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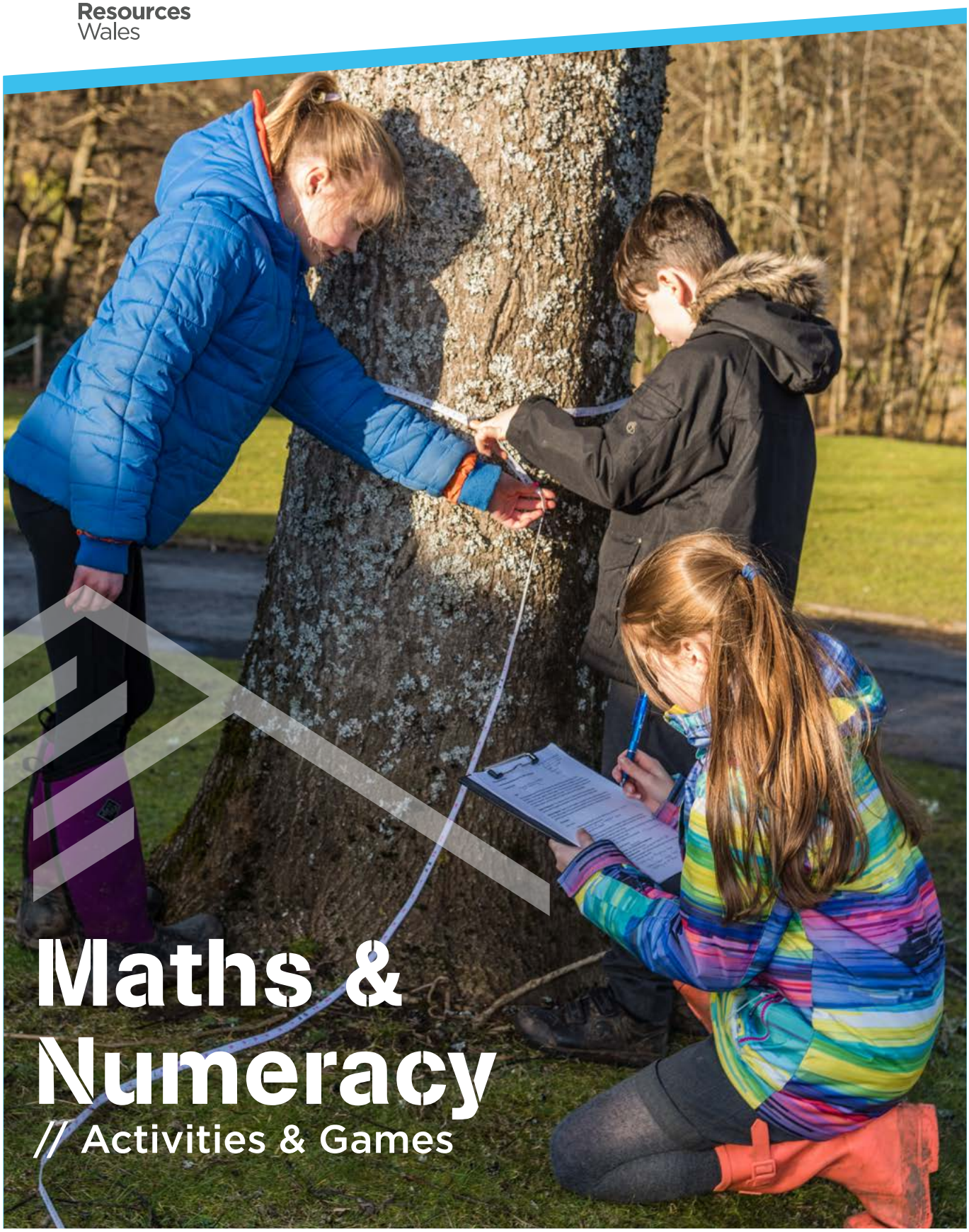

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CHILDREN, EDUCATION, LIFELONG LEARNING & SKILLS
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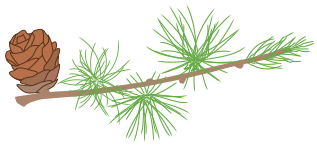
Contents



Looking for more learning resources, information & data?

Please contact: **education@naturalresourceswales.gov.uk**
or go to **www.naturalresources.wales/learning**

Alternative format; large print or another language, please contact:
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Context

This booklet highlights the importance of sustainably managing our natural resources, focusing on exploring nature for mathematics and numeracy.

Natural Resources Wales' purpose is to pursue the sustainable management of natural resources in all of its work. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

Introduction

All the following activities and many more can be adapted for use in woodlands, coastal settings, local parks, school grounds, etc.

The activities have come from many different sources and have been altered and adapted over the years.

All the natural resources required to complete the activities listed are easily collectible from local nature spaces if your setting has none available.

Please ensure that your activities are sustainably resourced and have minimal impact on the natural environment.

For example:

- Be aware of prickly, poisonous plants
- Guard any protected species on site
- Don't over use one area
- Leave nothing but footprints

// PICK AND CHOOSE from the following activities to explore the environment to further develop a sense of place, encourage physical activity and promote wellbeing.

AIM

To encourage everyone to spend time being in and connecting to nature through first-hand, positive experiences.

To aid the development of cross curricula skills and knowledge required to meet the four purposes of the Curriculum for Wales.

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ACTIVITY 1

LEAF STRINGS

Overview

This threading activity provides opportunities for collecting, sorting and sequencing leaves, as well as exploring different shapes, sizes and types of leaves.

Supporting information & resources:

Lengths of string (shoelace size). Knot one end and wrap sticky tape around the other for easy threading.

What to do...

1. Give each learner a length of string and encourage them to collect interesting leaves to thread on to their string by pushing the taped end through the mid-point of the leaf.

If required, give further direction, such as sequencing the leaves in order of size, shape and colour.

2. The string can be knotted in between leaves to create interesting patterns, simply hung up or joined together for display.

// *The same activity can be completed by threading leaves on to suitably sized twigs.*

EXTEND THE ACTIVITY by counting how many leaves are on each string and tally them to find out who has collected the most.

Measure the leaves to find the biggest or smallest, etc.

Weigh individual strings and/or the whole group's collection.

Use ID sheets to work out what trees or plants the leaves have come from – which species has the most collected leaves?

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ACTIVITY 2

PEBBLE LINES

Overview

This activity investigates line and shape.

Supporting information & resources:

Pebbles with lines/veins
OPTIONAL: chalk (use to create lines on pebbles if there are no naturally occurring options available)

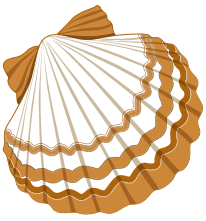
What to do...

1. Divide your learners into small groups, allowing time to search the space for pebbles with lines running through them. These are most common on a pebbled beach/coastline.

Ideally, your learners need to find at least one lined pebble each.

2. Ask each group to work together to see if they can arrange the pebbles so that the lines match up in a straight or curved line.

// Can the lines be joined together to create other shapes, e.g. a circle or a square? Can the same tasks be accomplished as a complete group?



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ACTIVITY 3

TWIG TOWERS

Overview

This activity explores non-standard measurement, height, weight, mass capacity and 3D shape.

Supporting information & resources:

Sticks

What to do...

1. Divide your learners into small groups.
2. Direct them to collect a range of straight sticks from around the area.
3. Ask for the sticks to be sorted according to length, from the longest to the shortest.

The task is for each group to build the tallest tower starting with the longest twigs.

You can allow time for problem solving or direct a little to get them started.

4. First place two twigs on the ground and then another two on top in the opposite direction.
5. Keep laying two twigs on top at a time, moving them in a little bit closer to the centre each time.
6. Keep going until all the twigs have been used to create a tower.

// Which group has made the tallest tower? Which tower is the most stable and why?

EXTEND THE ACTIVITY by trying to build a different 3D shaped tower, e.g. a triangular one.

LESS ABLE LEARNERS can work together as one big group with additional adult support.

MORE ABLE LEARNERS can complete this activity as a team challenge, use a set number of sticks or within a set time frame.

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// Activities & Games

4

ACTIVITY 4

PEBBLE TOWERS

Overview

This activity explores non-standard measurement, height, weight, mass capacity and 3D shape.

Supporting information & resources:

Stones and pebbles

What to do...

1. Divide your learners into small groups.

Direct them to collect a range of stones and pebbles from around the area.

2. Working together, ask your learners to order the stones and pebbles by size.
3. Then balance their stones and pebbles, starting with the biggest at the base, into the tallest tower possible without it collapsing.

Allow problem solving time as each group investigates strategies to improve the towers' stability.

// *Which tower has become the tallest?*
Which design provided the best stability and why?

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ACTIVITY 5

NATURAL SYMMETRY

Overview

This activity looks at symmetry in a creative way with supporting learners to understand and use the properties of position and movement to create a reflective or rotational picture using natural materials.

Supporting information & resources:

Natural materials
OPTIONAL: tape measures

What to do...

1. Challenge the group to find something symmetrical in the surrounding environment. Leaves are a good choice as the veins are often symmetrical.
2. Explain to the group that they are going to create a picture using natural objects.
3. Ask them to create a frame for their picture using sticks, stones or drawing with chalk on a playground, or in sand on a beach.
4. Ask your learners to estimate, then measure the perimeter of their picture frame. They then need to divide the frame in half or quarters in the same way that they created the frame.

Once this is completed, give the group time to collect a variety of natural objects.

5. Now arrange the items in a symmetrical pattern in the frame.

// *Does the result look symmetrical from the other end?*

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ACTIVITY 6

ART CHALLENGE

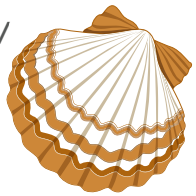
Overview

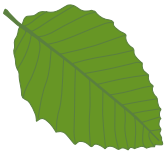
This activity uses percentages, shapes and pattern as part of a creative challenge.

What to do...

Challenge your learners to create a natural art installation that includes:

- **A minimum of 50% leaves/pebbles/ shells/pine cones**
- **A minimum of 20% branches/twigs/ driftwood/seaweed**
- **A triangle**
- **A circle**
- **A pattern of your choice**
- **1 man-made object**
- **Measurement of 1m squared (approximately)**





ACTIVITY 7

LEAF MATCHING

Overview

This activity explores matching by shape, size and colour.

Supporting information & resources:

Collecting box or tub

What to do...

1. Collect a wide range of different leaves from around the area prior to delivering the activity. Include the very small plants. You will need one leaf per learner.
2. Ask each of the group to randomly select one leaf out of the box/tub and to search the locality for as an exact a match as possible and to return with both leaves.

If there is a correct match, allow the learner to drop both into the main collection and choose a different leaf.

3. Continue until the group has had several goes each.

EXTEND THE ACTIVITY by sorting the collected leaves into different sets, e.g. by species, shape and colour. Tally the finds by sets. Use the collection of leaves to create a natural art piece, leaf strings, etc.

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ACTIVITY 8

FALLING LEAVES

Overview

This is a fun activity that supports the development of counting skills.

Supporting information & resources:

Collecting bucket or large bag

What to do...

1. Engage the whole group in collecting fallen leaves and place them in the bucket or bag.
2. Stand in front of the group, ideally at a slightly higher elevation than your learners.
3. Empty the container of leaves into the air.
4. Task the learners to try and catch as many leaves as possible before they fall to the ground.

DISCUSS THE OUTCOME.
How many leaves have been caught?
Who caught the most?
Did the group catch most of the leaves or did they land on the floor?

This activity can be repeated many times.

EXTEND THE ACTIVITY by calculating how many leaves would everyone have if they caught 2/3/4/5 more?

Explore better ways of catching leaves.

Investigate why some trees lose their leaves in autumn.

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9

ACTIVITY 9

NATURE SHAPES

Overview

This is simple activity identifies a range of shapes found in the natural environment.

Supporting information & resources:

OPTIONAL: collecting containers and digital cameras

What to do...

1. While exploring a local nature space, look for as many different shapes as possible. Optional – use a smart camera to collect any shapes that are not moveable, e.g. a triangle found in tree bark.
2. Bring the group back together and organise the found objects into 3D and 2D sets.
3. Organise the shapes into symmetrical and asymmetrical groups. Sort shapes into natural and geometric shape piles. How many squares and triangles did you find?
4. Discuss the differences between all the shapes found.

EXTEND THE ACTIVITY into a warm up game that reinforces the learning. Ask the group to get into a circle shape and hold hands. Call out different shapes for the group to form themselves into without letting go of hands. Make this activity harder by asking the group to move their shape in one direction without warping the shape.

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10

ACTIVITY 10

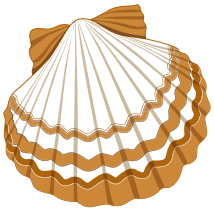
NATURAL PATTERNS

Overview

This is activity encourages the exploration of patterns in nature.

Supporting information & resources:

Collecting containers, crayons, paper



What to do...

1. Nature spaces provide a wealth of opportunities to look for natural patterns so allow time to explore whilst asking the group to look for patterns in nature, using both sense of sight and touch.
2. The group can record patterns found as drawings or wax rubbings.

MORE ABLE LEARNERS can explore more complex pattern theories such as spirals or Fibonacci.

EXTEND THE ACTIVITY by collecting as many patterned objects as possible and use them to create a pattern on the floor. Investigate if the objects are symmetrical and whether they will fit together (tessellate). This can be completed as an individual, pair or small group or the group could create one giant pattern.

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ACTIVITY 11

POOH STICKS

Overview

This is a simple activity which introduces velocity of water.

What to do...

1. This can be played on any bridge over running water.
2. Invite your learners to each find a small stick, fir cone, conker or similar item that will float in water.
3. Learners drop their item at the same time, over the upstream side of a bridge and the one whose stick first appears on the downstream side is the winner.
4. You can play this alongside a water course bank by choosing a start and end point.

EXTEND THE ACTIVITY by using a stopwatch to time the start to finish journey of the floating object, or try a range of different natural resources to see which travels fastest, floats higher, etc.

ACTIVITY 12

ANIMAL LEGS

Overview

This activity uses animal classification to promote mental calculation skills.

What to do...

1. Discuss a variety of different animals and the number of legs they have, e.g. woodlouse, badger, flea, spider, perhaps including the family name for each one, e.g. insects, mammals.
2. Ask the group to remember these numbers and using the two legs they each have organise themselves into groups which will represent the creature, as you call them out.
3. Ask the group to divide themselves into groups of fleas – an insect has six legs therefore there needs to be three learners in a group.
4. Continue this for each animal e.g. a woodlouse has fourteen legs – seven learners in a group.
5. Once this concept is grasped, ask them to combine the calculations, e.g. can they get into groups of badgers with a flea on its back? A badger has four legs - two learners. A flea has six legs - three learners. Number of learners required - five.

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// Activities & Games

ACTIVITY 13

ANIMAL HOME AUCTION

Overview

This activity supports mental calculation development through role play to explore selling and buying.

Supporting information & resources:

Set of small animal soft toys
Paper, counters or similar to represent money

What to do...

1. Divide the group into small teams. Each team needs to construct a mini shelter suitable to house a small, animal toy. The shelter needs to be built from natural materials in a suitable location and include three 'special features' that will stand out amongst the competition!
2. Once the shelter is complete, each team needs to take turns as estate agents to 'advertise/sell' their property to the rest of the group, highlighting the special features that they consider to be particularly attractive to potential purchasers.
3. Provide each team with a specified amount of money, which is not divulged to the wider group.
4. Each team must decide whether they want to bid on all, or just some of the properties up for sale.
5. Following this, each team must work out a strategy for bidding to try and secure the purchase on properties they have selected. Strategies may include: starting with a high opening bid or withholding a bid until the last minute.
6. Each team must select one member to bid on the properties.

The auctioneer (either yourself or a nominated learner) will give a summary of the first property for sale, for example:

'Lot Number 1, we have for a sale a dome shaped property with a water-tight, moss covered roof with a natural leaf flooring providing a cosy interior.'

The Auctioneer will then commence the bidding, for example:

'Lot Number 1, 'we're going to be using multiples of '6' in this bidding round. Let me start at 12 pounds... do I see 12 pounds?....I've got 12 pounds over here, do I see 18 pounds, 18 pounds anyone? Thank you sir, I have 18 pounds... do I hear 24 pounds?.... etc, 144 pounds going once, 144 pounds going twice, going three times, sold for 144 pounds to the team on my left, congratulations!'

Teams must indicate each of their bids by raising their hand in the air.

7. Bidding will continue on each property until the auctioneer has called out the last submitted bid three times, signifying the sale with a knock of the hammer.
8. Following this, bidding will commence on the next property using multiples of a different number.

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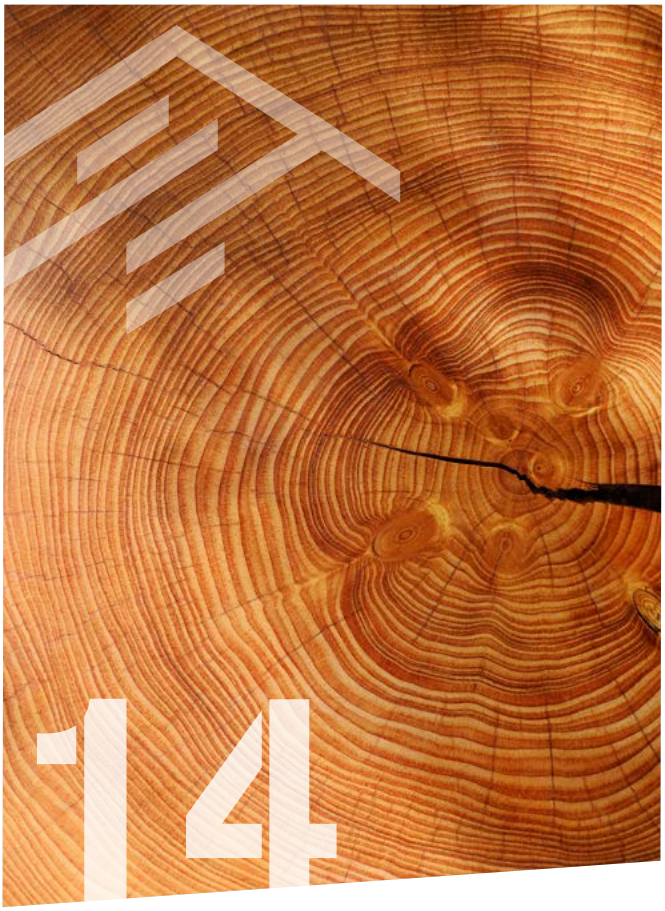
// Activities & Games



ACTIVITY 14

HOW OLD IS THAT TREE?

Overview

This activity uses estimation, counting, measuring and calculations to approximate for a real purpose.

Supporting information & resources:

Tree stumps or tree slices
Tape measure (over 2 m)
Pencils and paper

What to do...

Method 1:

1. Look at the tree stump/slice and discuss how each ring represents 1 year of tree growth. The light rings represent spring growth and the dark rings represent summer growth. A tree acquires one light and one dark ring annually. Count only the dark rings. The tree's rings vary in thickness because the weather each year is different, either hotter, colder, wetter or drier. Ask your learners what they think would make a good growing year for the tree?
2. Working in small groups ask your learners to choose 1 tree stump or slice at a time and estimate the age of the tree. Once they have made their estimate, task them with counting the rings and comparing their estimate with the tree's true age.

Method 2:

1. It is possible to estimate the age of a tree by taking a measurement of the girth (circumference) at chest height (1.3m) and using a simple equation.
2. There are two types of different trees growing in the UK, softwoods and hardwoods, which grow at different rates.
3. A soft wood tree is usually conical in shape and is the type of tree commonly referred to as evergreen, i.e. those trees that do not lose their leaves (needles) during the winter months. Hardwood trees are more spherical in shape and usually have no leaves during the winter months.
4. Ask your learners to find a suitable tree, decide if they think it is soft/hardwood variety and attempt to estimate its age and make a note.
5. Ask each group to use the tape measure, wrapping it around the trunk of the tree at chest height – approximately 1.3 metres.
6. Take the circumference measurement in centimetres and record the measurement.
7. Use the following equation to work out the age of the tree.

Soft wood
Circumference ÷ 3 = Age

Hard wood
Circumference ÷ 2 = Age
Compare findings and estimations.

EXTEND THE ACTIVITY by exploring our tree measuring pack.

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// Activities & Games

ACTIVITY 15

HOW TALL IS THAT TREE?

Overview

This activity uses simple geometry, estimation, counting, measuring and calculations to approximate for a real purpose.

Supporting information & resources:

Stick, the length of an arm
Tape measure (over 30m)
Pencils and paper

What to do...

1. Ask each learner to find a stick of equal length to the distance from their cheekbone to the end of fingers when their arm is straight and fully extended in front of their face (if stick is too long, break the end off or leave a mark on it).
2. Demonstrate how to hold the stick vertically, pointing upwards with arm fully extended making sure the stick is held with the tips of thumb and finger.
3. Ask your learners to hold the stick in the same way and to walk toward or away from a chosen tree until the tip of the stick is visually lined up with the top of the tree and the bottom of the stick is lined up with the base of the tree.
4. The distance from the eye to the base of the tree is now equal to the height of the tree. Learners can mark the ground at this point and then measure this distance with a measuring tape.
5. If no long distance measuring device is available, calibrate a learners step. This is the walking distance between a persons two feet when walking normally and not over stretching. Measure the step in centimeters (for more accuracy an average of 3 or 4 steps can be taken). Step the distance from where the learner was standing to the base of the tree. Multiply by the calibrated step measurement. Divide by 100 to convert to meters.

EXTEND THE ACTIVITY by finding out other ways to measure the height of a tree using our *Tree measuring pack* and discussing:

What if the tree is leaning toward you, away from you or to one side?

What are the possible sources of error?

Should everyone doing this end up the same distance from the tree (yes), or will it depend on their height or the length of their stick (no)?

What if you can't get level with the base of the tree?

What else could you measure the height of using this technique and how?

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// Activities & Games

16

ACTIVITY 16

HABITAT INVESTIGATION

Overview

This activity uses simple fractions and temperature readings to investigate and compare parts of different habitats.

Supporting information & resources:

Quadrats
Thermometers and ground thermometers
Clipboards, paper and pencils

What to do...

1. Set up 4-6 quadrats in 2 different habitat areas e.g. coniferous and deciduous woodland, sand dune and salt marsh. Try to choose areas with distinct differences in ground cover.
2. Ask the group to carefully observe each quadrat and estimate what fraction, or percentage is covered by flora / bare ground / leaf litter / grass and make note of their findings.
3. In each area, hang up a thermometer and set up a ground thermometer in separate locations e.g. one under a tree, one in a more open area. Ask the learners to take readings and note them down.
4. Bring the group together and discuss their findings. What were the main differences between the two locations? What factors contribute to those differences?

EXTEND THE ACTIVITY by trying the same activity in a different type of ecosystem. Or graph the results of the locations at different times of the year.

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17

ACTIVITY 17

SNAIL RACES

Overview

This activity investigates speed and estimation in a real context.

Supporting information & resources:

Stop watches
Snails
Tape measure
Damp plastic sheet

MORE ABLE LEARNERS can investigate:

How long would it take a snail competing at the Olympics to complete the 100m sprint race?

How many kilometres an hour can a snail travel?

How long would it take for a snail to travel from your home to school?

The speed of another minibeast.

Which would win the Olympic 100m sprint - a snail or a woodlouse?

What to do...

1. Place a damp plastic sheet on flat ground and mark a start and finish line 1 meter apart.
2. Decide how many snails the group needs to collect.
3. Estimate how long it will take the group to collect snails.
4. Set the stop watch and carefully collect snails, holding them gently by the shell.
5. Stop the watch. How long did it take? Where did the snails live? Was the estimate close?
6. Place the snails at the starting line.
7. Start the stopwatch.
8. Stop the watch when the snails have made it to the finishing line (place a couple of cabbage leaves at the end to encourage travel).
9. How long did it take for the winning snail to travel 1 metre? What was the time for the last snail to cross the line? Discuss any problems with the race.
10. When finished carefully replace the snails where they were found.

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// Activities & Games

ACTIVITY 18

NATURAL NUMBERS

Overview

This activity supports number recognition, numeric order and vocabulary and conservation of number.

What to do...

1. Ask your group to collect as many different natural materials as they can find in the area.
2. Explain that the group are going to create a number gallery.
3. Decide how many numbers will be in the gallery e.g. 1 to 5, 1 to 9
4. Ask each learner to make the shape of a number, (either one they know, or one chosen for them) out of the collected natural materials.
5. Can the group work together to create a gallery of numbers in this way, placing them in order?

EXTEND THE ACTIVITY by finding the correct number of objects to match with the number.

MORE ABLE LEARNERS could create an entire number gallery of their own.

ACTIVITY 19

LOG CIRCLES

Overview

This activity supports number recognition, numeric order and vocabulary.

Supporting information & resources:

Log circle or hoops to stand in
Number cards or similar - 1 to total number of the group

What to do...

1. Give each learner a number card.
2. Ask the group to sit down on the log circle or stand in one of the hoops.
3. There needs to be one empty log/hoop.
4. Shout out a random number. The learner holding that number needs to run around the outside of the circle to sit down on the empty log.
5. Explain to the group that when a chosen number is called, everyone must change logs.
6. Repeat until all have had a turn.
7. You can double up numbers so that 2 or more children must move place at a time.

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ACTIVITY 20

BEACH BOWLING

Overview

This activity develops counting skills through score keeping.

Supporting information & resources:

Light weight containers, e.g. paper cups
Balls

What to do...

1. Divide the group into teams and provide sufficient sets of containers and balls for each to play.
2. Ask your learners to fill the containers with damp sand and arrange in a bowling triangle.
3. Invite your learners to take turns using the balls to bowl down containers, awarding points for each container knocked over.
4. Repeat until everyone on the teams has had a turn at bowling.
5. Discuss number of points awarded.

ACTIVITY 21

NATURE'S MENU

Overview

This fun activity offers opportunity for developing mathematical language and skills.

Supporting information & resources:

OPTIONAL – paper plates

What to do...

1. Explain to your learners that they will be acting as cooks in the local takeaway. The animal residents of *.....insert the name of your local nature space.....* have all clubbed together to buy a Friday night takeaway.
2. Using natural materials, your group needs to create the following meals:

✔ **Owl** wants a mouse pizza. Owl has specified he only wants cheese on half his pizza and he would like the toppings to be symmetrical.
✔ **Rabbit** wants leaf kebabs. Rabbit has specified that he would like at least five helpings of leaf on each kebab but no more than 10 – he is trying to eat healthily.
✔ **Hedgehog** has requested a 'Chef's Special.' Learners need to apply a numeracy/math angle to this creation and be able to describe it. **Set the table for 3 in readiness because these animals are hungry!**

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// Activities & Games

22

ACTIVITY 22

PACE YOURSELF!

Overview

This activity uses animal classification to promote mental calculation skills.

Supporting information & resources:

Tape measure
10 metre markers, e.g. stones

What to do...

1. Lay out a 10 metre tape measure on the ground.
2. Ask your learners to walk the distance using their normal pace and count how many of their steps equals 10 metres.
3. This can then be used to measure distance or perimeter, e.g. the perimeter of the school grounds, the pond, or distance from the classroom to the school gate.
4. This can be done in several ways. Using a 14 paces to walk 10 metres as an example.

Method 1: Walk the distance/perimeter being measured, every 14 steps transfer a stone from left to right hand. Once finished, count the number of stones in the right hand and times by 10.

For example, walking the perimeter of the school playground, the learner has 7 stones in his right hand. 7x10=70, so the perimeter of the playground is roughly 70 metres.

Method 2: Simply count the paces, then calculate the real distance using the equation below. E.g. walking the school playground, the student takes 102 paces.

Number of paces ÷ 14 x 10
= distance/perimeter in metres.
102 ÷ 14 x 10 = 72.86 metres

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23

ACTIVITY 23

AM I FASTER THAN?

Overview

This activity compares speeds and times of travel across a set distance.

Supporting information & resources:

Stop watches, meter markers, paper and pencils

What to do...

1. Ask your learners to work in pairs to measure the time taken to travel across a chosen distance, using the 3 movement types within the table.

Then ask them to use this equation to work out their approximate speed: **Speed = distance ÷ time**

	Jog	Walk	Hop
Distance (meters)			
Time (seconds)			
Speed (meters per second)			

2. Now ask them to compare themselves against some members of the animal world.

What are you faster than?

a) Buzzards fly at 26 meters per second
b) Foxes move at 15 meters per second
c) Badgers move at 8 meters per second
d) Mice move at 5 meters per second
e) Frogs hop at 2 meters per second
f) Hedgehogs move at 1 meter per second
g) Beetles move at 0.5 meters per second
h) Woodlice move at 0.01 meters per second
i) Snails move at 0.001 meters per second

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24

ACTIVITY 24

SHELTER BUILDING

Overview

This activity encourages collaboration and communication in planning, designing and building a suitable shelter. A local woodland is the best environment for this activity.

Supporting information & resources:

INFORMATION NOTE: Shelters and dens
RESOURCE CARDS: Creative shelter challenge
String
Clipboards, paper and pencils

What to do...

1. Ask your learners to work in small groups to plan and draw the shelter design.
2. They should consider obstacles and modifications.
3. You might want to ask them to create a mini model to test suitability using small sticks or spaghetti with marshmallows as the connectors.
4. In their groups, learners should work together to complete the creative shelter challenge and build a full-size shelter from suitable natural materials in the area.

LESS ABLE LEARNERS can work together to build a shelter for a soft toy.

MORE ABLE LEARNERS can review the finished product. A retrospective plan can be drawn and annotated to demonstrate understanding of the construction process.