

World Around Us

For 11 to 15 year-olds

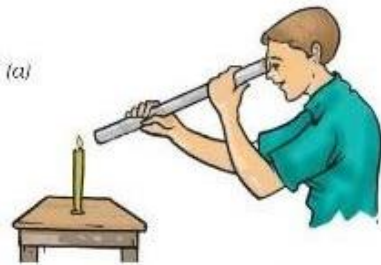
Screen-free learning activities that build multiple skills.



Diagnostic Test

Before beginning the workbook, answer the following questions in 20 minutes.

1. Are the following statements true or false?
 - a) Plastic is cheaper and more durable than most other materials.
 - b) If someone has a broken bone, we should move it slowly.
 - c) Vomiting is a symptom of food-poisoning.
 - d) Fish is a source of carbohydrates.
2. Which of these items are biodegradable: fruit, paper, aluminum, gold?
3. In which of the following cases will the boy NOT be able to see the candle light? Give reason.



4. If you throw away a plastic bag in a forest, what will you find if you return to the same spot after 1 year, assuming it has not been moved? Explain.
5. List 1 item of each type – transparent, translucent, and opaque.
6. List 2 ways to prevent the spread of COVID-19.
7. Gary has \$600 in a bank at 10% interest compounded yearly. How much interest would Gary have earned after 3 years?

Conduct the same assessment after you complete the workbook to check your progress!

Answer Key

Give the allotted marks for each correct answer.

1. Are the following statements true or false?

0.5 marks each

- a) Plastic is cheaper and more durable than most other materials. **True**
- b) If someone has a broken bone, we should move it slowly. **False**
- c) Vomiting is a symptom of food-poisoning. **True**
- d) Fish is a source of carbohydrates. **False**

2. Which of these items are biodegradable: fruit, paper, aluminum, gold?

Fruit and paper are biodegradable.

0.5 marks each

3. In which of the following cases will the boy NOT be able to see the candle light?

Give reason.

The boy will not be able to see the candle in the second case (b). Light travels in straight lines.

Since, there is a bend in the tube, it blocks the light and so, the boy cannot see the candle flame.



1 mark

4. If you throw away a plastic bag in a forest, what will you find if you return to the same spot after 1 year, assuming it has not been moved? Explain.

2 marks

The plastic bag will remain as it is because it is non-biodegradable.

5. List 1 item of each type – transparent, translucent, and opaque.

0.5 marks each

Transparent – Glass, Translucent – Paper or sunglasses, Opaque – Wood

(Accept other correct responses.)

6. List 2 ways to prevent the spread of COVID-19.

0.5 mark each

Wash your hands regularly. Wear a mask at all times. (Accept other correct responses.)

7. Gary has \$600 in a bank at 10% interest compounded yearly. How much interest would Gary have earned after 3 years?

1.5 marks

$P = 600, r = 4\%, t = 3, n = 1$

$$\begin{aligned} \text{Compound Interest} &= P \left(1 + \frac{r}{100n} \right)^{nt} - P = 600 \left(1 + \frac{10}{100 \times 1} \right)^{1 \times 3} - 600 \\ &= 600 (1.1)^3 - 600 \\ &= 798.6 - 600 = \$198.6 \end{aligned}$$

My Learning Journey

Name: _____

Draw a picture
or yourself here.

Week 1



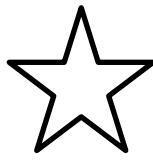
Day 1



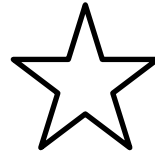
Day 2



Day 3



Day 4



Day 5

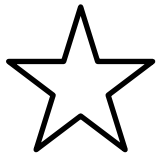


DONE!

Week 2



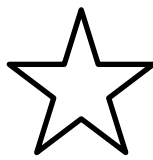
Day 6



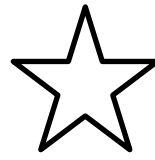
Day 7



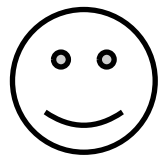
Day 8



Day 9



Day 10

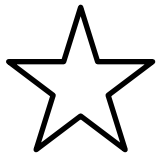


DONE!

Week 3



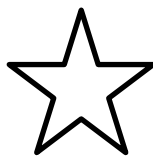
Day 11



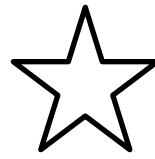
Day 12



Day 13



Day 14



Day 15



DONE!

Week 4



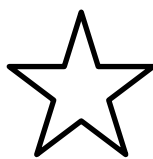
Day 16



Day 17



Day 18



Day 19



Day 20



My Emotions

Write how you feel **everyday** in your notebook. Think about why you feel a certain way. If you are feeling low, note down what will make you feel better too!

Today, I feel _____ because _____



excited



happy



joyful



calm



hurt



confused



nervous



lonely



frightened



annoyed



enraged

Week 1 Overview



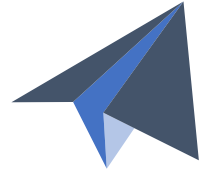
Project

Health & Well-Being

Explore your relationship with a healthy lifestyle!

First Aid

Be prepared to respond to people who are injured or are not well.



5

Get Well Soon

Support a friend going through a tough time.

4

Become A Chef

Put together a healthy meal for lunch or dinner!

3

Keep COVID Away

Check out house rules to stay safe during the COVID pandemic.

1

2

Water And Us

Explore how water affects our health and well-being.

Materials Needed

- Paper
- Pencil/Pen



Health and Well-Being

What can I do to lead a healthy life?

1. Have you ever fallen ill (or experienced a disease)? Make a list of the changes you noticed. These are called '**symptoms**'.
2. What do you think caused the disease?

Microorganisms are living things that are too small to be seen with our eyes. Many of them make soil fertile and even help us digest food. Some are harmful to us and can cause diseases. Eg:



Bacteria

- Food Poisoning
- Tuberculosis
- Cholera



Virus

- Influenza (Flu)
- COVID-19
- Chicken Pox

4. How do you think these disease-causing microorganisms reach us? Below are some visual clues:



Do all diseases spread in the same way?


5. Discuss the factors that affect our health (*weather, food, water, cleanliness of our surroundings, etc.*)

HEALTH POSTER


What are 2 to 3 common diseases people experience?

- What are the **symptoms** they experience?
How is the disease **caused**? How is it **spread**?
What can they do to **prevent** the disease in the future?
- Make a poster for a disease with your peers, to make people aware about the disease, cause, and its prevention.


SYMPTOMS




FLU




SORE THROAT




COUGH




FEVER




CHILLS




WEAKNESS



PAIN IN MUSCLES



HEADACHE




RHINITIS


CAUSES

Virus spread through


COUGH




SNEEZE




PREVENTION




EXERCISE




HEALTHY FOOD



FACE MASK



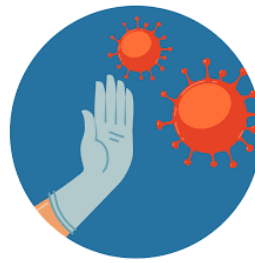
WASH HANDS



VACCINATE

When people with the flu cough, sneeze or talk, they send droplets with the virus into the air and potentially into the mouths or noses of people who are nearby.

KEEP COVID-19 AWAY



1. Discuss the following questions with people in your house:

- What do we know about COVID 19?
- What are the reliable sources of information about COVID 19? Is WhatsApp a reliable source? What about social media?
- What are the risks of getting information from an unreliable source?
- What news sources/websites should we go to in order to get reliable information on this matter?

1. Together, make house rules that everyone must follow to keep COVID 19 away. The plan should clearly mention who is responsible for what, and include fines for violators. Example:

Category	Rule	Observer	Violation Fine
Coming back from outside	Take off shoes at the entrance	Ayesha	Wipe the entire floor where violator stepped with proper detergent + Wash all the dishes for one full day.

Categories can include: Going out, coming back from outside, and actions taken while in the house.

1. Put the house rules on a chart and stick it on the wall. Start implementing them right away!



Health and Well-Being

Discuss with your peers:

- Why is it important to drink clean water?
- Which diseases spread through unclean water? (Eg: Polio)

1. Pour dirty water in one cup and clean water in the other.
2. Ask a friend to identify which one is safe to drink.
Note down what helped them determine it (colour, smell, taste etc.)

3. Repeat the activity.

Make it harder for others to spot the difference!



Filtering Impure Water

1. What are some ways to ensure clean water at home? (Eg: Boiling)
2. Mix some dirt with water in a glass. Challenge yourself to obtain clean water from this mixture in different ways. Which method works best?

Try These!

1 Cloth Filtration:

Place a light piece of cloth on top of an empty cup.

Pour the dirty water into the cup through the cloth.



2 Sedimentation:

Stir an empty cup with dirty water and notice how the dirt settles to the bottom.

Decantation:

Wait for a few minutes and transfer the clean water to another cup.

WATER AND US

1. Have you noticed how people who are ill are asked to drink more fluids? Why do you think that is?

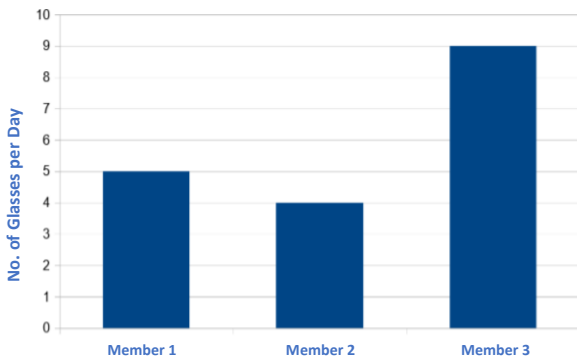
*Most of the human body is actually made up of water! The human body is **60% water**. When we are attacked by harmful microorganisms, we generally get a fever. By increasing our temperature, our bodies try to kill them.*

However, we also lose water more rapidly through the lungs and the skin. This in turn can easily lead to dehydration and all body functions would become less effective.



2. What do you think happens if we do not drink enough water?

Create a table to track how many glasses of water each person living with you drinks. Present it as a bar graph.



- Who drinks the least amount of water?
- Who drinks the most amount of water?
- What is the average no. of glasses people drink in your house?

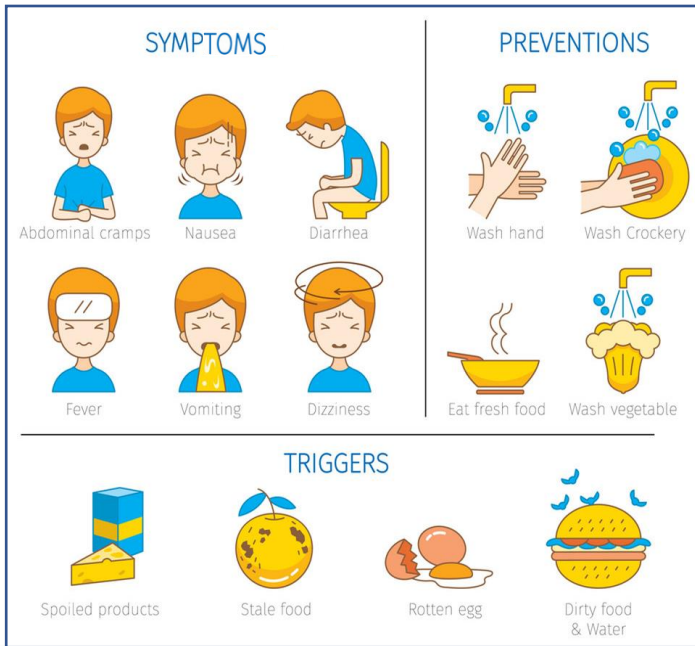
RECOMMENDED AMOUNT OF WATER PER DAY



Are people in your house drinking the recommended amount of water per day?

Health and Well-Being

1. Do you know any disease that spread through food?



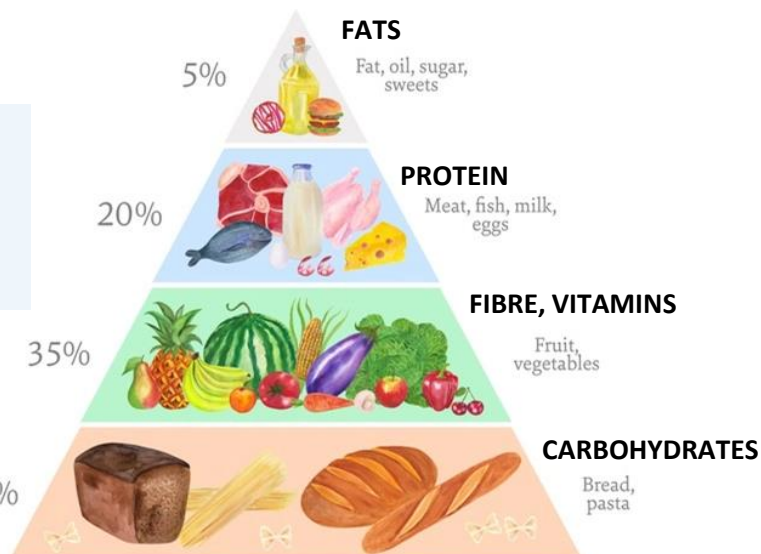
- Observe the poster on 'Food Poisoning', a common disease caused by bacteria.
- Research or recall when you or someone else suffered from it.
- What are 3 things you can do to make yourself feel better when you have food poisoning?
(Eg: drink more water)

2. Discuss with your peers:

- How does food impact our health?
- How can you identify if food is spoilt or not fit for eating?

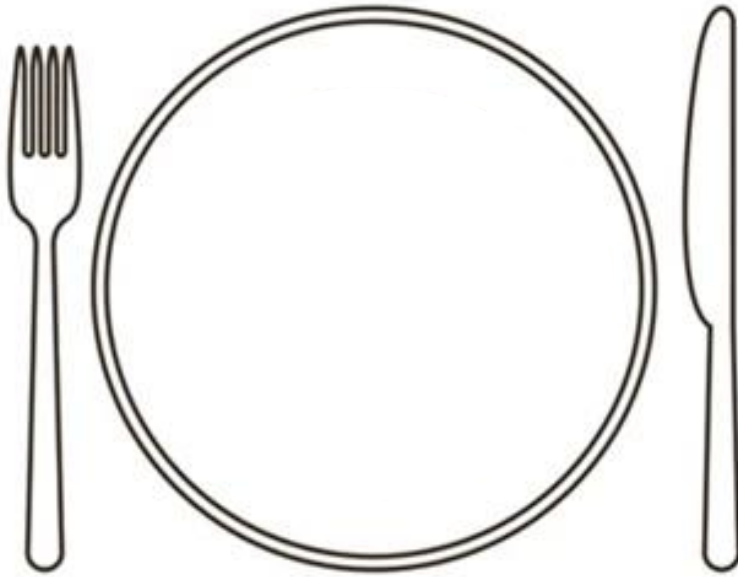
3. The pyramid shows what a healthy meal consists of.

Make your own 'healthy food' pyramid and draw your favourite food items in each category.



- Which foods are most healthy?
- Which ones are least healthy?
- What % of each of these should we have? Why?

- Put together a healthy meal for lunch or dinner. Explain to a partner why you think it is healthy. Identify the food group (*carbohydrates, fats, etc.*), count the total no. of items and mention the % of each food group.



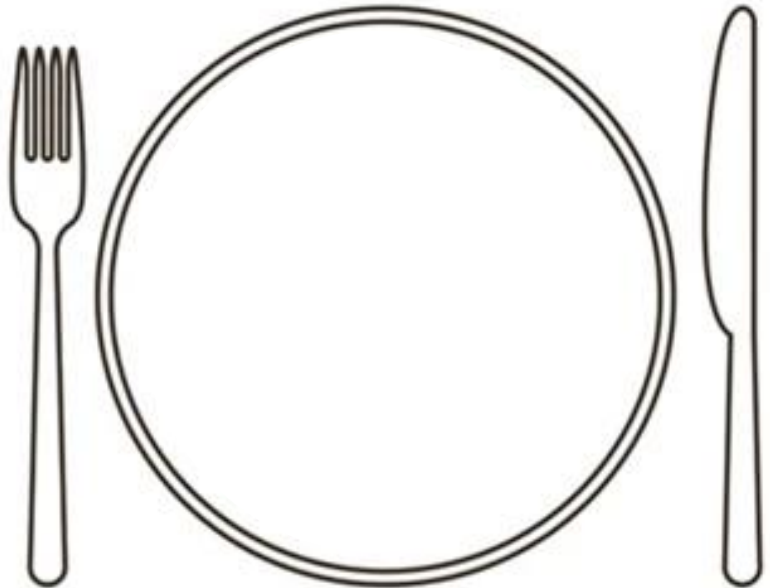
- Do they think it is tasty?
- Discuss how you can alter the recipe to make it tastier?

Chef's Special

Write your own recipe for a yummy, healthy, dish!

- Now, draw an unhealthy meal. Exchange it with your partner.

- What makes the meal unhealthy?
- Find the percentage of each food group and compare it with the healthy meal.
- How can you make the meal healthier, but still tasty? (*Eg: Grill instead of fry to reduce fats*)



Health and Well-Being

- How can diseases spread through unclean surroundings?
- Observe the images below. For each, share two ways you can maintain a clean and healthy lifestyle.
 - What are some reasons people would not follow your suggestions?
 - Convince a partner why it is good for them. Were they convinced?

Example:
Brush your teeth daily.
Wash your mouth after having food.



Oral Hygiene



Bathing Ritual



Hair Care



Foot Hygiene



Toileting Hygiene



Hand Hygiene



Coughing and Sneezing Hygiene



Home Hygiene

- Using the table below, list and track 5 habits you want to build for better hygiene.

Add a ✓ or ✗ to track your progress

Habit	When will I do it?	Week 1	Week 2	Week 3	Week 4
Brush my teeth 2 times a day	Morning and Night	✓	✓	✗ missed 2 days	✓

4. Look at the equation below and discuss the following questions:



Discuss with your peers:

- Does 'health' only mean physical health? Why/Why not?
- What does a 'healthy mind' mean to you?
- Do you think you have a healthy body and a healthy mind? Explain.

5. Discuss some ways in which you can be physically fit. Which of these do you already follow? Which ones do you not?
6. Enact the following scenarios to show what happens to your mental well-being when you are:

- *Not getting enough sleep*
- *Not having social connections or friends*
- *Bottling up emotions and not expressing them in a healthy way.*
- *Eating too much junk food and feeling lazy/tired.*

What do you understand about the factors that affect your mental wellbeing? What can one do to maintain good mental health?



GET WELL SOON

- Think about a friend or a family member going through a difficult time. This can even be yourself!
- Write a letter to them (or yourself) encouraging them to get well soon.
- Decorate your letter with flowers and smileys!



Dear _____,

Health and Well-Being

Become A Doctor

Doctors are trained to keep people healthy and to heal the sick. They save lives!

1. Between you and a partner, choose who will be the doctor and the patient.
2. Enact one of the following scenes:



- Patient is suffering from common cold.
- Patient thinks they have COVID 19.
- Patient has a bad case of food poisoning (loose motions).
- Patient is experiencing bad moods and is feeling low.

OR Create your own scenario!

3. There are many parts to a doctor's job:



- Observing the **symptoms** of a disease.
- Identify the possible **causes** of the disease.
- Decide on a **treatment**.
- Predict **when** the patient will feel better.
- Provide steps to **prevent** illnesses.

Ensure all the steps are being followed while you role-play. The patients must explain their situation crisply and clearly.

4. Observers can share feedback to the doctor and the patient. *(Did they explain the symptoms correctly? Was the treatment right? Will the patient recover? Were they respectful in their tone?, etc.)*
5. Verify your answers by researching or asking an adult.

When a person is injured or is not feeling well, it is important for us to know what to do as an immediate response. Always call an adult in such situations. If it is a serious case, call your local Emergency Number to alert the police or medical emergency services.

Note down the **Emergency Number** and stick it on the wall.

Enact the situations below. Ask a partner to show what they would do as a first responder. Others must say if the response was effective. If it was not, what would they do differently? Repeat the same activity to show things NOT to do as a first responder for each scenario.

If someone has a bad bleed...



Press on the bleed tightly, with cloth.

If someone is choking...



- Hit their back firmly up to 5 times.
- Check their mouth
- If the object doesn't come out, call an adult.

If someone has an allergic reaction...



- Keep away from the cause of the allergy.
- Make them sit and give them their medication.

If someone is unresponsive and breathing...



- Turn them on their side.
- Tip their head back.
- Call an adult.

If someone is having an asthma attack...



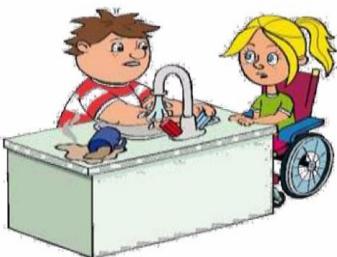
Make them sit and make them use their inhaler.

If someone has a broken bone...



- Do not move the broken bone.
- Call for an adult.

If someone has a burn...



Cool the burn under running water for 10 minutes.

If someone has a nose bleed...



- Sit up straight
- Lean head forward
- Pinch the soft part of the nose for 10 minutes.

Weekly Reflection

Did I enjoy learning this week?



What are some new things I learned?

What did I do well?

What can I do better next week?

If you liked this, go to our IFERB website for hundreds of more such resources. Visit <https://resources.educationaboveall.org>

Week 2 Overview



Project

Less Is More

Learn how to budget effectively.

Solve It!

Solve word problems on simple and compound interest!

Interest

Learn about simple and compound interest.

20-Bean Salary

Explore your spending patterns through a fun activity.

Count Your Blessings

Reflect on the things in your life that you are grateful for.

Budget Advice

Help County Bank's budget advisor in giving financial advice to her customers!

Materials Needed

- Paper
- Pencil/Pen
- Small objects such as small stones, leaves, counters, etc.



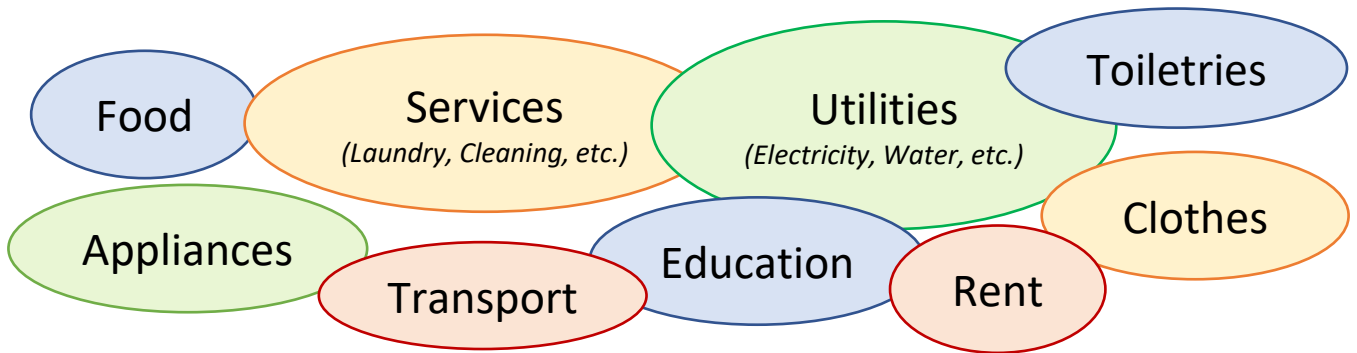


Less is More

How can you get the most value from money?

Expenses refer to the money spent to buy the things we need. **Fixed expenses** are a set amount spent on something regularly (Eg: rent, education, etc.). **Variable expenses** change from time to time. (Eg: gifts, new clothes, etc.)

1. Identify 5 to 8 typical expenses in a month.
2. Interview adults to get estimates of different expenses. Explore the costs of different items using bills, price tags, etc.
3. Divide these expenses into categories. Examples:



4. Make an Expense Table with all the costs. Example:

Expense per month	Fixed or Variable?	Cost
Toiletries	Variable	QR 50

Discuss why each expense is fixed or variable.

Calculate the total expenses per month.

COUNT YOUR BLESSINGS

Take a moment to note down 10 things or people you are thankful for. These are far more valuable than money!

The form consists of ten empty rectangular boxes with blue borders, arranged in two columns of five. At the bottom center, there is a glass jar filled with gold coins. A coin is falling from the lid of the jar, and another coin is shown floating above the second box in the second column.

Less is More

Income refers to how much money we earn.

- Savings is money left after paying for everything you need:

$$\text{Savings} = \text{Total Income} - \text{Total Expense}$$

- Debt is money owed to others:

$$\text{Debt} = \text{Total Expense} - \text{Total Income}$$

1. Interview 2 to 3 adults in different professions. Ask them about their income and expenses to understand how they manage their money.
2. What do you want to be when you grow up? By asking an adult, estimate the average income you will earn per month in your future profession.
3. Have a look at the expenses listed on the previous day. **Based on the average income, will you have savings or be in debt?** Find ways to reduce your expenses to save money!

From your savings, how much would you set aside to spend, save for the future, and share /donate)? Find the % for each option.

Discuss with your peers what you would spend on, what you would save for, and who would you share or donate to.



Add how much you would save and share to your Expense Table from Day 1!

BUDGET ADVICE

Help County Bank's budget advisor, Mrs. Trusty, give financial advice to her customers by calculating their incomes and expenses below.



- 1** Mrs. Tanya earns \$1000 each week and her husband earns \$750. Each week, they need to set aside \$200 for food, \$75 for gas, \$650 for the house rent, and \$350 for savings. How much money will they have left each week? At the end of the month?

Total income: _____ Total expense: _____

Remaining amount: _____

After some time, Mrs. Tanya wants to buy a small shop while her husband wants to buy a new car. What should they invest in? Why?

- 2** Moeen is going to school and working two part-time jobs. He works 20 hours for \$9.25 per hour at the grocery and 15 hours for \$11.50 per hour at Stellar Pizza Parlor. For all his hard work his mom gives him a monthly allowance of \$150. Moeen is responsible for his \$35 cell phone bill, \$50 gas bill, and \$200 car payment. Is he still able to save money? If so, how much?



Total income: _____ Total expense: _____

Can he still save \$200 for college? _____

If so, does he have \$50 to hang out with friends? _____

Should Moeen try and save more money for college? If so, how? If not, why?

Less is More

- Do the following activity with 3 or more friends. Each person is given a ‘salary’ of 20 beans (or small stones, leaves, counters, etc.). **This is your budget – the amount you have to spend on things you need.**
- They must decide how they will spend their beans based on the options on the **NEXT PAGE**. Each item shows how many beans are needed to “pay” for it. Discuss the questions below after each round.


Round 1 Decide how you will spend your salary of 20 beans.

1. Why did you choose the items that you did?
2. Look at the top 3 categories where you are spending most of your beans. How do these choices reflect your values around money?
3. What similarities and differences did you notice with your friends?

Round 2 Your budget has been cut to 13 beans. Make changes.

1. What kinds of items did you choose to give up? Why?
2. What did you learn about yourself and money in this process?
3. Compare your budget-cutting choices with another friend.

Round 3 Unexpected events occur! How will you address them?

1. You broke your leg! If you have health insurance,  you don't need to do anything. If you don't, take out 3 beans.
2. You got a 2 bean raise! Decide how you will spend it.

*an agreement you make with an insurer to have them pay for your medical expenses in exchange for a lesser amount you pay earlier (called **premium**).*

- What are your 3 learnings about budgeting from this activity?
- Revisit the **Expense Table** from Day 1. Would you make any changes to it based on your learnings? Prepare your final budget.



HOUSING + UTILITIES

Living with family, sharing costs of utilities	DD
Share an apartment with roommates	DDDD
Rent your own place	DDDDD



FOOD

Cook at home	DD
Buy from fast food joints.	DDDD
All meals away from home.	DDDDD



TRANSPORT

Walk or cycle	No Cost
Ride a bus or carpool	D
Buy a used car + petrol	DDDD
Buy a new car + petrol	DDDDD



RECREATION

Parks, Visiting friends, Videos/ Music on phone	D
Movie Theatres, Gym, Classes, Hobby groups	DD
Concerts, Sporting Events, Short Trips	DD
Long Vacations / Trips	DDDD



HEALTH

No Insurance	No Cost
Health Insurance	DD



PERSONAL CARE

Basics: soap, shampoo, etc.	D
Professional haircuts, branded products	DD
Regular visits to the salon	DDDD



FURNISHINGS / GADGETS

Second-Hand from Friends	No Cost
Buy used furniture	D
Rent furniture	DD
Buy new furniture	DDDD

EDUCATION

Free Public Schools	No Cost
Private School	DDDD
Additional Tuitions	DD



COMMUNICATION

No Phone	No Cost
Phone + Limited data	DD
Phone + Unlimited data	DDDD
Wi-Fi at home	DD
Laptop	DDDDD



GIFTS

Make your own	D
Purchase gifts sometimes	DD
Purchase gifts frequently	DDDD



CLOTHES

Wear present wardrobe	No Cost
Shop at discount stores	D
Shop for new clothes	DD
Shop for designer clothes	DDDD



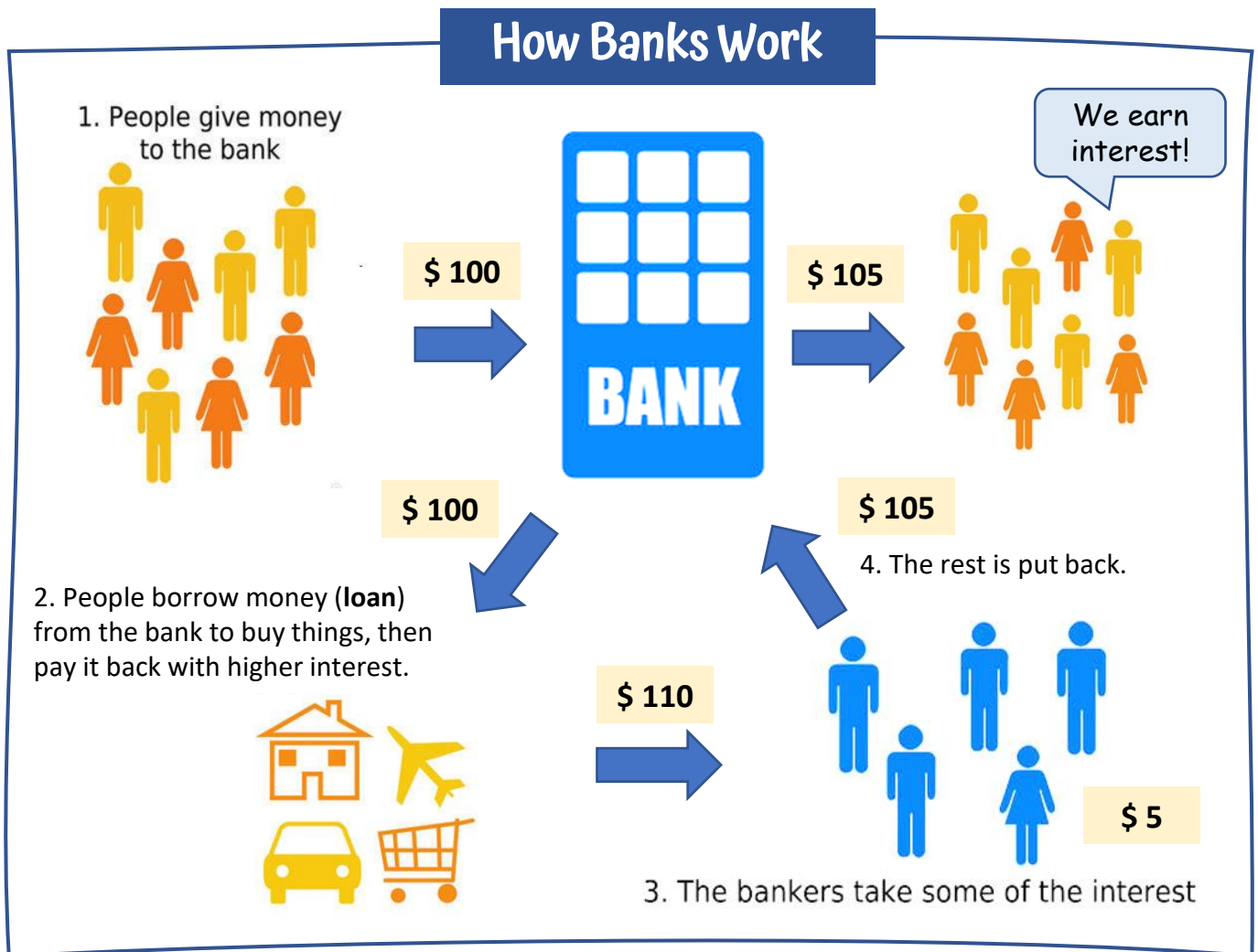
SAVINGS

Save cash at home	No Cost
5% of income in banks	DD
10% of income in banks	DDDD

Less is More

Would you keep the money you saved in a bank or at home? Why?

Observe the image below and answer the following questions.



Interest is the amount that is collected or paid for the use of money.

- Explain how banks work to your peers in your own words.
- To borrow money from banks, one deposits some things as **collateral** (house, land, belongings, etc.). If the loan is not paid back, the collateral is taken by the bank.

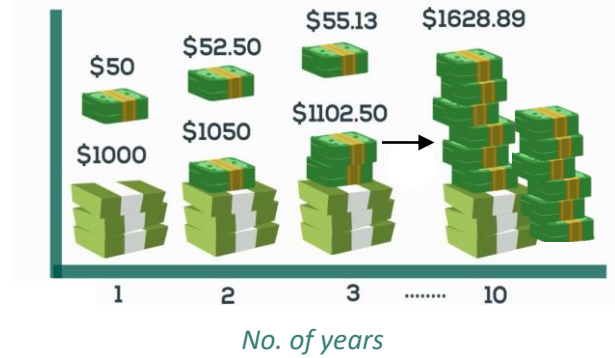
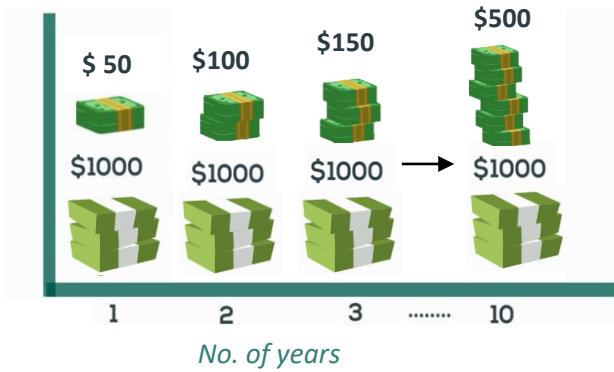
What is the risk in taking a loan from a bank?

There are 2 types of interests – Simple and Compound.

Simple Interest (SI)

5 % interest rate

Compound Interest (CI)



- Interest for all years is the same.
- Interest is on the Principal amount only.

- Interest for all years is different.
- Interest is on the Principal amount + Previous Interest.

$$SI = \frac{P \times r \times t}{100}$$

$$CI = P \left(1 + \frac{r}{100n} \right)^{nt} - P$$

Principal (P): Amount of money deposited or borrowed

Interest Rate (r): % of the principal amount earned.

Time (t): For how long (in years) you borrow or invest

n = No. of times the interest is compounded per unit 't'

Eg: If 't' = 1 year,
n = 1 (yearly)
n = ¼ (quarterly)
n = ½ (half-yearly), etc.

$$\text{Total Amount} = \text{Principal} + \text{Interest}$$

(to be paid or accumulated)

As a depositor, which type of interest would you prefer? Why?
As a borrower, which type of interest would you prefer? Why?

Use the formula to answer the following questions.

1. You invest \$ 40000 for 3 years at 8% per year in a bank compounded half-yearly. How much will you have in the bank at the end of 3 years?
2. Find the difference between compound interest and simple interest on \$ 12,000 compounded at 19% annually for 112 years. Which method results in more money?

Less is More

Become A Banker

1. Have 4 or more players for this activity. Assign the roles: **Depositor, Borrower, Bankers** (Bank 1, Bank 2, etc.)
2. The Depositor and Borrower can choose the principal amounts based on their budget, expense, and income. *(You can have multiple customers with different amounts too.)*
3. The bankers must use **compound interest** in a way that helps the bank make money and also attract customers.

Borrowers must fill out a loan application form stating details of the amount, time, reason, personal details, income, etc.



Depositors must evaluate their options and see which interest rates give them the best returns.



Bankers must

- Check the worth of items borrowers give as security, in case they are unable to pay the loan (also known as **collateral**)
- Give financial advice to the customer (the best interest rates, how much to deposit/borrow, etc.)



WORD PROBLEMS



- Use simple interest to find the ending balance.
 - \$34,100 at 4% for 3 years
 - \$7,400 at 10.5% for 14 years
- Find the total value of the investment after the time given.
 - \$7,300 at 7% compounded half-yearly for 3 years
 - \$130 at 9.4% compounded quarterly for 2 years

- Look at the image. Describe and correct the error in finding the balance of the **simple interest** account after two years.



Principal: \$700 Rate: 3% per year

t	Principal	Annual Interest	Balance at End of Year
1	\$700.00	\$21.00	\$721.00
2	\$721.00	\$21.63	\$742.63

Hint: *In simple interest, interest is always calculated on the original principal amount)*

- Hanna borrowed \$20000 from her friend Nancy at 12% per annum simple Interest. She lent it to Andy at the same rate but compounded annually. Find her gain after 2 years.
- In simple interest, a sum of money amounts to \$ 6200 in 2 years and \$ 7400 in 3 years. Find the principal.
- The owners of a company want to invest \$12,000 for 4 years. Which account should they choose? Explain.
 - Account A earns 5% simple interest per year.
 - Account B earns 5% interest compounded annually.

Weekly Reflection

Did I enjoy learning this week?



What are some new things I learned?

What did I do well?

What can I do better next week?

If you liked this, go to our IFERB website for hundreds of more such resources. Visit <https://resources.educationaboveall.org>

Week 3 Overview



Project

Shadow Play

Create your own
Shadow Puppet Theatre!

Story Time

Discover plants and animals that
produce lights in water!

5

Travelling Light

Answer questions on sources of light
and how it travels through objects.

4

You're A Star!

Express gratitude to a person
who is a star in your life.

3

Light Games

Play games to explore your
senses in darkness!

1

2

Tracking the Sun

Explore how shadows change based
on the sun's position.

Materials Needed

- Paper
- Tape
- Thin Cloth
- Pencil/Pen
- Stick / toothpick
- Chalk



Shadow Play

Can you create a puppet show with shadows?

What is light?

1. Draw a scene in the daylight and in the night.
2. What are different things we do when it is light or dark?
Why do you think we do different things at these times?
3. Draw what comes to your mind when you think of 'light'.

Write or draw your responses to the following:

Colour of light

Where do we see light?

Words that describe light

How does light feel?

Sources of Light

1. Identify 5 to 6 sources of light and make a list. Draw the examples.
2. Are these sources of light natural or artificial?

Natural Sources of Light

The universe is filled with objects that emit light. Some light from these sources reaches the earth. (Eg: Sun, stars, etc.)

Artificial Sources of light

We can produce light artificially too – by heating objects or through electricity. (Eg: Torch, candle, etc.)



Play a game of dark room!

- Turn off the room's lights to make it dark (or blindfold yourself).
- Leave the room. Meanwhile, players will hide in the room and make noises. Go back in and try to find them based only on their voice.

Did you notice how your other senses were heightened when you couldn't see? Let's understand how some animals "see" in the night!

Bats are blind but they follow sounds and echoes to hunt their prey!



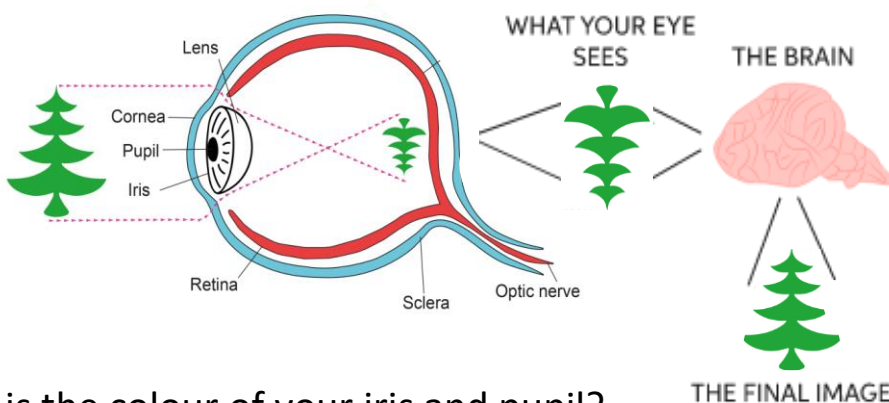
Foxes are mostly nocturnal. They use their large wet noses to follow scent trails of prey, predators or their family.



Animals that are active during the night and sleep during the day are called **nocturnal animals**. Can you think of 3 more nocturnal animals?

The Human Eye

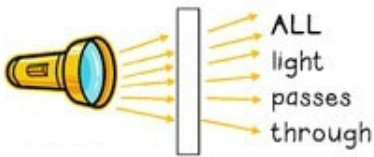
We need light to see objects. When light from a source falls on an object, it reflects the light into our eyes. Our eyes have light receptors which receive it and form an inverted image on our retina. The brain then shows us the image upright!



- What is the colour of your iris and pupil?
- Can you explain why you cannot see if there is no light?

Shadow Play

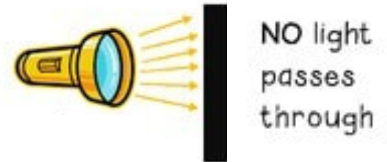
1. Hold different objects at home against a source of light.
2. Identify 4 transparent, 4 translucent and 4 opaque materials.



Transparent



Translucent



Opaque

Try and form shadows of your own body and discuss:

- Can you have a shadow without a source of light?
- Which properties of the object does its shadow not show (colour, shape, size, etc.)?
- Can you cast a shadow on a mirror?
- Can transparent and translucent materials form shadows?

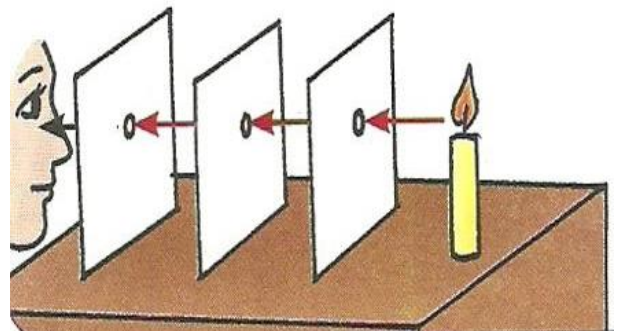


How Light Travels

1. Cut out a small hole in 3 pieces of cardboard or thick paper.
2. Place a torch/candle on a flat surface.
3. Arrange the cardboards so that the holes form a straight line, behind the candle, as shown. Can you see the light?

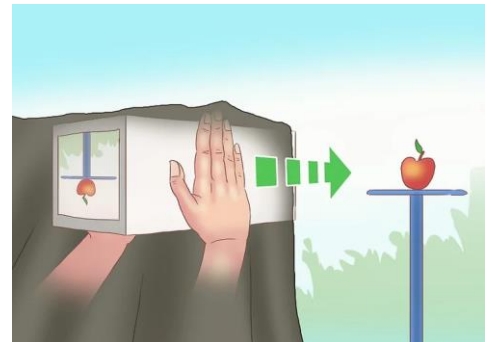
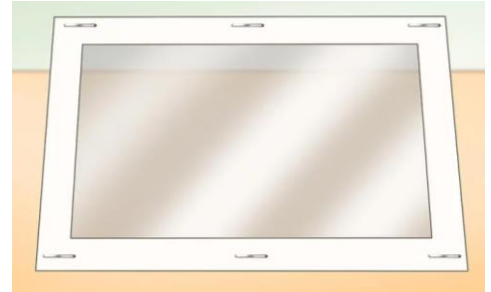
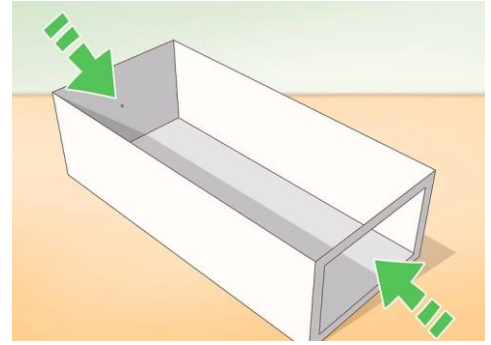
What happens if the holes are not aligned in a straight line?

We can conclude that light only travels in straight lines.

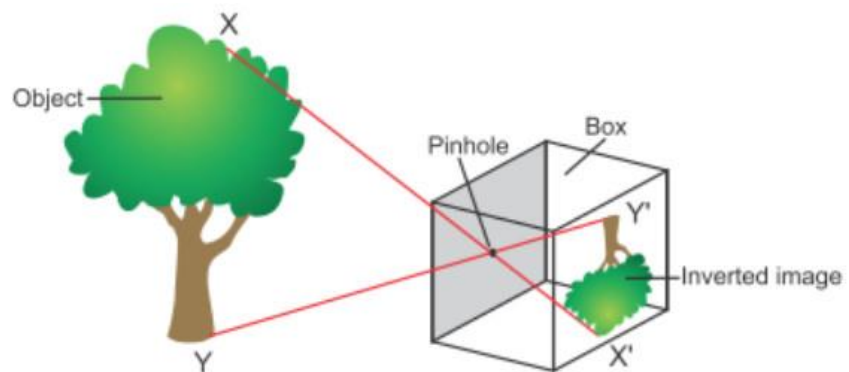


MY PINHOLE CAMERA

1. On one side of a shoebox, punch a hole using a pin. On the opposite side, cut out a frame, as shown.
2. Use a translucent material such as wax paper or plastic bag to make a screen and stick it on the shoebox.
3. **Your pinhole camera is ready!**
Aim the pinhole end at a well-lit object. Cover the shoebox with a thick, dark cloth. Can you see an inverted image of the object on your screen?



Working
of a
pinhole
camera

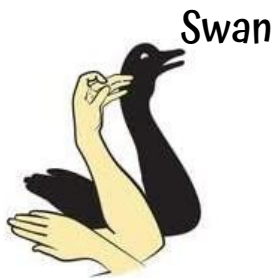


- Why do you think you see an inverted image through the pinhole?
- What can you conclude from this experiment?
- Explore how a camera works. How is it similar to your pinhole camera?

Shadow Play

Playing with Shadows

1. Use a torch or the sun to form shadows with your hands.
2. Form at least 10 different animals, objects and characters.
3. Get your family and friends to guess what these different shadows represent.



Writing a Story

A **shadow theatre** has figures that are placed between a light and a screen. Moving them creates the illusion of moving images on the screen and stories are told through it!



1. Think of a basic story that you will tell the viewers through the shadow theatre.
2. Pick a story with not more than 2 or 3 characters.
3. Draw or write out the story.
Think of a fairytale - Tortoise and the Hare, Three Little Pigs, etc.
4. Tell your story to a peer. Use dialogues for the characters too!

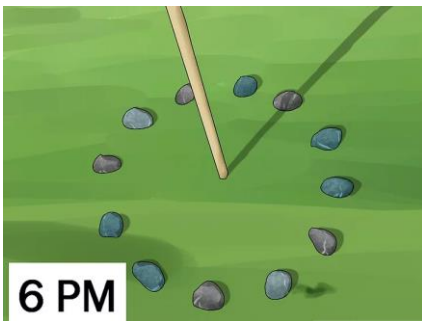
Did they like your story?

How can you make it more interesting? (*Sound effects, emotions, etc.*)

SHADOWS TELL TIME

1. Plant a stick on grass outside, where there is enough sunlight.
2. Start when the sun has fully risen (Eg: 7 am). Use a pebble to mark the place where the stick's shadow falls on the ground and note the time on the ground using chalk.
3. Repeat this process every hour and continue till sunset. (Eg: 6 pm)

As long as the sun is shining, you can use this simple device to tell what time of the day it is. Practice doing so the next day!



- Does the shadow move in clock-wise or anti-clock-wise direction?
- How does the position of the sun affect the stick's shadow?

Draw what sunrise, noon, and sunset look like in your area.



Think about the following while drawing:

- *What is the position of the sun? What is the time?*
- *How bright is the sun? How big is it?*
- *What is the color of the sky around it?*

Shadow Play

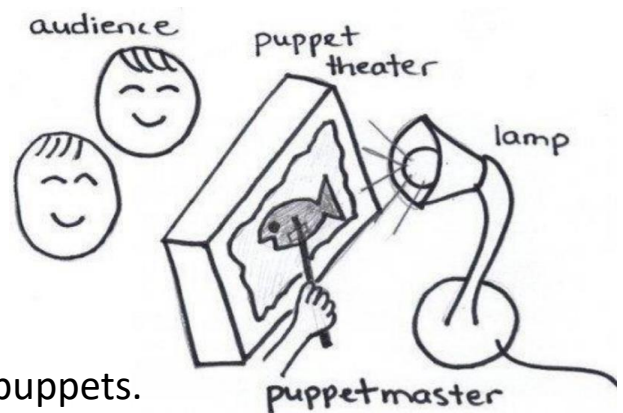
Making the Characters

1. Design the main characters of your story as 'shadow puppets'.
2. Draw the main outline of the character on paper or cardboard and cut it out.
3. Stick a toothpick or a twig behind it using tape.



Designing the Stage

1. Find a place to hang a large white bedsheet or paper (shadow screen) and pin it.
2. Ensure there is space behind the screen for you to stand and hold the puppets.



Should the screen be transparent, translucent, or opaque? Why?

3. The bottom half of the screen can have a desk or table for you to hide behind while operating the puppets
4. Find a good source of light (*Ex: Sunlight, lamp / torch behind the screen*)
5. Make space in front of the screen for audience to sit.

Play with light and experiment with it until you discover its effects on the shadows your puppets make.

When do the shadows grow bigger?
How do you can you make them smaller?

YOU ' RE A STAR!

Stars are natural sources of light in the night.

Who brings light to your life?

Think about a person who cheers you up when you feel low.

Note down or draw at least 5 reasons why they are a star below and show it to them if you can!



Shadow Play

Practice Time

1. “Act” out the story using these puppets.
2. Try to simultaneously narrate the story.
3. You can also add music or sound effects.

(Ex: plastic bottle with stones as a shaker for rain, animal noises, etc.)

4. Practice until you are ready to present your Shadow Theatre!



Shadow Theatre



Invite your family and friends to watch the shadow theatre and present the play to them.

Ask them for their opinion about the play:

- Did they identify the characters based on the shadows?
- Did they like the story?
- Did they enjoy any additional sound effects or the narration of the story?



**Let's
Review!**

- Do you know how shadows are formed?
- Can you predict the position of shadows based on where the sun is in the sky?
- Can you create your own shadow theatre for any story?

LIGHTS IN WATER

Written By Shreya Yadav



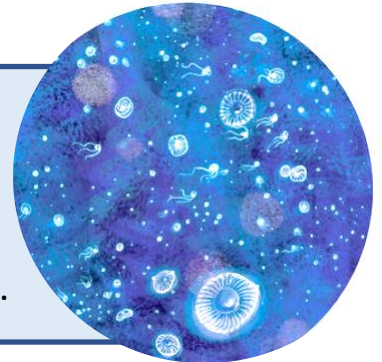
Maisha goes to the beach. She visits Flyman. Flyman is a flying fish. "Do you want to come meet my friends?" asks Flyman.

"Why not!" said Maisha, "But how will we see? It is dark in the night".

Then, Flyman sees a light in the water. It glows and fades and glows again.

Flyman shouts: "I have an idea! Get on my back.." They swim to the lights. Maisha takes a breath. They go under the water. Maisha gasps. Tiny animals glow in the sea. It is like a sky of stars. Who are these tiny animals? "These planktons can help us see," says Flyman.

Plankton are plants that glow when there is movement in the water. This helps to scare away predators that might eat the plankton. Sometimes the movement of boats can cause these sparks too.



Maisha hears a deep voice. It is a Firefly Squid. The squid has blue spots of light. "I can help, too," says the squid. They all swim down. Down, down, where it is very dark. But the plankton and the squid give light.

The **firefly squid** has special organs called photophores. The photophores make light to scare away the squid's predators or attract food.

LIGHTS IN WATER



They meet an Anglerfish. This fish has sharp teeth! But Maisha feels brave. “I can help you see too. I have a bulb of my own!” said the Anglerfish.

Anglerfish make their light from the glowing bacteria inside them. When a plant or animal makes light, that is called **bioluminescence**.

“It was wonderful meeting all of you,” said Maisha.

“See! you do not have to worry about light in the sea”, exclaimed Flyman.

Flyman and Maisha wave goodbye to the fish and swim back to the beach. Maisha sees the moon and stars in the sky. Now she knows there is light in the water too!

Based on your understanding of the story, answer the questions below.

1. Who is the main character of the story?
2. List the aquatic animals you come across in the story.
3. When plants and animals give off light, is it a natural or an artificial source of light? What is this type of light called?
4. Do you think shadows can be formed in water? Why or why not?
5. If you could be any of these fish or plants, which one would you be? Why?
6. Create and draw your own aquatic animal that gives off light!

How does it look?
What is it called?

Where does it
give off light
from?

How does
the light help
them?

Weekly Reflection

Did I enjoy learning this week?



What are some new things I learned?

What did I do well?

What can I do better next week?

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Week 4 Overview



Project

Why all the Plastic?

Learn all about plastic – its uses and dangers.

Article

Read an article about how plastic gets recycled.

Let's Upcycle!

Learn about upcycling and get creative with plastic wastes!

Marine Voice

Write a speech as a marine animal to express your concerns regarding plastic pollution.

In Numbers

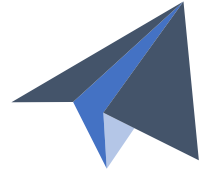
Reflect on some facts and figures about plastic.

Sort it Out

Differentiate between biodegradable and non-biodegradable objects.

Materials Needed

- Paper
- Pencil/Pen
- Colours (optional)



5

4

3

2

1

Why All the Plastic?

Can you find alternatives to plastic?


Plastic is a man-made material, made using certain types of chemicals, that can change its shape easily when soft.



- Which plastic items do you use every day?
- Make your **Home Plastic Diary** as shown below with an example:

1 Identify the 5 most commonly used plastic items, by exploring your home, discussing with family members, etc.

2 Write how many of each plastic item was used each day of the week. Also, calculate the average for the week.

Item	No. of uses /day	Single Use	Total Usage in a Week	Suggested alternative
 Plastic Bag	Monday: 4 Tuesday: Wednesday: Thursday: Friday: Saturday: Sunday: Average:	✘	My guess: 15 Family: 10 Actual: 7	

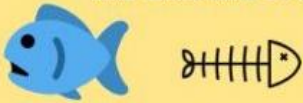
3 Is it discarded after one use? If yes, it is a 'Single Use' item. Tick (✓) or cross (✘) accordingly.

4 Guess how many times the item is used in a week. Interview family members to discuss and make the same guess.

Record your observations for a week and check if you guessed correctly. We will explore alternatives in the upcoming days.

2050

is the year experts think the amount of plastic in the ocean will weigh more than the amount of fish



Imagine what this would look like.

- How will it impact our lives?
- Why do you think plastic gets dumped in the oceans?

99%

Once it's in water, plastic breaks up into small particles called microplastics. By 2050 **microplastics could be found in 99% of all seabird species.**

- Why do you think people use plastic bottles?
- What can be used instead?



1 MILLION

plastic bottles are bought around the world every minute

Plastics can now be found on every beach in the world



LAND & SEA



Plastics have been consumed by land based animals, as well as marine life



Over the last 10 years we have made more plastic than during the last...

100 YEARS

How do you think plastic reaches the food of animals?

- Give 3 examples of single-use plastics.
- How can we avoid using it?

500 - 1,000

years is how long it could take for some plastics to break down



Not ALL plastics are recyclable

Single-use plastics make up 40% of the plastic made every year



Why All the Plastic?

Our environment has micro-organisms such as bacteria that break down (decompose) substances which go back into the soil. However, not all materials undergo this process.



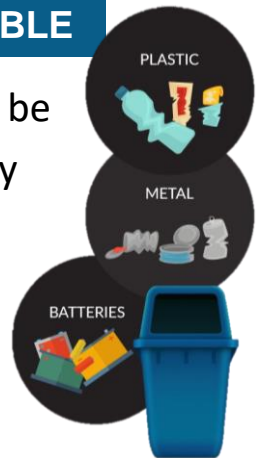
BIODEGRADABLE

Materials that can be broken down naturally in the environment.

Observe what your family throws into the trash can for a day. Categorize the wastes as biodegradable and non-biodegradable.

NON BIODEGRADABLE

Materials that cannot be broken down naturally in the environment.



Experiment Time

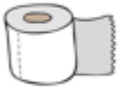
1. Dig two small holes in the soil of the garden/plant pots.
2. Put any plastic trash in one and fruit core/green leaf in the other.
3. Cover both the holes with soil. Insert a stick to mark the plastic hole.



Think about what you think you will find after a week and explain why you think so.

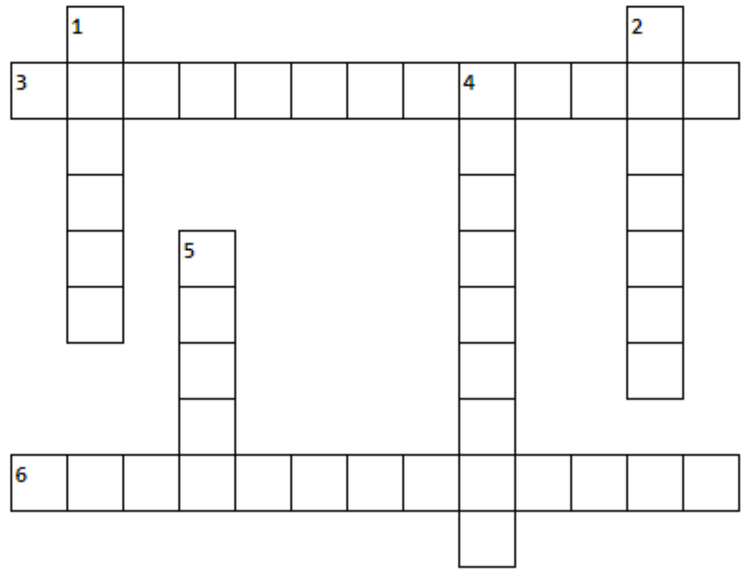
1. Go through your Home Plastic Diary. How do you dispose these plastic items?
2. What do you think happens to the items after disposal?
3. Since plastic is non-biodegradable, how does it affect the environment?
(Think about the oceans, soil, animals, etc.)
4. What happens if you burn plastic? How does it impact on air pollution given that plastic is made of chemicals?
(Many dangerous chemicals are packaged in plastic.)

Circle the items that are non-biodegradable.



Solve the crossword.

- Look at the clue below with its number.
- Identify the word and write it across or down that number in the crossword.



ACROSS

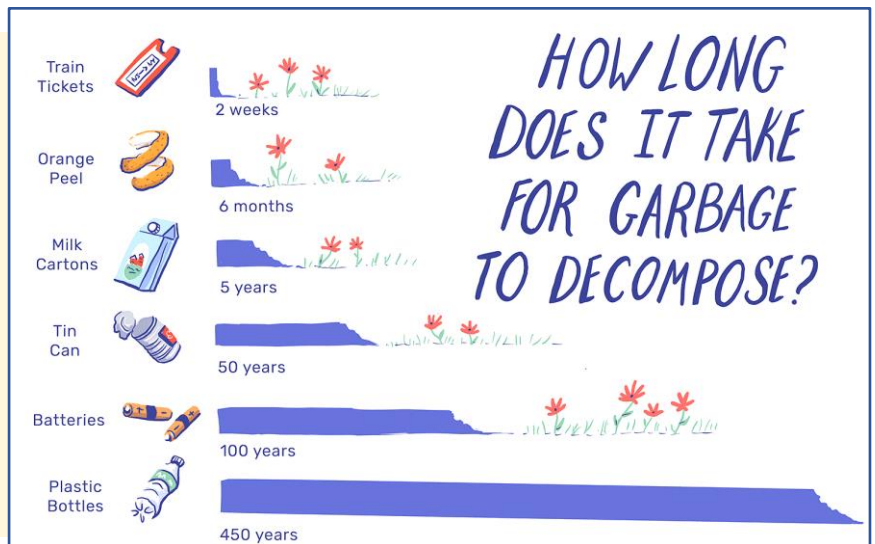
- 3. Leaves, jute, and fruits are examples of _____ substances.
- 6. Plastic in the oceans breaks up into small particles called _____

DOWN

- 1. _____-use plastics are discarded after one use.
- 2. Synthetically made material
- 4. A word for the 'breakdown of a substance' (or decay)
- 5. From paper, gold, and tin, _____ is biodegradable.

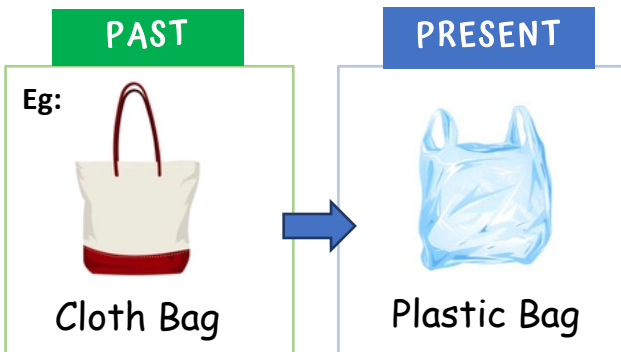
Make a similar graph to show how long an item will take to decompose, for any 6 items that you threw today.

Is there any item you could have re-used, donated, or repaired?



Why All the Plastic?

1. Interview older members of your home/community to understand how much they have used plastic in the past.
2. Draw the things in your Home Plastic Diary, that you use in the present and what people used instead in the past, based on the interviews.



For each item, discuss:

- Is the plastic item important?
- Can we use other materials for this item instead of plastic?
- Can we reduce the use of this plastic item?

Experiment Time

1. Collect a few items that are stored in plastic packaging.
(*Eg: Shampoo bottles, chips, etc.*)
2. How else can you package these items? Try using different materials and see if they work! (*Eg: using cloth, glass, metal, etc.*)

- Do the other materials get wet? Do the items inside get wet?
- Do these materials get torn or destroyed as easily?
- Are they heavy or easy to carry?
- Can all materials be made into any shape?
- Is it cheaper than plastic?
- Which other properties of plastic are different from the material's?



3. Why do you think plastic is commonly used?
4. Which plastic items cannot be replaced with alternatives?

MARINE VOICE

Imagine you are an animal living in the ocean.

Write a speech, addressed to human beings, expressing how much damage they are causing to the oceans and your lives. Use the template below.



Good morning, dear humans!

I see you thriving in cities and enjoying your technological advances. The human race has achieved a lot over the last decade. However, our kind is dying as a result. The plastic you use kills millions of us every year.

It _____ and _____.

My question for you is this: _____?

I strongly feel _____.

We all share our planet Earth and we all deserve to live. So, I urge you to think about _____.

There is still hope. Let us discuss some actions we can take towards this.

First, _____. This is important because _____.

Next, _____. This helps us _____.

Lastly, _____. Doing this results in _____.

Let us hope for a brighter future for my friends in the ocean and you.

Thank you!

Why All the Plastic?

Recycling is the process of taking materials ready to be thrown away and converting (changing) them into reusable materials. (Eg: Waste plastic bottles can be broken down in factories to make new plastic bottles.)



REDUCE

Which plastic items can you use less?

RECYCLE

Which plastic items can you recycle?
Are there Recycling Bins in your area?



From your Home
Plastic Diary...



REUSE

Which plastic items can you use again?

REPLACE

Which plastic items can be replaced with something biodegradable?



Write the suggested alternatives in your Home Plastic Diary.

- Calculate what percentage of plastic is reused in your home across each of the different plastic items in your diary. Example:

If only 4 of the 12 plastic bags used are re-used in my home,

$$\% \text{ re-used} = \frac{\text{No. of bags re-used}}{\text{Total no. of plastic bags used}} \times 100 = \frac{4}{12} \times 100 = 33.3\%$$

- Find the average % of all plastic being re-used in your home. Hint:

$$\text{Average \% re-used} = \frac{\text{Total no. of reused plastic items}}{\text{Total no. of plastic items used}} \times 100$$

LET'S UPCYCLE!

To **recycle** something means to completely break something down and make something new out of it. To **upcycle** means to use old things creatively and make something new out of them without changing its state too much.



Waste plastic bottles

RECYCLE



Road made using plastic

UPCYCLE



Toy cars from plastic bottles.

Think of 3 ways you can upcycle a plastic bottle?
Try them out. Below is an idea:

Plastic Bottle → Money Bank

1. Clean and dry the bottle. On the side of the bottle, cut a slot big enough to send a coin through.
2. Seal the edges with glued paper or tape to prevent any tearing.
3. Cover the bottle with the paper and paint it. You can even make it look like an animal with basic paper sticking. **Your money bank is ready!**



How can you use this money bank?
How much money will you save every week?

Why All the Plastic?

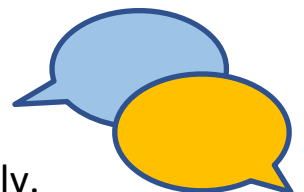
1. Check the status of the plastic and food waste you buried on Day 2.
 - What will happen to it in the next few days, weeks, and months?
 - How long will it take for each of the items to decompose completely?
2. Compile all of the work from the week to make a **poster** to convince family members to reduce, reuse or replace plastic. Include:

- How much plastic do we use per day?
- Why is plastic bad? What makes plastic special?
- What can we reduce, reuse, recycle, or replace?



3. Present your argument to the family using the poster.

- How many were convinced with the suggestions?
- Reflect on why other family members were not convinced and discuss what they could do differently.
- What is one change you and your family pledge to make to be more plastic-free?



HOW IS PLASTIC RECYCLED?

Plastics have only been around for a little over a century, yet they've become part of almost every aspect of our lives. From children's toys to food packaging, plastic materials are an important part of 21st-century life. In fact, in roughly 70 years, there has been 8.3 billion metric tons of plastic produced, with around 6.3 billion metric tons of that becoming waste.

And only 9% of that waste has been recycled.

There are many reasons for this, and while our plastic waste continues to grow, advances in technology and changes to the way we use plastic are helping us make recycling more efficient and effective. Let us understand how plastic is recycled.

1 Waste Collection and Transportation



First, plastic waste is collected from homes and offices. This can be done by either local government or private companies. In many countries, communities have designated recycling bins where people can throw their plastic. These are then transported to the recycling plants.

2 Sorting and Bundling

The next step in the plastic recycling process is sorting. There are several different types of plastic, which need to be separated from each other by recyclers. Further to that, plastics

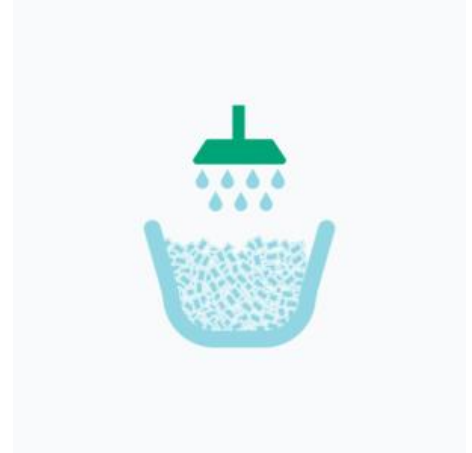


HOW IS PLASTIC RECYCLED?

might be sorted by other properties such as color, thickness, and use. This is done by machines at the recycling plant and is an important step to increase the efficiency of plants

3 Washing

Washing is a crucial step in the plastic recycling process since it removes some of the impurities that can impede the operation, or completely ruin a batch of recycled plastic. The impurities targeted in this step commonly include things such as product labels and adhesives as well as dirt and food residue.



4 Shredding

The plastic is then fed into shredders, which break it down into much smaller pieces. These smaller pieces, unlike formed plastic products, can be processed in the next stages for reuse. Breaking down the plastic into smaller pieces also allows

for any remaining impurities to be found. This is especially true of contaminants such as metal, which may not have been removed by washing but can be easily collected with a magnet at this stage.

5 Quality Inspection

Here, the plastic pieces are tested for their class and quality. First, they are segregated based on density, which is tested by putting particles of plastic in a container of water.

Will plastic float or sink? Why?

HOW IS PLASTIC RECYCLED?

This is followed by a test for what is known as the “air classification”, which determines the thickness of the plastic pieces. It is done by placing the shredded plastic into a wind tunnel, with thinner pieces floating while larger/thicker pieces stay at the bottom.



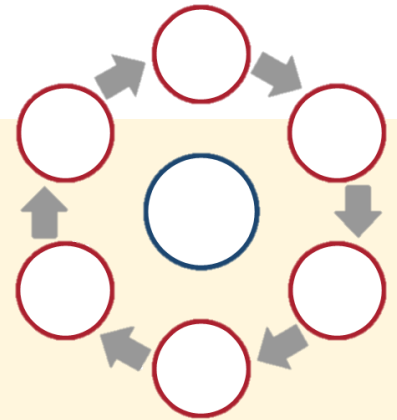
6 Melting and Compounding



This final plastic recycling process step is where the particles of shredded plastic are transformed into a usable product for manufactures. The shredded plastic is melted and crushed together to form pellets. These pellets are used to make new plastic products.

Answer the following questions:

1. Summarize the plastic recycling process in the form of this flowchart →
2. More dense plastic particles are of better quality. True or False? Give reason.
3. If your area does not have a recycling bin, write a letter to an official to convince them to install one. If there is one, write a letter to the editor of a local newspaper to convince people to use the bins.
4. Observe some plastic items around you. Check if they were made using recycled plastic by looking for a similar symbol:



Weekly Reflection

Did I enjoy learning this week?



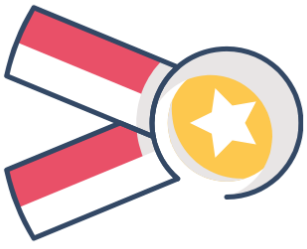
What are some new things I learned?

What did I do well?

What can I do better next time?

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Pg. 41, 42: Lights in Water, re-written from the original story ‘The Night the Moon Went Missing’ (English), written by Shreya Yadav, illustrated by Sunaina Coelho , supported by Oracle, published by Pratham Books (© Pratham Books, 2018) under a CC BY 4.0 license on StoryWeaver.

Pg. 54, 55: ‘How is Plastic Recycles’, paraphrased by EAA from the blog ‘The Complete Plastics Recycling Process’ published on October 12, 2020 by RTS, available on <https://www.rts.com/blog/the-complete-plastics-recycling-process-rts/>

