Unit 1

SCIENTIFIC SKILLS

State two science process skills that you can observe in the situation above. Suggest easier ways for Ana to pull Melia.

SCIENCE PROCESS SKILLS

The pupils of 5 Zamrud are having a competition on designing paper planes. Each pupil receives a coloured paper from the teacher. Let us look at what they did a day before the competition.

Look at my paper plane, Melia. Its nose cone is long and pointed.

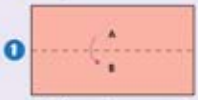
Yes, Ana. Why did you design your paper plane that way?

This shape can reduce the wind resistance.

Ana, it seems like our paper planes have different sizes. The wings of my paper plane are bigger. Can you guess why I made such a design?

Then, they discussed how their paper planes were folded.

Steps on how Ana folded her paper plane:

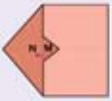


1. Fold part A to part B and unfold them.

2. Fold part C to part D. Then, fold part E to part F. Flip the folded paper over.

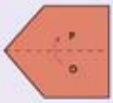
3. Fold part G to part H.

4. Fold part I to part J. Then, fold part K to part L.



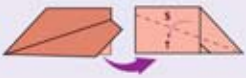
5. Fold part M to part N.

6. Flip it over.



7. Fold part O to part P.

8. Fold part Q to part R.



9. Flip it over and then fold part S to part T.

10. The completed paper plane.

Legend:

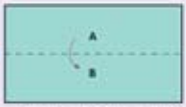
- folding direction
- flip over
- folding lines

1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6

Wow! The nose cone of your paper plane is so attractive, Ravi. Why did you design it that way?

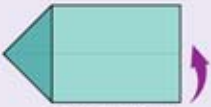
This shape increases the mass of the front part of the paper plane. It will be more stable and can fly farther. This is how I fold it.

Steps on how Ravi folded his paper plane:

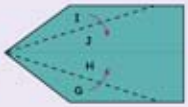


1 Fold part A to part B and unfold them.

2 Fold part C to part D. Then, fold part E to part F.

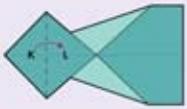


3 Flip the folded paper over.



4 Fold part G to part H. Then, fold part I to part J.

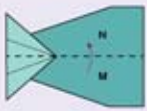
5 Unfold the bottom part.



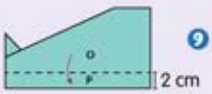
6 Fold part K to part L.

Legend:

- folding direction
- flip over
- folding lines

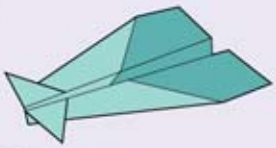


7 Fold part M to part N.



8 Fold part O to part P. Repeat this step on the other side.

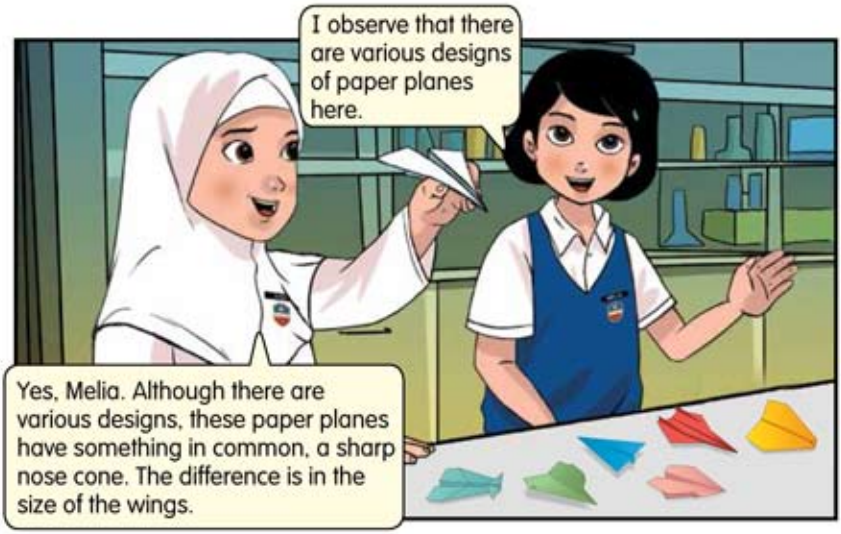
9 The completed paper plane.



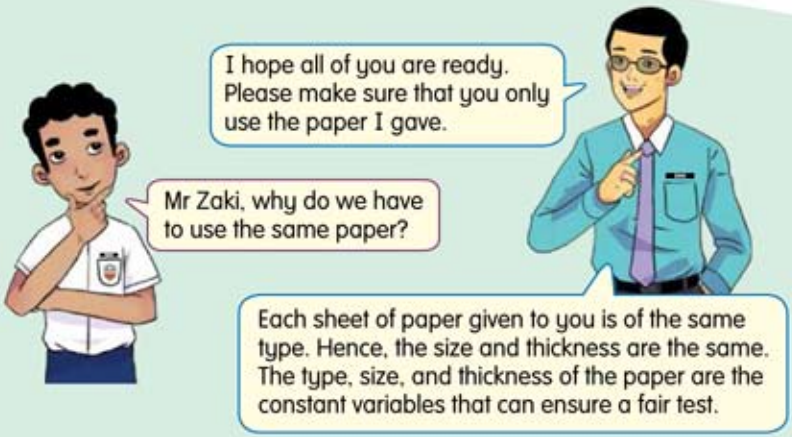
Look! My paper plane is ready.

Great! I predict that your paper plane will fly far because of the large size of its wings.

The pupils have successfully made their paper planes.



The following day, Mr Zaki asks the pupils of 5 Zamrud to bring along their paper planes and gather in the school indoor hall. They are going to launch the paper planes they have made.



Mr Zaki, how do we launch these paper planes to fly farther?

That is a good question, Ana. After this competition, we will investigate other ways of launching paper planes.

How do the size and thickness of the paper affect the distance travelled by the paper plane? Test and discuss.

How do science process skills help the pupils of 5 Zamrud in solving the problem? Let us follow how they investigate the factors affecting the distance travelled by their paper planes.

Pupils, only use the paper given to you. Use Ana's method of folding the paper plane so that all of the paper planes have the same design. For this activity, we will make some modifications to the paper planes.

All right, Mr Zaki.

LET'S TEST

DISTANCE TRAVELLED BY A PAPER PLANE

GROUP ACTIVITY

AIM

To investigate the relationship between the length of the stretched rubber band and the distance travelled by a paper plane.

MATERIALS

Measuring tape, stapler, paper plane, paper clip, wooden pencil, and rubber band.

STEPS

1. Prepare a paper clip as shown above.

2. Place the paper clip at the front part of the paper plane.

3. Staple the paper clip so that it does not fall off.

4. Fasten the rubber band to the paper clip and pencil.

5. Stand at the starting point and stretch the rubber band for 10 cm.

6. Release the paper plane and observe its movement.

7. Measure the distance travelled by the paper plane.
8. Repeat steps 4 to 7 by stretching the rubber band for 20 cm and 30 cm.
9. Record your observations in the table as shown below.

Length of stretched rubber band (cm)	Distance travelled by the paper plane (cm)
10	
20	
30	

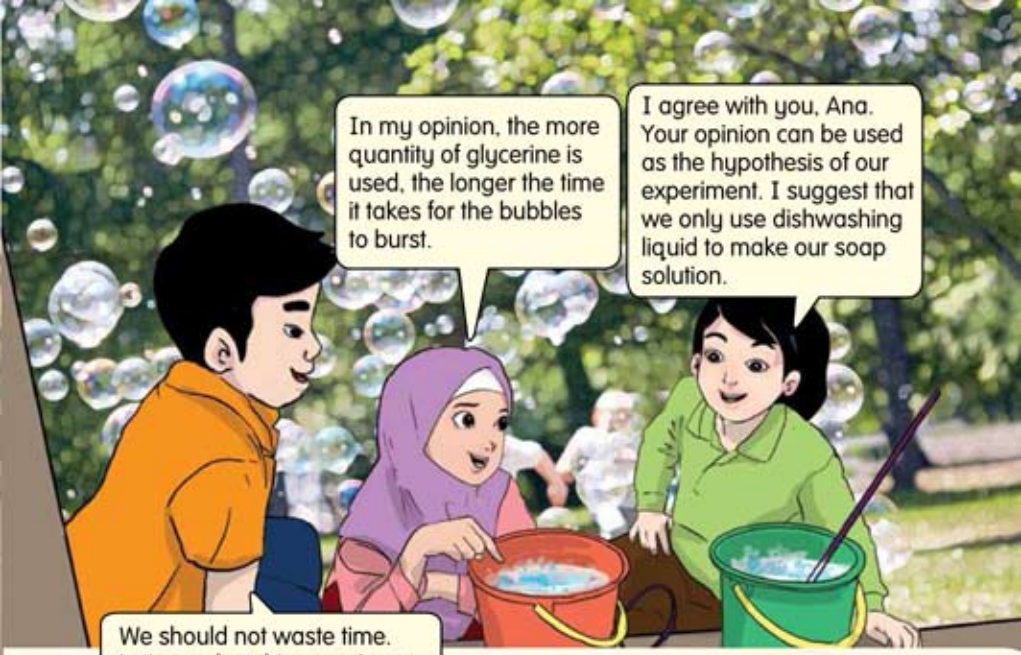
(a) State your observation when the rubber band was stretched for 30 cm.
(b) Give your inference.
(c) Based on this investigation, identify the following variables:
  (i) manipulated.
  (ii) responding.
  (iii) constant.
(d) What is the relationship between the manipulated variable and the responding variable in this investigation?
(e) Give the operational definition for the distance travelled by the paper plane.
(f) State your conclusion for the experiment conducted.

How were the science process skills used in this situation? Explain.

1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6

SCIENCE PROCESS SKILLS IN SOLVING PROBLEMS

Science process skills is one of the scientific skills that are used to solve problems. Let us observe the situation below. Ana, Ravi, Chan, and Melia are playing giant soap bubbles at a park.



1. **Aim**
   To investigate the relationship between the quantity of glycerine and the time taken for the soap bubbles to burst.

2. **Problem statement**
   Does different quantity of glycerine affect the time taken for the soap bubbles to burst?

3. **Hypothesis**
   The more quantity of glycerine is used, the longer the time taken for the soap bubbles to burst.

4. **Determining the variables**
   - manipulated: quantity of glycerine.
   - responding: time taken for the soap bubbles to burst.
   - constant: type of dishwashing liquid, volume of water, size of the bubbles produced, and the speed of surrounding wind.

5. Apparatus and materials

Safety goggles, measuring cylinder, stopwatch, plastic container with a lid, drinking straw, tablespoon, water, dishwashing liquid, and glycerine.

6. Steps

(a) Conduct this experiment at a less windy area.
(b) Wear safety goggles to protect your eyes.

(c) Prepare a soap solution using 200 mℓ of water and 50 mℓ of dishwashing liquid. Then, stir the solution well without producing any bubbles.

(d) Add one tablespoon of glycerine into the soap solution. Stir well without producing any bubbles.

(e) Then, leave the solution for four hours at room temperature.

(f) Dip a drinking straw into the solution and place the end of the straw on the plastic lid.

TEACHER'S NOTES Glycerine is used to make the bubbles last longer. It can be bought at baking supply stores or pharmacies.

(g) Keep blowing until a bubble appears and covers the surface of the plastic lid. Then, start the stopwatch immediately.

(h) Record the time taken for the soap bubble to burst in the table as shown above.

(i) Repeat steps (c) to (h) by using three and five tablespoons of glycerine into every soap solution.

7. Data

Quantity of glycerine (tablespoon)	Time taken for the soap bubble to burst (seconds)
1	
3	
5	

8. Analysing the data

(a) Based on the quantity of glycerine used in this experiment, _____ tablespoons of glycerine are needed to produce a soap bubble that can burst the latest.

(b) The time taken for the soap bubble to burst is _____ seconds.

9. Conclusion

(a) The hypothesis is (accepted/not accepted).

(b) The _____ the quantity of the glycerine, the _____ the time taken for the soap bubble to burst.

Space-time relationship

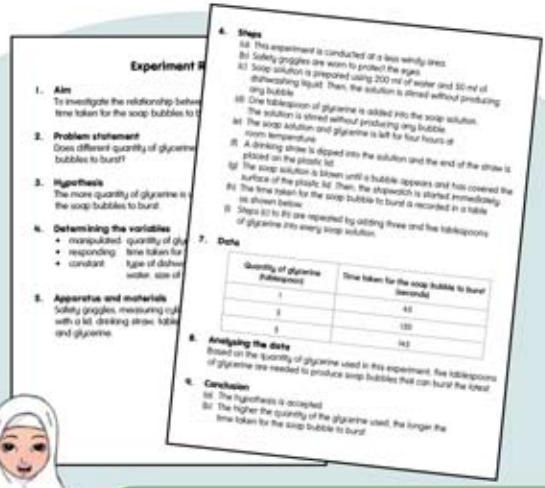
How do we relate the relationship of time and space in this activity?

In this situation, the bigger the size of the soap bubble, the longer the time taken for the soap bubble to burst.

Operational definition

How do we make an operational definition for the durability of the soap bubbles?

The durability of the soap bubbles can be defined operationally as the time taken for the soap bubbles to burst.



Friends, our experiment was a success. We should produce more of the soap solution to be sold during the Entrepreneur Week.

That's a good idea, Ana. The profit obtained can be used to decorate the Science Garden in our school.

(a) What is the aim of the experiment?
(b) What is your observation when a soap bubble made using one tablespoon of glycerine is blown and being left for a moment?
(c) Give an inference to your observation.
(d) State the manipulated and responding variables in this experiment.
(e) What is the relationship between the quantity of glycerine with the time taken for the soap bubbles to burst?

Plan and conduct a new experiment using different types of dishwashing liquid such as body wash and hand wash. Use different items such as cornflour or potato starch to make the soap bubbles last longer.

FUN SCIENCE ICE CREAM STICK BOAT

Build an ice cream stick boat using a ruler, pencil, knife, hot glue gun, sandpaper, small saw, rubber band, and ice cream sticks.

STEPS

Ice cream stick boat

1. Prepare all the materials.

2. Measure and cut the ice cream sticks.

3. Arrange the ice cream sticks that have been cut.

4. Attach the ice cream sticks as shown in the picture.

5. Smooth the edges using sandpaper.

6. Build the paddle of the ice cream stick boat using a knife or small saw.

7. Attach the rubber band.

8. Insert the paddle to the ice cream stick boat.

9. Rotate the paddle and launch it on water.

Be careful when using hot glue gun and sharp tools such as a knife or small saw.

MIND REFLECTION

We can understand and solve a problem scientifically using the science process skills as follows:

- observing.
- classifying.
- measuring and using numbers.
- making inferences.
- predicting.
- communicating.
- using space-time relationship.
- interpreting data.
- defining operationally.
- controlling variables.
- making hypothesis.
- experimenting.

MIND TEST

Answer all questions in the Science exercise book.

1. Provide a suitable inference for each of the following situation:

(a) 

Large logs float on water.

(b) 

Rate of breathing is higher after exercising.

2. The following figures show how two pupils of Year 5 Zamrud travel to school. The distances between their houses and the school are the same, which is 1 km.

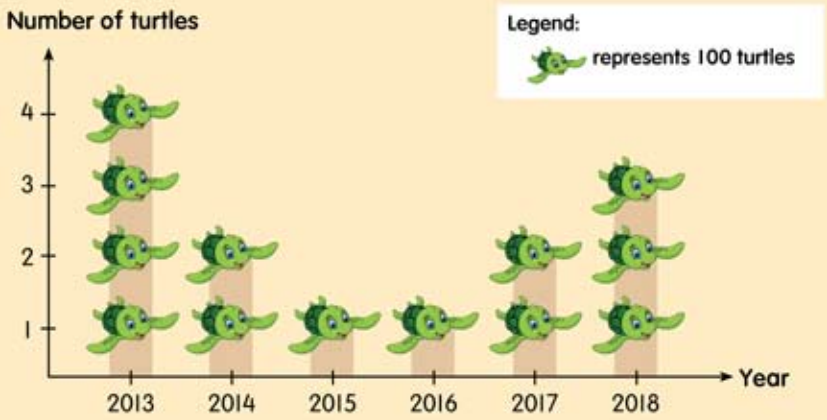
Pupil A

Pupil B

(a) Predict the time taken for both pupils to travel to school.

(b) If Pupil B takes 15 minutes to reach the school, how long will Pupil A take?

3. The figure below shows the number of turtles that landed on the beach of State M for a duration of six years.



(a) Based on the figure above, what is your observation?
(b) Give an inference on the number of turtles that landed in 2015 and 2016.
(c) What is the total number of turtles that landed from 2016 until 2018?

4. Classify the following objects based on an identified characteristic.

5. An investigation was carried out to identify the chemical properties of substances J, K, L and M by using red and blue litmus papers. The results of the investigation are as follows:

Substance	Colour change on litmus paper	
	Blue	Red
J		
K		
L		
M		

(a) Predict the chemical properties of substances K and M.
(b) Classify substances J, K, L and M according to the correct chemical properties.
(c) What is the operational definition of an alkali?
(d) Which following pair of substance is alkaline?
Tick [✔] the correct box.

Lime juice and vinegar		Lime water and soap	

6.

What is the space-time relationship for the situation above?

7. The figure below shows the positions of planets from the Sun in the Solar System. The position of a planet determines the time it takes to make one complete revolution around the Sun.

   (a) What is Planet R?

   (b) Based on the investigation above, state the variable that is:
   (i) manipulated.
   (ii) responding.

   (c) Make a hypothesis from the information identified based on the observation in this investigation.

   (d) Predict the time taken by planet R to make one complete revolution around the Sun as compared to the Earth. Give your inference.