

## USING AND APPLYING MATHEMATICS TO SOLVE PROBLEMS

Pupils should be taught to:

Solve word problems and investigate in a range of contexts (continued)

As outcomes, Year 7 pupils should, for example:

### Problems involving probability

For example:

- Samir spins a fair coin and records the results. In the first four spins, 'heads' comes up each time.

1st spin	2nd spin	3rd spin	4th spin
head	head	head	head

Samir says:

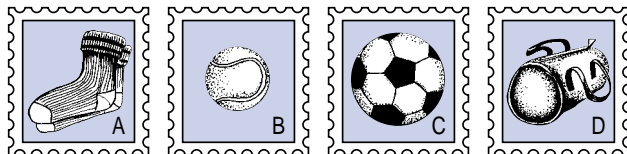
'A head is more likely than a tail.'

Is he correct? Give a reason for your answer.

- There are six balls in a bag. The probability of taking a red ball out of the bag is 0.5. A red ball is taken out of the bag and put to one side. What is the probability of taking another red ball out of the bag?
- In each box of cereal there is one free card. You cannot tell which card will be in a box. Each card is equally likely.

Altogether there are four different cards.

When you have them all, you can send for free sports socks.



Zoe needs card A. Paul needs cards C and D.

They buy one box of cereal.

What is the probability that:

- the card is one that Zoe needs?
- the card is one that Paul needs?

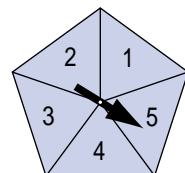
Their mother opens the box.

She tells them the card is not card A.

What is the probability now that:

- the card is one that Zoe needs?
- the card is one that Paul needs?

- A fair spinner has five sections numbered 1, 2, 3, 4, 5. What is the probability of getting a prime number from one spin?



What about a fair spinner with 6 sides? 7 sides?

Draw a bar-line graph to show the probability of getting a prime number from one spin of a spinner with 4 to 15 sides.

- Some children choose six tickets numbered from 1 to 200. Kay chooses numbers 1, 2, 3, 4, 5 and 6. Zak chooses numbers 14, 45, 76, 120, 137 and 182. Mary then picks a number at random from 1 to 200. Is Kay or Zak more likely to have Mary's number? Explain why.

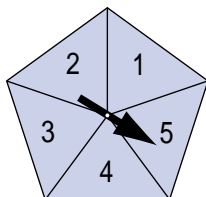
See Y456 examples (pages 112–13).

As outcomes, Year 8 pupils should, for example:

### Problems involving probability

For example:

- Here is a spinner with five equal sections.



Jane and Sam play a game. They spin the pointer many times. If it stops on an odd number, Jane gets 2 points. If it stops on an even number, Sam gets 3 points. Is this a fair game? Explain your answer.

- Bag A contains 12 red counters and 18 yellow counters.



Bag B contains 10 red counters and 16 yellow counters.



I am going to take one counter at random from either bag A or bag B. I hope to get a red counter. Which bag should I choose? Justify your choice.

- All the cubes in a bag are either red or black. The probability of taking out a red cube at random is  $\frac{1}{5}$ . One cube is taken at random from the bag and placed on the table. The cube is red. What is the smallest number of black cubes there could be in the bag?

Another cube is taken from the bag and placed beside the first cube. The second cube is also red. From this new information, what is the smallest number of black cubes there could be in the bag?

- The names of all the pupils, all the teachers and all the canteen staff of a school are put in a box. One name is taken out at random. A pupil says: 'There are only three choices. It could be a pupil, a teacher or one of the canteen staff. The probability of it being a pupil is  $\frac{1}{3}$ .'

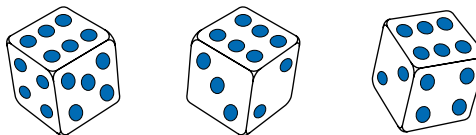
The pupil is wrong. Explain why.

As outcomes, Year 9 pupils should, for example:

### Problems involving probability

For example:

- Some pupils threw three fair dice.



They recorded how many times the numbers on the dice were the same.

Name	No. of throws	Results		
		all different	two the same	all the same
Morgan	40	20	12	2
Sue	140	81	56	3
Zenta	20	10	10	4
Ali	100	54	42	0

Write the name of the pupil whose data are most likely to give the best estimate of the probability of getting each result. Explain your answer.

- Two bags, A and B, contain coloured cubes.



Each bag has the same number of cubes in it. The probability of taking a red cube at random out of bag A is 0.5. The probability of taking a red cube at random out of bag B is 0.2.

All the cubes are put in an empty new bag. What is the probability of taking a red cube out of the new bag?

*What if bag A has twice the number of cubes that are in bag B?*

- Karen and Huw each have three cards, numbered 2, 3 and 4. They each take one of their own cards. They then add together the numbers on the four remaining cards. What is the probability that their answer is an even number?
- John makes clay pots. Each pot is fired independently. The probability that a pot cracks while being fired is 0.03.*
  - John fires two pots. Calculate the probability that:*
    - both pots crack;*
    - only one of them cracks.*
  - John has enough clay for 80 pots. He gets an order for 75 pots. Does he have enough clay to make 75 pots without cracks? Explain your answer.*