A place value and an addition or subtraction game with four dice

In pairs each person throws four dice.

The idea is to make two 2-digit numbers.

From here different challenges can be given according to whether the teacher wants the children to practice addition or subtraction as follows:

Addition game

Each player has to decide how to rearrange their dice (as two 2-digit numbers) in order to:

a) make the largest (maximum) total or

b) make the smallest (minimum) total

when they add the two numbers together

Subtraction game

Each player has to decide how to rearrange their dice (as two 2-digit numbers) in order to

a) make the largest total difference or

b) make the smallest total difference

when they subtract one number from the other (for some children negative values might emerge)

An addition game with 5 dice

This game requires 5 dice and two or more players.

Player 1 throws all five dice. If either a 2 or a 5 appear then the score for that 'go' is zero and any of the dice which has a 2 or a 5 on it are removed.

The **same player continues** to throw the remaining dice. If no 2 or no 5 appears, then the score for that 'go' is the total of all spots showing.

For example if I throw 3, 1, 5, 6, 6 then I score zero because a 5 appeared. I now remove the 5 and for my next go I throw the remaining four dice

If on the next go I get 6, 1, 3, 4 (so no 2 or no 5 appears) I score 6 + 1 + 3 + 4. I then throw the four dice again.

Below is my full set of 'throws' together with the running totals:

1st throw	3, 1, 5, 6, 6	Total score 0 (because a 5 was thrown)
2nd throw	6, 1, 3, 4	14
3rd throw	2, 4, 4, 5 (score 0)	14 (Remove the dice with 2 and the 5)
4th throw	3, 6 (score 9)	23 (9 + 14)
5th throw	1, 4 (score 5)	28 (23 + 5)
6th throw	2, 6 (score 0)	28 (Now remove the dice with the 2)
7th throw	4 (score 4)	32
8th throw	3 (score 3)	35 (32 + 3)
9th throw	5 (score 0)	35

The final total for this play is 35

The next player then takes the 5 dice and the game continues.

A game with six dice

This game is about scoring runs that always begin at 1

The first player throws all six dice and scores a certain number of points if any of the following combinations appear:

1, 2 (and anything else which is not a 3)

This scores 3

1, 2, 3 (and anything else which is not a 4)

This scores 6

1, 2, 3, 4 (and anything else which is not a 5)

This scores 10

1, 2, 3, 4, 5 (and anything else which is not a 6)

This scores 15

1, 2, 3, 4, 5, 6

This scores 21

Of course there could be two runs so a throw of

1, 2, 1, 3, 5, 2 could score 1+2+3 + 1+2 = 9

Likewise a throw of 2, 1, 1, 2, 2, 1 will score 1+2 + 1+2 + 1+2 = 9

Players take turns.

The winner is the first player to score a running total of whatever you think would be appropriate or until each player has had an equal number of turns.

The four dice problem

Throw four dice and use the uppermost values as single digit numbers. The idea is to use **all** four numbers, in any order and once each together with any of the four operations which can be used more than once as well as brackets.

The task is to see how far you can without missing out any values from zero upwards. The example below is based upon throwing: 1, 3, 5 and 3

Calculation	Target	Calculation	Target
	= 0		=15
	= 1	(5 + 3) x (3 – 1)	= 16
	= 2		= 17
	= 3		= 18
	= 4	3 + 5 x 3 + 1	= 19
	= 5		= 20
	= 6		= 21
	= 7		= 22
	= 8		= 23
	= 9		= 24
	= 10		= 25
	= 11		= 26
5 + 3 + 3 + 1	= 12		= 27
	= 13		= 28
	= 14		= 29

Can all the values be found?
Can you go beyond 29?
Can you generate negative values?

Your four dice are

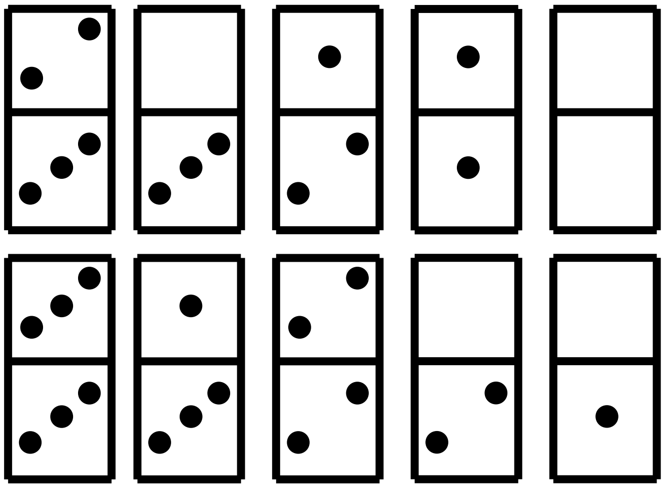
Calculation	Target	Calculation	Target
	= 0		=15
	= 1		= 16
	= 2		= 17
	= 3		= 18
	= 4		= 19
	= 5		= 20
	= 6		= 21
	= 7		= 22
	= 8		= 23
	= 9		= 24
	= 10		= 25
	= 11		= 26
	= 12		= 27
	= 13		= 28
	= 14		= 29

Your four dice are

Calculation	Target	Calculation	Target
	= 0		=15
	= 1		= 16
	= 2		= 17
	= 3		= 18
	= 4		= 19
	= 5		= 20
	= 6		= 21
	= 7		= 22
	= 8		= 23
	= 9		= 24
	= 10		= 25
	= 11		= 26
	= 12		= 27
	= 13		= 28
	= 14		= 29

Dominoes and pairs games

A 3-3 set of dominoes are made from dominoes using the numbers 0, 1, 2 and 3 only as follows:



Pupils can play the game of pairs, where they choose two dominoes and count if the total number of spots is equal to 6

They might begin by seeing all the dominoes face up.

With a 4-4 set, and because there are 15 dominoes in this set, you may wish to remove any domino with a total of four spots.
This will leave 7 pairs each of which total to eight.

With a 5-5 set, there are 21 dominoes so remove any domino with a total of five spots. This makes 10 pairs so each totals to ten.

With a 6-6 set there are 28 dominoes and there are 14 pairs which total to twelve.

Dominoes and ordering

Ask pupils to find a way of placing the above 3-3 set of dominoes into some kind of order. Such a task might inform the teacher of pupils' understanding of the idea of ordering.

Dominoes and differencing 1

Choose whichever size of set you think will be appropriate for your pupils. You might even use larger sets; a 7-7 set has 36 dominoes, an 8-8 set has 45 and a 9-9 set has 55 dominoes.

These games are to practice the idea of 'difference between' and pupils might work in groups of three's

The set of dominoes needs to be turned over, face down, and spread across a table. Pupils take turns to:

- choose two dominoes
- find the total for each one
- find the (positive) difference between these two totals
- this value becomes their score for that 'go'
- the dominoes are not returned to the table

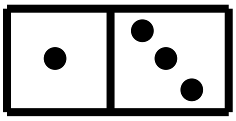
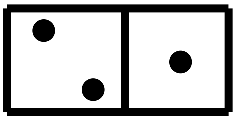
Players take turns and the 'winner' is the person with the greatest sum of the differences. Clearly everyone will need to take the same number of turns so with some sets there will be some unused dominoes at the end of each game.

You might ask one member of the group to become the recorder of the scores for the other pair of players. However each player should obviously be encouraged to work out their scores which the recorder needs to check.

The teacher may suggest players have a certain number of turns; clearly the more turns will involve slightly harder arithmetic calculations and totals.

Dominoes and differencing 2

The game could be made harder by applying place value.

For example if the two dominoes chosen are the
 and the  pupils have to turn these
into tens and units.

So as they appear above they would be worth 13 and 21 respectively, in which case the difference would be 8.

If the idea is to maximise the difference then, strategically, the best choice would be 31 and 12 so the difference becomes 18

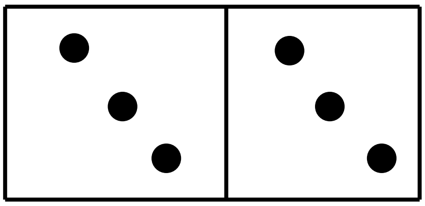
Dominoes and differencing 3

This game involves multiplication and subtraction.

As before pupils choose two of the face down dominoes and find the product of each, thus with a 5-5 set if the 5-3 and the 3-2 dominoes are chosen, the products become 15 and 6 so the resulting calculation will be 15 – 6 = 9

This game is also useful for practising multiplication by zero!

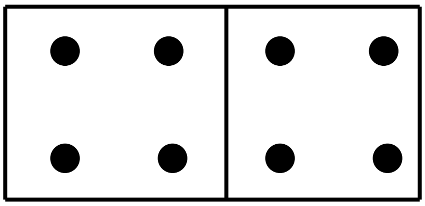
Dominoes and partitioning 1



Using all the dominoes in a 3-3 set, split them into five pairs so the total number of spots for each pair is the same.

Using all the dominoes in a 3-3 set, try to make two equal size groups so the total number of spots for each group is the same.

Dominoes and partitioning 2

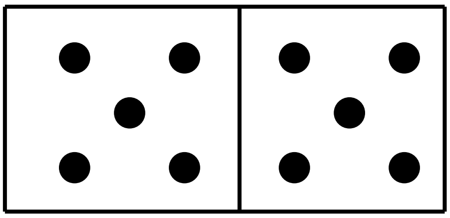


Using all the dominoes in a 4-4 set, split them into three equal size groups so the total number of spots for each set is the same.

Split a 4-4 set of dominoes into five equal size groups so the total number of spots for each group is the same.

Group a 4-4 set of dominoes into a 5 by 3 array, so the 5 rows of dominoes each sum to 12 **AND** the 3 columns of dominoes sum to 20

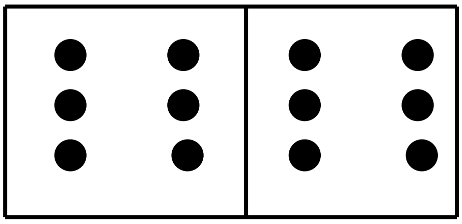
Dominoes and partitioning 3



Split a 5-5 set of dominoes into three equal size groups so the total number of spots for each group is the same

Split a 5-5 set of dominoes into seven equal size groups so the total number of spots for each group is the same.

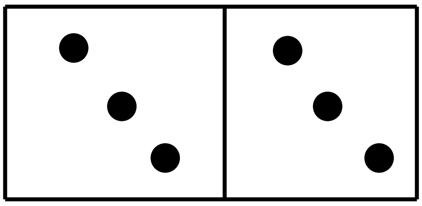
Dominoes and partitioning 4



From a 6-6 set remove all the doubles and split it into **three** equal size groups so the total number of spots for each group is the same.

From a 6-6 set remove all the doubles and split it into **seven** equal size groups so the total number of spots for each group is the same.

Number of dominoes problem



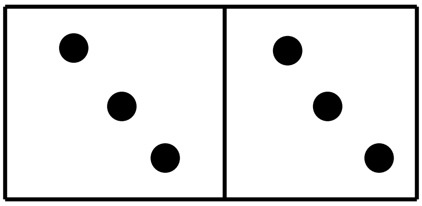
How many dominoes are there in a 3-3- set?

How many dominoes are there in other sets?

Look for patterns in the number of dominoes in the different sets

Could you predict how many dominoes there would be in a 7-7 set, an 8-8 set and a 9-9 set?

Number of spots problem



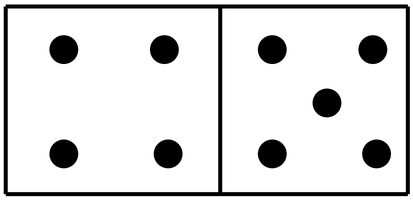
See if you can find a way of answering these questions without counting each spot.

How many spots are there in a 3-3- set?

How many spots are there in other sets?

Look for patterns in the number of dominoes in the different sets.

Domino magic



Choose any domino and decide which is the left-hand and which is the right-hand value; if you choose a double then it does not matter.

In the picture above the left hand number is 4 and the right hand number is 5

To the right hand value add 7

Double this answer

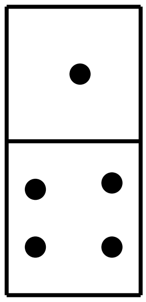
Multiply the left hand value by ten

Add this to your current total

Subtract the value of the right hand value from your total

If you tell me your total I will tell you your domino

Dominoes and fractions



$= \frac{1}{4}$

For this problem we need to use a 6-6 set of dominoes with all the dominoes which have a blank removed.

The task is to work out the fractional values of all the dominoes as ‘proper’ fractions. The fractional value of any double is 1.

Place these fractions in order from smallest to largest

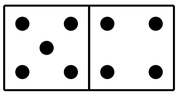
Continue by making all the fractions which are ‘top-heavy’ or improper (or even ‘vulgar’ fractions)

Continue the fraction-number line.

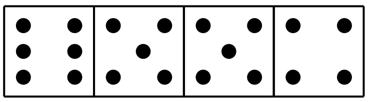
Learning to play the game of 5's and 3's

The basic idea is to play dominoes by matching pairs of the same numbers and adding together the values appearing at either **<u>end</u>**. Players score points according to whether this total is divisible by either 5 and/or 3.

'Doubles' are placed 'vertically' rather than horizontally.

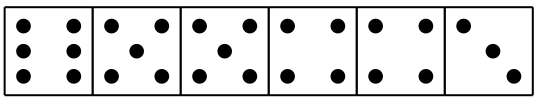
Below is the beginning of a game between two players A and B:
If **player A** plays  this scores 3 points because (5 + 4)÷3 = 3

If **player B** adds the 6-5 domino to form the following arrangement:



this gives a score of 2 because (6 + 4) ÷ 5 = 2 (points)

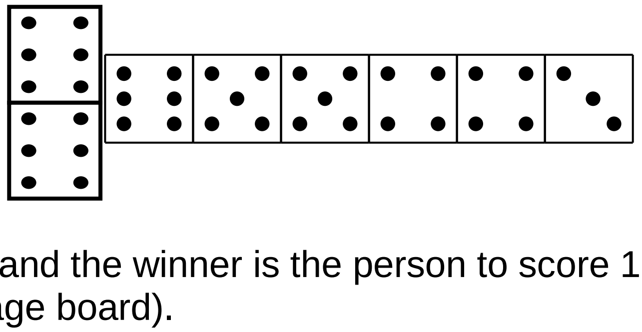
If player a now plays the 4-3 this will give a score of 3
This is because (6 + 3) ÷3 = 3 (points)



Scores are accumulated so **player A** at this point of the game has scored a total of 6 points.

If **player B** now plays the double 6 this is placed 'vertically', as shown below and the two ends now total to 15 (i.e. 6 + 6 + 3).
In fact all doubles are placed vertically.

In this situation **Player B** scores 8 points for making a total of 15 because 15 divides by both 5 and 3, so 15 ÷ 5 = 3 (points) and 15 ÷ 3 = 5 (points), e.g.



The game continues and the winner is the person to score 121 points (or twice around a cribbage board).

The game of 3’s and 2’s

This is a simpler version of the game of 5’s and 3’s above but could be played with a 4-4 set of dominoes. So points are scored when the ‘ends’ total to a multiple of either 2 or three.

Thus if the end values total to 12, this would score six (for the 2’s) and four (for the 3’s) making a total of ten points.

Similarly if the end values totaled to 6, this would score three (2’s) and two (3’s) making a total of 5.