he starts at 60.)

Finally, ask learners to think of two (or more) fictional characters of their own and choose each person’s jump size and starting point. They should create a graph to show the race, then a report, with blanks, for other groups to complete.

On the graph, only some of the numbers on the axes are shown. Why don’t we show them all? (Not enough room) What does each vertical line represent? (One jump) What does each horizontal line represent? (10 squares jumped)

What do the points on the graph represent? (The position of each boy) What do the lines joining the points represent? (Nothing, they are there to help the eye connect the points)

When we read a point on the graph, which value do we read first? (The x-axis, i.e. the horizontal value) So what are the coordinates of this point?

What does this point (the intersection of the two lines) represent? (Where the two boys meet)

Who is in the lead for most of the race? (Sam) How do you know when Mick overtakes him? (Mick’s points are higher up the y-axis.)

Whose line is steeper? (Mick’s) Why? (His jumps are bigger so he moves more each time.)

(When the race is a draw) How are you going to start this problem? What do you know already?

(When creating their own race) Who is racing? What jumps are they taking? Where are they starting? Who do you want to win?

Have you checked your report? How? Is all the information needed available on your graph? Have you kept a record of the solutions? Which of your questions is easiest/most difficult? Why?
Activity 2 – Mick and Sam's race – Resource sheet

The long and the short of it

Which square they are on

Key:
- Mick's jumps
- Sam's jumps

Number of jumps

Which square they are on

Key:
- Mick's jumps
- Sam's jumps

Number of jumps

0 5 10 15 20 25

0 20 40 60 80 100
Race takes place!

The long-awaited race between Mick and Sam took place today. Crowds of people gathered to watch the race – everyone was tense. Who would win?

Mick started at ______ and jumped ______ squares at a time.

Sam started at ______ and jumped ______ squares at a time.

After 6 jumps, Mick was on ______ and Sam was on ______ .

After ______ jumps, Mick was on ______ and Sam was on 70.

The gap was narrowing!

Would Mick catch Sam? Yes . . . by the ______th jump Mick was ahead of Sam for the first time and after ______ jumps he reached 100 which is the end of the race. Well done Mick!

And well done to Sam too, who reached 100 after ______ jumps.

We look forward to their next race!
Activity 3

A different race
Activity 3 – A different race

Outline
The theme of racing is continued in this activity, which focuses on a race using positive and negative numbers. As part of the activity is for learners to construct their own number sentences, you may wish to work with a small group at a time or have additional adult support.

You will need
- Whiteboard – Two-dice game
- Resource sheet – Our game board
  One sheet per group/pair
- Each group of two pairs needs two blank dice (widely available on the internet) which you will need to number as shown on the whiteboard two-dice game
- Glue/tape for sticking the strips of board together
- Card for making their own game
Show **Two-dice game** on the whiteboard and say this is a game for two pairs of players. It uses two dice, as shown. Each pair will start with a counter on 0. They throw both dice and find the total, then move their counter that number of places along the board. They take it in turns until one of them goes beyond 10 or −10, in which case they are out and the other pair wins. Demonstrate on the whiteboard.

Once learners understand the rules, say that they are going to play the game – but first they need to create their own game board that goes from −20 to 20. Give each group of two pairs a copy of the resource sheet **Our game board**, which they cut out and glue to make a long strip. Let them play the game, then use the questions below to probe their understanding.

Finally, learners can make their own game using negative numbers for other groups to play. *(This could involve spinners if no more blank dice are available.)*

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**Tell me what a negative number is. When do we use them in real life?** *(For example, temperatures)*

**What is the greatest number of moves forward you could make?** *(11, from 5 + 6)*

**What about the greatest number of moves backwards?** *(−11, from −5 and −6)*

**What is the smallest number of throws you could have before you are out of the game?** *(2)*

**What about the greatest number of throws?** *(In theory, infinite)*

**Suppose someone throws the dice and doesn’t move. What numbers could they have thrown?** *(1 and −1, 2 and −2, etc.)*

**What if they move from 3 to 7?** *(6 and −2, 5 and −1)*

**Or 7 to 3?** *(−6 and 2, −5 and 1)*

**Can you show me all possible moves?** *(A table, as shown right, is an efficient method.)* Which is more likely – that you move forwards, backwards or stay still? *(Moving forwards or backwards are equally likely, and both are more likely than staying still. If appropriate, learners can use probabilities to describe outcomes.)*

**Suppose they move from 3 to 7? (6 and −2, 5 and −1)**

**Or 7 to 3? (−6 and 2, −5 and 1)**

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**Suppose they move from 3 to 7? (6 and −2, 5 and −1)**

**Or 7 to 3? (−6 and 2, −5 and 1)**

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**Question**

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**Explain**

(Note: throughout, ‘negative’ describes a number below zero, e.g. −3 is read as ‘negative 3’. This differentiates it from the operation which can be read as ‘subtract’ or ‘minus’. So ‘4 + −3’ is read as ‘4 add negative 3’ and ‘−3 + 2’ is read as ‘negative 3 add 2’. Although it is not used here, ‘−4 − −3 = −1’ would be read as ‘negative 4 minus (or subtract) negative 3 equals negative 1’.)

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**Activity 3 – A different race**
Activity 3 – Two-dice game – Whiteboard

The long and the short of it

-1, 2, -3, 4, -5, 6

1, -2, 3, -4, 5, -6

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10
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