The 100 Metres Dash – probability investigation

Name _____ Date _____

Teacher's Notes

Objectives

- to add single digit numbers
- to record information in a table
- to organise information in a bar chart
- express the likelihood of an event using fractions
- find the total number of possible outcomes of combined events

Functional skills content - see pages 7-8 for details

Entire resource is a non-calculator set of tasks

KEY

Underpinning task or information. Problem solving task

Di Mellor, the contributor, says:

Entry learners will complete the practical part of the activity, throwing the dice and adding the scores. With support, they could also draw a chart of their results and comment on it. It therefore fulfils several NS (Using numbers and the number system) and HD (Handling information and data) subject content descriptors.

In addition, Level 1 and 2 learners can discuss any patterns emerging, make predictions, draw a table of results and calculate probability using fractions. This again covers several NS and HD subject content descriptors.

I deliberately made it a 100m race not a horse race because I have learners who do not gamble, whether for cultural or religious reasons.

I made an *OHT of the "race card" and we did it as a group the first time through and talked about it. Of course, someone noticed that athlete number 1 had no chance of winning. I like group teaching where basically everyone does the same thing at different levels.

As usual E1 & E2 learners did not go as far as L1 & L2 learners, but E3 learners did and enjoyed it. I like to introduce people to new things before they need to do them. So, we all have fun really!

Di Mellor, 2004.

*Overhead transparency. Nowadays, likely to be replaced by projecting the race card on a smart board.

PLEASE NOTE: pages 9-11 (answers, sample bar charts, teaching ideas and points for discussion) of this document are only available to resource contributors. If you are a skillsworkshop.org contributor please use the site contact link to ask for your free copy.

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Name _____ Date _____

Lane	10m	20m	30m	40m	50m	60m	70m	80m	90m	100m
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

Lane	10m	20m	30m	40m	50m	60m	70m	80m	90m	100m
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

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Game Instructions (use the '100 Metres Dash' table on page 2)

1. Which athlete do you think will win?
2. Throw 2 dice and add the scores together. Move the athlete with that number one place / 10 metres.
3. Keep throwing 2 dice together and moving the athletes until one athlete gets to the finish line.
4. Which athlete won? Who came last?
5. Repeat the race. Which athlete do you think will come first, second, etc. this time?

Fill in the table below, writing in the totals when you throw 2 dice.

+	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

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Use your completed table on page 3 to help answer these questions.

How many ways can you score 1? _____

How many ways can you score 2? _____

How many ways can you score 3? _____

How many ways can you score 4? _____

How many ways can you score 5? _____

How many ways can you score 6? _____

How many ways can you score 7? _____

How many ways can you score 8? _____

How many ways can you score 9? _____

How many ways can you score 10? _____

How many ways can you score 11? _____

How many ways can you score 12? _____

Altogether, how many possible ways are there of getting a score (possible outcomes)? _____

Probability is the number of ways an event can happen divided by the total number of possible outcomes.

You can write this as a fraction, like this: $\frac{\text{number of ways an event can happen}}{\text{total number of possible outcomes}}$

Calculate the probabilities of each athlete from 1 – 12 winning the race and write them as fractions.

Display your answers in a suitable table or list.

- Use the space on the next page.
- Simplify your answers.
- How can you check your work?

Draw a suitable graph or chart to show the results of one of your 100m races.

Use page 6 or a separate sheet of graph paper.

Check that your chart is correctly labelled and has a title.

Write three sentences about the race. Use your chart to help you.

Example: The runner in lane _____ came second in the race.

_____

_____

_____

_____

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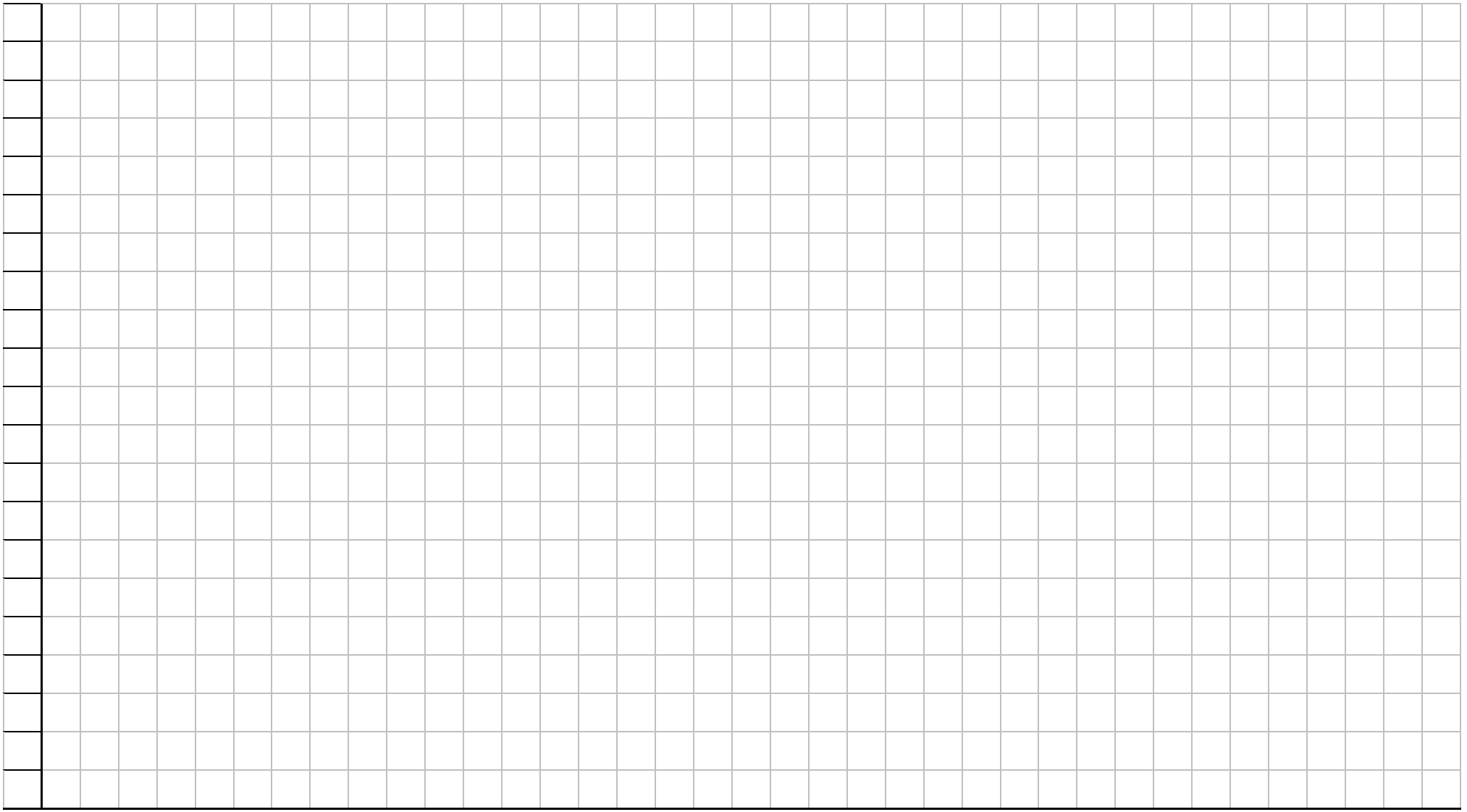

The 100 Metres Dash – probability investigation Curriculum mapping

Source: *DfE (Feb 2018), Subject content functional skills: mathematics* https://www.gov.uk/government/publications/functional-skills-subject-content-mathematics

Subject content - FUNCTIONAL SKILLS MATHEMATICS				
✓ indicates the **content and problem-solving skill(s)** covered in this resource, although these will vary with the student group and how the resource is used by the teacher. (✓✓ = a key learning objective). → = not covered but included to show progression across levels (*content at each level subsumes and builds upon the content at lower levels).*				
Fundamental mathematical knowledge and skills These must be demonstrated in their own right, **both with and without a calculator**, in addition to being used to solve problems or complete tasks.				
Entry Level 1	**Entry Level 2**	**Entry Level 3**	**Level 1**	**Level 2**
Using numbers and the number system – whole numbers, fractions, decimals, percentages (NS)				
1. Read, write, order and compare numbers up to 20 ✓ 3. Add numbers which total up to 20, and subtract numbers from numbers up to 20 ✓✓	10. Recognise simple fractions (halves, quarters and tenths) of whole numbers and shapes →	6. Recognise and continue linear sequences of numbers up to 100 ✓ 7. Read, write and understand thirds, quarters, fifths and tenths including equivalent forms →	8. Read, write, order and compare common fractions and mixed numbers ✓✓	7. Order, add, subtract & compare amounts or quantities using proper and improper fractions and mixed numbers ✓ 8. Express one number as a fraction of another ✓
Handling information and data (HD)				
11. Read numerical information from lists → 13. Read and draw simple charts and diagrams including a tally chart, block diagram/graph ✓✓	22. Extract information from lists, tables, diagrams and bar charts ✓ 23. Make numerical comparisons from bar charts ✓ 25. Take information from one format and represent the information in another format including use of bar charts ✓✓	23. Organise and represent information in appropriate ways including tables, diagrams, simple line graphs and bar charts ✓✓	30. Understand probability on a scale from 0 (impossible) to 1 (certain) and use probabilities to compare the likelihood of events ✓ 31. Use equally likely outcomes to find the probabilities of simple events and express them as fractions →	27. Express probabilities as fractions, decimals and percentages) ✓✓

Mathematical problem solving (at all levels of Functional Mathematics)		
Although underpinning knowledge is tested in its own right, problem solving (p-s) is a core element of Functional Skills mathematics yet should not obscure or add additional mathematical complexity beyond the level of the qualification. Defining p-s is a challenge but the attributes below are helpful. Not all (in fact often just one) of the listed attributes must be present in a single task for it to be considered to be p-s. ✓ indicates why all or parts of this resource can be considered to be problem solving.		
One or more of the following attributes may be present in a single task for it to be considered problem solving.		
A	Tasks that have little or no scaffolding: there is little guidance given to the student beyond a start point and a finish point. Questions do not explicitly state the mathematical process(es) required for the solution.	
B	Tasks that provide for multiple representations, such as use of a sketch or a diagram as well as calculations.	✓
C	The information is not given in mathematical form or in mathematical language; or there is a need for the results to be interpreted or methods evaluated, for example, in a real-world context.	
D	Tasks have a variety of techniques that could be used.	✓
E	The solution requires understanding of the processes involved rather than just application of the techniques.	✓

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Source: *DfE (Feb 2018), Subject content functional skills: mathematics https://www.gov.uk/government/publications/functional-skills-subject-content-mathematics*

Solving mathematical problems, carrying out tasks and decision making.

Entry Level 1 students are expected to be able to:	**Entry Level 2 students** are expected to be able to:	**Entry Level 3 students** are expected to be able to:	**Level 1 students** are expected to be able to:	**Level 2 students** are expected to be able to:
Use the content knowledge and skills to recognise a [1]**simple problem** and obtain a solution ✓			Use the content knowledge and skills to recognise and obtain a solution or solutions to a: [2]**straightforward problem**. ✓	[3]**complex problem.**
E1a. Use given mathematical information and recognise and use simple mathematical terms appropriate to E1 ✓	E2a. E3a. Use given mathematical information including numbers, symbols, simple diagrams and charts ✓		L1a. L2a. Read, understand and use mathematical information and mathematical terms used at this level ✓	
	E2b. Recognise, understand and use simple mathematical terms appropriate to Entry Level 2	E3b. Recognise, understand and use simple mathematical terms appropriate to Entry Level 3	L1b. L2b. Address individual problems as described above ✓	
			L1c. L2c. Use knowledge and understanding to a required level of accuracy	
E1b. E2c. E3c. Use the methods given above to produce, check and present results that make sense ✓ [*E3 only:* to an appropriate level of accuracy].				L2d. Identify suitable operations and calculations to generate results ✓
E1c. Provide a simple explanation for those results. ✓	E2d. Present appropriate explanations using numbers, measures, simple diagrams, simple charts and symbols appropriate to Entry Level 2. ✓	E3d. Present results with appropriate explanation using numbers, measures, simple diagrams, charts and symbols appropriate to Entry Level 3. ✓	L1d. L2e. Analyse and interpret answers in the context of the original problem ✓	
			L1e. L2f. Check the sense, and reasonableness, of answers ✓	
			L1f. Present results with appropriate explanation and interpretation demonstrating simple reasoning to support the process & show consistency with the evidence presented	L2g. Present results and explain results clearly and accurately demonstrating reasoning to support the process and show consistency with the evidence presented

KEY: MCA = appropriate mathematical content area(s). NS = Using numbers and the number system. MS = Using common measures, shape and space. HD = Handling information and data.

[1]A **simple mathematical problem** requires **working through one step or process**. At Entry Level it is expected that students will be able to address individual problems each of which draw upon knowledge and/or skills from **one** MCA (NS, MS or HD). **Context** should be familiar to all students and easily described.

[2]A **straightforward problem** requires students to either work through one step or process **or to work through more than one connected step or process**. Individual problems are based on the knowledge and/or skills in the MCA (i.e. NS, MS or HD). At Level 1 it is expected that the student will be able to address individual problems, some of which **draw upon a combination of any two of the MCA** and require students to make connections between those content areas. **The context** of individual problems at L1 will require some comprehension in order for the student to be able independently to identify and carry out an appropriate mathematical approach.

[3]**A complex problem** requires **a multi-step process, typically requiring planning and working through at least two connected steps or processes**. Individual problems are based on a combination of the knowledge and/or skills from the MCA (NS, MS or HD). At Level 2 it is expected that the student will be able to address individual problems some of which draw upon a combination of **all three MCA** and require students to make connections between those content areas. **The context** of individual problems at L2 will require interpretation and analysis in order for the student to be able independently to identify and carry out an appropriate mathematical process or processes.