



MOSAICS & MATHS

A CHALLENGE THAT WILL TURN THEORY INTO ACTION.

AIM: To design a picture using maths

ITEMS NEEDED:

- Lots of basic LEGO pieces
- Base plates (either 32x32 or 16x16)
- Brick Separators

SET UP:

1. Place the LEGO in the middle of the table or on a mat on the floor
2. Provide each student (or team) with 1 base plate and 1 Brick Separator.

Setting the Scene

Depending on what learning level you are working with select the focus from the options below. Explain what students are going to do for this task.

If you are providing this activity as a workstation for students to choose to do during the day, or as a 'free time' session provide written instructions or make cards that they can select to pull out on complete.

ALTERNATIVES & EXTENSIONS

Option 1: Practicing Patterns

Students will use the parts provided to design a picture using patterns. This could be as simple as using 2 colours and practicing alternating them. For experienced students allow them to choose how many colours they use for their pattern.

NOTE: Remember LEGO has all types of shapes, sizes, and coloured parts. The pattern might not be about colour, it could be about the shape of the piece, the size of the piece, or even a combination of all these elements.

Option 2: Lines of Symmetry

Students will use the parts provided to design a picture using lines of symmetry. For students beginning to explore this topic start with just 1 line of symmetry and add more lines as they become experienced. For students that need additional help, design something basic on one side of the base plate and get them to build the reflection.

NOTE: LEGO base plates are all even-numbered. This means there is no line of studs that are in the center as the exact middle of the base plate is in between these stud lines. This also means the center of the base plate is made up of 4 studs.

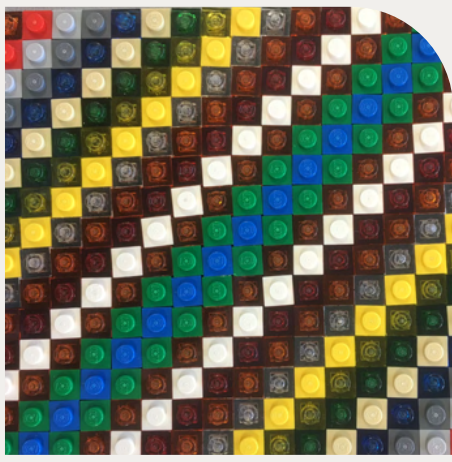
Option 3: Rotations & Tessellation

Students will design a picture using one of these concepts. This task is definitely for advanced students. Remember to allow them the space to try and retry as these can be tricky to navigate.

Option 4: Combine them all!

This option is for the students that are experienced and confident with each of these maths concepts. Allow them the space to design a picture that incorporates as many of these exciting maths concepts as possible.





MOSAICS & MATHS

A CHALLENGE TO ENCOURAGE CREATIVE THINKING

AIM: To design a picture using maths

RICH EXPERIENCES

- **Patterns** - children learn to create patterns of varying degrees of difficulty. Repetition of the same pattern can be calming for some children
- **Symmetry and reflections** - the introduction of these concepts enables children to reverse in their mind how the pattern would be reflected and then the action is replicated on the board. Elements of how symmetry works can be explored to illustrate this concept in a creative way.
- **Colour, shape, size recognition** - these mathematical aspects are important as the foundation for mosaic making. Understanding how different shapes and sizes work together and the coordinating of colours for the patterns to be enhanced are all part of these activities.
- **Collaboration** - working together on a board, pattern design and creating it, or sharing the LEGO pieces and discussing individual designs are all part of collaboration.
- **Design and art** - mosaic work is art. The colour combinations, patterns, and how the bricks are assembled all contribute to the design and execution of the mosaic.

LINKS TO CURRICULUM

Te Whāriki

Mana reo- Communication

Children recognise mathematical symbols and concepts and use them for enjoyment, meaning and purpose. This will be observed by children having the ability to explore, enjoy and describe patterns and relationships related to quantity, number, measurement, shape and space. They will also show an ability to be creative and expressive through a variety of activities including visual art activities.

➡ This links to children using maths in a creative way where patterns are part of visual art.

Mana aotūroa- Exploration

Children learn strategies for active exploration, thinking and reasoning. Progress in this area happens when children show an ability and inclination to cope with uncertainty, imagine alternatives, make decisions, choose materials and devise their own problems.

➡ This links to children understanding that trying things out, exploring, playing with ideas and materials and collaborating with others are important and valued ways of learning.

New Zealand Curriculum

Maths

Students will demonstrate their knowledge of shape recognition and reflections.

➡ This links to the use of symmetrical pieces being offered (2 of the same piece which can be used to mirror each other)

Students are able to describe the transformations [reflection, rotation, translation, or enlargement] that have mapped one object onto another.

➡ This links to how the patterns are designed on the board and whether they can articulate it for someone else to copy.

Visual Arts

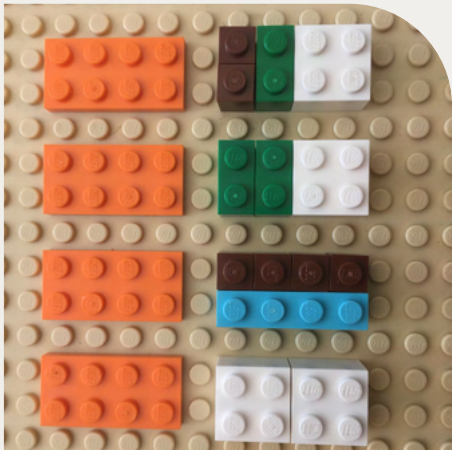
Students will explore a variety of materials and tools and discover selected principles.

➡ This links to the variation in pieces, including the principles of colour especially when the same shade is used, and the possibilities of construction e.g. vertical, horizontal.



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.ako.expert
vida@ako.expert



HOW MANY WAYS?

AN ALTERNATIVE WAY TO EXPLORE FACTORS.

AIM: To discover how many ways a number can be formed.

ITEMS NEEDED:

- 1 Baseplate per student
- LEGO Bricks in a variety of different sizes. Specifically looking at bricks with the following amount of studs: 1, 2, 3, 4, 6, 8, 10.

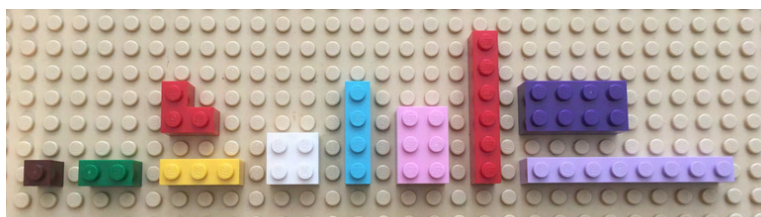
Demonstrate:

To start this activity demonstrate what to do. The aim is to discover as many ways you can make up a number.

For example, take the number 8 (a 2x4 brick). Just some of the ways to create this number include the following combinations:

- 1x1 bricks x8.
- 2x1 bricks x4.
- 2x2 bricks x2.
- 1x1 brick x2 + 1x2 brick x1 + 2x2 brick x1.
- 1x2 brick x2 + 2x2 brick x1
- 1x1 brick x4 + 1x2 brick x2
- 2x3 brick x1 + 1x2 brick x1
- Plus many more!

ALTERNATIVES & EXTENSIONS



How this activity is presented will depend on the learning level of the students.

These bricks are the parts recommended to use. Remember, sometimes there is more than 1 shaped brick with the same number of studs on top of the brick. Adding in the different shapes will encourage students to think differently.

Early years: Provide students with a simple brick (such as the classic 2x4 brick) and get them to place a combination of different shaped bricks on top to cover each of the studs. Encourage them to count the number of different bricks used, and recognise the different sizes used (such as how many bricks have just 2 studs, how many have 1 stud, or 4 studs?).

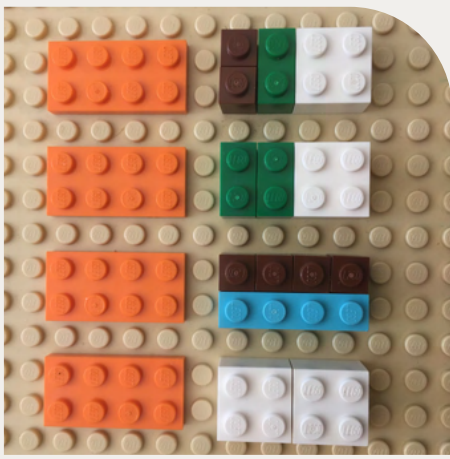
Either record the different bricks used, or provide the students with a chart and get them to record with tally marks. An alternative could be taking the bricks off and putting them on the chart to visually see/record what combination they used.

Next level - Factors of...: This level is suitable for students with an understanding of addition and early multiplication. When students have an understanding of factors, get them to put it into practice by visually representing it with LEGO.

For example, the number 12 has the factors 1, 12, 2, 6, 3, and 4. With bricks get students to visually represent the different factor combinations. Working on the number 12, students would have 12x 1x1 bricks + 2x 2x3 bricks, 6x 1x2 bricks, 3x 2x2 bricks, and 4x 1x3 bricks.

Extending on this students can explore all the different ways to make numbers through different addition equations. For example, the number 10 can be made by adding $2+1+3+4$ or $4+4+2$ or $1+1+2+3+3$. How many different combinations are there? Is it possible to even figure out the number of combinations? For advanced students give them a time limit and see how many combinations they can put together with bricks in the time allowed.





HOW MANY WAYS?

AN ALTERNATIVE WAY TO EXPLORE FACTORS.

AIM: To discover how many ways a number can be formed.

RICH EXPERIENCES

- **Visual representation** - children can visually represent using LEGO different combinations of numbers.
- **Mathematical concepts** - are used in this activity including addition, multiplication, tally charts, graphing, combinations of numbers, shape and size.
- **Self checking** - this is an excellent activity for students to self check their knowledge of addition and multiplication. By representing the factors of a number in multiple ways they are affirming to themselves the different combinations for that number.
- **Communication** - Through representation of numbers using a range of combinations, students can communicate with each other and their teacher how they came to their answers.

LINKS TO CURRICULUM

Te Whāriki

Mana reo - Communication

Children recognise mathematical symbols and concepts and use them with enjoyment, meaning and purpose.

➡ This links to children gaining knowledge and understanding of the addition and multiplication and understanding that these can also be represented in a number of different combinations. Children learn maths through fun and creative games. Extending children through tally charts, graphs, and more complex mathematical problems.

Mana tangata - Contribution

Children are encouraged to learn with and alongside others.

➡ Children work together to come up with multiple combinations for each number. They learn how to take turns, encourage each other, help and correct each other in a positive way which makes it enjoyable for all participating.

New Zealand Curriculum

Maths - Number & Algebra

Students will be able to record and interpret additive and simple multiplicative strategies, using symbols with an understanding of equality. (L3)

➡ This links to students being able to add & subtract and later when the game is extended to simple multiplication.

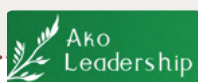
Students will be able to generalise that the next number gives the result of adding one object to a set and that counting the number of objects in a set tells how many. (L1)

➡ This links to students learning how to count the number of studs on the brick and then add them together to get the total number they need to cover the first brick.

Maths - Statistics

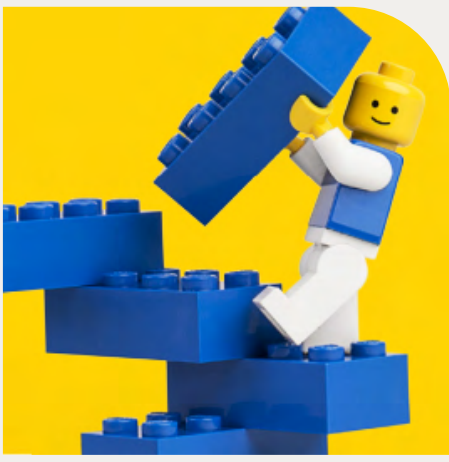
Students will conduct investigations using the statistical enquiry cycle and communicate findings using data displays.

➡ This links to students creating tally charts and graphs to represent the number of bricks used to create the total number.



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.ako.expert
vida@ako.expert



HOW LONG, HIGH OR WIDE?

A CHALLENGE DESIGNED TO
EXPLORE WAYS OF MEASURING
ITEMS USING BRICKS AS YOUR UNIT
OF MEASUREMENT.

AIM: To explore
measurement via
units of bricks

ITEMS NEEDED:

- a selection of LEGO bricks that are all the same size (for example all 2x4 bricks)
- A selection of items from around the learning space.
- Pencil and paper

SET UP:

Step 1: Select a variety of items that vary in sizes such as a pencil, shoe, stapler, book, and a waterbottle.

Step 2: Demonstrate to students how to measure an item using their bricks (the unit of measurement) by placing the bricks alongside the item they are measuring.

Step 3: Students will then count how many bricks (or studs) long the item is.

Step 4: Record the measurements.

ALTERNATIVES & EXTENSIONS

Beginner students:

For students in the early stages of understanding the concepts of measurement ensure that they have bricks that are all the same size for their measuring unit (for example all 2x2 or all 2x4 basic bricks). It doesn't have to be a brick. You could use leaves, minifigures (the item measures 2 mini figures plus 1 head), wheels, etc. Be creative, just remember to keep the measurement item constant.

Level up: As students become more advanced in their measuring skills and ability to count, you can progress to any size brick, and use the stud as the measurement unit.

Experienced students:

Introduce the concept of estimating. How many bricks or studs long do they think the object is? Get students to estimate the length of all the objects before measuring all the items (you could allow 1 or 2 test objects to allow them to practice before completing the full activity, this can be done individually or as a class/group).

Other measurements:

There is more than 1 measurement for each object.

It has width, height, length, and weight. Using scales how many bricks does it take to match the same weight? If students can measure the width, length, and height can they calculate the volume of the object (is this possible based on the shape of the object)?

Recording the results:

By recording the results of students can take that data and develop graphs to show their results. Move outside the learning space and into the wide environment outside. Leaves, stones, grass, and flowers are all items that can be found in a variety of sizes. Can they measure 10, 20, or even 100 of these objects from around the school, at home, in the community, and record their results on a graph.





HOW LONG, HIGH OR WIDE?

A CHALLENGE DESIGNED TO
EXPLORE WAYS OF MEASURING
ITEMS USING BRICKS AS YOUR
UNIT.

AIM: To explore
measurement via
units of bricks

RICH EXPERIENCES

- **Measurement** - this is a fun way to explore the wider classroom and environment to see how long, wide, and high different items are.
- **Rich mathematical terms** - longest, longer, long, shortest, short, shorter etc. Introducing these terms in a practical everyday situation brings meaning to this vocabulary.
- **Understanding estimation** - this is a great way for children to guess if something is longer or shorter than an original item as they go about their environment measuring things. Can they find three things that are the same - guess, measure, collect.
- **Collaboration** - this is an activity that can be done in teams and together they work to complete the task.

LINKS TO CURRICULUM

Te Whāriki

Mana reo - Communication

Children recognise mathematical symbols and concepts and use them with enjoyment, meaning and purpose.

➡ This links to children being given opportunities to learn numeric symbols and to use mathematical concepts and processes, such as volume, quantity, measurement, classifying, matching and pattern recognition.

Mana aotūroa - Exploration

Children learn strategies for active exploration, thinking and reasoning

➡ This links to children having confidence in exploring, puzzling over and making sense of the world, using such strategies as setting and solving problems, looking for patterns, classifying, guessing, using trial and error, observing, planning, comparing, explaining, and engaging in reflective discussion.

New Zealand Curriculum

Maths - Geometry & Measurement

Students will be able to order and compare objects by length and area by direct comparison and counting whole numbers of units (L2).

➡ This links to students being able to measure using a LEGO brick as their form of measurement to compare others items to the environment.

Students will be able to use linear scales and whole numbers of metric units for length and area (L3)

➡ This links to students being able to measure accurately then represent their findings on a graph.



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.ako.expert
vida@ako.expert



NUMBER HOUSES

A CHALLENGE TO REINFORCE
LEARNING AROUND NUMBER
RECOGNITION AND PLACE VALUES

AIM: To practice
breaking down
numbers into
place values

ITEMS NEEDED:

A variety of bricks
1 base plate per student.

SET UP:

1. Place the LEGO on trays on a table.
2. Or place the LEGO on a mat on the floor
3. Set up an example number house for students to copy. They will need 3 Rooms called Ones, Tens, and Hundreds.
4. Write on the board a variety of numbers from 0-999 that you would like your students to focus on.

NOTES:

- If you are only learning numbers from 1-99 you will only need to make 2 'rooms' in the number house.
- If you are working with larger numbers, make more 'rooms' for the house.
- Get students to draw the same house on their personal whiteboards and practice writing the numbers before using the LEGO as extra practice.
- You can choose to allow the students to come up with their own numbers too!
- Add your numecon resources to this. Have the students complete all 3 ways - written on whiteboards, with numecon, and with the LEGO.

ALTERNATIVES & EXTENSIONS

For younger students who are learning to recognise and form numbers;

Get students to 'write' with the LEGO* and form the number using bricks. If they are unsure where to start follow these steps;

- a. Show them the number in written form.
- b. Get them to trace the number with their finger.
- c. Then trace the number with their finger on the LEGO base plate to help them visualize what it will look like and where they will place the bricks (you can also get the students to write the number if needed).

Representation of a number: How can students use LEGO bricks to visually show a number? This could be by the number of bricks used or by the number of studs on the top of a LEGO piece.

NOTE: Challenge students to read out the number they have created. Can they interpret and read their peers' numbers?

SIDE NOTE/ACTIVITY: by focusing on the number of studs this creates an opportunity around adding - for example, to form the number 5 a student could use a LEGO brick with 4 studs on it plus a brick with 1 stud on it. Or a LEGO brick with 2 studs on it plus a brick with 3 studs on it. Turn it into a game - get students to pair up, pick out a number randomly, set a timer, and see who can come up with the most combinations to produce that number.

**"Repetition is great to reinforce learning.
Creative repetition makes learning exciting".**

(Quote by Rachel de Vries, Managing Director, House of Bricks Ltd)



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.houseofbricks.co.nz
info@houseofbricks.co.nz



NUMBER HOUSES

A CHALLENGE TO REINFORCE
LEARNING AROUND NUMBER
RECOGNITION AND PLACE VALUES

AIM: To practice
breaking down
numbers into
place values

RICH EXPERIENCES

- **Knowledge and strategy learning** - students learn the knowledge of placement value particularly of numbers larger than one. They also learn different strategies to create numerical representation of numbers in different ways including creating the numerical figure with LEGO, working out the different ways they can represent the whole number by counting the studs or number of bricks.
- **Mathematical terminology** - students learn what these terms mean in a practical and meaningful way:- Place value, ones/ units, tens, hundreds, one thousand
- **Abstract to concrete learning** - students learn the number represented in its 2D written form can also be created into a 3D number. This reinforces number formation for students who learn best using tactile prompts.
- **Repetition** - Students can repeat, extend and create alternative ways to practice the skill of placing numbers in their place value column.

LINKS TO CURRICULUM

Te Whāriki

Mana reo - Communication

Children recognise mathematical symbols and concepts and use them with enjoyment, meaning and purpose.

➡ This links to children learning there are numbers beyond ten and when numbers are placed in a different 'room of the house' this will change the value of the number.

Children will develop non-verbal communication skills for a range of purposes

➡ This links to children learning and recognising that numbers can be represented in a myriad of different forms e.g. numerical 7, written seven, quantity X X X X X X X.

New Zealand Curriculum

Maths

Students will develop knowledge of ones, tens, and hundreds up to 1000

➡ This links to students understanding the difference between each of these place values, experimenting with different combinations of numbers and presenting these numerals in a creative way.

Students will know basic addition and subtraction facts

➡ This links to students using the studs on the LEGO pieces to represent the number in the number house e.g. the number 5 can be represented with a 4 stud piece + a 1 stud piece or a 2 stud piece + a 3 stud piece.

English

Students will select and use sources of information (meaning, structure, visual information) and prior knowledge with growing confidence to make sense of increasingly varied and complex texts

➡ This links to students using their writing skills during this activity to practice forming each number and transfer that number formation onto the base plate using the LEGO pieces to form the number.

"The essence of mathematics is not to make simple things complicated, but to make complicated things simple".

Quote by Stan Gudder



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.ako.expert
vida@ako.expert



ADDITION TOWER

A CHALLENGE FOCUSED ON REINFORCING NUMBER RECOGNITION & RECALL OF BASIC FACTS

AIM: To quickly recall basic addition equations to build a tower using LEGO* & dice

ITEMS NEEDED:

- 2 Dice
- 40 basic LEGO bricks per person
- Optional - A base plate or other large LEGO plate to act as the base to build from

THE TASK:

Step 1: Decide who starts

Step 2: When it is your turn, roll both the dice together.

Step 3: Add the 2 numbers together and call out your answer. If you get it correct you get to add the total you called out to your tower.

For example, if you roll a 3 and a 5 when added together they equal 8. Now you can add 8 bricks to your tower.

Twist: if you answer incorrectly you do not get to add the bricks to the tower.

Step 4: Keep taking turns until someone uses all 40 of their bricks!

ALTERNATIVES & EXTENSIONS

Note about dice: Depending on where you are at with your students you choose which type of dice you need - dice with actual numbers on it, or the classic dice with dots.

Note about Step 4: You can change up the final goal in many ways. You could add more - use 50, 60, or even 100 bricks. You could keep going until someone's tower falls over, and the winner is the one that stays in for the longest without their tower falling over.

Note about the Twist: If you really want to make the game exciting, if students get the answer incorrect they have to subtract their incorrect answer off their tower!

Let's start at the beginning. Do you have young students who are learning to recognise numbers and count? If yes then start with this basic counting challenge...

Alternative #1 - Early number recognition and counting: Use just 1 dice per person. This activity can be done individually or in groups. Roll the dice, get your student to say the number that is rolled. Once they have this correct get them to count out the right number of bricks and start their tower. NOTE: If their fine motor skills are not advanced enough to build a tower, simply get them to build the bricks on a base plate.

Do you have students that need an extra boost? If yes, let's make things trickier! You choose the level to suit where your student's learning is at. Here are some ideas to extend this game and include more skills.

Extension #1: Add more dice. If your students have aced adding 2 numbers easily add in more dice. 3, 4, 5...

Extension #2: Change the type of dice. There are dice out there with more than 6 sides. Check out a toy store that sells board games for extra dice. You can get 4, 6, 8, 10, 12, and 20, plus a wide variety more if needed!

Extension #3: Change from addition to multiplication or subtraction. Simply use the same rules as per the original game but change 'add the dice' to 'multiply the dice numbers'. If your students are working on subtraction get them to subtract the lowest number from the highest number (remember to use the correct language and prompt those that need it by suggesting "which number is greater than...or less than").



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.houseofbricks.co.nz
info@houseofbricks.co.nz



ADDITION TOWER

A CHALLENGE FOCUSED ON
REINFORCING NUMBER
RECOGNITION & RECALL OF BASIC
FACTS

AIM: To quickly
recall basic
addition
equations to
build a tower
using LEGO* &
dice

RICH EXPERIENCES

- **Number recognition** - the dice can have either the numerical number or the number represented by dots, children need to be able to identify the number in both of these forms to play the game.
- **Fine motor skills** - assembling the tower takes hand eye co-ordination and fine motor strength as the tower is built. If playing the subtracting the bricks for a wrong answer then this also takes dexterity as they disassemble the tower.
- **Group participation** - playing this as a games encourages group participation and learning the rules of the game.

LINKS TO CURRICULUM

Te Whāriki

Mana reo - Communication

Children recognise mathematical symbols and concepts and use them with enjoyment, meaning and purpose.

This links to children gaining knowledge and understanding of the numbers 1-6 and understanding that these can also be represented in symbol form as dots on a die. Children learn maths can be learnt through fun and creative games. Extending children through early maths skills from counting the dots to matching this with the bricks and building the tower to simple addition.

Mana tangata - Contribution

Children are encouraged to learn with and alongside others.

This links to groups of children working together to play the game. Learning how to take turn, encourage each other, help and correct each other in a positive way which makes it enjoyable for all participating.

Mana whenua - Belonging

Children learn the limits and boundaries and respect the rules and rights of others.

This links to children deciding and agreeing on the rules of the game and respecting each others turns and learning to be good winner and a good loser.

New Zealand Curriculum

Maths - Number & Algebra

Students will be able to record and interpret additive and simple multiplicative strategies, using symbols with an understanding of equality. (L3)

This links to students being able to add & subtract and later when the game is extended do simple multiplication to build the tower.

Students will be able to generalise that the next counting number gives the result of adding one object to a set and that counting the number of objects in a set tells how many. (L1)

This links to students learning how to count the dots on the dice and then add them together to get the total number they need to build their tower.



*LEGO, DUPLO & TECHNIC are protected trademarks of the LEGO Group of companies which does not in any way sponsor, authorise or endorse the House of Bricks website, or any of the individual House of Brick services. House of Bricks is not affiliated with, endorsed by or licenced by any of the LEGO Group of companies. House of Bricks Ltd respects LEGO Trademarks.

www.ako.expert
vida@ako.expert