Mathematical investigation (1)

Investigating is a great way to learn to think mathematically, apply logic, spot patterns and improve our perseverance.

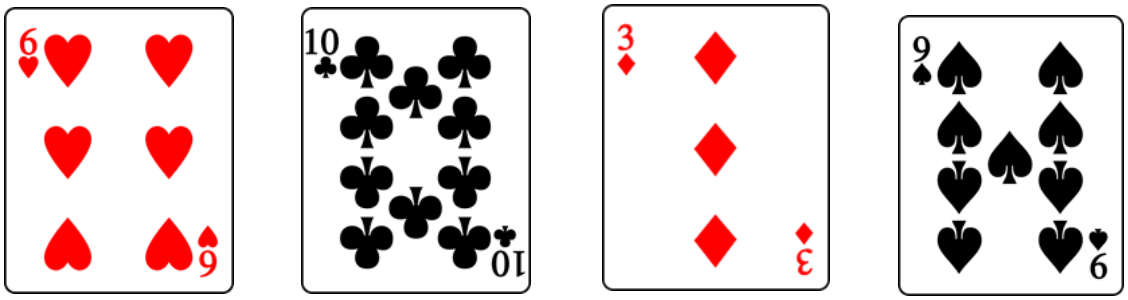
What are the chances of that?!

Aim:

- Apply learning about **fractions** to explore **probability**.

You will need:

- A pack of playing cards *with the kings removed* or 'Chance cards' (*see resource*)



What to do:

- Print and cut out the cards; shuffle them REALLY well.
  If using your own playing cards, each one has its face value.
  Note that Aces = 1, Jacks = 11, Queens = 12
- We will explore the **chances** of turning over certain cards.
  We will discover that there is a lot of maths involved, using **FRACTIONS**!

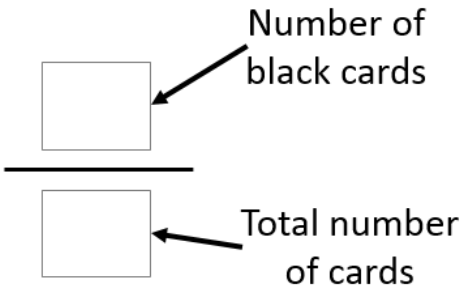
Let's make sure we've got the basic facts…

- How many cards are there in total?
- How many 'black' cards are there (cards with a black shape)?
- How many 'red' cards?
- How many cards with a heart ♥? A diamond ♦? A club ♣? A spade ♠?
- How many 1s? 2s? 12s?
- How many even numbers? Odd numbers?

Let's Start Thinking!

Probability This is a topic you'll be studying at secondary school!!
It's based on an understanding of fractions…

- Fill in the numbers in this fraction.



- Write this fraction In its **simplest** form.

That makes sense doesn't it…? 24 out of 48 cards are black. So, one in every two ($^1/_2$), i.e. **half** of the cards are black; the other half are red.

- What do you *expect* to happen if you turn over the first 12 cards from your pack? 6 reds and 6 blacks?
- Now have a go… write down what happens. Keep those cards on one side.
- Now try again with the next 12 cards… And the next... And the last 12.

The *theoretical* **probability** (chance) of turning over a red/ black card is $^1/_2$. BUT sometimes what we *expect* to happen does happen; sometimes it doesn't…

- Shuffle all the cards
- Work out the probability of picking **one** card from a shuffled pack of 48 which is each of these:

a heart

a 3

an odd number

a prime number

a 1-digit number

a multiple of 5

a 1 *or* a 12

an odd number *or* a 12

a 1, 2, 3 or 4

Turn to the next page to check your answers….!

Answers

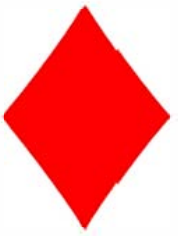
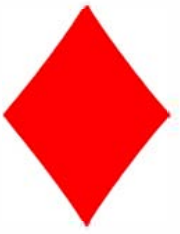
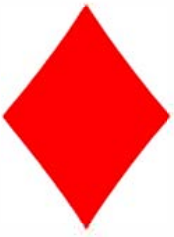
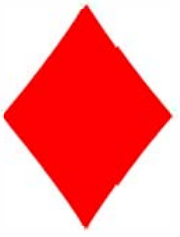
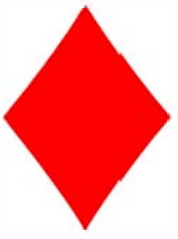
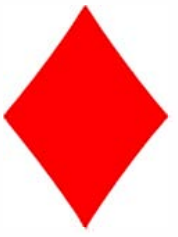
The probability of picking one card which is:

- a heart: there are 12 heart cards out of 48 cards ($^{12}/_{48} = \mathbf{^1/_4}$)
- a 3: there are four 3s out of 48 cards ($^{4}/_{48} = \mathbf{^1/_{12}}$)
- an odd number: there are 24 odd numbers out of 48 cards ($^{24}/_{48} = \mathbf{^1/_2}$)
- a 1 or a 12: there are four 1s and four 12s, so 8 out of 48 cards ($^{8}/_{48} = \mathbf{^1/_6}$)
- a 1, 2, 3 or 4: there are four of each number so 16 out of 48 ($^{16}/_{48} = \mathbf{^1/_3}$)
- a 1-digit number: 36 cards have a 1-digit number so 36 out of 48 ($^{36}/_{48} = \mathbf{^3/_4}$)
- an odd number or a 12: there are four 12s and 24 odd numbers, so 28 out of 48 ($^{28}/_{48} = \mathbf{^7/_{12}}$)
- a multiple of 5: there are two in each suit (5 and 10), so 8 in all, 8 out of 48 cards ($^{8}/_{48} = \mathbf{^1/_6}$)
- a prime number: there are five in each suit (2, 3, 5, 7, 11), which makes 20 in all. 20 out of 48 ($^{20}/_{48} = \mathbf{^5/_{12}}$)

1 	2 	3 
4 	5 	6 
7 	8 	9 
10 	11 	12 

1 	2 	3 
4 	5 	6 
7 	8 	9 
10 	11 	12 

1 	2 	3 
4 	5 	6 
7 	8 	9 
10 	11 	12 

1 	2 	3 
4 	5 	6 
7 	8 	9 
10 	11 	12