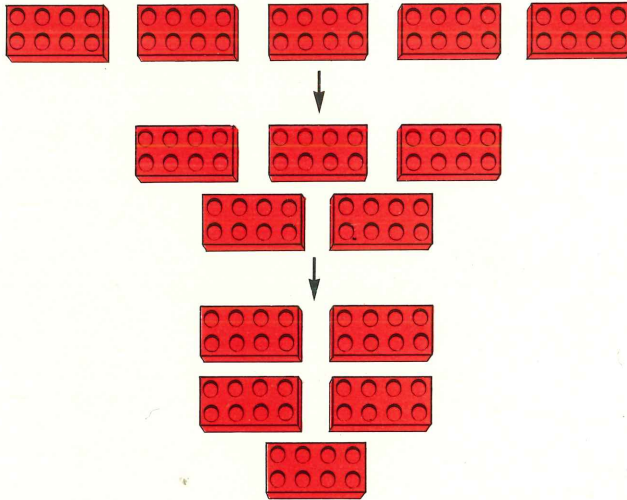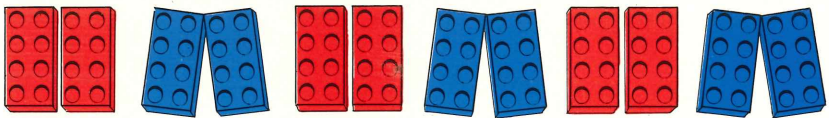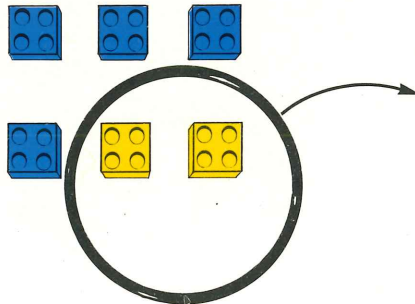# **LEGO** **Addition and Subtraction**

Putting bricks together and seeing new pattern.
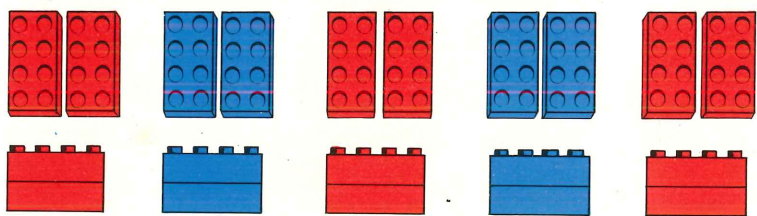

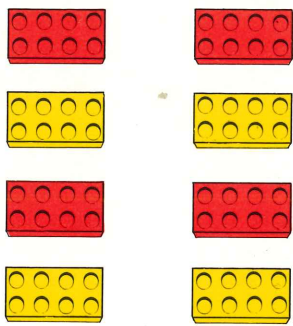Seeing patterns within patterns.
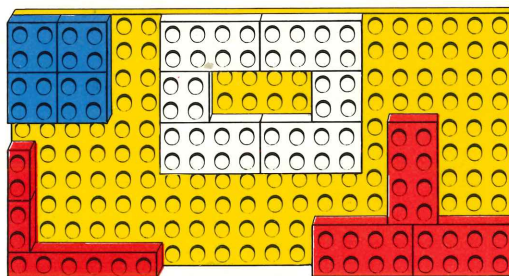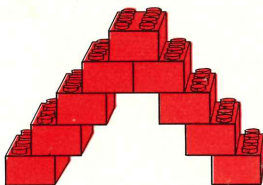

Separating parts within a pattern.
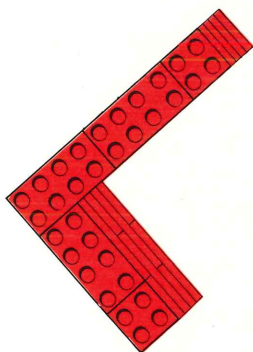
Multiplication and Division

Making simple patterns in twos.
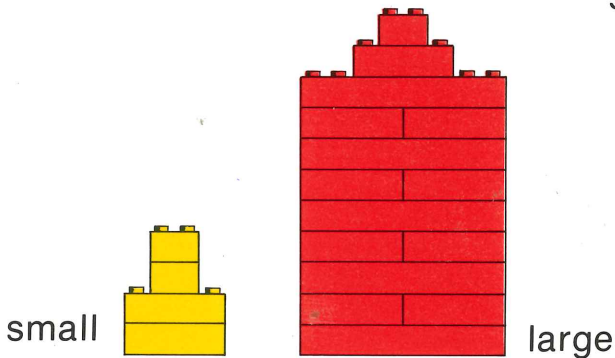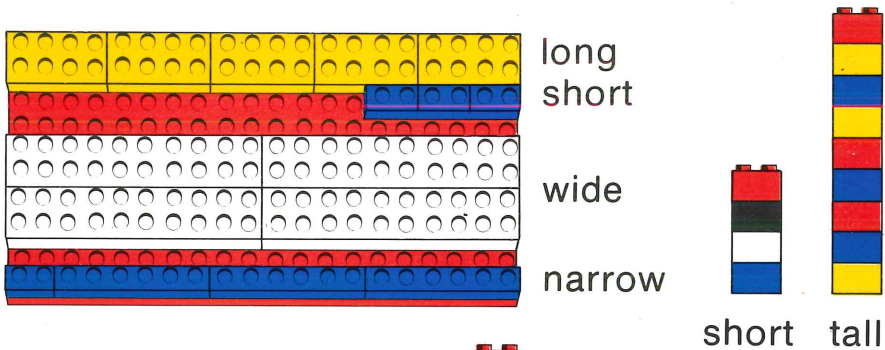
Making rows that are the same.

Geometry

Seeing likeness and differences in shape, size, thickness, by exploring shape and space when building with *LEGO*® bricks.

LEGO

Measurement

Experimentation to allow children to recognise likenesses and differences in length, width, height, size.

long
short

wide

narrow

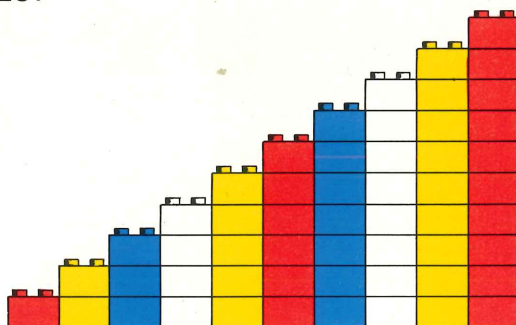short   tall

small

large

Thin

Thick

LEGO
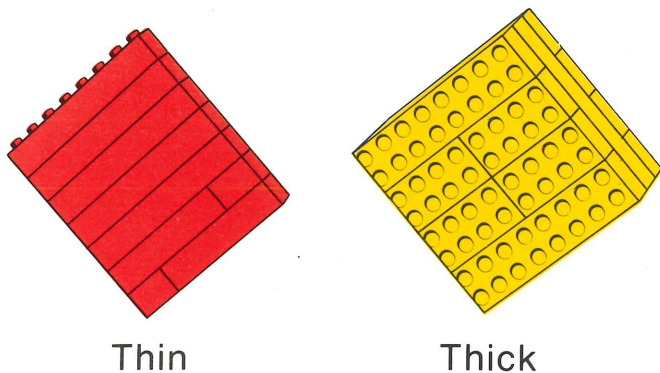
Numeration

Seeing likenesses and differences in quantity:
1. Matching a set of bricks to a set of studs on baseplate.
2. Making long rows, short rows.
3. Making a row at the top, matching with one at the bottom.
4. Making lines the same length, different lengths.
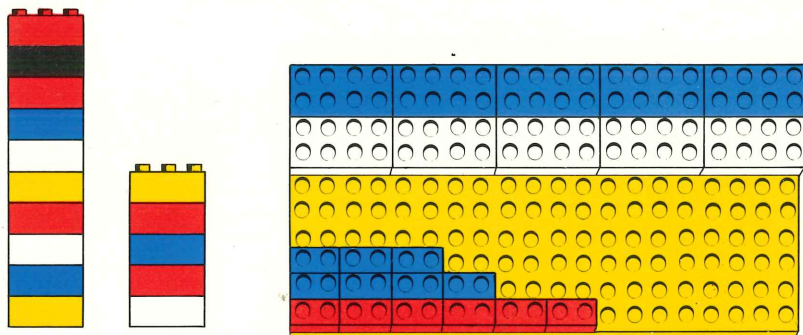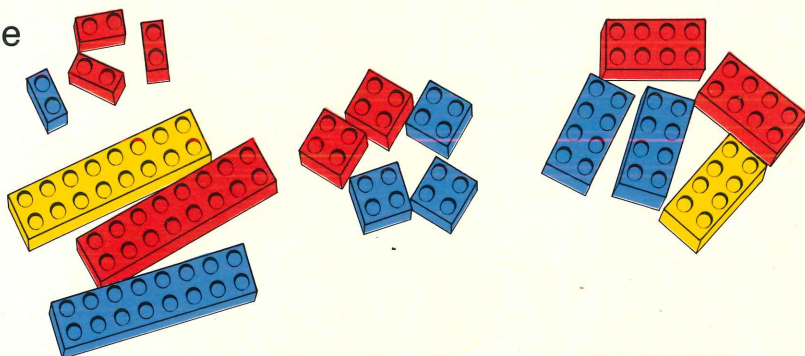
5. Order of size.

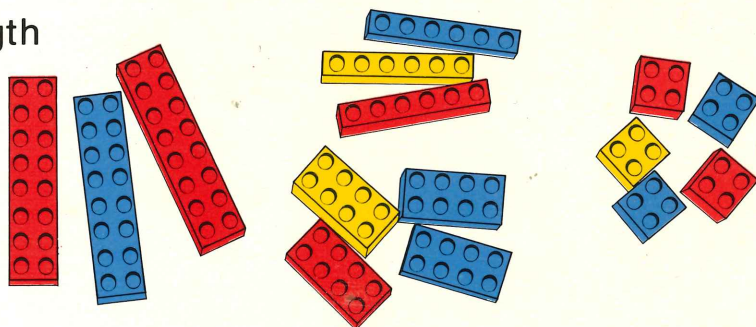Seeing relationships – biggest, smallest, last, first. Questions such as:
Why is this one here? Which one is this? Why does this one come here?

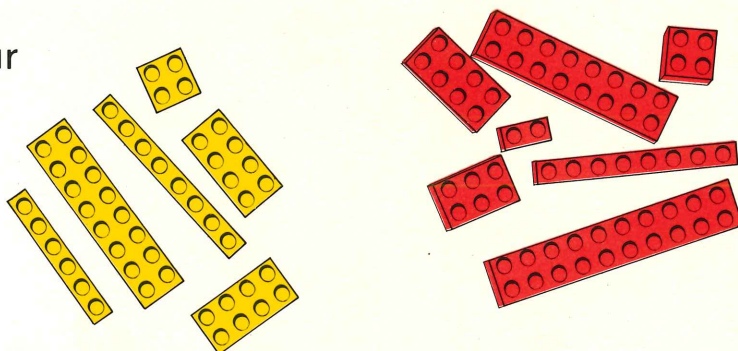# LEGO Sets

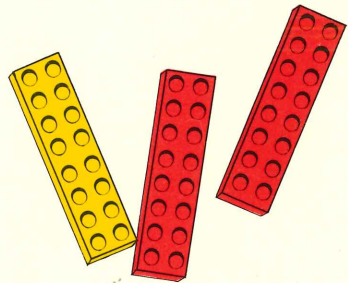Classifying for likenesses and differences.
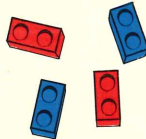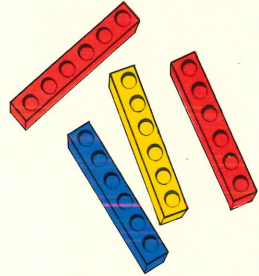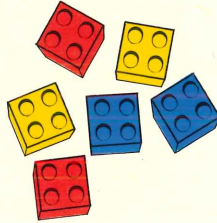
By shape

By length

By colour

LEGO

Sets (contd)

By size

Through discussion children describe the way they have classified the *LEGO*® bricks.

Language grows along with understanding.

From – a lot of ⎫
       a group of ⎬   red
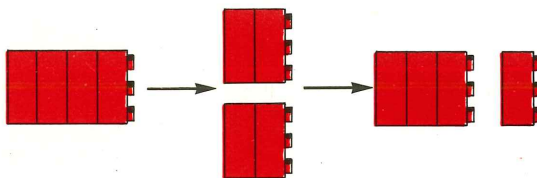to   a set of ⎭   long
                    square   bricks
                    small
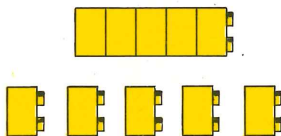   mixed

Addition and Subtraction

Joining and separating sets.
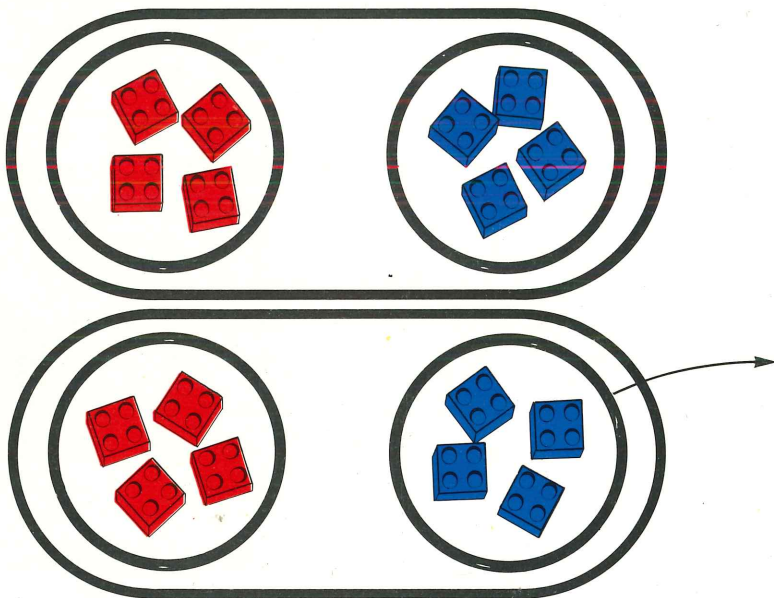
Putting patterns together and seeing new patterns.
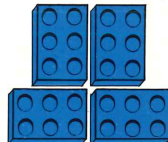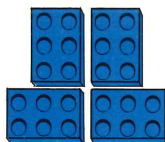Rearranging patterns.
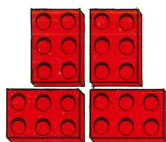
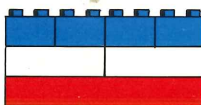Understanding that a whole is made up of parts.

Multiplication and Division

Appreciating groups by sharing and matching.
Making patterns.

Building walls:

Geometry

Exploration of shape and patterns. Experimenting with shapes, changing shapes, through construction activities.
Concept of simple closed curve – inside, outside.
Squares, rectangles.

Inside

Outside
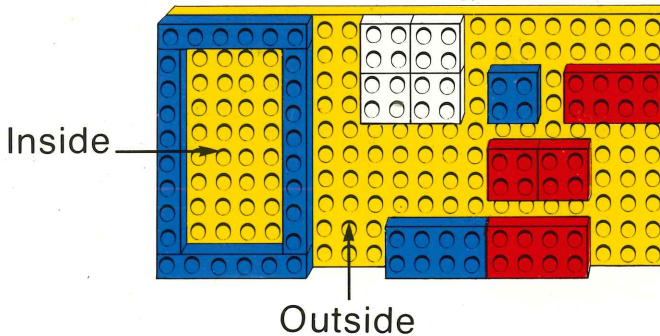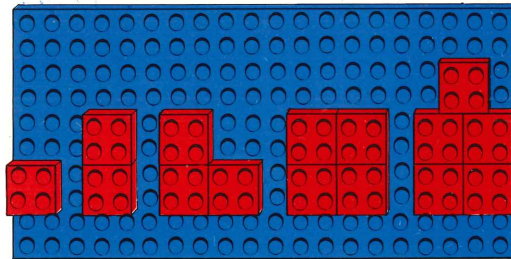
Measurement

Comparisons of measurement.
Making cars – longer, shorter, the same as.
Making towers – taller, shorter.
Making walls – thicker, thinner, higher, lower.
Making houses – bigger, smaller.
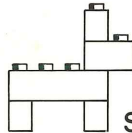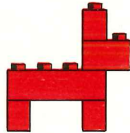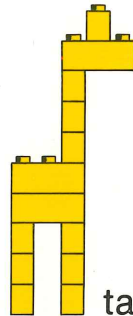
the same as   shorter   taller

Short   Taller   Tallest
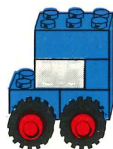
Smaller   Bigger

Numeration

Comparing sets. Matching in 1-1

Seriation – ordering of size. Developing ideas of greater, less, equal.

Matching in regular patterns. Use as a pattern board.

LEGO Sets
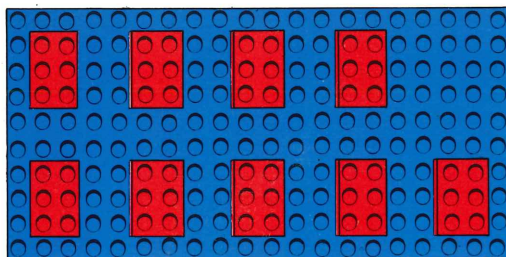
Classifying for equivalence and non-equivalence.
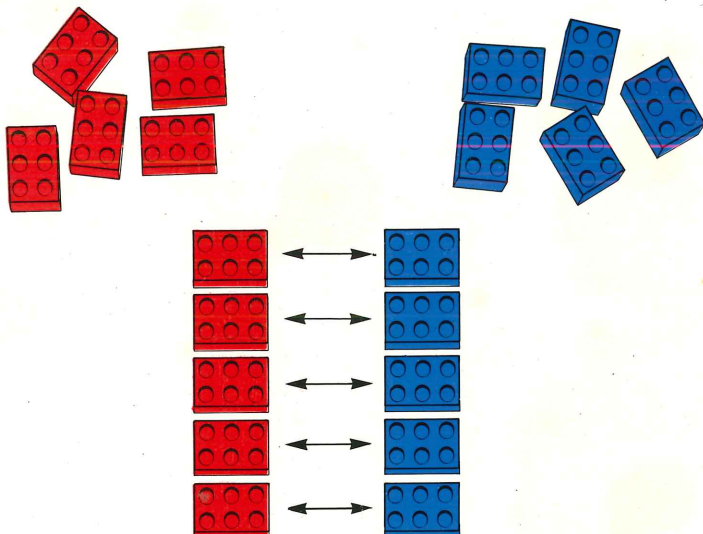
Equivalent sets (the sets have the same number of elements.)
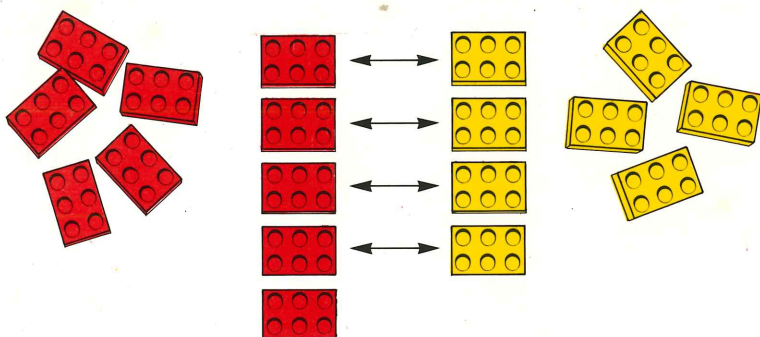
Non-equivalent sets (the sets do not have the same number of elements.)

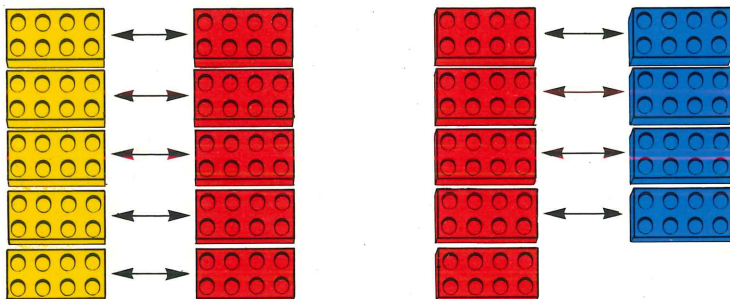Seeing some bricks belong to more than one set.

The long yellow brick could belong to the set of yellow bricks or the set of long bricks.

Matching in 1-1 correspondence.
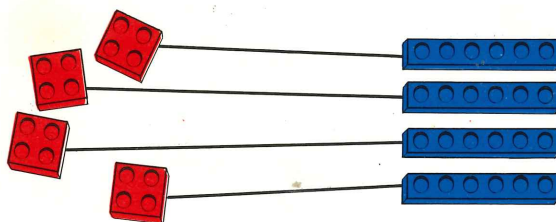
Rearranging sets, showing in another way (conservation).
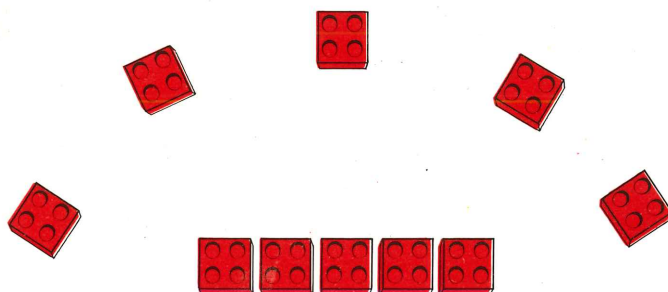
Putting bricks together
to make patterns.

Keeping a
pattern the
same length.

Bring *LEGO*®bricks together to make a new set of bricks.
Separating *LEGO*® bricks to make a different set.
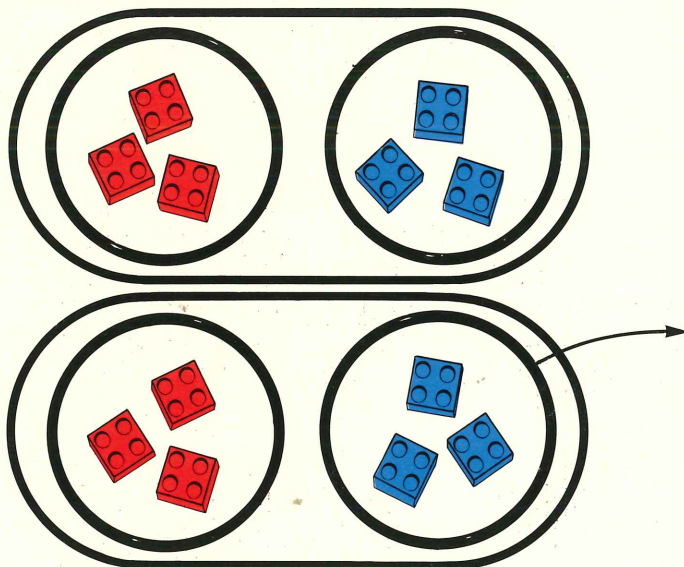
1 more and 2 more cards:
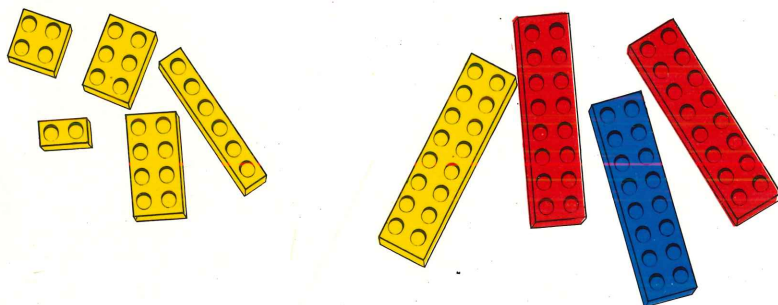Children place appropriate bricks on bases.
Building across or up.

| 1 and 1 more | 2 and 1 more | 3 and 1 more |
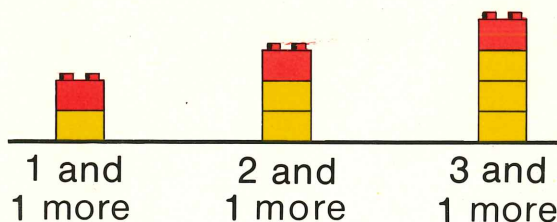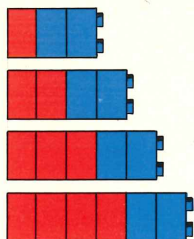
Addition and Subtraction (Contd)

Make and count cards:
e.g. Make a wall with 6 white bricks and 2 red bricks
Make a tower with 7 blue bricks and 3 white bricks.

Counting and recording orally:
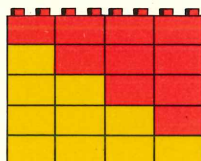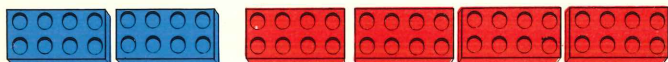
2 and 4 make 6
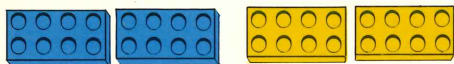
2 and 2 make 4

1 and 3 make 4

Seeing the unit content of a number

one six

one four

one two

Recognition of equivalent groups.

Patterns
Children arrange bricks as shown on a pattern card.

Seeing patterns in groups.
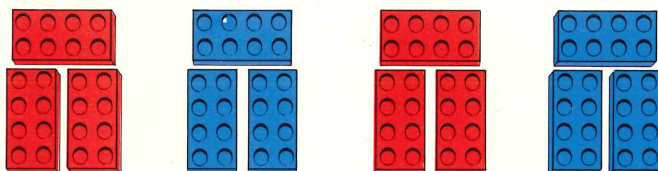
Building and Matching:
One child builds a tower, another builds one to match it exactly
or
Building a tower, making a road with the same number of bricks

Geometry

Awareness of shape, size, space. Choosing the right shape, filling in a space.
Construction work with *LEGO*® bricks offers valuable opportunities for language development as children discuss their work with each other or with the teacher.
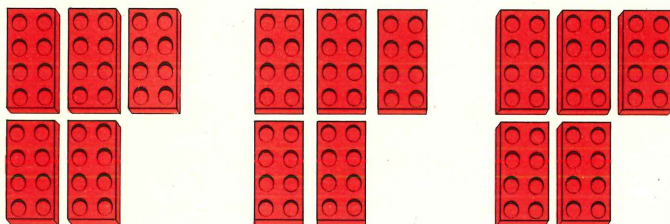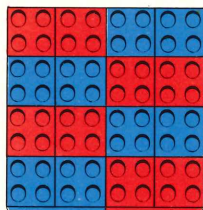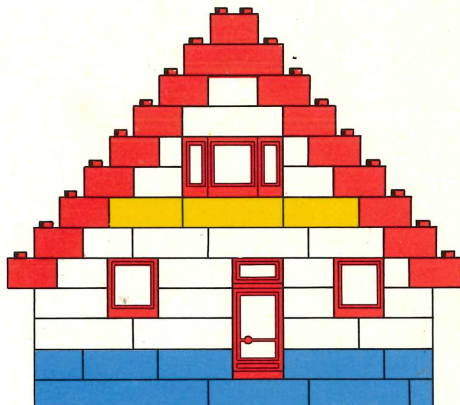

Children's discussion arising out of construction such as above leads to the use of vocabulary such as:
around, inside, outside, up down, on, under, top, side, square, rectangle, circle, round, etc.

Measurement

Using bricks as an unconventional measure.

Using 4 stud, 8 stud, 20 stud bricks – How many bricks long is the baseplate? How many bricks wide?

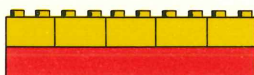Measuring one brick against another.
e.g. The big brick is 5 square bricks long.


The big brick is 10 small bricks long.
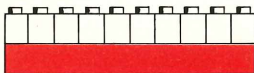
Working from instruction cards:

> E.g. 1. Make a wall 7 bricks long.
> 2. Make a train 4 bricks high.
> 3. Make a tower 10 bricks high.
> 4. Make a car 6 bricks long.

Numeration

c

a) Counting out given number of bricks.

b) Counting out 3 bricks, arrange pattern with yellow in middle, then red in middle. Seeing that there are always 3 bricks:
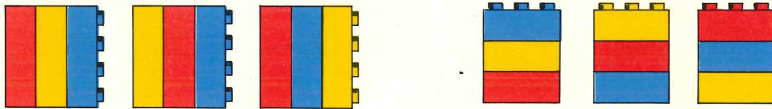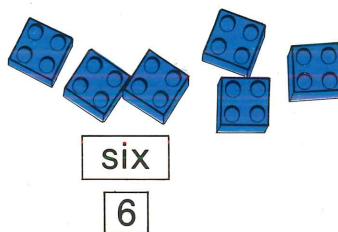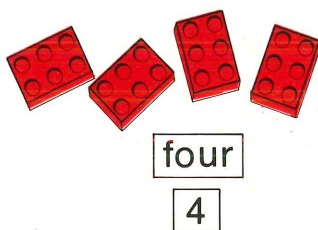

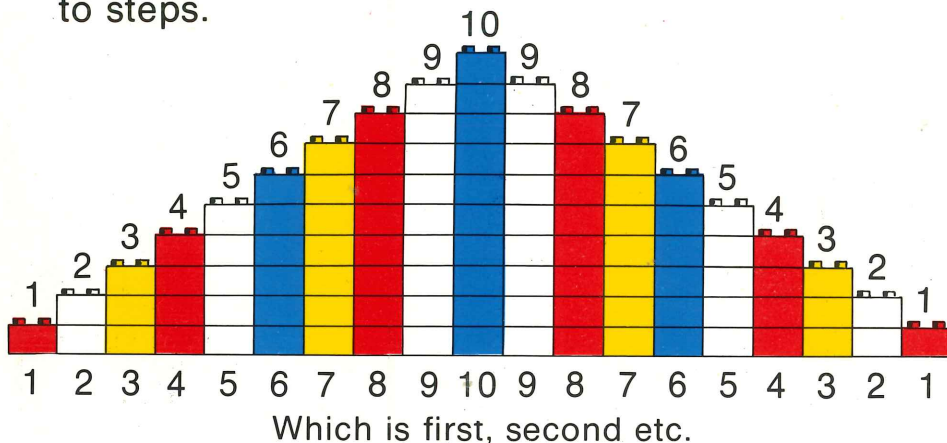c) Making rows of bricks. Finding first, second, last etc.
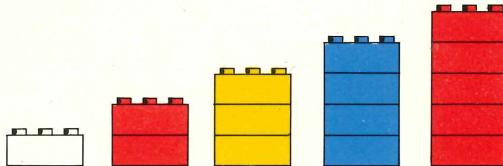
d) Picking up a set of bricks. Counting who has the most, the least, the same number as someone else.

e) Construction with card instructions:
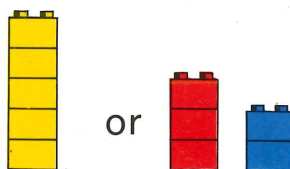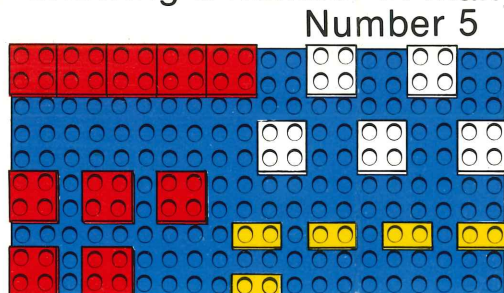Make a wall with 10 bricks.
Make a rocket with 9 bricks.

Numeration (contd)

f) Matching sets of bricks to number word, number symbol (numeral).

four

4

six

6

g) Making a staircase. Matching number symbols to steps.

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

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

Which is first, second etc.

h) Showing a number in many ways.

Number 5

or

one five or one
three and one two

Naming the number of *LEGO*® bricks (elements) in each set (cardinal property). Matching word, numeral and pattern.
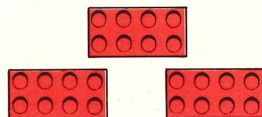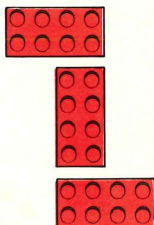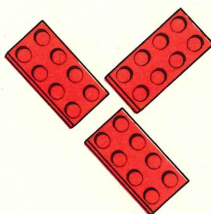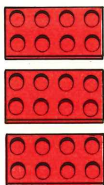
six	four
6	4

Making patterns with sets of a given number.

Comparing the number of 2 sets.
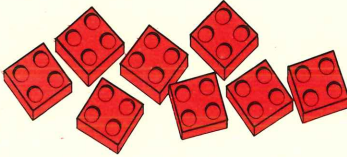
is greater than
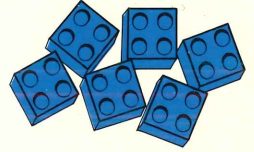
| 8 | $\bigcirc\!\!>$ | 6 |

Finding if sets have the same number of elements, or if different.

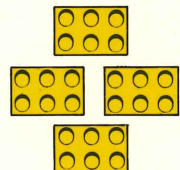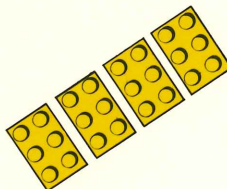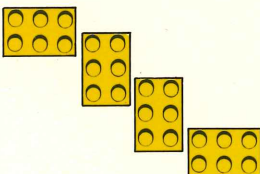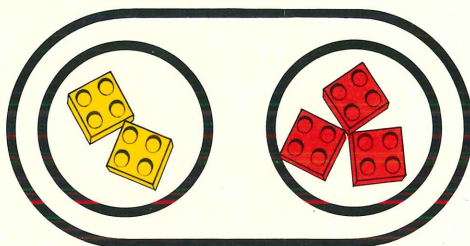
| 8 | $\bigcirc\!\!>$ | 6 |

Difference is | 2 |

The cardinal number of a set remains the same irrespective of the order in which the elements are counted.

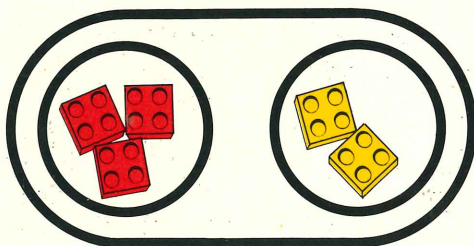# **Addition and Subtraction**

Adding wholes to wholes.

$$2 + 3 = 5$$

One 2 and one 3 equals one 5.
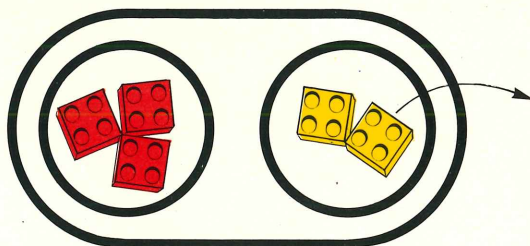
Reversing
the order
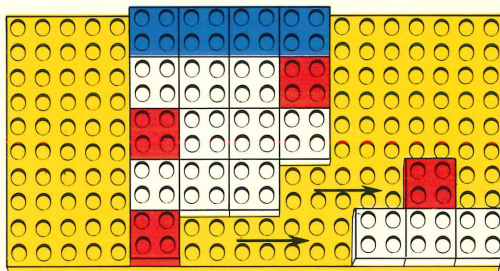
$$3 + 2 = 5$$

one 3 and one 2 equals one 5

Separating a part from a whole and finding the part
that remains.

$$5 - 2 = 3$$

Addition and Subtraction (Contd)
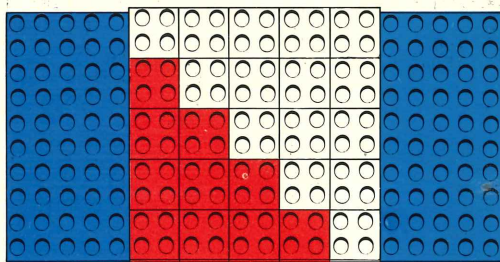
Addition and Subtraction facts:

$3+1=4$

$1+3=4$

$4-1=3$

$4-3=1$

Compensation:

Making a Square.   Building to a pattern.

or

Building a wall:

5
2+3=5
3+2=5
1+4=5
4+1=5
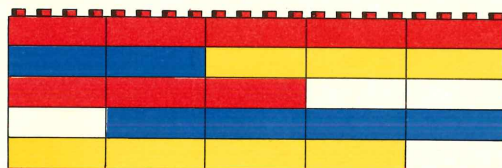
Names for 5

Building walls:
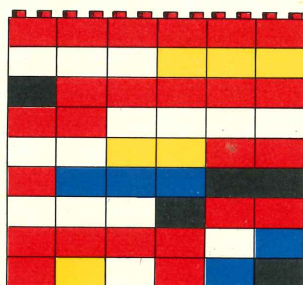
6
3+3=6
1+5=6
2+4=6
2+2+2=6
1+3+2=6
3+1+2=6
4+1+1=6
1+1+1+1+1+1=6

Turn wall around to reverse pattern.

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

Multiplication and Division

Making groups of 2, 4, 6, 8, 10.
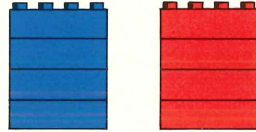
3 groups of 2   2 groups of 4

Four lots of 2

Building walls

Geometry

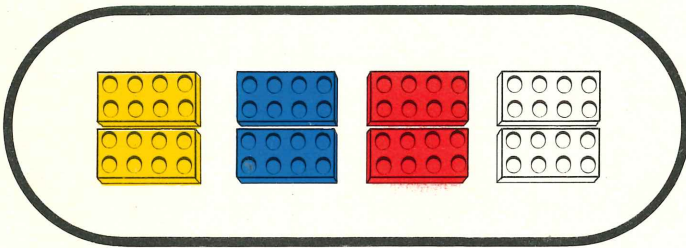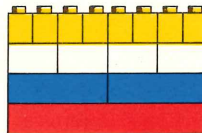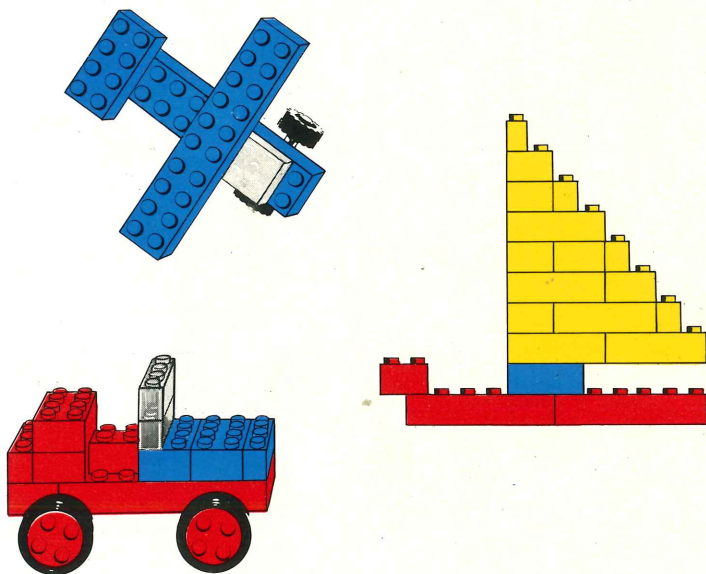Applying spatial ideas in construction – the shape of a house, parallel fences, the shape of a car, the shape of a boat etc. Recognising shapes that are the same.

Developing an awareness of the relationship between form and function.

Measurement

Bricks are 1cm in height. Ideal for introducing measuring in centimetres. Children build and measure what they have made.
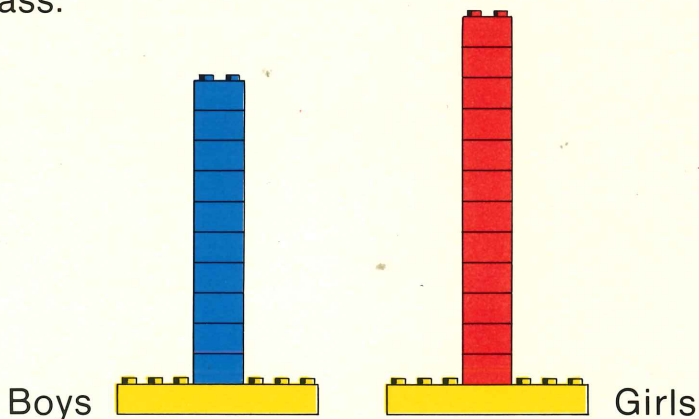Examples of measuring cards:
1. Build a wall 10 cm high.
2. Build a house 9 cm high.
3. Build a car 8 cm long.

Graphs:
LEGO® bricks are ideal for making graphs, building upwards or across the baseplate.

A graph showing the number of girls and boys in the class.

Boys   Girls

Children tell the story,

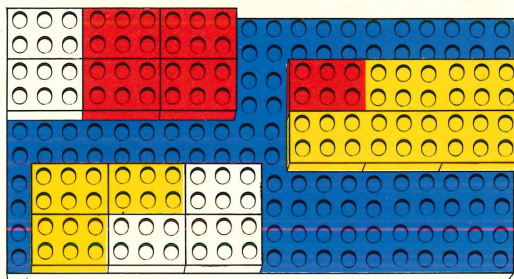There are more girls than boys in the class.
There are less (fewer) boys than girls.
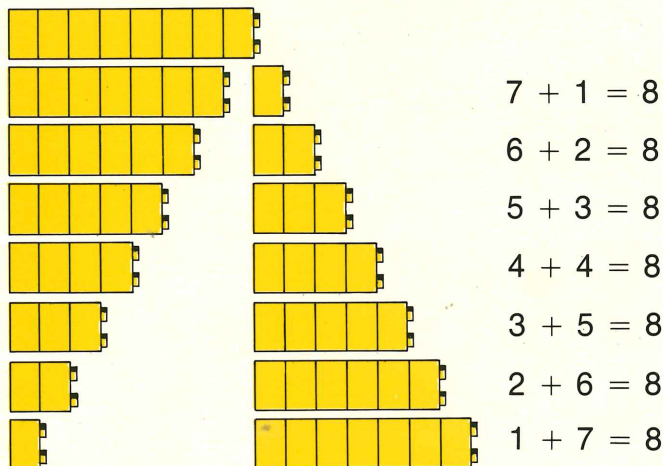There are 12 girls.
There are 10 boys.
There are 2 more girls than boys.
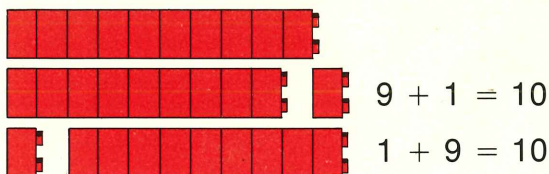There are 2 fewer boys than girls.

Numeration

Looking at patterns with *LEGO*® bricks.

Starting with a pattern and naming the parts.

$7 + 1 = 8$

$6 + 2 = 8$

$5 + 3 = 8$

$4 + 4 = 8$

$3 + 5 = 8$

$2 + 6 = 8$

$1 + 7 = 8$
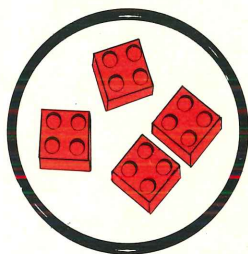
Bricks can be used to represent numbers. Sets are joined; numbers are added. *LEGO*® bricks are placed together but their numbers are added.
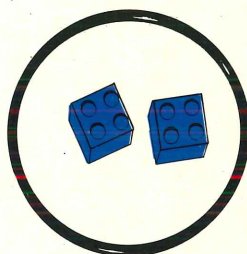
$9 + 1 = 10$

$1 + 9 = 10$

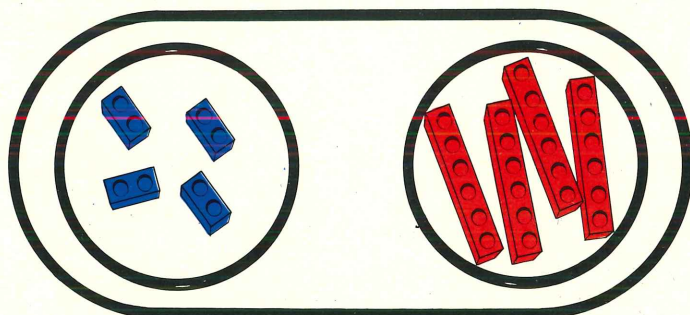Changing the order of the addends leaves the sum unchanged.

Sets

Joining sets
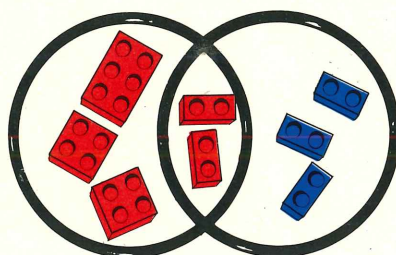

4   2
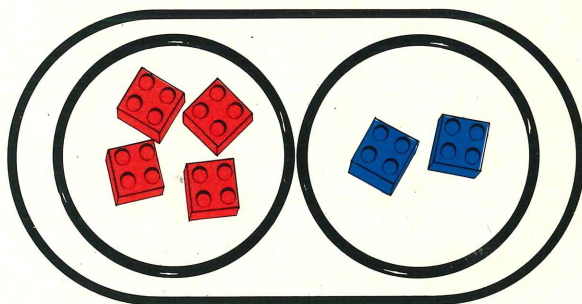
4 + 2 = 6

Pairs of sets with the same cardinal number are equivalent sets
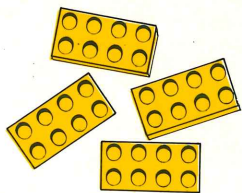
Seeing subsets within a set.

Seeing overlapping in sets.

Addition and Subtraction
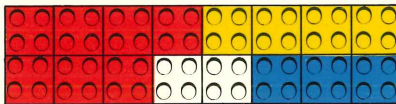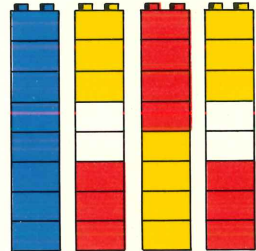
Understanding equivalences, the inner structure of numbers and the conservation of quantities.
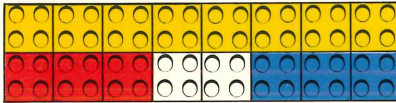
$8=3+2+3$ or $3+2+3=8$
then becomes

or

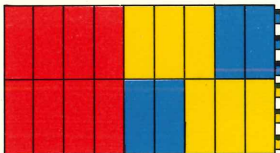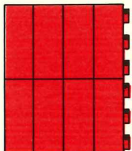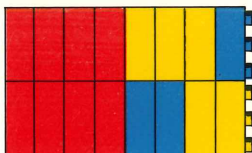$4+4=3+2+3$ or $3+2+3=4+4$

Adjustments
Equality conserved when equal amounts are added:

$4+3+2=4+2+3$
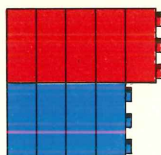
Equality conserved when an equal amount is removed.

 → Removal of
1 brick from
→ each line gives –

$4+3+1=4+2+2$

Equal additions to unequal quantities do not affect the difference.
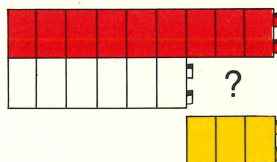
By adding 2 bricks
to each becomes
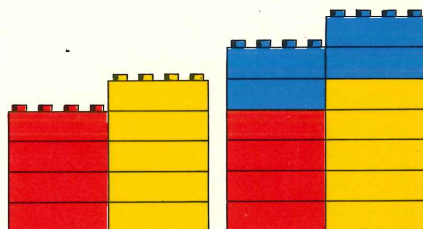
The difference is still the same.

Complementary addition:
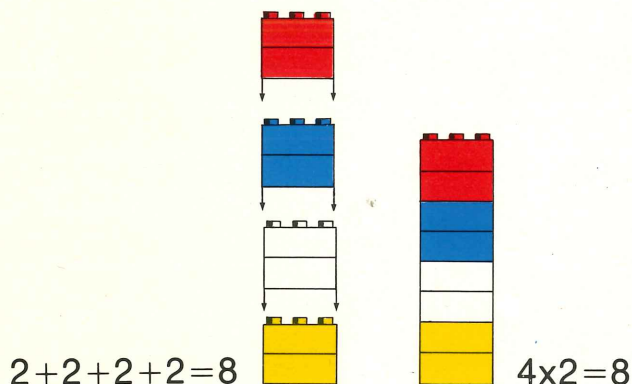Understanding the complementary function of a number:

Understanding the complementary function of the 3.

?

6 and how many more make 9?
6 and what equals 9?
$6+?=9$ or $9-6=?$

LEGO

Multiplication and Division

Seeing multiplication as repeated addition.

Four   eight   twelve   sixteen

$$2 + 2 + 2 + 2 = 8$$

$$2+2+2+2=8 \qquad 4 \times 2 = 8$$
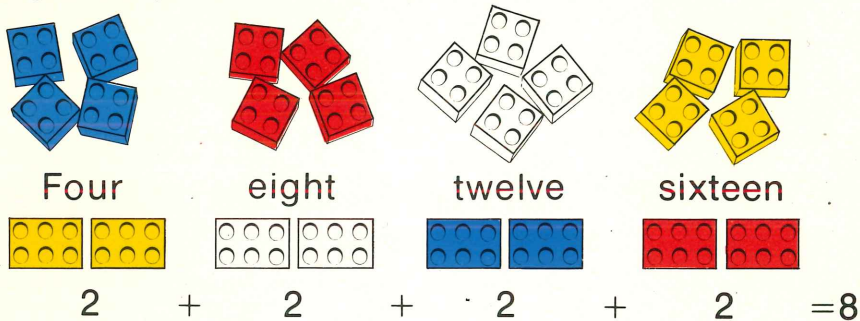
Seeing division as repeated Subtraction

Taking 2 away
from 8 4 times

once

twice

three
times

four
times
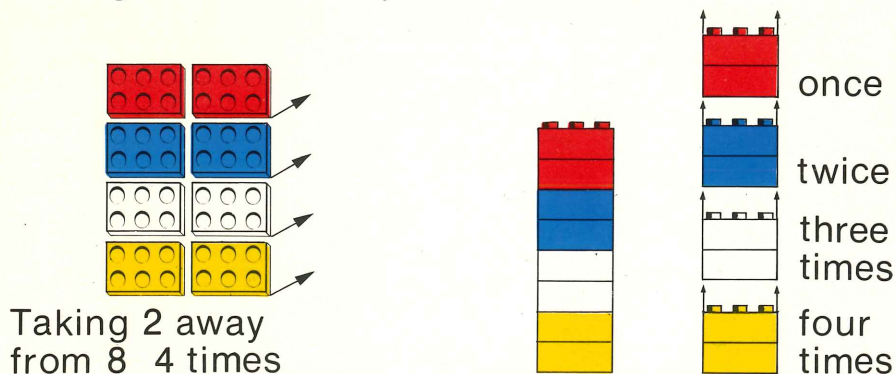
Geometry

Using regions – rectangular, square. Recognising geometric shapes in objects made e.g. How many rectangles in this house?
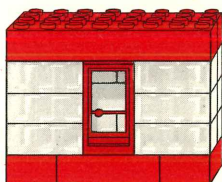
Recognition of patterns, lines, boundaries:

Measurement

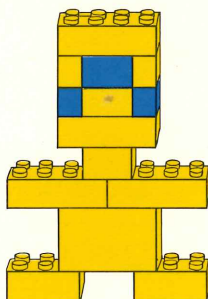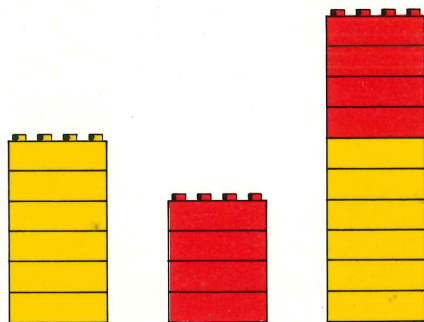Reinforcing the understanding of addition.

Examples of measuring cards:

1. Build a tower 6 cm high. Build one 4 cm high. Join them. What do they measure?
2. The **LEGO**® boy is 6 cm tall. Make a bed for him.
3. Build a stool 4 cm high. Make it into a table. What does it measure now.?

$$6 \text{ cm} + 4 \text{ cm} = 10 \text{ cm.}$$

Graphs
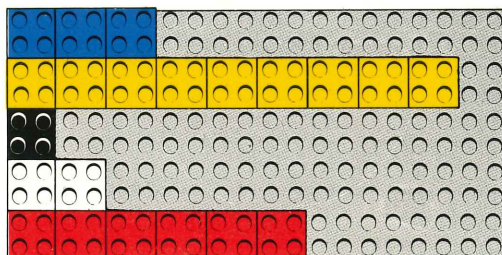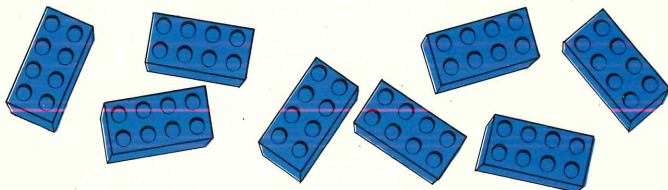A graph of traffic passing the school gate.

Trucks
Cars
Buses
Cyclists
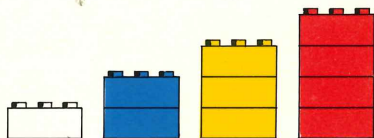People

LEGO

Numeration

Numbers have both cardinal and ordinal value.
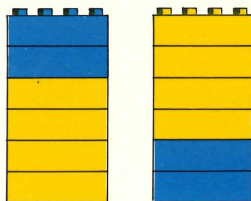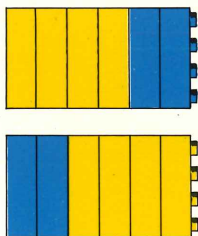Cardinal number tells how many

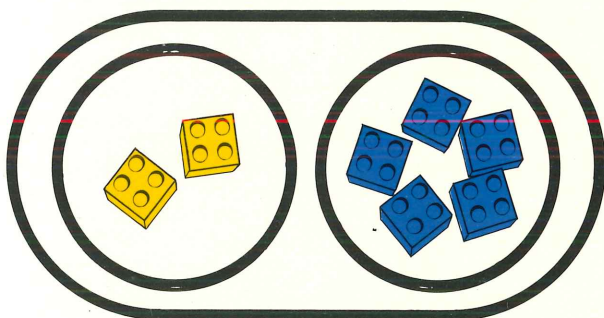Cardinal number is 8

Ordinal number tells which one in order

fourth one

The difference between each counting number is always 1.

Varying the arrangement of bricks to maintain the idea of equality irrespective of position.
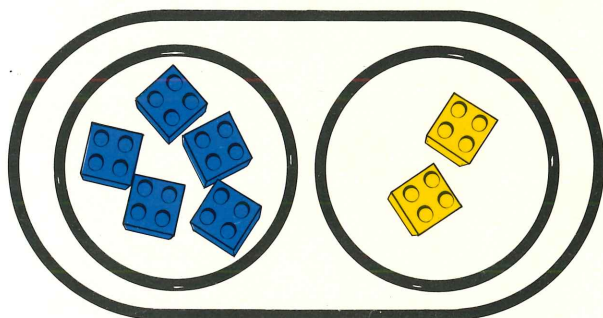
LEGO Sets

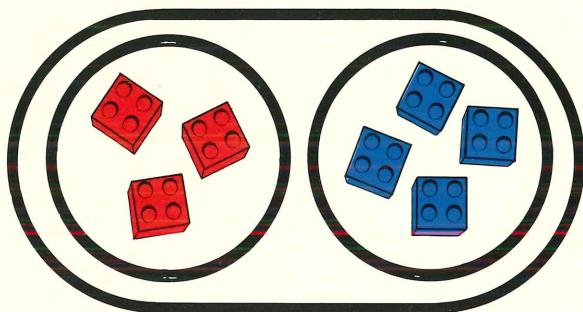The joining of sets is related to the addition of numbers.

The number of this set is $\boxed{7}$ The numbers of the subsets are $\boxed{2}$ and $\boxed{5}$

Changing the order of the subsets leaves the sum unchanged.

The number of this set is $\boxed{7}$ The numbers of the subsets are $\boxed{5}$ and $\boxed{2}$

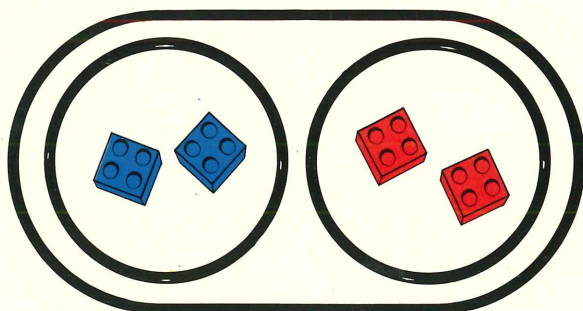The number of this set is $\boxed{7}$ The number of the subsets are $\boxed{3}$ and $\boxed{4}$

The number 7 is constant but it may have many names.

$7 = 5 + 2$
$7 = 3 + 4$
$7 = 6 + 1$
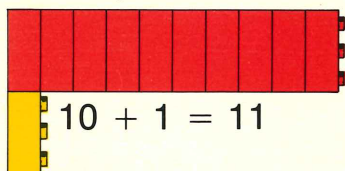
Patterning sets into equivalent subsets.

½ of 4 is 2.

Addition and Subtraction

Finding facts about 12
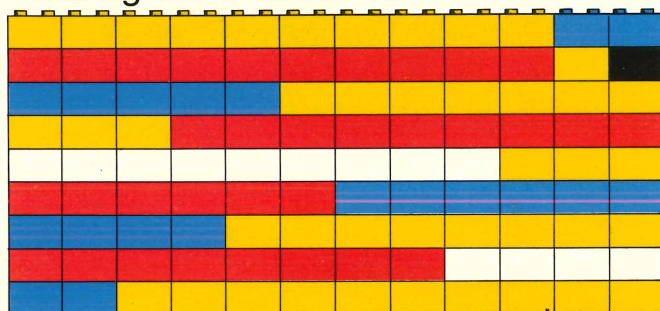
$10 + 2 = 12$
$10 + 1 + 1 = 12$
$5 + 7 = 12$
$3 + 9 = 12$
$9 + 3 = 12$
$6 + 6 = 12$
$4 + 8 = 12$
$8 + 4 = 12$
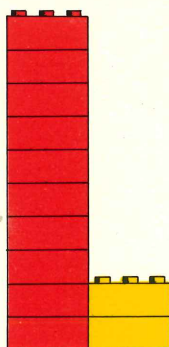$2 + 10 = 12$
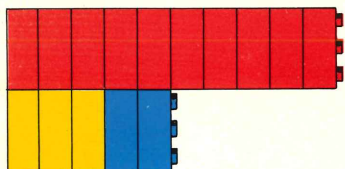
Turn wall for reversals
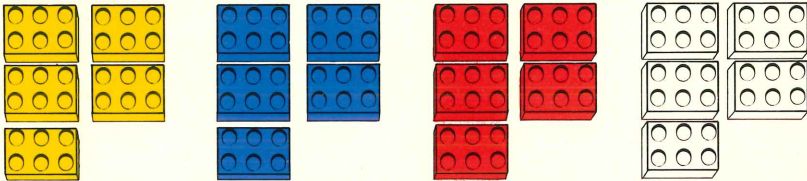
Adding to 10

$10 + 1 = 11$
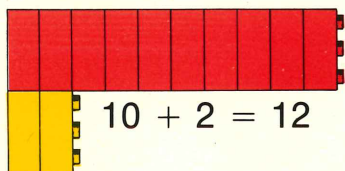
$10 + 2 = 12$ or

Extended addition:

$3 + 2 = 5$ and $13 + 2 = 15$

Patterning with LEGO® bricks and counting in groups.
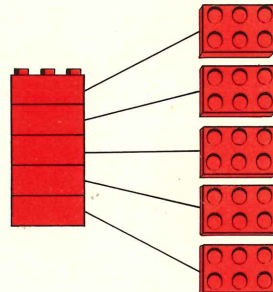
Children can count – five, ten, fifteen, twenty
Could read as:
five   plus   five   plus   five . plus   five
5   +   5   +   5   +   5
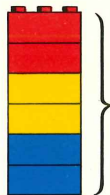Could read as four fives are twenty 4 x 5 = 20

Matching five patterns
made of discrete LEGO® bricks
to 1 five
(five bricks joined together)

Compact grouping:
Children can see multiplication by converting to compact arrangement of bricks The length is proven by counting out (alternate colours or colour patterns allow counting in groups).
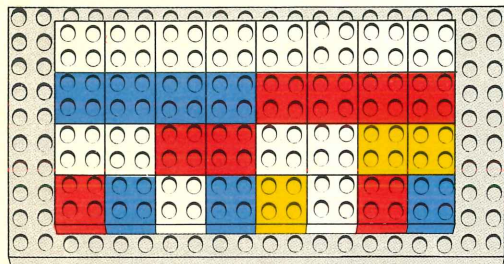
two, four, six

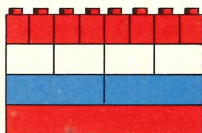This is one six
          or
    2+2+2
          or
      2x3

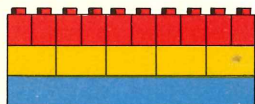Language usage of "times", "lots of" will purposefully move to the need for the sign X

Fractions

Using colour

1 whole
2 halves
4 quarters
8 eighths

Using size
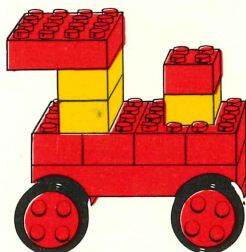

8 eighths
4 quarters
2 halves
1 whole

10 tenths
5 fifths
1 whole

Geometry

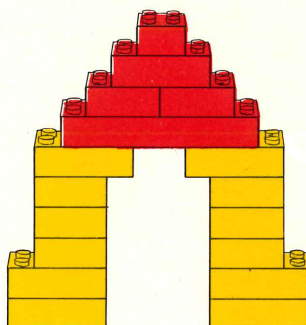Seeing relationships between shapes, seeing differences between shapes. Making new shapes.

Example of work card:

1. Make a small square.
2. Make a large square.
3. Use the bricks from the large square to make a rectangle.
4. Can you make it into a square again?

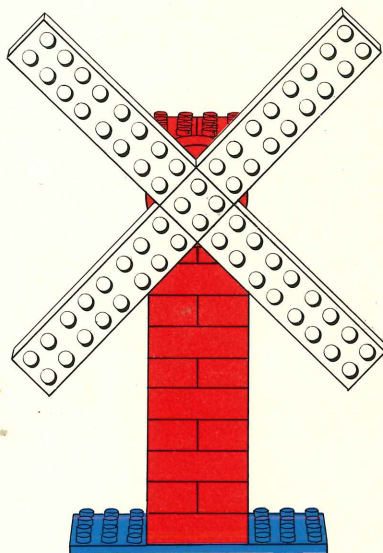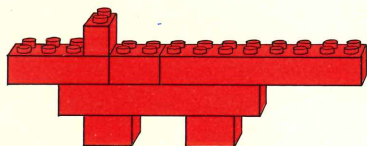Seeing shapes within shapes:

Using symetrical patterns:

Measuring using numbers above 10.
Examples of measuring cards:
1. Build a rocket 19 cm high.
2. Build a house that is 13 cm long.
3. Build a tower that is 20 cm high.
4. Make a house _____ cm high. Add a chimney
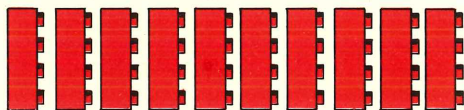   _____ cm high. How tall is your building?

Make and measure:

Children build and write measuring story.
1. My windmill is _____ cm high and _____ cm wide.
   The sails are _____ cm long.
2. My alligator is _____ cm long. Its feet are _____
   cm wide.

Numeration

Grouping a set of discrete (separate) *LEGO*® bricks into sets of 10 and stating the number as a base 10 numeral.
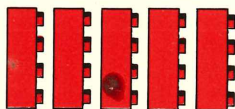

Ten *LEGO*® bricks.
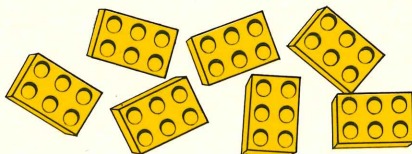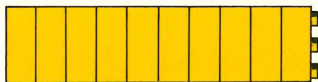

one ten

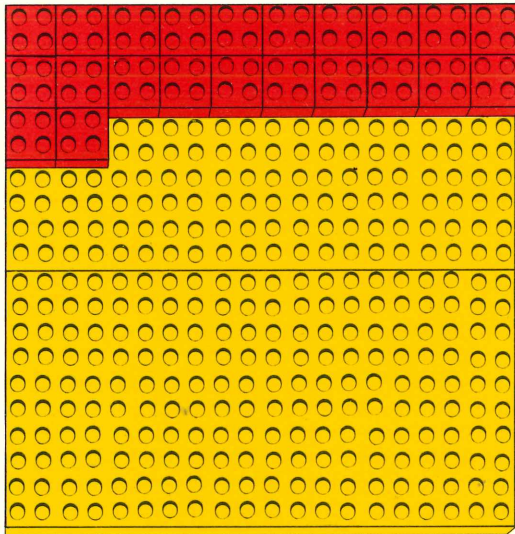10 is one ten and no ones – 10

Base 5

Five *LEGO*® bricks.

One five

A numeral such as 17 is a compact numeral which represents a sum of 1 ten + 7 ones or 10 + 7. 10 + 7 is an expanded numeral.
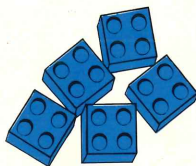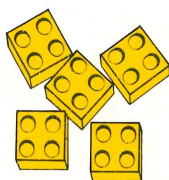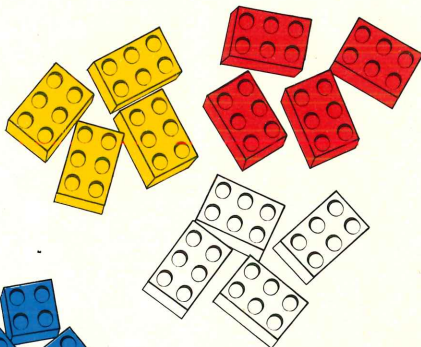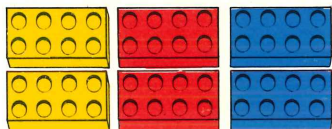

17 is ☐1 ten and ☐7 ones

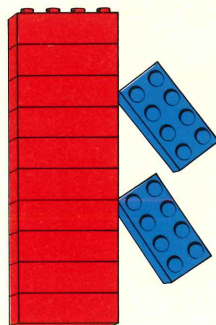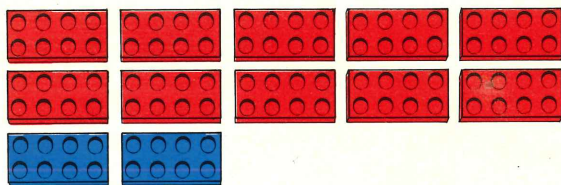Baseplates can be used as a hundred board.

Cover card will allow attention to focus on special groupings.

LEGO Sets

Making sets of 2s, 4s, 5s, 10s.

A set of 12 which can be regrouped as one ten and two ones.

Can be regrouped as two fives and two ones.