

Problem Solving and Using Maths

A useful guide to the importance of "How and Why" in Numeracy.



Table of Contents

Pg 1 & Pg 2 - Examples of Standardised Assessment Questions where Problem Solving Strategies are Required

Pg 3 - Using Maths everywhere for Primary One and Two

Pg 4 - Using Maths everywhere for Primary Three

Pg 5 - Using Maths everywhere for Primary Four

Pg 6 - 7 - Using Maths everywhere for KS2

Pg 8 - 9 Writing Frames

Pg 10 - The Importance of Effective Questions in Numeracy Problem Solving.

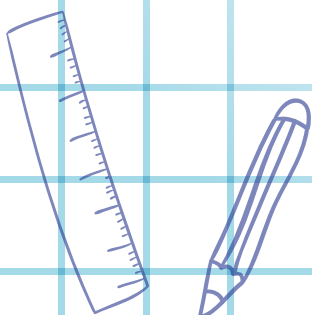
Pg 11 - Problem Solving Strategies

Pg 12 - Rules of “Groups of 4”

Pg 13 - 16 - Examples of Problems

Pg 17 - Examples of Investigations

Pg 18 - Good Websites



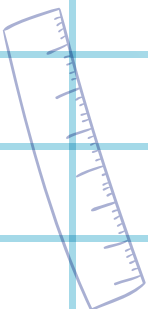
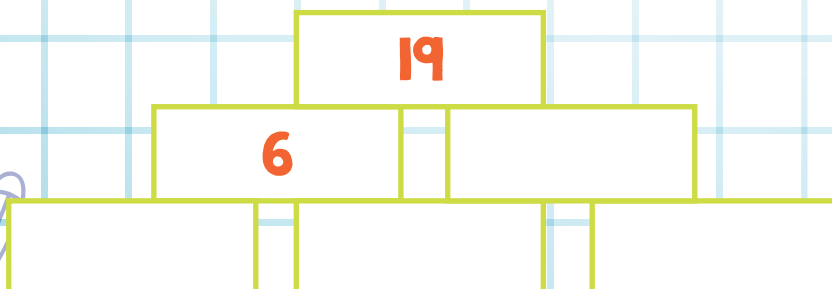
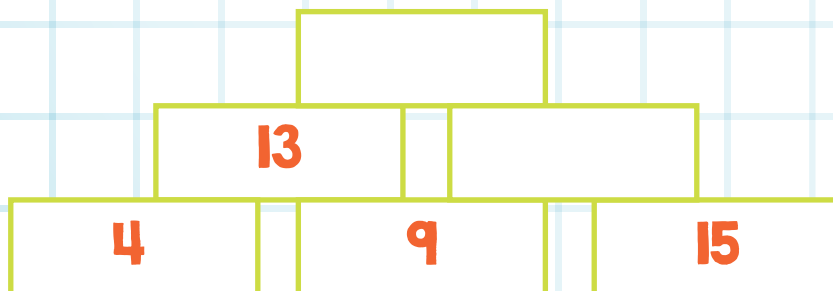
Examples of standardised assessment questions where Problem Solving Strategies are required.

Carol has one pound.
She buys a pencil for thirty-five pence. Work out how much money Carol has left.
Write your answer on the answer line.



Answer_____ p.

Sara starts to fill in the first number wall. She adds up the numbers that are next to each other then she writes the answers in the box above.
For example, four add nine is thirteen.
Fill in the rest of the first number wall. Then fill in all the empty boxes in the second number wall.



Examples of standardised assessment questions where Problem Solving Strategies are required.

I. Use the number fact in the box to help you to fill in the gaps.

$$15 \times 20 = 300$$

$15 \times 21 =$

$15 \times 19 =$

2. There are 4000 tickets on a full roll. 1999 have been sold. How many are left?

3. There are some digits missing in each of these sums. Fill in the missing digits. The first is done for you.

$$321 + 246 = 567$$

a) $216 + 51_ = 730$

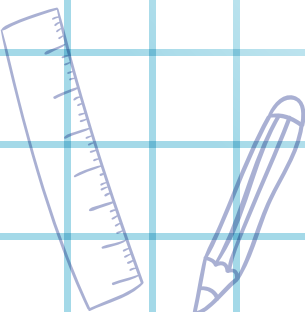
b) $234 + 3_1 = 575$

c) $486 + 3_7 = 823$

4. Use the number fact in the box to help you to fill in the gap.

365 x 28 = 10220

$$365 \times \underline{\hspace{2cm}} = 5110$$



Using Maths Everywhere for Primary One

Shopping Bags

Sort items from a shopping bag into sets.
Say how many items are in each set (max.6)
Place correct numeral on each set.

Patterns

Children in line according to a certain pattern e.g. boy-girl, boy-girl etc.
Rest have to predict who should go next in line.

Using Maths Everywhere for Primary Two.

Towers of 3

Use two colours of cubes,
How many different towers of 3 cubes can you make?

Attribute Blocks

Sort a collection of attribute blocks for one criterion.
Children have to guess the attribute.

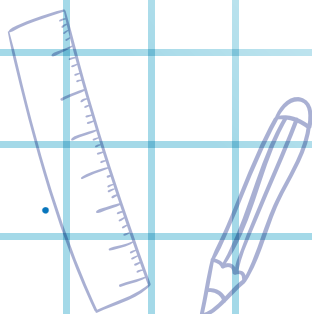
Dominoes

Find pairs of dominoes which have seven dots altogether.

Number Balance

Hang a weight on number 10. Try and hang two weights on the other side so they balance the ten. How many different ways can it be done?

What about 3 weights?



from www.clounagh.org

Using Maths Everywhere for Primary Three.

Four Coins

You have a 1p, a 2p, a 5p and a 10p coin.

How many different amounts of money can you make?

What's the largest amount you can make?

What amounts can't you make?

Digit Cards

Choose three different single digit cards. How many different 2-digit numbers can you make?

Choose another three. Can you make the same amount of 2-digit numbers?
Is it always the same amount?

Dice

Take two dice.

How many ways can you turn them so the numbers have a difference of 1?

What about a difference of 2? 3?

Number Balance

Hang a weight on number 10. Try and hang three weights on the other side so they balance the ten. How many different ways can it be done?

What about 4 weights?

Bag of Sweets

A bag of sweets costs 10p.

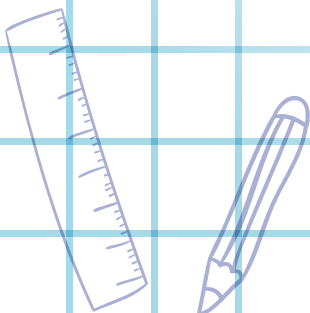
How many different ways can you find to pay for it?

Odd Numbers

What happens when you add two odd numbers?

Is this always true?

What about 3 odd numbers?



Using Maths Everywhere for Primary Four.

Three by Three

Place 3 yellow, 3 blue and 3 green counters on a 3x3 grid so that each row and column has only one of each colour.

Dice Sort

How many different ways can you show only odd numbers using 2 dice?

Traffic Lights

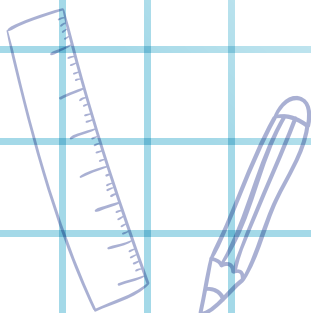
Take a red, orange and green counter. How many different traffic lights can you make?

Moneybags

You have 15p in 1ps. Share it into 4 bags so that you can pay for any amount from 1p to 15p without taking any coins out of the bags.

1	8
2	+
4	=

Make all the numbers from 1 to 15 using any of these cards. (You will need to cut them out!)



Using Maths Everywhere for KS2.

Have You Got Change?

I have more than £2 in my pocket but I can't make exactly £2.
E.g. I might have one pound, one 50p and three 20p's.
What's the largest amount I could have?

Getting Smaller

Take digit cards 5, 3, 4, 7.

Arrange them to make two 2-digit numbers side by side so the left number is smaller than the right.

e.g. 35 47

How many other ways can you find?

Digital Sum

Take a blank and a numbered 100 grid. For each number on the numbered 100 grid find the digit sum and write the result in the corresponding place on the blank grid.

What patterns can you find on the digit sums square?

Dicey Times

How many different numbers can you make by multiplying the two numbers you get when you throw two dice?

Calculator Keys

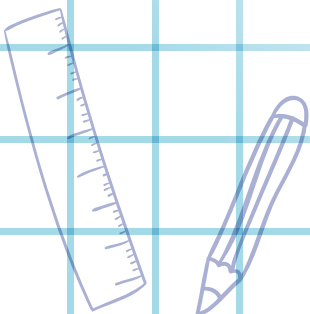
Your calculator has broken and you only have the "2" key and the operation keys:

+ - x ÷ and =

Your challenge is to make the number 15

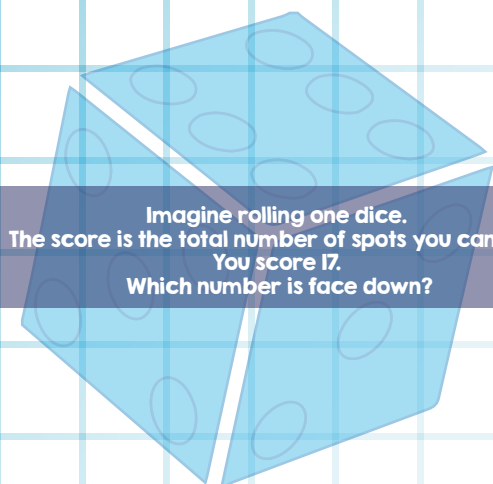
Record how you did it.

Is there more than one way?

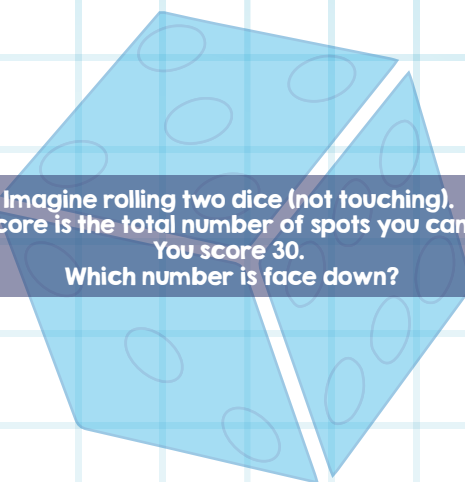


Dicey Dots

Did you know... that the dots on opposite faces of a dice always add up to 7?
Use this to help solve these puzzles:



Imagine rolling one dice.
The score is the total number of spots you can see.
You score 17.
Which number is face down?



Imagine rolling two dice (not touching).
The score is the total number of spots you can see.
You score 30.
Which number is face down?

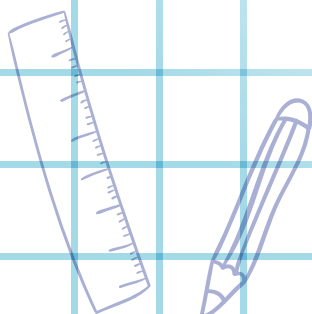
Biggest Sheep Pen

- a) A farmer has 50m of fencing. What area is the biggest rectangular sheep pen he could make?
- b) Another farmer also has 50m of fencing, but he has a 50m long straight wall already in the field. What is the biggest area he could enclose as a pen for his sheep?
- c) A third farmer has 50m of fencing as well, but he has two 50m long straight walls meeting at right angles in the field. What is the biggest area he can enclose?

Former 1st Field

Former 2's Field

Former 3's Field



from www.clounagh.org

Writing Frames

Options for recording “Using Mathematics” Activities.

Name
Date

Activity

What I did?

I used

apparatus



game



writing



computer



calculator



my head



anything else

What maths I learnt

What I could do next?

How I liked it



Writing Frames

I worked with...

I remembered

I asked these questions...

I learned...

I used...

apparatus

game

writing

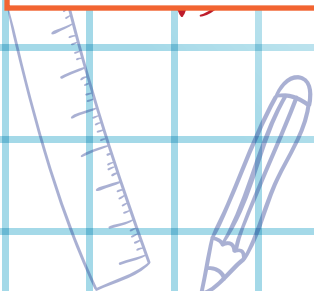
computer

calculator

my head

anything else

The strategy I used was ...



“The Importance of Effective Questions in Numeracy Problem Solving”

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Choose any “H” and add the opposite corners - what do you notice?

Does it always work?

Compare the total of the opposite corners with the centre of any “H”.

What do you notice?

Which “H” has opposite corners which add up to 64? What about 156?

What is the total of the 45 “H”?

What about the 19 “H”?

Will the total of the 82 “H” be odd or even? Check and see.

Can you find a quick way of finding the total of any “H”?

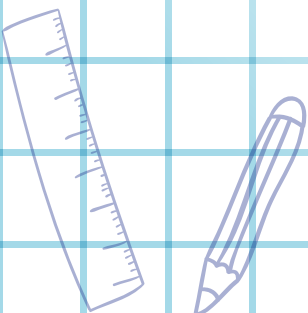
Can you work out the total of any “H” mentally?

Which “H” has a total of 105?

Problem Solving Strategies

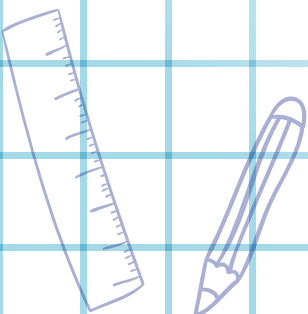
The main strategies are:

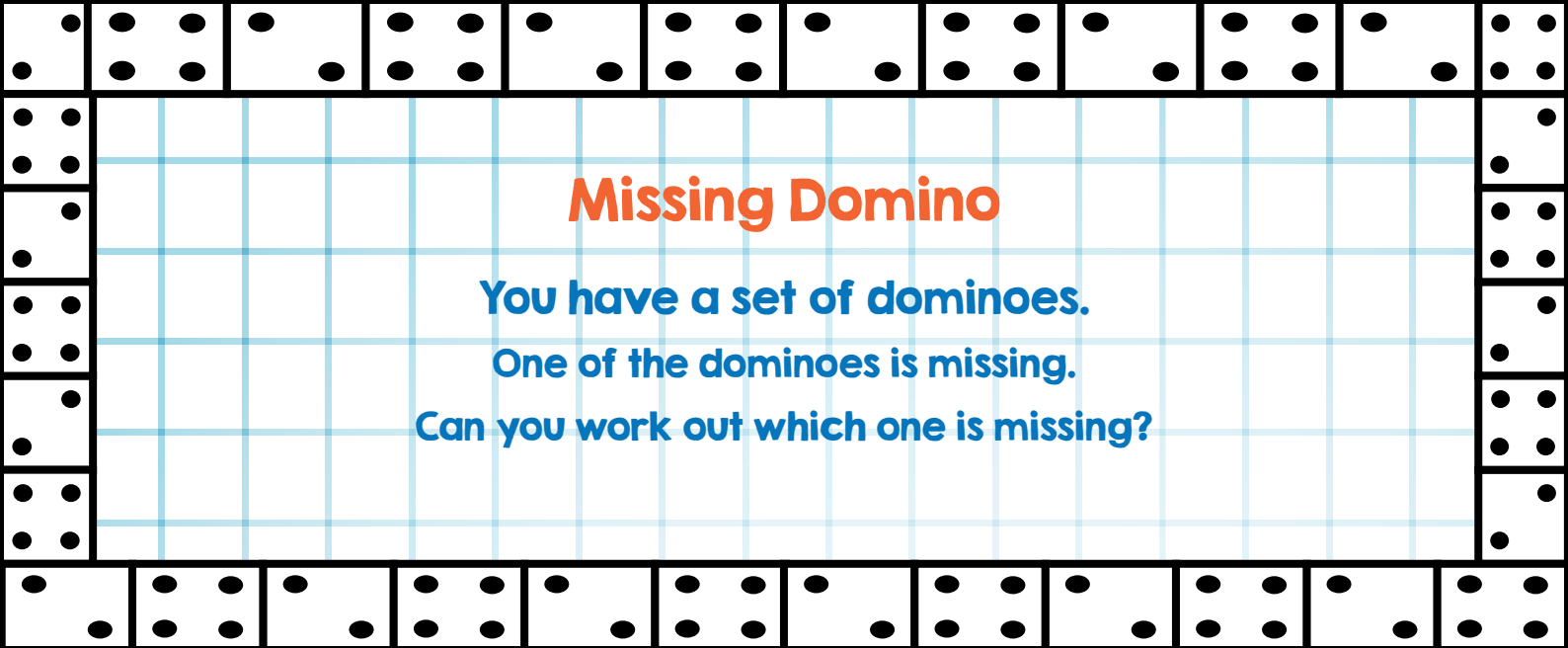
- Make a list or table.**
- Look for a pattern.**
- Make a picture or diagram.**
- Guess and check (trial and improvement).**
- Make it simpler.**
- Use logical reasoning.**
- Work backwards.**



Rules of Groups of 4 / “Working in groups”- Mixed Ability or Differentiated?

- 1. You are responsible for your own behaviour.**
- 2. You must be willing to help anyone in your group who asks.**
- 3. You may not ask the teacher for help unless all of you have the same question.**





Missing Domino

You have a set of dominoes.

One of the dominoes is missing.

Can you work out which one is missing?

Sharing Money

Four children were on holiday together.

One wet day they were stuck inside feeling bored. They had no money, so one of them said "Let's look down the back of the chairs and see if we can find any money."

They agreed to share what they found equally between them.

These are the coins they found:

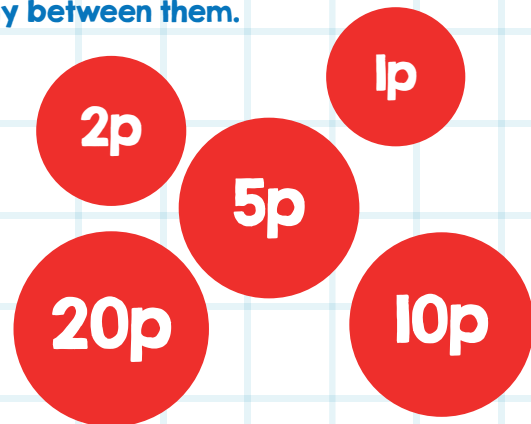
Six 1p coins

Nine 2p coins

One 20p coin

Four 5p coins

Two 10p coins



How did they share the coins out so each person got the same amount?

Towers of Three

You have a red cube, a blue cube and a yellow cube.

Use them to make towers which are 3 cubes tall.

How many different towers can you make?

How do you know you have made them all?

Oranges

Small oranges cost 8p each.

Large oranges cost 13p each.

Last week I bought some oranges and the bill was exactly £1.

How many of each size of orange did I buy?

Calculate This

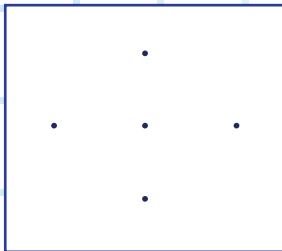
I bought a calculator
and paid the exact money

I used three coins.
One was a 50p coin

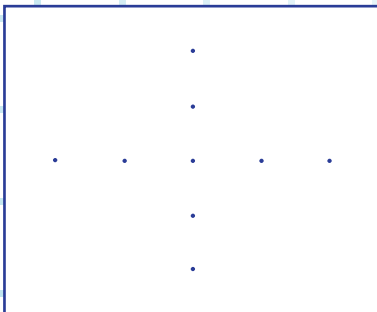
The calculator
cost more than £2
and less than £3

Tell me the possible amounts I could have paid for the calculator.
What's the least amount I could have paid?
And the most?

Don't make me cross!



1st Cross - 5 dots



2nd Cross 9 dots

Build the third cross.
How many dots did it take?

How many dots do you think it will take to build the 4th Cross?
Build it to see if you were right.

How many dots for the 100th Cross?

See the light

A boy standing on a cliff can see two lighthouses flashing. One flashes once every 20 seconds, the other once every 15 seconds. As he watches, they both flash at exactly the same time.

How long will it be until they flash together again?

Maths Investigation Report

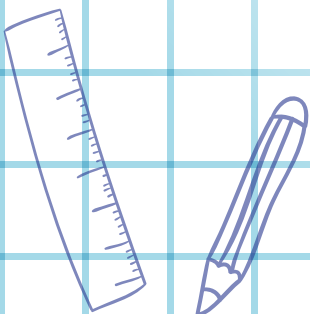
Names in Group:

What we had to find out:

What we decided to do:

Our calculations:

What we found out:



Walk to Belfast

Could you walk from here to Belfast in a day?
(find out how far it is and how fast you walk)

Head and Height

Is it true that a person's height is about three times the circumference of their head?

Do I need a tape measure? Yes/No

What if I haven't got one, can I still work out the problem?

A Pile of Pounds

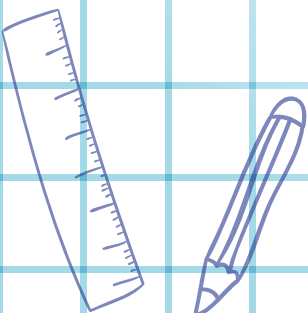
If you had a pile of £1 coins, one on top of another, as tall as you are, how much money would you have?

Jelly Bellies

Do you get equal amounts of each colour in a pack of Jelly Babies?

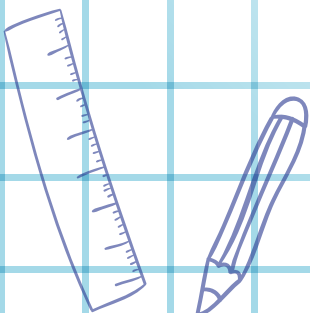
What would you expect to find about 10 packs?

What about 100 packs?



Examples of Investigations

- Is there an easy way to find $12\frac{1}{2}\%$?
- Find a quick way to get 15% of any quantity.
- Can you make all the numbers from 1 to 20 using only the number 4?
- Which breakfast cereal is the best value for money?
- How many grains of rice in a packet?
- If you sold wristbands in your school, what 3 types would sell best?
- If you counted out loud for 24 hours, what number would you get to?
- Can you find a quick way to add up all the numbers from 1 to 100? (A hundred square might help you)
- How many litres of tea or coffee does your teacher drink in a year?
- How many seconds old are you?
- How thick is a piece of paper?
- Can you make a square from four dominoes so each side has the same total?
- Can you find some other ways?
- Find ten true statements about the number 9.



Useful & Good Websites

www.topmarksmaths.co.uk

Go to Whiteboard Resources- KS1 or KS2 Problem Solving - Cuddly Toy Sale.

This is an excellent site for real life money/shopping problems. There are two main activities, a one stage problem and a two stage problem. Well worth a visit.

Go to Whiteboard Resources - KS2 Problem Solving - A Bit Fishy.

A nice challenge for children encouraging the use of seeing patterns, making a table and logical reasoning. Thought provoking!

Under the other headings there are so many problems and thinking skills to explore that involve parent / child interaction.

Eg KS2 - Data Handling - Bar Charts, Carroll Diagrams.

www.primaryresources.co.uk

Go to Maths - Solving Problems- Word and Real Life Problems.

Loads of resources for all ages here for your child to try out with you.

www.nrichmaths.org

Search for KS1 or KS2 Problems on the Student pages and there are loads of excellent examples to choose from. Work through some of these with your child.

www.crickweb.co.uk

Search for KS2 Numeracy. There are 7 sub sections (Shape/Weight, Tools, Calculations, Money & Mean, Properties & Ordering, Times Tables, Division) all very good and some great activities underneath. Eg Interpreting data etc. Worth exploring.

www.woodlands-junior.kent.sch.uk/maths

Great KS2 site with lots of exciting challenges for your children. Maths Investigations section is good fun to go “head to head” in Who wants to be a Mathionaire? Or Countdown. Other sections on Measure Skills, Data and Probability, Shape and Space Skills, Number Skills all very worthwhile also.

These are some useful websites.

Other useful materials, activities and games can be found on www.clounagh.org and Developing Number Knowledge (Sage publications).

