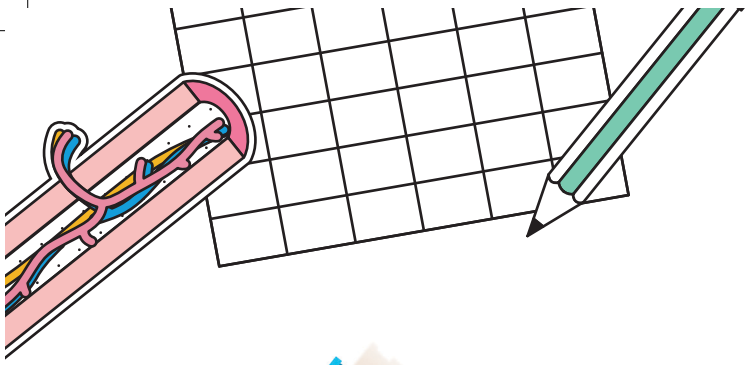
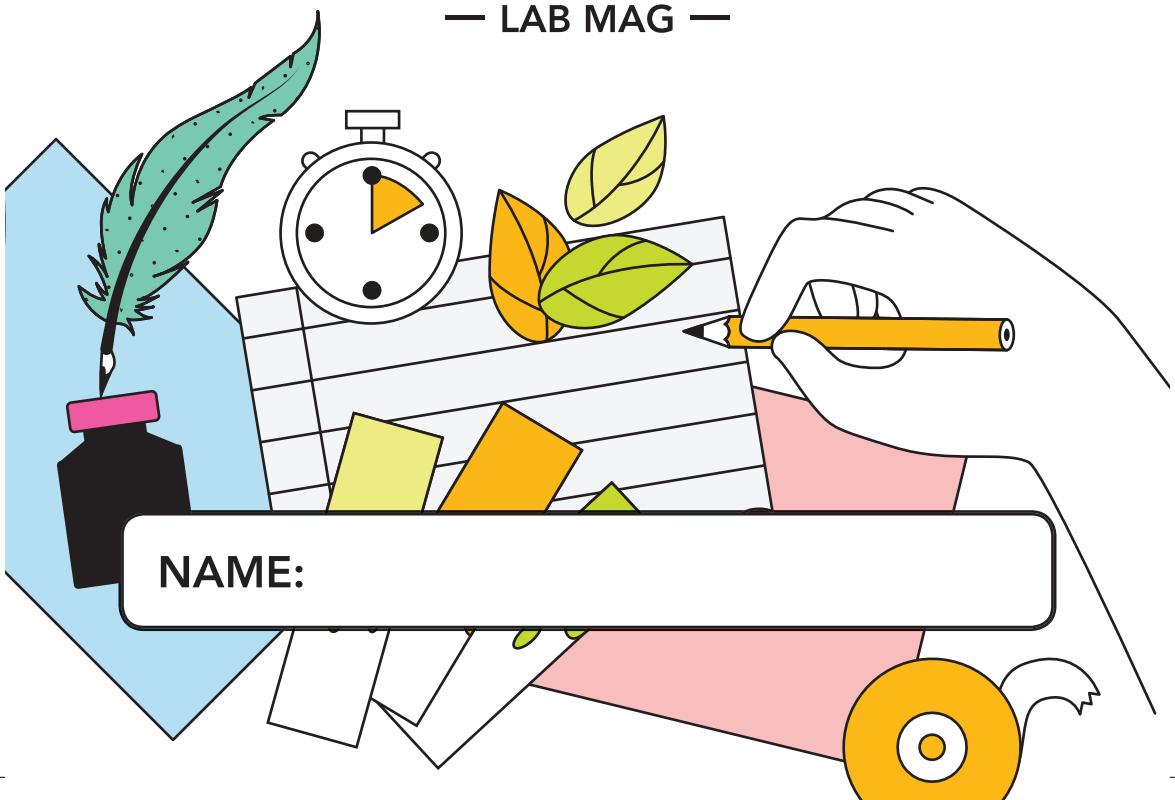


ISSUE 03

Tweenkerama

— LAB MAG —



NAME:

Look out for these workshops coming your way!

Tweenkerama Workshops
(Mar, Jun, Nov and Dec)

Tweens get to explore and learn through a series of workshops related to S.T.E.A.M. subjects such as augmented reality, coding, digital photography, etc.

Tweens S.T.E.A.M. Lab
(Nov)

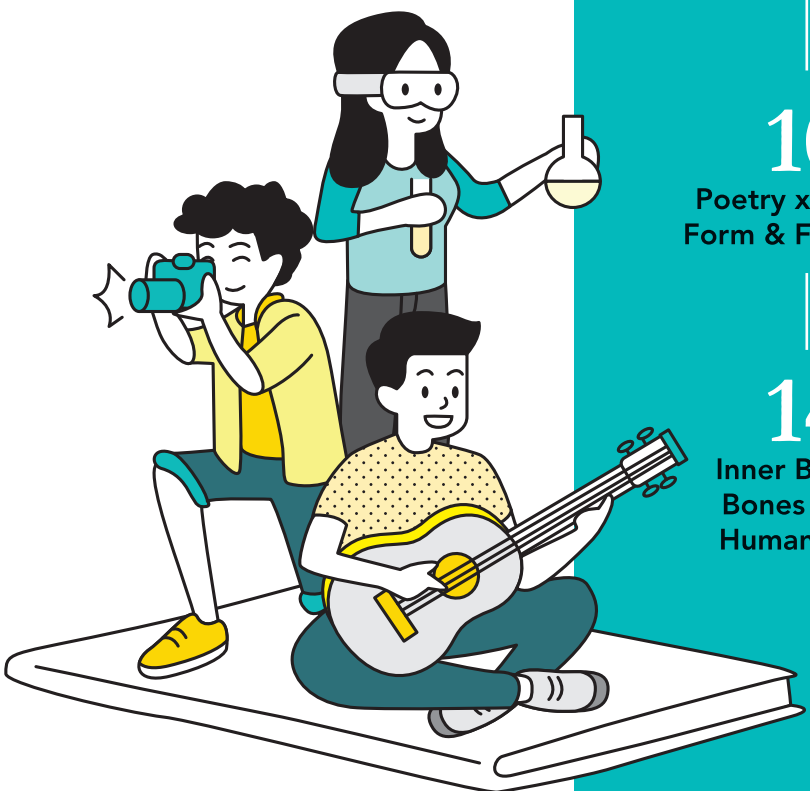
The Tweens S.T.E.A.M. Lab is an annual event featuring a variety of exciting hands-on and experiential learning activities.

For more information on Tweenkerama programmes, past issues of Lab Mag and answers to the activities, visit **www.nlb.gov.sg/discovereads/tweens**

What is Tweenkerama Lab Mag?

The only magazine you need for cool, creative and out-of-this-world ideas and easy DIY projects.

Each issue of Tweenkerama Lab Mag is packed with information about STEAM topics and activities for you to complete.



Contents

Science of Stars

Did you know that the Sun is actually a star?

A star is a massive ball of exploding gases. Most scientists believe that the universe was created after a big explosion called the Big Bang. After the Big Bang, stars began to form from clouds of gas and dust.

The locations of stars in the universe are not random. In fact, they are grouped in galaxies – each galaxy contains billions of stars. The galaxy we live in is called the 'Milky Way'.

Stars have different lifespans and they burn with different levels of intensity. Smaller stars tend to live longer. The death of a star occurs when its supply of gas runs out.

Fun Fact

Shooting Stars

Have you ever seen a flash of light streak across the sky and disappear? That was probably a meteor, or what we call a 'shooting star'.

- A *meteor* is a chunk of rock or dust that burns up as it enters Earth's atmosphere.
- Some meteors survive long enough in the atmosphere to hit the Earth's surface. These are called *meteorites*. A meteorite strikes our atmosphere at around 32km (20 miles) per second.

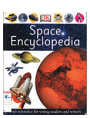
Constellations

People have noticed patterns of stars in the sky. They call these patterns 'constellations'. Constellations are named after characters or objects taken from ancient Greek myths. They are made up of the most prominent stars in the sky.

There are a total of 88 constellations. Some are only visible at certain locations. Constellations change over time and can also look different depending on the viewer's location.

There are smaller patterns within each constellation. These are called 'asterisms'. The Plough, or Big Dipper, is a famous asterism and it forms part of the constellation Ursa Major. Star maps are available for us to identify constellations in the night sky. Some of the easiest constellations to find are the Ursa Major, Leo, and Cygnus!

References



Space Encyclopedia
Author: Caroline Bingham
Call No.: J 520.3 BIN
All Rights Reserved, Dorling Kindersley, 2010.

The Usborne Book of Astronomy & Space
Author: Lisa Miles
Call No.: J 520 MIL
All Rights Reserved, Usborne, 2009.

Space Encyclopedia
Author: David A. Aguilar
Call No.: J 523.1 AGU
All Rights Reserved, National Geographic, 2013.

ACTIVITY

Starry Night

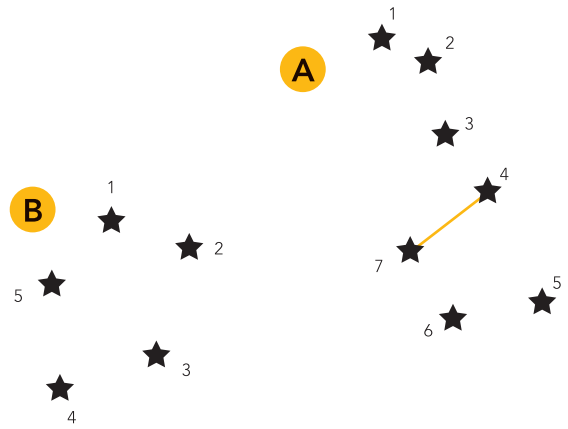
Connect the dotted lines to form the constellations and match them to their correct names!

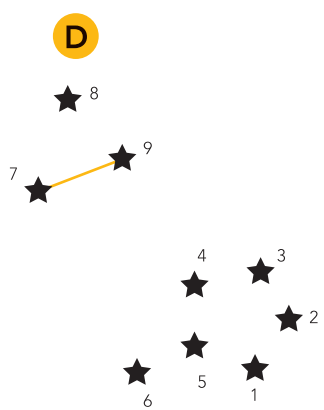
BIG DIPPER
The seven principal stars in the constellation of Ursa Major

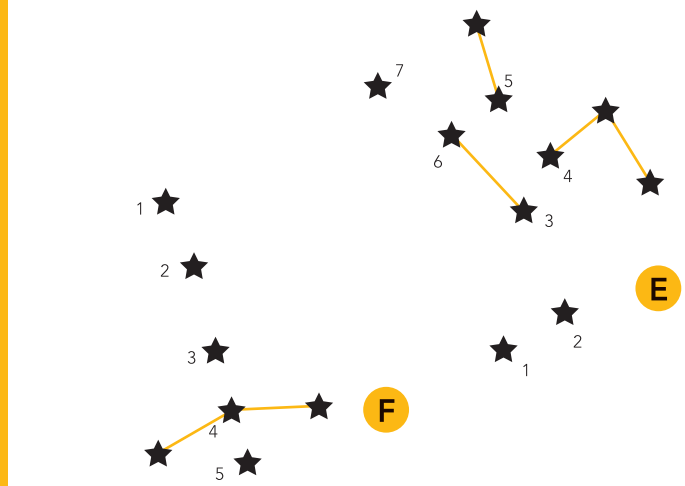
LEO
A northern constellation east of Cancer

CEPHEUS
A constellation between Cygnus and the North Pole

LITTLE DIPPER
The seven principal stars in Ursa Minor

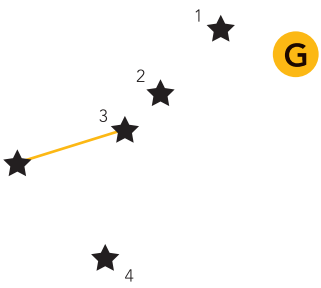






CYGNUS
A northern constellation between Lyra and Pegasus in the Milky Way

HERCULES
A northern constellation between Corona Borealis and Lyra



CASSIOPEIA
The wife of King Cepheus who gave birth to Andromeda and was later changed into a constellation

CANCER
A northern zodiacal constellation between Gemini and Leo

Additional references:

"Constellation Map dot to dot." *Super Colouring*, 13 January 2013, http://www.supercoloring.com/dot-to-dots/constellation-map. Accessed 27 August 2019.

"Big Dipper", "Leo", "Cassiopeia", "Little Dipper", "Cepheus", "Hercules", "Cygnus", "Cancer", *Merriam-Webster.com*. https://www.merriam-webster.com/dictionary. Accessed 27 August 2019.

MAKE!

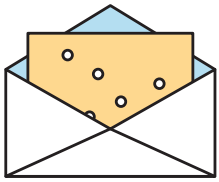
Daytime Stars

Stars are always shining. They shine even in day time. Let's find out more in this activity!

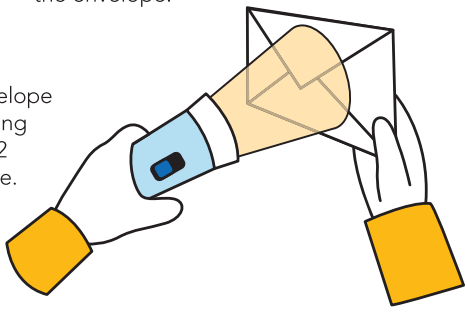
YOU'LL NEED
- Paper hole punch
- Index card
- 1 white letter envelope
- Flashlight

Instructions:

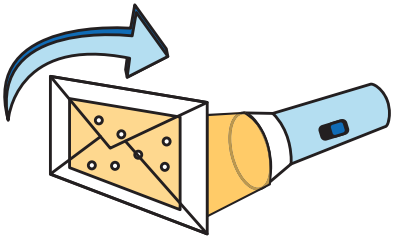
1. Create seven or eight holes in the index card with the hole punch.



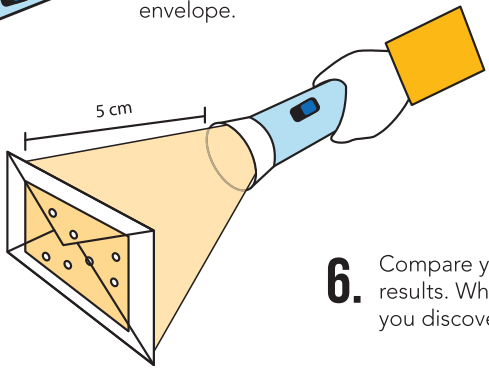
2. Insert the index card into the envelope.



3. In a well-lit room, hold the envelope in front of you with its back facing you. Hold the flashlight about 2 inches (5 cm) from the envelope. Write down your observations.



4. Move the flashlight to the front of the envelope.



5. Hold the flashlight about 2 inches (5 cm) from the front of the envelope. Write down your observations.

6. Compare your results. What have you discovered?

Additional references:

VanCleave, J. P. *Even more of Janice VanCleave's wild, wacky, and weird astronomy experiments.* New York: Rosen Publishing, 2018.

Giants of Nature: Trees

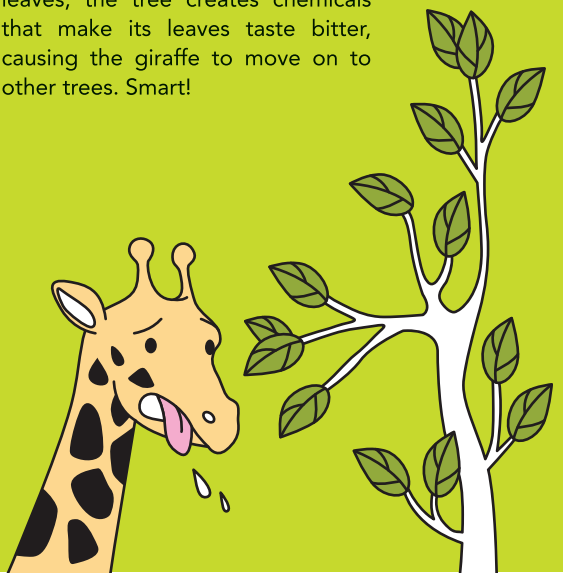
Trees are tough survivors. They can live for hundreds of years and can thrive almost anywhere in the world, from the dwarf willow hanging on stony arctic mountains, to the baobab tree in the dry African Sahara.

You may think that trees are stuck in one place, but they can actually *move*. They often display forms of tropism or directional growth due to an external stimulus. For example, tree branches display phototropism (they grow toward sunlight).

Tree roots display gravitropism (they grow toward gravity's pull). Tree roots are so sensitive that they can sense pollution in the soil and avoid it by growing in a different direction.

Fun Fact

Acacia trees can sense giraffe spit. When giraffes nibble on acacia leaves, the tree creates chemicals that make its leaves taste bitter, causing the giraffe to move on to other trees. Smart!



A tree is also an ecosystem on its own. Living things may depend on a single tree for food and shelter. For example, mangrove trees have roots that poke into the mud, providing a safe breeding ground for many fish and crustaceans hiding from predators. Mangrove roots help us too – they slow down the water and stop the coast from eroding over time.

In Singapore, our streets are lined with striking trees such as the Handkerchief Tree and the Leopard Tree, earning us our global identity as a 'City in a Garden'. Tembusu trees are native to Singapore and those found at Singapore Botanic Gardens are estimated to be more than 150 years old. This species is so iconic that it is currently featured on the back of the $5 note!

References

Trees: Kings of the Forest (Science Comics)
Author: Andy Hirsch
Call No.: J 582.16 HIR
All Rights Reserved, First Second, 2018.

The Magic & Mystery of Trees
Author: Jen Green
Call No.: J 582.16 GRE
All Rights Reserved, DK Children, 2019.

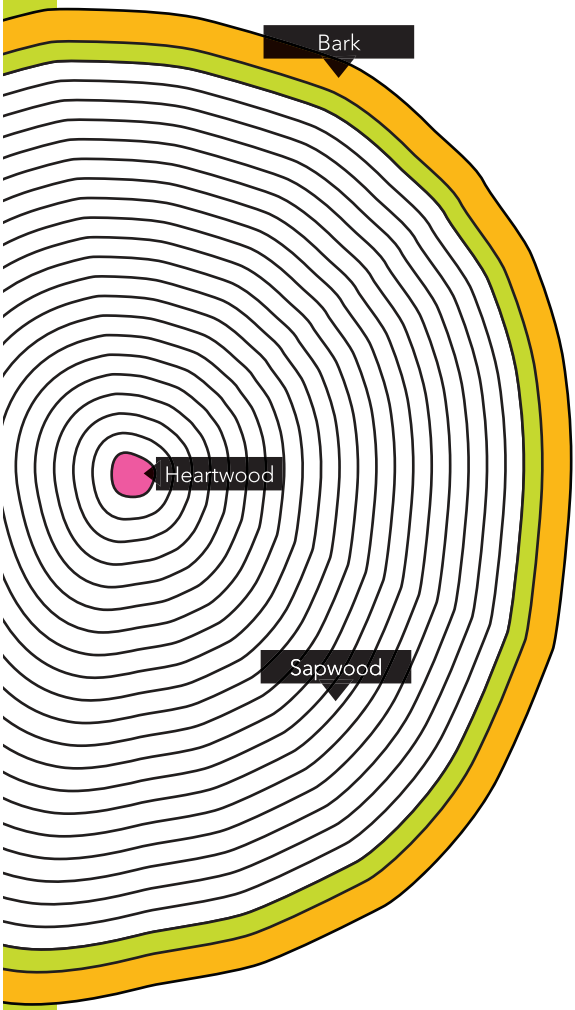
Under the Canopy: Trees Around the World
Author: Iris Volant
Call No.: J 582.16 VOL
All Rights Reserved, Flying Eye Books, 2018.

Additional references:

Lin, M. "Singapore's grand old dames: A guide on heritage trees". *The Straits Times*, 7 March 2017. https://www.straitstimes.com/singapore/singapores-grand-old-dames. Accessed 14 August 2019.

"Benefits of trees". *National Parks Board Singapore*, (n.d.), https://www.nparks.gov.sg/trees/learn/benefits-of-trees. Accessed 14 August 2019.

ACTIVITY



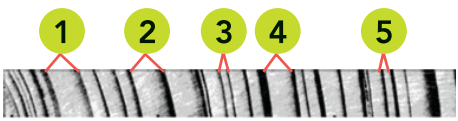
Inside the Trunk

'Heartwood' is found at the centre of a tree trunk. It is surrounded by sapwood, which contains tiny tubes that carry water from the roots to the rest of the tree.

Tree rings provide clues about the tree's history. Dendrochronology is the scientific method of measuring the history of trees as they grow outward from the centre, with a new 'ring' created around the trunk every year.

A narrow ring means that the tree grew slowly due to low rainfall or extremely cold weather. A wide ring means that the tree grew quickly.

See if you can be a dendrochronologist! Compare the relative widths of the rings marked 1 through 5 below.



Which rings might indicate years of relative abundant rainfall?

_____

Which rings might indicate years of drought?

_____

Additional references:

"Exploring Earth: How Do Trees Record Time?". *Earth Science*, (n.d.), http://www.classzone.com/books/earth_science/terc/content/investigations/es2905/es2905page02.cfm?chapter_no=investigation. Accessed 14 August 2019.

MAKE!

Leaf Chromatography

Chromatography is a scientific technique for separating a mixture into the chemicals from which they are made. Discover what makes leaves so colourful through leaf chromatography!

YOU'LL NEED

- Leaves in different colours
- A cup for each leaf
- 1 piece of coffee filter paper (cut into 15cm by 2cm strips)
- Nail polish remover
- Pencils (1 for each cup)
- A roll of clear tape

SAFETY NOTE

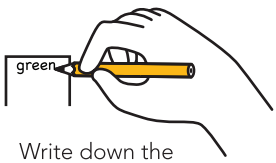
Nail polish remover is flammable; do not use near heat. It is also harmful if ingested.

Instructions:

1. Tear each leaf into small pieces.

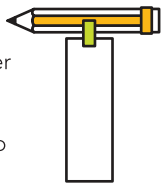
2. Put the pieces of each leaf into a cup. Each leaf should get its own cup.

3. Pour enough nail polish remover into the cups to just cover the pieces of leaves. These are your pigment mixtures.



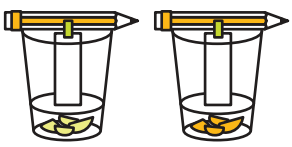
4. Write down the original colour of one leaf on the end of a strip of filter paper.

5. Tape the end of the strip of filter paper with the written colour onto the pencil.



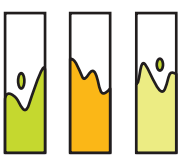
6. Suspend the pencil across the cup and let the strip just barely touch the pigment mixture.

7. Repeat steps 4, 5 and 6 for the other strips and pigment mixtures in the cups.



8. Wait for 10 minutes as the liquid travels up the paper.

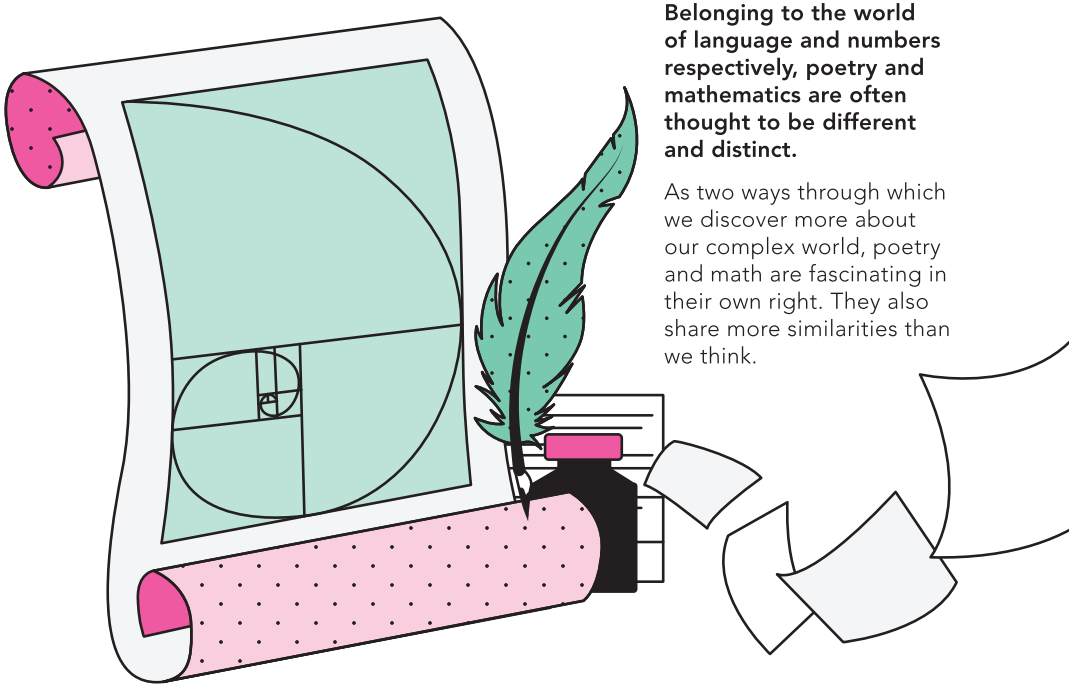
9. Take the filter paper from the cup and let it dry. Compare the results for all your leaves. How do the pigments differ?



Additional references:

"Saturday Science: Leaf Chromatography." *The Children's Museum of Indianapolis*, 9 November 2013, https://www.childrensmuseum.org/blog/saturday-science-leaf-chromatography. Accessed 30 August 2019.

Poetry x Math = Form & Fun-ction!



Belonging to the world of language and numbers respectively, poetry and mathematics are often thought to be different and distinct.

As two ways through which we discover more about our complex world, poetry and math are fascinating in their own right. They also share more similarities than we think.

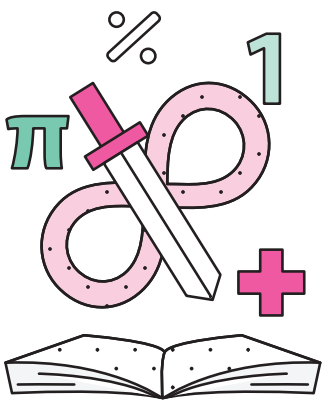
Symbols

Both poetry and mathematics contain symbols. For poetry, symbols represent a deeper meaning beyond the literal. In a poem, a sword would not just be a weapon – it could also represent the bravery of its owner.

In math, mathematical symbols form part of the equation necessary to solve a problem.

For instance, the number pi (symbol: $\pi = 3.14$) is a constant that measures the ratio of a circle's circumference to its diameter. Symbols in both poetry and mathematics can represent and simplify complex concepts.

Knowing our mathematical symbols and poetic symbolism gives us a sense of a larger, and perhaps even ∞ (infinite) wonder of the wider world.



Patterns

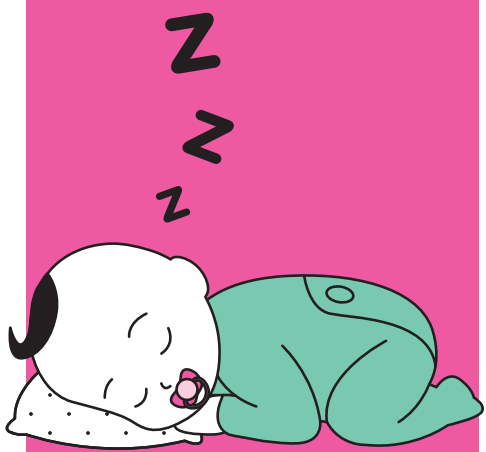
Patterns are another common feature of poetry and math. One of the most well-known mathematical patterns is the Fibonacci sequence. It runs like this: 1, 1, 2, 3, 5, 8, 13 . . . and so on. The next number is found by adding the previous two numbers before it.

Likewise, in poetry, patterns can be found in the rhyme scheme of verses:

Twinkle, twinkle little star — A
How I wonder what you are — A
Up above the world so high — B
Like a diamond in the sky — B

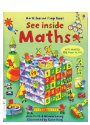
'Star' and 'are' rhyme, as do 'high' and 'sky'. Hence, this verse has the AABB rhyme scheme. The rest of the song follows this rhyme scheme as well. Patterns repeat their way through poetry and mathematics to give shape to otherwise random occurrences.

Fun Fact



Did you know that the rhyme scheme of a lullaby actually helps babies fall asleep?

References



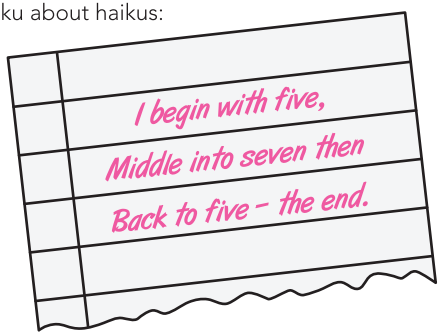
See inside Maths
Author: Alex Frith & Minna Lacey
Call No.: J 510 FRI
All Rights Reserved, Usborne, 2008.

Read, Recite, and Write Haiku
Author: JoAnn Early Macken
Call No.: J English 808.1 MAC
All Rights Reserved, Crabtree, 2015.

Arithme-tickle: An Even Number of Odd Riddle-rhymes
Author: J. Patrick Lewis
Call No.: JP 513 LEW
All Rights Reserved, Voyager Books, 2007.

ACTIVITY

A haiku about haikus:



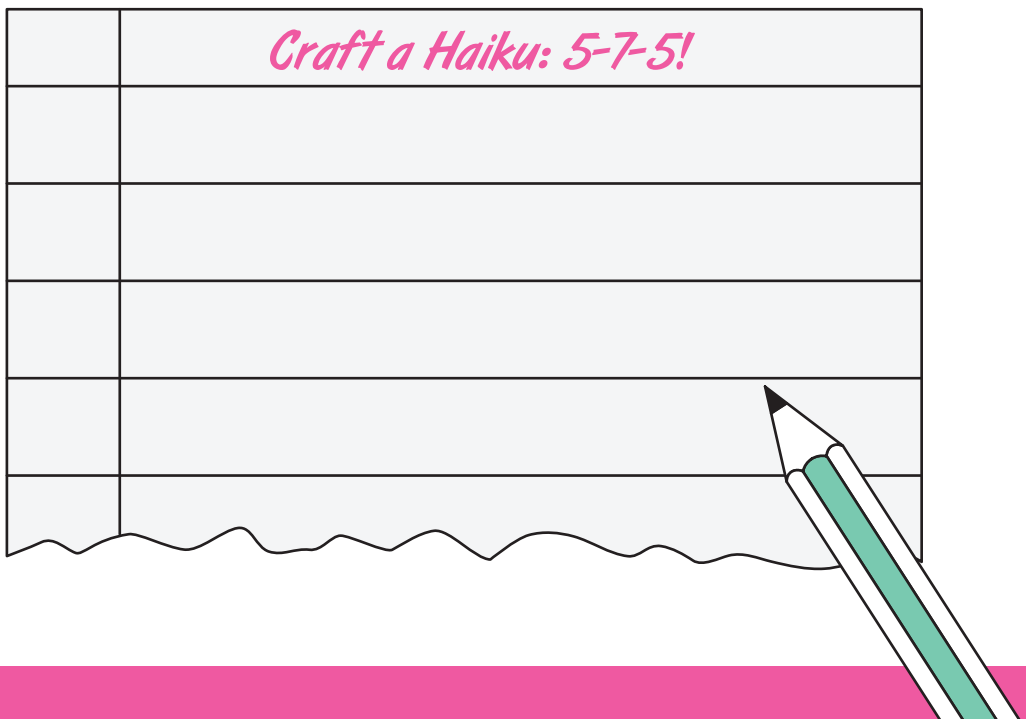
Hai there, Haiku!

Now that you have learnt about symbols and patterns, try your hand at writing a poem on math!

A haiku is a form of traditional Japanese poetry that consists of three lines. The first and last lines of a haiku have five syllables, while the middle line has seven syllables.

Here are some helping words categorised by the number of syllables:

One-syllable words	Plus	Times	Add	High	Sky
Two-syllable words	Minus	Divide	Numbers	Fraction	Rocket
Four-syllable words	Irrational	Numerical	Mathematics	Golden Ratio	Fibonacci



MAKE!

Magnetic Poetry Kit

YOU'LL NEED

- 1 A4 sized paper
- 1 A4 sized magnetic sheet
- Any word processor that allows you to create word tables (eg. Microsoft Word)
- Printer
- Ruler
- Scissors
- Magnetic surface (i.e fridge, whiteboard)
- Small container

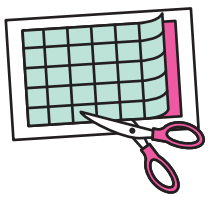
Instructions:

1. Fill up your word table with words and mathematical symbols

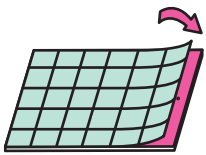
Here is an example:

bottle	game	chocolate	zebra	star	peanut	giants
÷	+	-	x	=	∞	≤

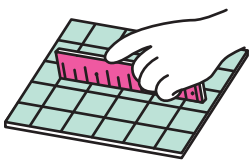
2. Print out your word table on A4-sized paper and cut it out.



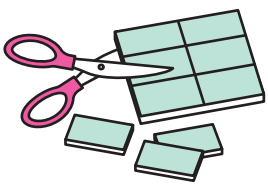
3. Carefully paste the word table on the adhesive (sticky) side of one magnetic sheet.



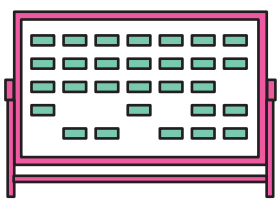
4. Use a ruler to smoothen out the paper on the magnetic sheet.



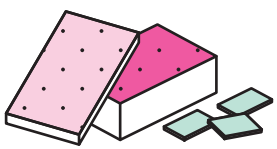
5. Cut each word out until you have many boxes of words.



6. Play with your magnetic boxes of words! Paste your magnetic poetry on the fridge or the whiteboard.



7. Store your magnetic boxes of words in a container for future use.



TIP

If you store it in a magnetic tin container, this becomes a pocket-sized activity that you can bring anywhere you go.

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"How Math and Poetry Intersect." *National Geographic*, 26 April 2018, blog.education.nationalgeographic.org/2018/04/26/how-math-and-poetry-intersect/. Accessed 28 March 2019.

Laing, L. "The Math of Poetry." *Math for Grownups*, 13 April 2012, mathforgrownups.com/the-math-of-poetry-yep-theres-a-connection/. Accessed 28 March 2019.

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"Nature, The Golden Ratio, and Fibonacci Too . . ." *Math is Fun*, (n.d.), www.mathsisfun.com/numbers/nature-golden-ratio-fibonacci.html. Accessed 28 March 2019.

Inner Beauty: Bones in the Human Body

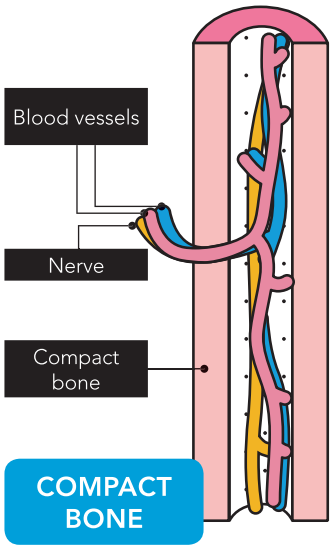
Our bodies are fascinating machines.

Each part of a machine is designed for a special function. The same can be said for the bones in our bodies.

Did you know that our hands are flexible because they are composed of numerous small bones? These small bones allow us to wrap our fingers around objects, make fists, and curl our fingers.

Also, did you know that the skull of a human baby actually has gaps in it? This is because as a baby grows, its brain gets bigger – these gaps provide space for a baby's brain to expand as it grows.

Isn't that amazing? Let's take a closer look at our bones!

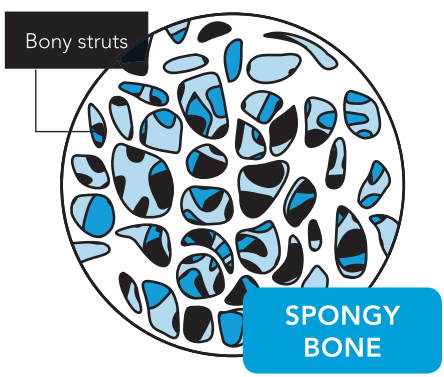


What's inside our bones?

80% of the human skeleton consists of compact bone. The other 20% is composed of spongy bone.

Compact bone is dense and hard. Tiny channels carry blood vessels and nerves through compact bone.

Spongy bone, when viewed with an electron microscope, has a honeycomb-like structure made of bony struts. In some bones, the spaces between these struts are filled with bone marrow, which help to make blood cells for your body.



How do our broken bones repair themselves?

When a bone breaks, our body begins mending it instantly. Cells near the break in the bone make cartilage to bridge the two pieces of bone. Cartilage is a springy tissue that supports our skeleton. It can be found in our ears and nose.

However, cartilage is not as strong as bone. That's why our bodies eventually replace the cartilage in the break with bone cells. Our bodies also divert blood to the break to ensure there is enough energy to make new bone.

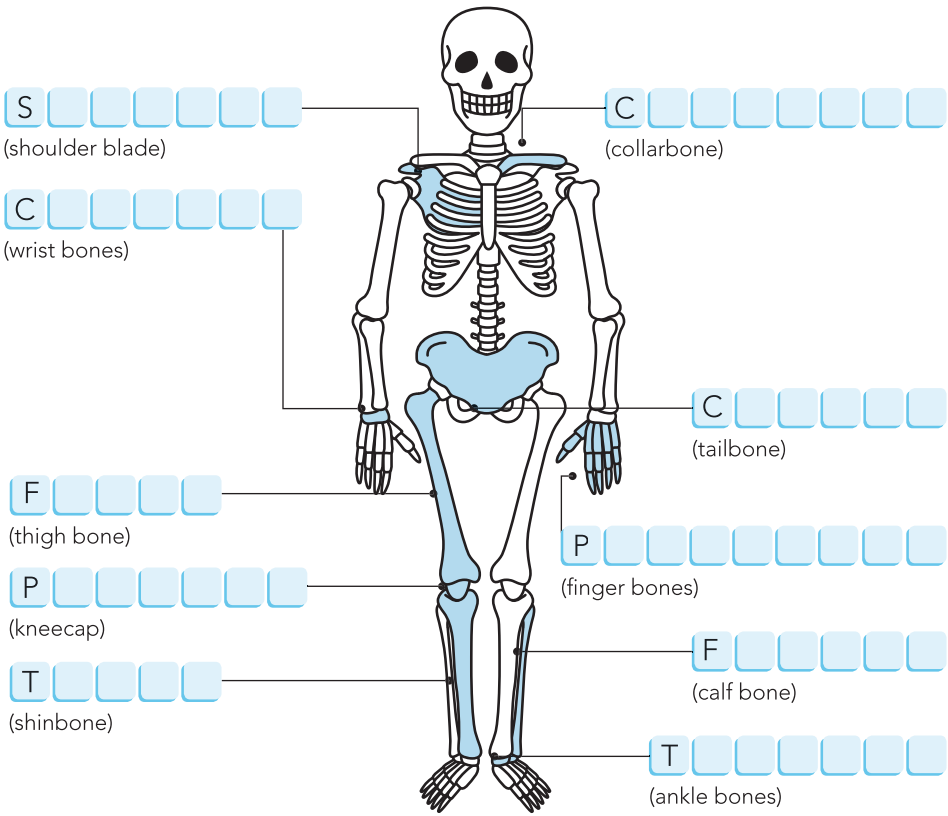
Fun Fact

Ever knocked your funny bone against the table? Ouch! It hurts so much because your funny bone is actually a nerve in your elbow.

ACTIVITY

Getting to the Bone of It

Can you name these bones?



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Call No.: J 612 SET

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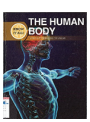
Author: Adam Frost
Call No.: J 612 FRO

All right reserved, Bloomsbury, 2016.



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Author: Moira Butterfield and Pat Jacobs
Call No.: J 612 BUT

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MAKE!

Make No Bones

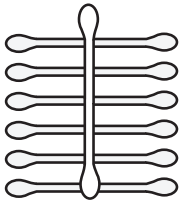
Now that you know more about our bones, craft a skeleton using cotton buds!

YOU'LL NEED

- 1 piece of coloured construction paper
- Cotton buds
- White paper
- Scissors
- Glue
- Marker

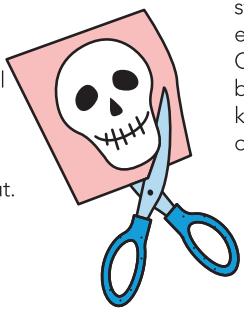
Instructions:

1. Glue these 6 cotton buds onto a piece of coloured construction paper. This will be your skeleton's ribs.



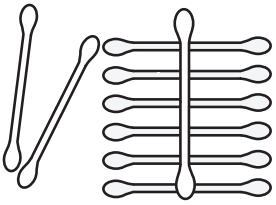
2. Glue 1 cotton bud down the middle over the ribs. This will be your skeleton's spine. Let one end of this cotton bud poke out slightly over the first rib. This will be your skeleton's neck bone.

3. Using a marker, draw a skull on a piece of white paper. Cut the skull out.



4. Glue the skull just above your skeleton's neck.

5. To make an arm for your skeleton, glue 1 cotton bud starting from one end of the first rib. Glue another cotton bud joined at the elbow. Repeat for the other arm.

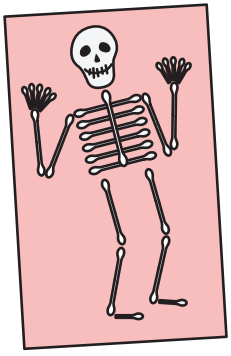


6. To make a leg for your skeleton, glue 1 cotton bud starting from one end of the last rib. Glue another cotton bud joined at the knee. Repeat for the other leg.

7. Cut 5 cotton buds in half. Use 5 half-cotton buds to form each hand of your skeleton.

8. Cut 1 cotton bud in half. Use each half-cotton bud to form each foot of your skeleton.

9. Voilà!



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