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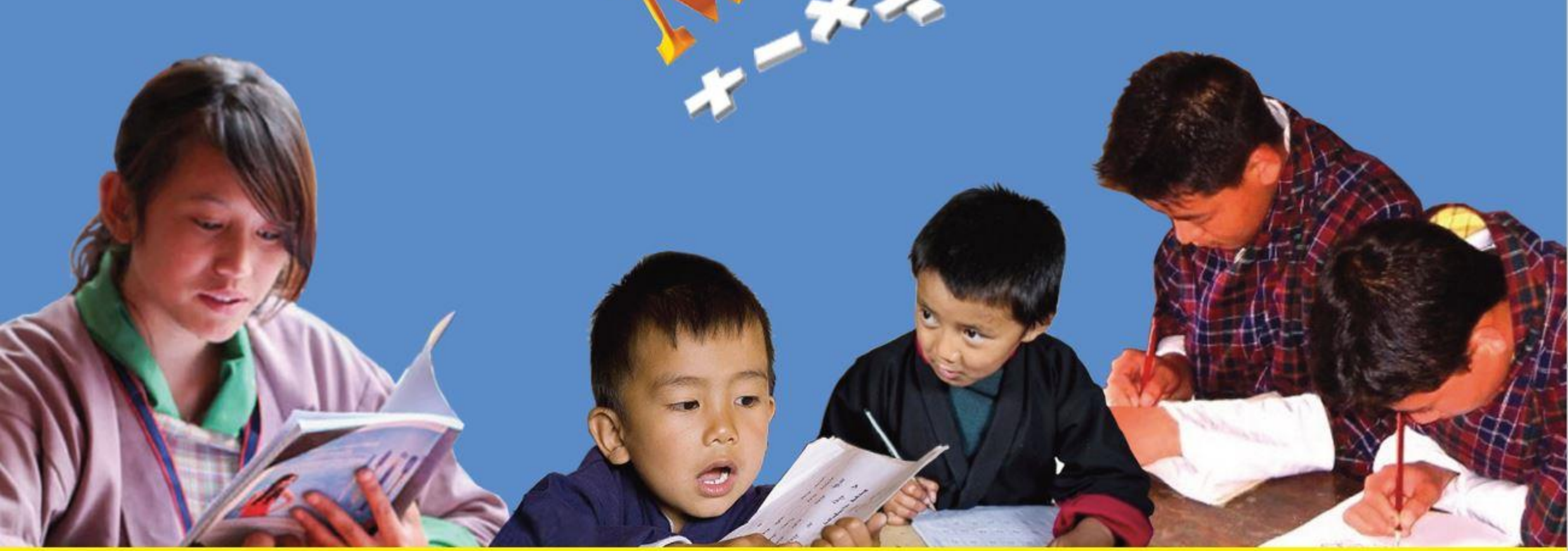
# རང་ཉིད་སློབ་སྟོན་མཁོ་ཆས།

# Education in Emergency

## Self - Instructional Materials



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དེབ་དང་པ།

Key Stage 4 Cl - IX - X
Vol. I

# Self-Instructional Materials

## Key-stage IV

## (Classes IX and X)

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**Lesson No:** 1 **Subject:** English **Class:** 9 – 10 **Time:** 60 minutes

**Topic:** Descriptive and Expository Essay Writing

1. Identify the **SEVEN WRITING TRAITS.**
2. Apply them while writing a descriptive or an expository essay.

## Introduction

### Activity 1

Write your answers to the following questions in your notebook. (Note: You may also write your answers to the questions in other activities in your notebook)

1. What are the writing traits?
2. Why do you think you need to learn about writing traits?

## Purpose of learning the SEVEN WRITING TRAITS

Writing gives the power to express your inner feelings, thoughts and ideas. It provides shape and form to your idea so that you can communicate with others clearly and meaningfully. Therefore, being able to understand and use **SEVEN WRITING TRAITS** will help you provide clarity and meaning to your essay. These traits will take you through a step by step process of writing. It will be helpful to know the writing traits to enable you to become a passionate and self-assessing writer.

Following are the **SEVEN WRITING TRAITS** that you are going to learn.

- Ideas
- Organization
- Voice
- Word Choice
- Sentence Fluency
- Convention
- Presentation

## Activity 2

1. Read the following and work on the subsequent activities.

## 1. Ideas

Every time you think, you have ideas. You are thinking all the time. Your head is bursting with ideas. Ideas come from things you see and do, people you meet, places you visit and feelings you have. However, everyone's ideas are different. No one else in the world thinks alike.

What's the Big Idea?

1. It is the main message a writer is trying to convey. Good writing always has the main idea. The main idea should be easy for the reader to find.

Look at some sample writings below to check for the big ideas.
*I have a dog. My birthday is next month. Pizza is my Favorite food. My dad says he hopes it will rain soon so the plants will grow.*

1. Now, what do you think? Is there a main idea in this paragraph?

You may now read the following paragraph. See whether you can figure out the writer's main idea.
*People say that if you ate the very same food at every meal, you would get tired of it. I don't think so. You see, I love pizza and I could eat it for every meal even for snacks! My favourite kinds of pizza are plain cheese or cheese with pepperoni. I love pizza hot from the oven, warmed up in the microwave, or even right out of the refrigerator. I am ready for pizza right now!*

1. What is the **BIG Idea** in the above paragraph?

***The main idea here is; I love pizza.***

**Trash or Treasure**

Another important aspect of ideas is you must know whether your ideas are trash or treasure. Meaning you must know what to delete and what to keep. Did you ever read a book and think 'this has so many details that I feel buried alive?' Some writers do not know when to stop! You want to put lots of interesting details into your writing but don't try to tell everything. Your writing will grow and grow and grow until it filled many pages.

Keep the intriguing details and delete the details that everyone already knows.

For example: *Penguins are black and white.* It does not make for a very engaging reading.

### Activity 3

**Instructions:**

1. Think of an idea. An idea that you like to write on.
2. Write a paragraph.
3. Read your paragraph now and look for the big idea. Does your paragraph have a big idea?
4. Is it trash or treasure? What makes it trash or treasure? How can you improve your writing?

## 2. Organization

Now let's look at the organization.

1. How do you organize your idea and thought process?

Did you ever look in your closet and say to yourself, 'I would better get this place in order!' you may have socks, shirts, trousers, underwear all mixed. It's tough to find what you want, isn't it? That is what the organization does to your writing. Organization in writing means putting information in an order that makes sense. You can organize your writing by;

**2.1. Begin your writing with an interesting lead or a hook.**

You must have a **strong lead** or hook to **grab the reader's attention** and to make them keep reading your essay.

Can you read the sample:

*My name is Tandin and last summer my dad Karma who is a doctor sent me to the shop for some rice, tomatoes and potatoes. I bought them and came back…*

1. Does this hook get your attention?
2. How would you hook your reader?
3. How would you begin your paragraph?

*I climbed up on my bike while my dad held on to the back. As my dad gave me a push, I knew something was different but I didn't know what until the bike was rolling. The wheels were gone!*

The above is an example of a strong lead. It just sets the whole tone-the whole point of view.

**Activity 4**

1. Now, try writing a paragraph with a strong hook.
2. How did it go? Is it a strong hook? If not, try writing it again.

**2.2. Staying on Topic**

When you have decided what the main idea you will write about, stay with it. If you wander from the topic, your readers will get confused. They will miss your whole message. The fact that your writing makes sense inside your head doesn't mean that it will make sense to your readers. For instance, the menu in a restaurant. The menu is easy to read because foods that are alike are grouped; drinks in one section, continental dishes in another, snacks in other section.

Think how hard it would be to order if everything were mixed - sandwiches with ice cream, French fries with pizza. How confusing! When you write, it's important to put your information in order too so that your readers will not get confused.

**2.3. Writing a Strong Conclusion**

You have now written an interesting hook or lead, put all your details in order.

Congratulations! Now all you have to do is decide how to end your writing.

Remember though that there is a difference between stopping and concluding. You cannot just abruptly stop your writing. Instead, you will need to write an ending that concludes your thoughts and wraps up everything you have said about your topic. If your conclusion is as strong as the lead, you will have a perfect end to your writing.

## 3. Voice

1. When a friend calls you, how long does it take you to recognize that person's voice?

Probably not long! That's because every voice is different.

1. Do you vary your voice? When do you vary it?
2. Why do you vary your voice?
3. How do they help the writer in conveying the idea or the message?

### Activity 5

Now, read the following paragraph. It will help you understand more about VOICE.

You have different voices at different times and places. Sometimes, you need to whisper. Other times you talk in your regular voice. Sometimes you shout or sing. Your writing voice is pretty much the same. First, you have your voice like your fingerprints. Second, you can change your writing just as you can change your speaking voice. Sometimes, your voice may be quiet and soft. Sometimes, it can be as big and bold as thunder.

**Read the following paragraphs and see which has the strongest voice.**

***My Puppy***

*I have a dog. He is very cute. I love to hold him. His name is Zorro. I got him as a present. He is nice and cute. I play with him. Zorro is black and white. He is a good dog.*

***Dance***

*I dance all the time. I guess it is in my blood. Sometimes, I think why walk when I can dance? Even before I could stand, I would dance with my dad. He would hold me in his arms and sing to me as we bounced and twirled around the family room. When the music stopped, I would yell, "More, daddy! Again!" Maybe it was because of this that I love to dance so much now. All I know is that when I hear music, my feet start tapping, my hips begin to wiggle and then I am off into the dancing zone.*

1. Which paragraph has a strong voice?
2. Why do you think it has a strong voice?

Obviously the second one, right? When you write about your life or what interests you, your voice needs to come through clearly. Make readers feel about all the things you feel. Think of voice as the energy behind the words. They can be humorous, sad, scary, silly, carefree or serious.

## 4. Word Choice

1. Does word matter?
2. How important are the words to a writer?
3. Why do you think as a writer you need to choose words?

Words are the tools of writing. Just as the painter works with paint and a potter works with clay, a writer works with words. But not all words are alike. Good writers are choosy. They choose the very best words to get their ideas across. That's why this trait is called a word choice. And here are some ways to choose words.

### 4.1. Wanted: Verbs with Muscles

Suppose you are the author of a story about a girl who can run faster than anyone else. You have to think about which action words or verbs will best describe how she moves when she runs. Strong verbs like **bolted** or **sprinted** will tell more about this girl's speed than just saying **'She ran fast.'**

### 4.2. Painting Word Pictures

1. Can words paint pictures?
2. How can you paint word pictures?

Words that connect to your senses of sight, hearing, smell, touch or taste are called sensory words. For instance, take the sense of smell. Name something like perfume or gasoline, your reader can just about smell it! Or take the sense of hearing. Suppose the writer mentions a horse's hooves on a wooden bridge, aloud trumpet or the chirping of the birds.

1. Can you hear each sound?
2. How powerful is the use of those sounds?

**When you use sensory language, you paint a complete picture of your idea in your readers' mind. Now that's powerful!**

### 4.3. Cut the Chatter

Sometimes, writers get a little carried away with words. Maybe they don't want any words to feel left out, so they try to squeeze in all they can. This makes their writing puffed-up sort of like a bullfrog. It may sound something like this:

*"At all times, no matter what else you carry on your adventures, have a bag for garbage in your gas-powered vehicle."*

That's wordy! The writer could simply have said,

*"Always carry a litter bag in your car."*

That's much better.

## 5. Sentence Fluency

1. What is sentence fluency?
2. Can you think of things that flow?

**Flow is that which moves smoothly with a kind of rhythm and grace.**

Maybe you picture a dancer, a river or a waterfall. Running horses move with the rhythm. So do flying birds. Good writing also has rhythm. Like flying birds or grass in the wind, it moves along with grace and ease.

**One sentence just seems to glide into the next. This is called a sentence fluency.**

To put sentences together smoothly, you will have to;

## 5.1. Let it Flow

1. What is the flow in writing?
2. Why is it important for writing?

Fluent writing flows like a river from word to word, sentence to sentence and paragraph to paragraph. It is pleasant to read and easy to understand. Writing that is not fluent starts and stops like a car in heavy traffic. This kind of writing is often difficult to read and maybe confusing. To test the fluency of your writing, **read** it **aloud**. If you find yourself starting and stopping every few seconds, it's time to revise.

Read the paragraph below

*My grandma's house is pretty big. Her house is old. It has lots of rooms. It has a cool attic. There is a scary cellar. My grandma's house has a porch. The porch goes all the way around the house. There is a swinging bench. It's on the porch. Her yard has lots of trees. There are apple trees. There are oak trees, too. Her yard is great for playing tag. I love her house.*

1. How does the above paragraph sound?
2. Is there a flow?
3. Did you find yourself stopping frequently?

**The above paragraph is an example of writing that is suffering from the starts to stops.**

This writing sounded bumpy and jerky. One way to revise choppy writing is to push together some of the sentences that have the same idea. This sentence combining creates a better rhythm or flow of writing.

Now, check your experience with the following paragraph in which sentences are combined. See if you can feel the difference in the flow.

*I love my grandma's big, old house. It has lots of rooms and there is a cool attic and a scary cellar. There is even a porch which goes all the way around the house and a bench swing too. Her yard has lots of apple and oak trees. It's a great place to play tag.*

1. How did the paragraph sound?
2. Isn't it much smoother?
3. What made it smoother?

Combining sentences is a great way to get rid of short, choppy sentences that take your reader on a jerky ride.

**5.2. Varying Sentence Beginnings**

1. Why vary sentence?
2. How does it help the writer?

Think of how dull it would be to read a book in which almost every sentence began the same way.

Sentences that begin in different ways help create writing that is interesting and fun to read.

1. How many pages do you think it might take to put you to sleep?

Read the paragraph below. Pay attention to the beginning of each sentence.

*Yesterday I and my girl saw whales, little pilot whales look like dolphins, except that their heads are round instead of tapering into a long nose. "Whales ahoy!" Cody shouted. The whales came close to the boat. We lay flat on our stomachs on the deck watching them. After a while, we could identify some of them – a mother and her baby…*

1. How does the paragraph start?
2. What can you say about the paragraph?
3. What if the paragraph was written as under?

*We saw whales. We saw whales from the deck. We saw whales come close to the deck. We saw a mother and a baby whale...*

1. Would it be as interesting as the first one?

**5.3. Stop that Run-on Sentence!**

As its name suggests, a run-on sentence is one that forgot to put the brakes. Like a runaway train, it simply stormed past where it should have stopped. Many run-ons are two or more complete sentences written as one long sentence. Perhaps the writer forgot to put in a period at the end of one sentence and a capital letter at the beginning of the next. Or there are too many connecting words.

Read the following and see how a run-on sentence can be.

*Here is no lake at Camp green lake there was once was a very large lake here the largest lake in texas that was over a hundred years ago now it is just a dry flat wasteland*

**This looks like one long sentence. But is it just one sentence? Let's look at another one.**

*There is no lake at Camp Green Lake but there was a very large lake here, the largest lake in Texas but that was over a hundred years ago and now it is just a dry flat wasteland.*

**Reading the above sentences takes a BIG breath because there are no places to rest. No periods.**

Read the following paragraph and see what it is like without run-ons.

*There is no lake at Camp Green Lake. There once was a very large lake here, the largest lake in Texas. That was over a hundred years ago. Now it's just a dry, flat wasteland.*

1. Did you notice any difference?
2. How was your experience reading the last paragraph?
3. What made it easy for you to read?

The author wrote four separate sentences in the above paragraph. It's clear, easy to read and has the rhythm the author wants.

## 6. Conventions

1. What are the conventions of writing?

Conventions or mechanics are the items you look for when you are editing your work. Capital letters, correct spelling, question marks, periods and grammar are part of ways we turn spoken work into the written work.

**Read the following sentence where there are no spaces between words. Writing could be very hard to read.**

***Itmitluksumthinglikthis!***

1. What if we had no conventions at all?
2. What if the writing had no punctuation?
3. What if people spelt things in an old way?

Have you ever heard someone described as having an 'eagle eye'? A person with an eagle eye is great at spotting things that others miss. Developing a writer's eagle eye will help you spot spelling, punctuation, capitalization and grammar errors in your writing. It also takes a sharply tuned ear to spot mistakes. When you are editing, it helps to read the piece of writing aloud too. This gives your ears a chance to hear how words sound or catch a missing word or an extra word.

## 7. Presentation

1. What comes in your mind when you think of the presentation?
2. How should a good writing look like?

Presentation is how the writing looks to the readers.

Here are some guidelines to help you in the presentation of your written work.

- *Uniform spacing.*
- *Legible and consistent handwriting or appropriate fonts and sizes.*
- *Appealing use of space.*
- *When necessary, use of bullets, side headings and other markers.*
- *Effective integration of text and illustration, charts, graphs, maps, tables…*

So that was writing traits in brief. Use seven writing traits whenever you write an essay and behold you are on your way of becoming a passionate and self-assessing writer!

## Summary

**SEVEN WRITING TRAITS**

We need to consider the seven traits in writing to be an effective writer and communicator.

- The **idea** in the writing will give the main message.
- **Organization** in writing means putting information in an order that makes sense.
- **Voice** gives tone and flavour to the writing.
- **Word Choice** is the appropriate vocabulary a writer chooses to convey meaning.
- **Sentence Fluency** is the rhythm and flow of the language.
- Conventions are the mechanics of writing like punctuation marks.
- **The presentation** shows how the writing looks on the page.

## Self-check for Learning

1. What are SEVEN TRAITS of writing?
2. Can you think of an example of a word with muscle?
3. How do you begin writing an essay?
4. What is the significance of **conventions** in writing?
5. Write a three paragraphed descriptive essay for class 9 and expository essay for class 10 on any topic of your choice integrating the SEVEN writing traits. USE WRITING PROCESS

## Self-check for Learning

1. Idea, Organization, Vocie, Word Choice, Sentence Fluency, Conventions and Presentation
2. Eg. 'Sprinted' instead of 'ran fast'
3. By first considering an idea that you might like to write about
4. It provides proper structure to the writing

**Lesson No:**1 **Subject:** Chemistry **Class:** 9-10 **Time:** 45 minutes

**Topic: Gas Laws**

1. Define Boyle's law.
2. Define Charles's law.
3. Derive gas law equation.

## Introduction

The molecules of gases are always in constant random motion. Compared to solids and liquids, the intermolecular distance among the gas molecules is large. Hence, the intermolecular forces among the molecules are weak. The change in physical conditions like temperature or pressure results in a change in the physical properties of gases, which is explained by ***gas laws***.

While looking at the gas laws, we need to consider the following ***four*** variables:

1. **V**olume
2. **P**ressure
3. **T**emperature
4. **N**umber of moles (n)

The gas law always talks about any of the two variables, while the other two remains constant. For example, if a gas law talks about the relationship between Volume (**V**) and a number of moles of gas (**n**), which means now, pressure (**P**) and Temperature (**T**) of gas should remain constant.

## Purpose of Learning the Gas Laws

A ***gas law*** is a simple mathematical formula that allows us to model, or predict the behaviour of a gas. Gas laws have many real-life applications and knowing how the gases behave under different conditions will help us explain the chemistry behind why certain things behave the way they do.

You might have noticed that when a packet of chips is taken to a high altitude, it swells. Have you ever asked yourself, why does it swell when taken to high altitude? Well, it has all to do with the behaviour of gas, which is explained by gas laws.

### Activity 1

Which balloon will have a higher air pressure inside?

A (An inflated balloon)

B (A fully squeezed inflated balloon)

If you carefully observe the two pictures above, you can see that the volume of the gas decreases when you squeeze the balloon (due to increased pressure) and vice-versa, keeping the temperature of the gas constant. Therefore the relationship between volume and pressure is inversely proportional, meaning when the pressure of a gas increases, the volume decreases and vice-versa. The relationship between volume and pressure of gas was studied by Robert Boyle and it came into existence as the BOYLE'S law.

***Boyle's law*** states that the pressure of a ***fixed amount*** of gas at a constant temperature is inversely proportional to the volume of the gas.

i.e. $\mathbf{V \propto 1/P}$

where the symbol $\alpha$ means proportionality sign. We can change '$\alpha$' to an 'equal to' sign and write:

$V = k \times 1/P$

Where k is a constant called the proportionality constant. We can rearrange the equation and obtain, $V = k/P$, cross multiply and we get $\mathbf{PV = k}$ ..........................(1)

Where; P = pressure, V = volume, k = constant

From equation(1), we can conclude that the product of pressure (P) and volume (V) of a given gas at constant temperature is always constant (k).

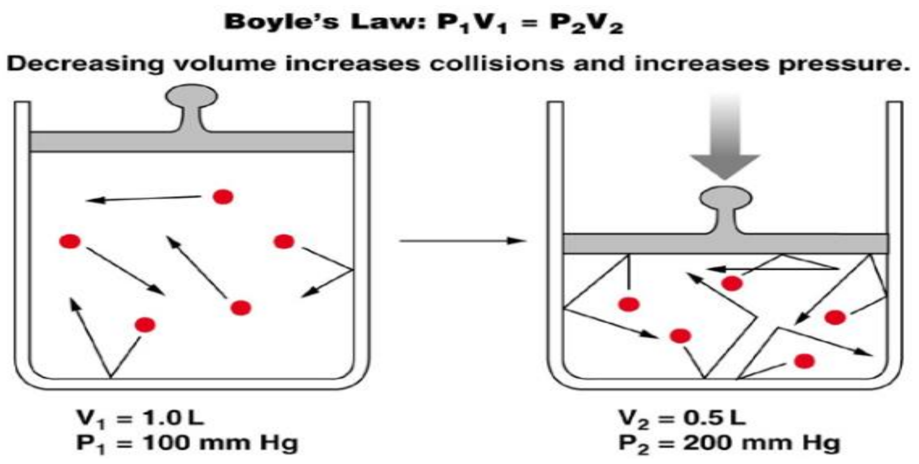
Let's imagine that at a constant temperature you have a gas sample occupying the volume $V_1$ at pressure $P_1$. If you change the initial pressure to new pressure ($P_2$), the volume also changes to $V_2$. Here, we can use Boyle's law to express both the conditions as shown in the figure,

$P_1 V_1 = k$

$P_2 V_2 = k$

$P_1 V_1 = P_2 V_2 = k$

**$P_1 V_1 = P_2 V_2$ This is Boyle's Law equation.**




**Practice problem**

**Question:** A sample of gas was initially found to be 2 L at 1.2 atm. How much will be its volume if the pressure is increased to 2.6 atm at constant temperature?

**Solution:**

Given;

$V_1 = 2L$, $P_1 = 1.2$ atm, $V_2 = ?$ $P_2 = 2.6$ atm

According to Boyle's Law, $P_1V_1 = P_2V_2$ (Let's substitute the above values in the Boyle's equation)

$2L \times 1.2 \text{ atm} = V_2 \times 2.6 \text{ atm}$

$V_2 = 2L \times 1.2 \text{ atm} / 2.6 \text{ atm}$

$V_2 = 0.92$ L

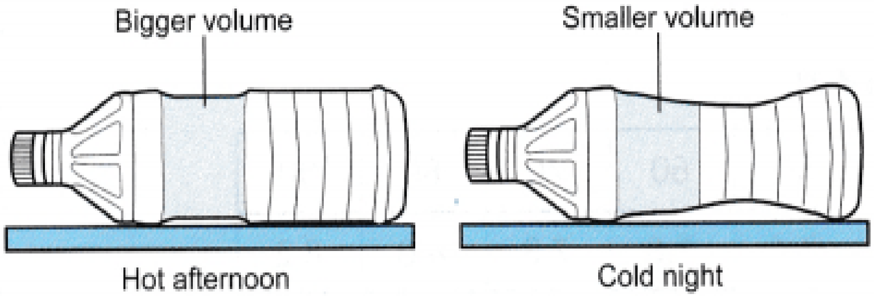
Therefore, the volume of the gas will be 0.92L if pressure is increased to 2.6 atm.

## Activity 2

Write your answers to the following questions in your notebook.

1. At a constant temperature, the volume of a gas was found to be 300 $cm^3$ at a pressure of 760 mm Hg. If the pressure of the gas is increased by 10%, what will be the new volume of the gas?
2. A balloon with a volume of 2.0 L is filled with a gas at 3 atmospheres. If the pressure were reduced to 0.5 atmospheres without the change in temperature, what would be the volume of the balloon?

What can you conclude from the following illustrations?




Note: Bottle is empty (no liquid), Just filled with gas molecules.

From the above illustrations we can observe that during noon when the temperature is high, the gas occupies more volume and during the night when the temperature is low, the gas occupies less volume. Therefore, the relationship between the volume and the temperature is directionally proportional when the pressure is constant. Jacques Charles studied this relationship and the law came to be known as **Charles Law.**

According to **Charles Law**, *"The volume of a gas is directly proportional to its temperature at constant pressure."*

i.e. $V \alpha T$

$V = kT$

$V/T = k$

Where; V = volume, T = temperature, k = constant

If $V_1$ and $V_2$ are the volumes of a certain quantity of gas at temperatures $T_1$ and $T_2$ under two sets of conditions at constant pressure.

$\frac{V_1}{T_1} = k$ …………… (Equation………a)

$\frac{V_2}{T_2} = k$ ……………. (Equation……….b)

On combining equations (a) and (b) we get,

| | |
|---|---|
| $\mathbf{\frac{V_1}{T_1} = \frac{V_2}{T_2}}$ | **This is Charles Law equation.** |

**Note:** Temperature should always be in kelvin scale in Charles's Law ($0^oC = 273K$).

## Practice problem

**Question:** A sample of gas measuring 3L was kept at 6 °C. What will be the volume, if we increase the temperature to 15 °C?

**Solution:**

Given;

$V_1$ =3L, $T_1$ = 6 + 273 = 279K, $V_2$ =?, $T_1$ =15 + 273 =288K

According to Charles Law, $V_1/T_1 = V_2/T_2$

3L /279K = $V_2$ /288K

$V_2$ = 3.1L

Therefore, the volume will be 3.1L if we increase the temperature to 15 $^0$C.

### Activity 3

Write your answers to the following questions in your notebook

1. The volume of a given mass of gas is 720 ml at 15°C. Assuming constant pressure, at what temperature will its volume be 960 ml?
2. A sample of gas is found to occupy a volume of 900 $cm^3$ at 27$^0$C. Calculate the temperature at which it will occupy a volume of 300 $cm^3$, provided the pressure is kept constant.

## Combining the two Gas Laws

According to Boyle's Law, V α 1/P

According to Charle's Law, V α T

If we combine both the laws,

V α T/P V = k. T/P

PV/T = k (Gas Law equation)

Where; P = pressure, V = volume, T = temperature, k = gas constant

For the initial values: $P_1V_1/T_1 = k$ …………(1)

For the final values: $P_2V_2/T_2= k$……………(2)

Since both the equations (1) and (2) are equal to k (constant), we can write as

**$P_1V_1/ T_1 = P_2V_2/ T_2$ This is the Gas Law Law equation**

**Summary**

- Boyle's law states that the volume of a gas is inversely proportional to the pressure if the temperature is kept constant.
- Charles' law states that the volume of a gas is directly proportional to its Kelvin temperature if pressure is kept constant.
- Boyle's law and Charles' law can be combined into a single mathematical expression known as the combined gas law: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

## Self-check for Learning

1. A sample of helium measuring 6 L was kept at a pressure of 1.5 atm. If the pressure is doubled, what would be its new volume?
2. Why does a perfume bottle burst when placed inside the flame?
3. The given mass of a gas occupies a volume of 450cm$^3$ at 14 degree Celsius and 0.9 atm. What will be its volume at 28 degree Celsius and 1.8 atm?

## Self-check for Learning

1. Given;
   $V_1 = 6$ L, $P_1 = 1.5$ atm, $V_2$ =?
   $P_2 = 1.5 \times 2 = 3$ atm (pressure is doubled)
   According to Boyle's Law, $P_1 \times V_1 = P_2 \times V_2$
   1.5 atm × 6 L = 3 atm × $V_2$
   $V_2 = 3$ L
2. This is because at high temperature the volume of gas inside the bottle increases so much that the pressure exerted by the gas becomes high, leading to explosion.
3. Given;
   $V_1 = 450$ cm$^3$ $T_1 = 14\ {}_0C + 273$ K = 287 K $P_1 = 0.9$ atm
   $V_2$ =? $P_2 = 1.8$ atm
   $T_2 = 28\ {}_0C + 273$ K = 301 K
   According to combined gas law equation : $P_1 V_1 / T_1 = P_2 V_2 / T_2$
   =0.9 atm × 450 cm$^3$ / 287 K = 1.8 atm × $V_2$/301K , $V_2$= 235.98 cm$^3$

**Lesson No:** 1 **Subject:** Physics **Class:** 9 – 10 **Time**: 45 minutes

Topic: Newton's First Law of Motion

1. State Newton's first law of motion.
2. Define inertia.
3. Explain the applications of Newton's first law of motion.

## Things you should know (Prerequisite knowledge)

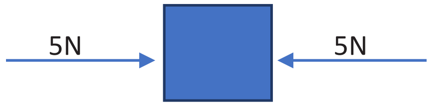
Before exploring Newton's laws, we must revisit the following concepts.

### 1. Balanced and Unbalanced Forces

There are two types of forces based upon the effect they produce on the object when it is applied to it.

1. **Balanced Forces**: It refers to forces that do not bring any change in the state of **rest** or **uniform motion** of the object.

   a. **When the object is at rest**: Say, as shown in the figure below, two persons are applying a force of 5N (read as 5 Newton) against each other on a box that is at rest. In such cases, since the forces are of equal magnitudes (size) and are acting opposite to each other, it does not produce any effect on the object because the forces acting on it get cancelled out. In other words, the box remains at rest even though forces are acting on it. Such forces, which do not change the state of the object at rest are called balanced forces.

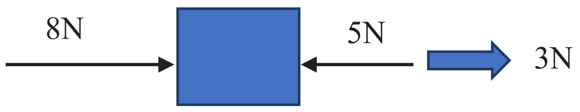



Object does not move since the total force acting on the body is zero (5N-5N = 0. We subtract because the forces are acting against each other)

   b. **When the object is moving with a uniform (same/constant) motion**: Similarly, if the same amount of force is applied against each other on an object moving with a uniform speed, the forces will not produce any effect on the box. Such forces, which do not change the state of the object in motion are called balanced forces.

2. **Unbalanced Forces**: It refers to forces that bring changes in the state of **rest** or **uniform motion** of the object.

a. **When the object is at rest**: If two forces of different magnitudes are acting opposite to each other, as shown in the figure below, then the object moves in the direction of greater force.




Object move since the total force acting on the body is 3N

(8N – 5N = 3N).

In this case, the object moves in the direction of 8N (in the direction of greater force) with a total force of 3N.

b. **When the object is moving with a uniform motion**: When unbalanced forces act on a moving object, it can change the direction, increase or decrease speed, or stop moving objects.

## Generalization:

1. Balanced forces do not bring change to the state of the object whether it is resting or moving at a constant speed.
2. Unbalanced forces bring change to the state of the body at rest or moving with a uniform speed.

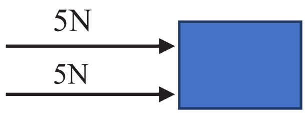
In general, it can bring about the following changes:

i. make a stationary object move,
ii. change the shape of the object,
iii. change the direction of moving object,
iv. increase or decrease the speed of the moving object, and
v. stop moving objects.

### Activity 1

A pair of force of the same magnitude is acting on a box as represented in the figure below.

a. Will the box move? Why?
b. What is the total force acting on the box?



## 2. Interpretation of the Simple Equations

There are numerous equations in physics. Generally, in physics, equations are used to meet the following three purposes:

**1.** To represent the main information using symbols

Let us take velocity for example.

**Definition**: Speed is defined as the rate of change of distance.

Now let;

1. Speed = $s$
2. Displacement = $d$
3. Time = $t$

Then;

$$s = \frac{d}{t}$$

Likewise, the main information is presented using symbols.

The symbols, v,d,t are called variables because their values can vary depending upon the information presented.

**2.** To find the unit for the subject of the formula (refers to a single variable that everything else is equal to)

In this case, speed is the subject of the formula. Usually, the subject of the formula lies on the left-hand side of the equation.

Let us find out the unit for speed. To do that, we need to write the formula first.

$$Speed = \frac{Distance}{Time}$$

Now, since we are looking out for unit of  speed, our formula becomes like this:

$$unit\ of\ speed = \frac{unit\ of\ distance}{unit\ of\ time}$$

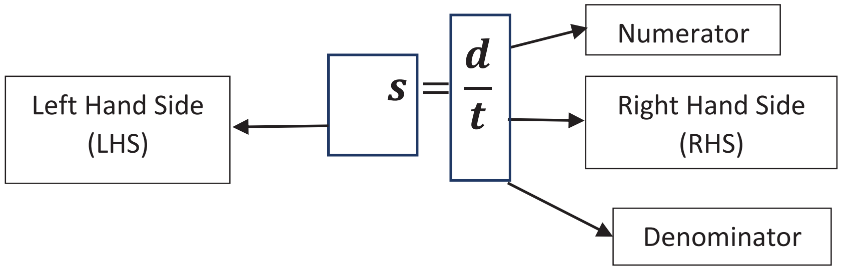
Now we have to write the SI unit of distance and time. The SI unit for distance is a metre (represented by small/lower-case letter, ‘m’) and for time is seconds (represented by a small letter, ‘s’)

$$unit\ of\ speed = \frac{m}{s}$$

It is important to note that in physics, units are not written as fractions instead it is written as follows:

$\therefore unit\ of\ speed = m/s\ or\ ms^{-1}$ It is read as, metre per second.

**3.** Constructing the relationship between the quantities.




Generally, LHS of the equation depends on the RHS of the equation. That is, speed depends upon distance and time.

The relation is such that, any change in the magnitude of variables on RHS will affect the magnitude of a variable in LHS of the equation.

**1.** The subject of the formula will directly depend upon the variable holding the numerator position in the RHS of the equation provided variable in the denominator remains constant.

That is, in our case, the subject of the formula is ‘speed’, the variable numerator position is ‘distance’ and constant variable in the denominator is ‘time’. The dependence will be such that, if the distance is increased, it is only intuitive that speed will have been naturally increased because time remains the same. The case will be opposite if the distance is decreased.

In such a case, we say that speed is directly proportional to the distance (provided time is constant). This kind of direct dependence is represented as:

$$speed \propto distance$$

Where $\propto$ is the proportionality symbol.
The meaning stands the same, that is when the distance is increased speed will also be increased and vice-versa.

**2.** The subject of the formula will depend inversely upon the variable holding the denominator position in the RHS of the equation provided the variable in the numerator remains constant.

That is, in our case, the subject of the formula is ‘speed’, the variable denominator position is ‘time’ and the constant variable is ‘distance’ which holds the numerator position. The dependence will be such that, if time is increased, speed will have been naturally decreased because distance remains the same. The case will be the opposite if the time is decreased.

In such a case, we say that speed is inversely proportional to time (provided distance is constant). This kind of direct dependence is represented as:

$$speed \propto \frac{1}{time}$$

The meaning stands the same, that is when time is increased speed will decrease and vice-versa.

## Introduction

Newton's laws of motion describe the relationship between an object and unbalanced forces acting on it. We know the effects of unbalanced forces. Sir Issac Newton laid down three laws of motion, therefore, it is sometimes known as Newton's Laws of Motion. Let us explore the laws.

### Laws of Motion - Newton's First Law of Motion

The law states that an object at **rest** or in **uniform motion** continues to be in that state unless acted upon by an unbalanced force.

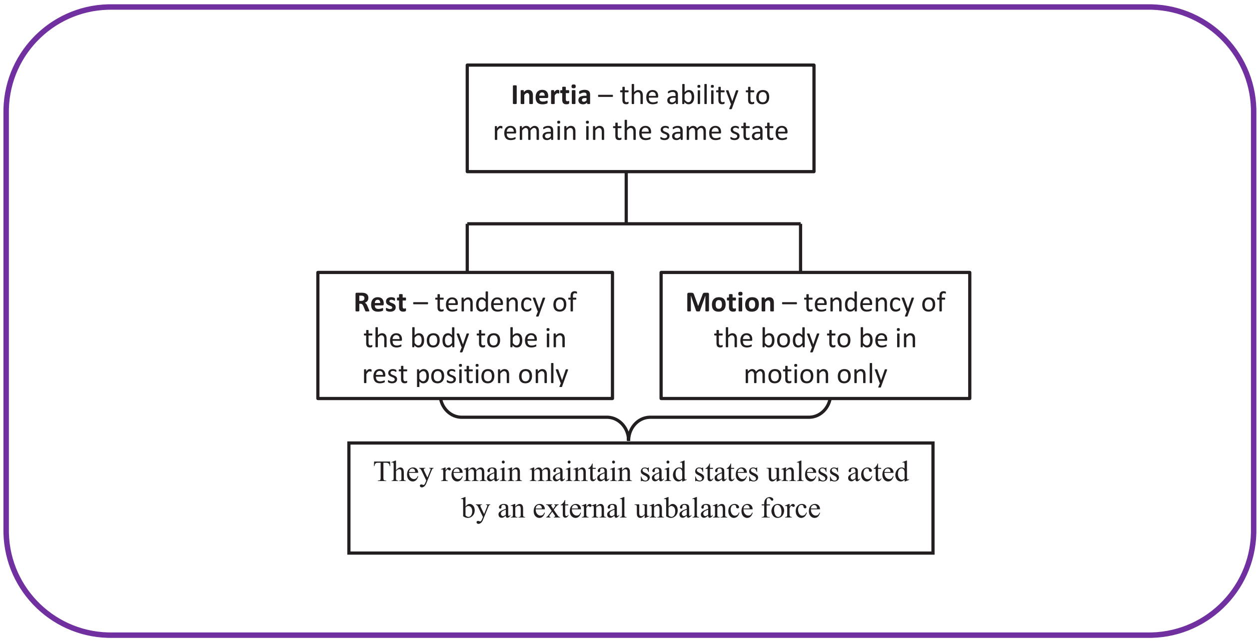
Newton's first law deals with the inertia. Inertia is the property of an object to maintain the same state. That is, if the object is at rest it will continue to remain at rest only, like a rock. If the object is at motion, then it will remain in motion only, like a ball rolling down a frictionless slope.

So, there are two types of inertias:

1. **The Inertia of Rest**: The body tends to remain at rest.
2. **The Inertia of Motion**: The body tends to remain in motion.

That is, Newton's first law states that if the object is at rest then it will continue to be at rest unless an external unbalanced force is applied to it and if the object is in uniform motion then it will continue to remain in motion unless an external unbalanced force is applied to it.

Newton's first law of motion discusses the inertia of a body therefore, it is also referred to as the law of inertia.



**Note**: If the forces acting on an object at rest or in uniform motion is balanced then the body will continue to remain in the same state.

### Activity 2

1. Which will have more inertia, a body with greater mass or lesser mass? Why do you think so?

Newton's first law of motion helps us understand experiences such as why we fall backward when a vehicle that we are in suddenly starts to move or why we fall forward when a vehicle suddenly stops.

When the car that you are in suddenly starts to move, we fall backward because initially both car and you are in the state of rest (inertia of rest). As the vehicle starts to move forward, your body continues to be in the state of rest due to inertia of rest and you feel a backward push.

When the car suddenly stops, your upper body is still in motion while the car and your lower body come to rest and because of the inertia of motion, your upper body continues to move forward.

### Summary

- Object at rest will remain at rest unless an external unbalanced force is applied to it.
- An object in uniform motion will remain in motion unless an external unbalanced force is applied to it.
- Objects will move in the direction of greater force.

### Self-check for Learning

1. Do you think it is important to wear seat belts while traveling in a car? Why?
2. Think of experiences that can be explained with the help of Newton's first law. Explore.
3. The carpenters normally tighten the head of a hammer onto the wooden handle by banging the bottom of the handle against a hard surface. How can we explain this action by using Newton's first law of motion?

## Self-check for Learning

1. Yes. It is important to wear a seat belt while traveling in a car. The reason is, during the journey, our body remains in motion because of the car and if a car stops suddenly, our body will be still in motion because of inertia (of motion) increasing the risk of injuries. However, if you were wearing a seat belt, it would act as the unbalanced force and stop us from being in motion thereby reducing the risk of injuries.
2. The following are some of the experiences that can be explained with the help of Newton's first law of motion.
    1. Moving of a stationary box using an unbalanced force.
    2. Catching a football by a goalkeeper using an unbalanced force.
    3. Rolling of a ball down the hill without stopping in the middle.
3. The reason is, when handle of the hammer is hit on a hard surface, the motion of the handle is stopped abruptly while the loose head of a hammer continues to move because of the inertia of motion and gets tightened into the handle.

**Lesson No:** 2 **Subject:** Physics **Class:** 9 – 10 **Time**: 45 minutes

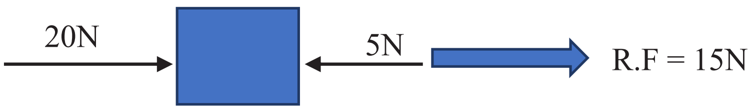
**Top**ic: Principle of Moments

1. Define moment of force.
2. Explain principle of moment.
3. State applications of principle of moments.

## Things you should know (Prerequisite knowledge)

When unbalanced forces (forces of different magnitudes) act on an object, it makes the object move because of the total force acting on it. The total/net force acting on the object is called the resultant force (R.F).

For example, if two persons are pushing a box against each other with a force of 20N and 5N, then the resultant force will be 20N minus 5N, which is15N. We subtract forces because they are acting in opposite directions.

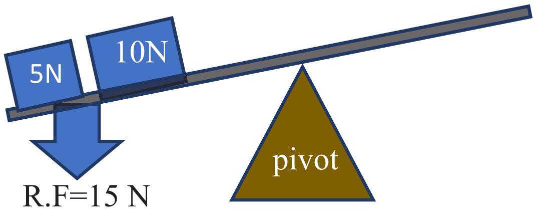



The object moves in the direction of greater force!

## Moment of a Force

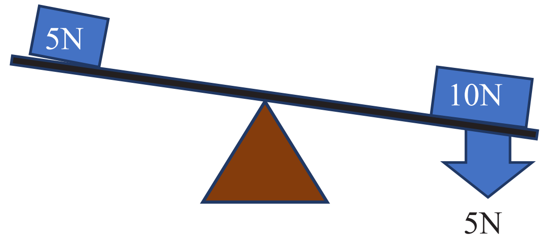
In the above example, we considered the box to be on a plane surface. Now, let us consider seesaw as an example.

From our common experience, we know that if we place a weight (which is a gravitational force acting on the body) only on one side of a seesaw then because of the weight, seesaw will move downward or rotate until it hits the ground as shown in the figure below. The seesaw is not in an equilibrium position.



On the other hand, if we put both the weights right on top of the pivot (point of rotation) then the seesaw will not be able to move. In such a case, we can say that the seesaw is in an equilibrium position.

But if separate the weights as shown in the figure below, we know, there will still be a rotation of seesaw since both weights are not equal. We also know that the seesaw will rotate in the direction of greater force. Here we can say that the seesaw is not in the equilibrium position.




We can balance the above seesaw by just rearranging the positions of the weights from the pivot.

So the general conclusion that we can make from the above examples is that to rotate any object about its axis (or about a pivot), we need **force** and a sufficient **distance** from the point of rotation.

This turning effect of a body about a pivot is called a moment of a force or moment or simply torque. It is represented by a Greek letter '$\tau$' (Tau). The seesaw is an example of a moment of a force.

It is a measure of the ability of an applied force to rotate an object. Therefore, the moment of force or torque is the product of force and the perpendicular distance between the point of application of force and rotation (pivot).

That is;

$$\boldsymbol{Moment\ of\ force(\tau) = Force(F) \times distance\ from\ the\ fulcrum\ (d)}$$

Or;

$$\boldsymbol{\tau = F \times d}$$

As it is clear from the formula, the moment of a force depends upon the:

1. applied force, and
2. the perpendicular distance between the point of application of force and rotation.

## Unit of Moment of Force

We know;

$$\boldsymbol{\tau = F \times d}$$

That is; $\boldsymbol{unit\ of\ \tau = unit\ of\ Force \times unit\ of\ distance}$

We know that force is measured in newtons (N) and distance in metres (m). Therefore, substituting the units, we have;

$$unit\ of\ \tau = N \times m$$

0r simply;

$$unit\ of\ \tau = Nm$$

Therefore, the unit of torque is newton-metre (Nm)

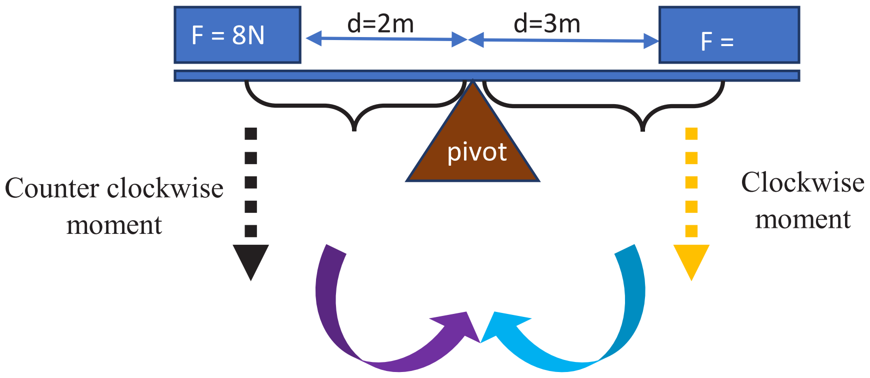
**Activity 1**

1. Explore some other examples of torque.
2. Create a formula triangle to help you remember the formula better.

## Principle of Moments

We calculate torque (or moment of a force) by using the above formula.

Consider the example below:




Here pivot is the point of rotation.

There are only two ways in which a seesaw can rotate. Say, if there are weights only on the left side of the seesaw and none on the right-hand side then seesaw would move downwards as represented by a dotted **black** arrow. If it is allowed to rotate freely then its rotation about pivot would be counter-clockwise as represented by the curved **purple** arrow. This type of turning effect/moment is called a counterclockwise moment.
Let us calculate the counter-clockwise moment.

Counterclockwise moment ($\tau$) = $F \times d$

$\boldsymbol{\tau = 8N \times 2m}$

$\boldsymbol{\tau = 16\ Nm}$

The case would be opposite if weights are placed only on the right-hand side of the seesaw and none on the left-hand side. In this case, the moment is called a clockwise moment since it would move in a clockwise direction if it is allowed to rotate freely as represented by a **blue** arrow.

Let us calculate clockwise moment:

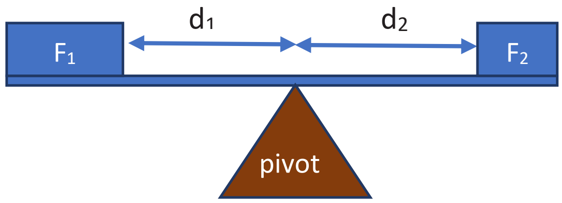
Clockwise moment ($\boldsymbol{\tau}$) = $\boldsymbol{F \times d}$

$\boldsymbol{\tau = 5N \times 3m}$ $\boldsymbol{\tau = 15\ Nm}$

We can see that the counter-clockwise moment and clockwise moment are not equal. This means the seesaw is not balanced. If counter-clockwise moment and clockwise moments are equal then the seesaw will be in a balanced position or equilibrium.

A body (or any system) is said to be in equilibrium if it is balanced.

The principle of moments states that the total counterclockwise moment is equal to the total clockwise moment when the body is in equilibrium.



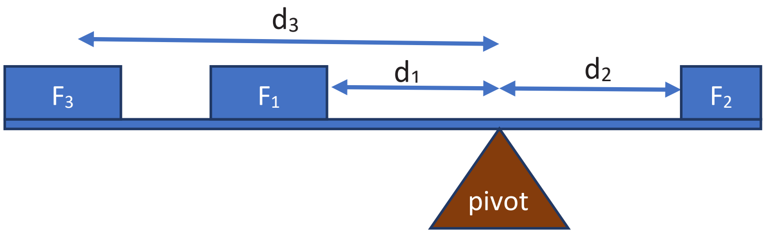

That is when the body is in equilibrium;

$Total\ counter\ clockwise\ moment = total\ clockwise\ moment$

We have;

$$\boldsymbol{F_1 d_1 = F_2 d_2}$$

If the system remains in equilibrium even if more forces are acting on either of the sides of the point of rotation or pivot then accordingly, we add the moments together as shown below.




As the above system is in equilibrium, we have;

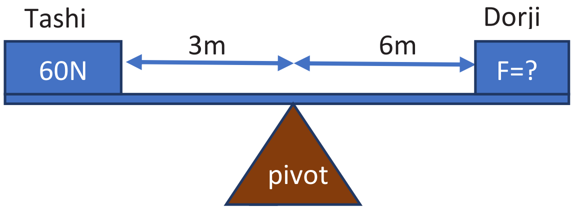
$$\textbf{Total counter clockwise moment} = \textbf{total clockwise moment}$$

That is; $\boldsymbol{F_3 d_3 + F_1 d_1 = F_2 d_2}$

**Example:**

Mr. Tashi and Dorji are playing a seesaw as represented in the figure below. Tashi weighs $60N$ and is sitting $3m$ away from the pivot on the left while Dorji is $6m$ away from the pivot on the right. If seesaw is at a balanced state,

1. calculate the weight of Dorji.
2. who will turn clockwise?
3. what is the clockwise moment?




**Solution:**

Given: $F_1 = 60N$, $d_1 = 3m$, $d_2 = 6m$

**1.** As the system is in equilibrium, we know;

$$\textbf{Total counter clockwise moment} = \textbf{total clockwise moment}$$

We have; $F_1 d_1 = F_2 d_2$

That is; $60 \times 3 = F_2 \times 6$ Or;

$F_2 = \frac{60\times3}{6}$ Or;

$F_2 = 30N$ Therefore, weight of Dorji is 30N.

**2.** Mr. Dorji will turn the seesaw clockwise.

**3.** Calculation of clockwise moment; We have: $F_2 = 30N$, $d_2 = 6m$

We know; Clockwise moment $(\tau) = F_2 \times d_2$

That is; $\tau = 30N \times 6m$ $\tau = \mathbf{180\ Nm}$

## Summary

- The turning effect of a force about an axis is called the moment of a force.
- Moment of a force is a product of force and the perpendicular distance between the point of application of force and rotation.
- Moment of a force $(\tau) = F \times d$
- The unit of Torque is Nm
- Moment of a force or torque depends upon the force applied and the distance between the point of application of force and rotation.
- A balanced system is said to be in equilibrium state.
- The principle of moments states that, at equilibrium, the total counter clockwise moment is equal to the total clockwise moment.

## Self-check for Learning

1. Explore ways to balance the above seesaw.
2. Is opening a door an example of a moment of a force? Investigate.
3. **Discover**: Which one of the following levers would you chose to move a weight:
   **a.** a lever with a long bar or
   **b.** a lever with a short bar? Why?
   **c.** Does it have anything to do with the moment of a force? Investigate.
4. **Try it yourself**:
   **a.** Try closing a door by placing your finger near to the door hinge.
   **b.** Now try closing a door by placing your finger much away from the door hinge.

**c.** Compare the experiences and look out for possible explanations.

## Self-check for Learning

1. In order to balance the seesaw, the total clockwise moment and total anticlockwise moment should be same.
2. Yes. Opening the door is an example of moment of a force because we need a force to turn the door about its fixed point of rotation (door hinge).

1. I would chose a lever with a long bar because it would produce more torque compared to the lever with a short bar since torque depends directly upon the distance between the point of application of force and point of rotation.

   Yes. In order to produce turning effect, we need a force that is applied on an object at a sufficient distance from the point of its rotation. In addition, moment of a force depends directly upon the magnitude of the applied force as well as the distance between the point of application of force and point of rotation.

2. You would find it more difficult to close the door when your finger is placed near to the door hinge and easier to the same when your finger is placed away from the door hinge. The reason is, moment of a force or torque directly depends upon the distance between the point of application of force and point of rotation (in this case the door hinge).

**Lesson No:** 3 **Subject:** Physics **Class:** 9 – 10 **Time**: 45 minutes

Topic: Ohm's Law

1. State Ohm's law.
2. Explain ohm's law.
3. Solve word problem related to Ohm's law.

## Things you should know (Prerequisite knowledge)

Before exploring Ohm's laws, we must revisit the following concepts. **Electric current (I):** It is the measure of how much charges (or electrons) pass across any cross-section of a conductor in a certain given time.

Therefore;

$$\textit{Electric current}\ (I) = \frac{\textit{Charge}\ (Q)}{\textit{Time}\ (t)}$$

Or;

$$I = \frac{Q}{t}$$

It is measured in ampere (A).

1. **Potential difference or voltage (V)**: It is the difference between the concentrations of electrons (potential) across the two ends of the conductor. This difference help charges to move in the circuit. It is measured in volts (V).

2. **Resistance (R)**: It is the obstruction offered by the conductor to the flow of current in it. It is measured in Ohms (Ω).

## Ohm's Law

Ohm's law explains the behaviour of the flow of electric current through a conductor concerning the potential difference maintained across the terminals of the electric circuit. An electrical circuit is formed when a conductive path is created to allow the electric charge to continuously flow.

German scientist Georg Simon Ohm found out that the voltage and current in a circuit depend directly upon each other provided the circuit remained under same physical conditions.

Ohm's law states that the current flowing through any cross-section of the conductor is directly proportional to the potential difference applied across its ends provided physical conditions like temperature and pressure remain constant.

That is; using the proportionality sign, we have;

$\boldsymbol{Voltage\ (V) \propto Current\ (I)}$ Or; $\boldsymbol{V \propto I}$

This means as voltage increases current will also increase and vice-versa. In other words, voltage and current have a direct relationship.

Removing the proportionality sign, we have;

$\boldsymbol{V = IR}$

Here 'R', which is the resistance of the conductor, is the constant of proportionality.

Mr Ohm found out that the relationship between voltage and current is such that, the voltage is equal to the product of the current flowing through the conductor and the resistance offered by it.

The relation between voltage, current, and resistance is the consequence of Ohm's law.

From Ohm's law, we can define resistance as the ratio of the potential difference applied across its terminals to the electric current flowing through the conductor.

That is; $\boldsymbol{R = \frac{V}{I}}$

## Activity 1

1. Find the equivalent unit for Ohm using the above formula.
2. Design a formula triangle to help you memorize the formula.

Let us look at some of the numerical problems related to Ohm's law to understand the formula clearly.

**Example 1**: What is the voltage of an electric fan if it draws a current of $2A$ through a resistance of 50Ω.

**Solution**:

Given:

$I = 2A$

$R = 50\Omega$

We know; $V = IR$

We have; $V = 2 \times 50 = 100V$ Therefore, the voltage is $100V$.

**Example 2**:

An electric water boiler draws a current of $5A$ when a voltage of $230V$ is applied to it. Find the resistance of the water boiler.

**Solution**:

Given:

$I = 5A$

$V = 230A$

We know;

$R = \frac{V}{I}$

That is;

$$R = \frac{230}{5} = 46$$

Therefore, the resistance of the water boiler is $46\Omega$

## Summary

- Ohm's law states that the current flowing through any cross-section of the conductor is directly proportional to the potential difference applied across its ends provided physical condition like temperature and pressure remain constant.
- $V = IR$

## Self-check for Learning

1. A Laptop runs on a $24V$ battery. If it takes $1.5A$ of current to make it run, what is the resistance?
2. A toy car has $2A$ of current. If the car runs on four $1.5V$ batteries, what is the resistance?
3. Check out word problems in your textbook.

**Self-check for Learning**

1. $16\Omega$
2. $3\Omega$

**Lesson No:**1 **Subject:** Mathematics **Class:** 9 – 10 **Time**: 50 minutes

**Topic:** Matrices

1. Define a matrix.
2. Identify the types of matrices.
3. Add and subtract matrices.
4. Multiply matrices.

## Introduction

A **matrix** (plural **matrices**) is a rectangular **array** of items used to store and display information in rows and columns. The information can be numbers, shapes, expressions or other symbols.

**Matrices** are commonly written in box brackets. The horizontal and vertical lines of entries in a **matrix** are called rows and columns, respectively.

Did you know that we use the matrix in our daily life?

**Matrices** find many applications in scientific fields and apply to practical **real-life** problems as well, thus making an indispensable concept for solving many practical problems. Matrices are used in graphic software, in a study of electrical circuits, in robotic and automation etc.

An example of a matrix is shown below.

Matrix B

$$\begin{bmatrix} 4 & 3 & 1 & 0 \\ 7 & 3 & 1 & 8 \\ 5 & 9 & 1 & 4 \end{bmatrix} \quad \text{or} \quad B = \begin{bmatrix} 4 & 3 & 1 & 0 \\ 7 & 3 & 1 & 8 \\ 5 & 9 & 1 & 4 \end{bmatrix}$$

- Each item inside the matrix is called an **element.** The element that is in the 3rd row, 2nd column of Matrix B is 9. You can write (3, 2) as the **address** of the element.
- You should write the row number first and then the column number **(row x column)**.
- Open square brackets or box brackets **([ ])** are used on the left and right of the matrix.
- The size, or **dimensions**, of a matrix tells the number of rows and then the number of columns. Matrix B is a 3-by-4 matrix or $3 \times 4$ matrix since it is 3 rows by 4 columns. You read this as "B is a three-by-four matrix."
- A $3 \times 4$ matrix has different dimensions than a $4 \times 3$ matrix.

## Types of Matrices

1. **Row matrix**: A matrix with only one row is called a **row matrix.**

For example: $B = \begin{bmatrix} 1 & -2 & 4 \end{bmatrix}$

2. **Column matrix**: A matrix with only one column is called a **column matrix.**

For example: $D = \begin{bmatrix} 1 \\ 2 \\ -4 \end{bmatrix}$

3. **Zero/ Null matrix**: A matrix that has all its elements zero as zero is called a **zero/null matrix.**

For example: $N = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

4. **Square matrix**: A matrix with the same number of rows as columns is called a **square matrix**.

For example: $T = \begin{bmatrix} 4 & -1 \\ 5 & 0 \end{bmatrix}$ and $H = \begin{bmatrix} 7 & 8 & 2 \\ 3 & 4 & 1 \\ 0 & -1 & 0 \end{bmatrix}$

5. **Diagonal matrix**: A square matrix that has all the elements zero except for principal diagonal is called a **diagonal matrix.**

For example: $G = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

6. **Unit/ Identity matrix**: A diagonal matrix that has all the elements in principal diagonal as one is called a **unit/identity matrix.**

For example: $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

## Operation of Matrices - Addition and Subtraction of Matrices

You can add or subtract matrices that have numerical elements, but the matrices must have the same dimensions.

When you add or subtract matrices, you find the sum of, or difference between, the elements in the same positions in the matrices.

**For example:**

**2 + 10 = 12**

$$\begin{bmatrix} 2 & 1 & 0 \\ 4 & 3 & 2 \end{bmatrix} + \begin{bmatrix} 10 & 3 & 0.5 \\ -2 & 1 & -4 \end{bmatrix} = \begin{bmatrix} 12 & 4 & 0.5 \\ 2 & 4 & -2 \end{bmatrix}$$

**2 - 10 = 12**

$$\begin{bmatrix} 2 & 1 & 0 \\ 4 & 3 & 2 \end{bmatrix} - \begin{bmatrix} 10 & 3 & 0.5 \\ -2 & 1 & -4 \end{bmatrix} = \begin{bmatrix} -8 & -2 & -0.5 \\ 6 & 2 & 6 \end{bmatrix}$$

## Multiplying Matrices by a Scalar

You can multiply a matrix by a single value, called a **scalar.** To do this, you multiply each element in the matrix by that value.

**For example:** (The 2 × 2 matrix below is multiplied by the scalar 0.5)

$$\underset{\text{Scalar}}{0.5} \times \underset{\text{Matrix}}{\begin{bmatrix} 22 & 16 \\ 10 & 8 \end{bmatrix}} = \begin{bmatrix} 0.5 \times 22 & 0.5 \times 16 \\ 0.5 \times 10 & 0.5 \times 8 \end{bmatrix} = \begin{bmatrix} 11 & 8 \\ 5 & 4 \end{bmatrix}$$

## Multiplying Matrices

Two matrices can be multiplied if the number of columns in the first matrix equals the number of rows in the second matrix. When comparing dimensions of matrices to see if they can be multiplied, the two inner numbers must match.

**For example:**

Can Multiply

$$\begin{bmatrix} 2 \\ 4 \\ 3 \\ 5 \end{bmatrix}_{4\times 1} \text{ and } \begin{bmatrix} 1 & 2 & 5 \end{bmatrix}_{1\times 3}$$

**Same inner Number**

**Outer Number/Dimension of PM**

Cannot Multiply

$$\begin{bmatrix} 2 \\ 4 \\ 3 \\ 5 \end{bmatrix}_{4\times 1} \text{ and } \begin{bmatrix} 1 & 0 & 3 \\ 4 & 5 & 1 \end{bmatrix}_{2\times 3}$$

**Diff. inner Number**

**Outer Number**

You can multiply 4 × **1** and **1** × 3 matrices because the **inner number** is same, but we cannot multiply 4 × **1** and **2** × 3 matrices because the **inner number** doesn't match **(different inner number)**.

The dimensions of the **product matrix (PM)** are based on the number of rows in the first matrix and the number of columns in the second matrix.

**For example:**

From the above-given matrix, multiplying a **4** × 1 matrix by a 1 × **3** matrix results in a **4** × **3** matrix.

**Dimension of a product**

To multiply matrices, you multiply each element in a row of the first matrix by the corresponding element in a column of the second matrix and then add the products.

**For example:**

Suppose you have Matrix A and Matrix B below. You know you can multiply them since the number of columns in A matches the number of rows in B. You also know that the product matrix will be **3-by-3** because of **3**-by-2 × 2-by-**3** = **3-by-3**.

**Note:** Multiplication is carried out *row by column-wise*.

**Demonstration:**

Let's multiply Matrix A and Matrix B.

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}_{3\times 2} \quad and\ B = \begin{bmatrix} 7 & 8 & 9 \\ 10 & 11 & 12 \end{bmatrix}_{2\times 3}$$

**Same inner number**
**(Can multiply)**

**Solution:**

= A × B

$$= \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \times \begin{bmatrix} 7 & 8 & 9 \\ 10 & 11 & 12 \end{bmatrix}$$

$$= \begin{bmatrix} 1\times 7+2\times 10 & 1\times 8+2\times 11 & 1\times 9+2\times 12 \\ 3\times 7+4\times 10 & 3\times 8+4\times 11 & 3\times 9+4\times 12 \\ 5\times 7+6\times 10 & 5\times 8+6\times 11 & 5\times 9+6\times 12 \end{bmatrix}$$

$$= \begin{bmatrix} 7+20 & 8+22 & 9+24 \\ 21+40 & 24+44 & 27+48 \\ 35+60 & 40+66 & 45+72 \end{bmatrix}$$

$$= \begin{bmatrix} 27 & 30 & 33 \\ 61 & 68 & 75 \\ 95 & 106 & 117 \end{bmatrix}_{3\times 3}$$ **(Product Matrix Dimension)**

**(Product Matrix)**

## Activity

Complete the following questions.

1. Add or subtract these matrices.

a) $\begin{bmatrix} 9 & 0.3 & 4 \\ -2 & 5 & 0.8 \end{bmatrix} + \begin{bmatrix} -4 & 0.9 & 1.9 \\ 2 & -3 & 0.3 \end{bmatrix}$

b) $\begin{bmatrix} -8 & -4 \\ 7 & 0 \end{bmatrix} + \begin{bmatrix} 0.3 & -8 \\ -0.5 & 2 \end{bmatrix}$

c) $\begin{bmatrix} 8 & -11 \\ 1.9 & 3.2 \\ -8.4 & 6 \end{bmatrix} + \begin{bmatrix} -5 & 2.3 \\ -2 & 1.8 \\ 0.4 & -2.5 \end{bmatrix}$

2. Multiply.

a) $3 \times \begin{bmatrix} 2 & 0.4 \\ 0.8 & 1 \end{bmatrix}$

b) $\frac{2}{3} \times \begin{bmatrix} 24 & 16 \\ 10 & 15 \\ 9 & 31 \\ 18 & 21 \end{bmatrix}$

c) $0.6 \times \begin{bmatrix} 8 & 1.2 & 4 \\ 3.5 & 0.6 & 5 \end{bmatrix}$

d) $-3 \times \begin{bmatrix} -2 & -5 \\ 0.4 & 0.9 \end{bmatrix}$

3. Multiply all possible pairs of matrices given below.

$A = \begin{bmatrix} 2 & 0 \\ 3 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 1 & 3 \\ 0 & 4 & 1 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 1 & 1 \\ 2 & 0 & 1 \end{bmatrix}$ $D = \begin{bmatrix} 1 & 0 \\ 3 & 0 \\ 0 & 2 \end{bmatrix}$

4. Given Matrices A and B, calculate each.

$A = \begin{bmatrix} 2 & 0 & -3 \\ 9 & 1 & -2 \\ -3 & 2 & 8 \end{bmatrix}$ *and* $B = \begin{bmatrix} 0 & 1 & 2 \\ 2 & -1 & 0 \\ 1 & -3 & 5 \end{bmatrix}$

a) $2A + B$

b) $A - 2B$

c) $2A + 2B$

d) $B - 2A$

## Summary

- Matrix is a rectangular arrangement of items into rows and columns.
- There are several types of matrices.
- Elements, address, dimension, rows, and columns, box bracket or square brackets and matrix product is matrix terms.
- To add or subtract matrices, it must have numerical elements and same dimension.
- Multiplying a matrix by a single value is called a **scalar** and to do this, multiply each element in the matrix by that value.
- Two matrices can be multiplied if the number of columns in the first matrix equals the number of rows in the second matrix.
- When comparing dimensions of matrices to see if they can be multiplied, the two inner numbers must match.
- The result of multiplying two matrices is called a matrix product.

## Self-check for Learning

1. Define a matrix.
2. Name the types of matrices.
3. Add or subtract.

   a) $\begin{bmatrix} -9 & 3 & 4 \\ 2 & 5 & 8 \end{bmatrix} + \begin{bmatrix} 4 & 9 & 9 \\ 2 & 3 & 3 \end{bmatrix}$ b) $\begin{bmatrix} -8 & 11 \\ 1.9 & 3.2 \\ 8.4 & 6 \end{bmatrix} + \begin{bmatrix} 5 & -3 \\ 2 & -8 \\ 4 & -5 \end{bmatrix}$

4. Multiply.

   a) $0.5 \times \begin{bmatrix} 10 & 20 \\ 30 & 40 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 0 \\ 3 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 0 \\ 3 & 1 \end{bmatrix}$

## Self-check for Learning

1. A matrix is a rectangular array of items used to store and display information in rows and columns.
2. Row Matrix, Column Matrix, Zero/Null Matrix, Square Matrix, Diagonal Matrix, Unit/Identity Matrix
3. a) $\begin{bmatrix} -5 & 12 & 13 \\ 4 & 8 & 11 \end{bmatrix}$ b) $\begin{bmatrix} -3 & 8 \\ 3.0 & -4.8 \\ 12.4 & -1 \end{bmatrix}$
4. a) $\begin{bmatrix} 5 & 10 \\ 15 & 20 \end{bmatrix}$ b) $\begin{bmatrix} 4 & 0 \\ 9 & 1 \end{bmatrix}$

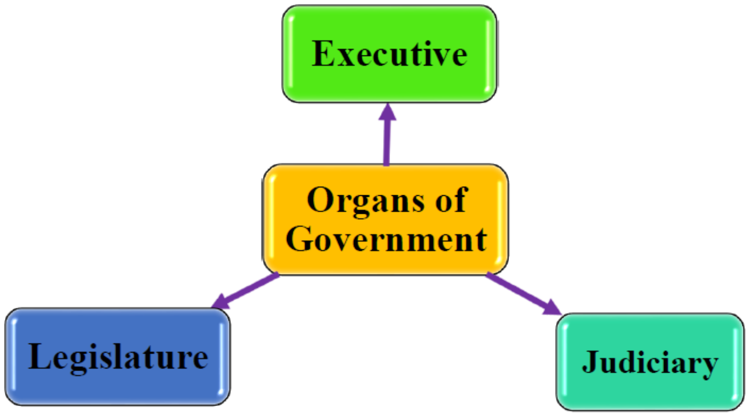
**Lesson No:** 1 **Subject:** History **Class:** 9 – 10 **Time:** 45 minutes

**Topic:** Bhutanese Government System

1. Explain the system of government.
2. Identify the three branches of government.
3. Describe the structure of legislature and executive.
4. Explain the main functions and power of legislature and executive.
5. Value the rights and responsibilities of citizens.
6. Define the term Interim Government.

## Introduction

Government is the organization that looks after the administration of a country. It is divided into three main branches: Legislative, Executive and Judiciary. We need to know about these three branches of government for a better understanding of how government functions. This lesson provides an insight into the system of our government, the structure and the main functions of all three branches of government.

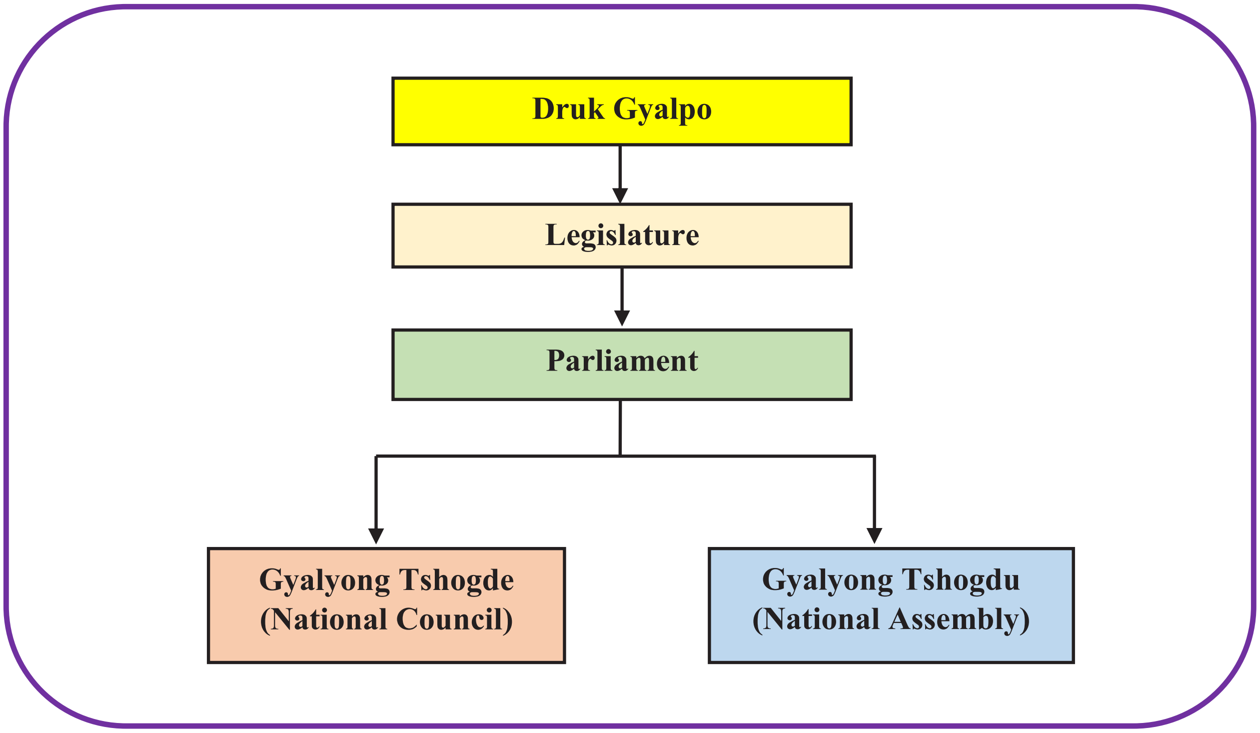


### Activity 1

1. Think of your family. Who makes important decisions in the family and how these decisions are made? Why is there a need for the family to make a decision?
2. How is the classroom rules prepared in your school? Explain the procedure.

## The Legislature

It is a deliberative organ of the government responsible for making and amending laws and policies. The legislature in Bhutan is bicameral with two houses- the Gyalyong Tshogde and the Gyalyong Tshogdu.




## The Relation between Two Houses in the Parliament

The Parliament of Bhutan consists of the Druk Gyalpo, the Gyalyong Tshogde (National Council) and the Gyalyong Tshogdu (National Assembly). The Gyalyong Tshogde consists of 25 members (20 members elected from 20 dzongkhags and 5 members eminent members appointed by the King). The Gyalyong Tshogdu comprises of 47 members elected from 47 constituencies. All the members of Parliament are required to take an Oath or Affirmation of Office before they assume their office.

As enshrined in the Constitution, Parliament is vested with all legislative powers. Parliament is mandated to ensure that the government safeguards the interest of the nation and fulfills the aspiration of the people through public review of policies and issues, Bills and other legislations and scrutiny of state functions. Although both houses are the bodies of Legislature, they have both similarities and differences in terms of their functions, power and features.

## Differences between Gyalyong Tshogde and Gyalyong Tshogdu

| | **Gyalyong Tshogde (National Council)** | **Gyalyong Tshogdu (National Assembly)** |
|---|---|---|
| Composition (Membership) | 25 members (20 members elected 20 dzongkhags and 5 members appointed by the King) | 47 members (Ruling and Opposition members combined) |
| Term of Office (Tenure) | 5 years<br>(No premature dissolution) | 5 years<br>(premature dissolution may take place) |
| Meeting presided by | Chairperson | Speaker |
| Roles | It has no authority to introduce money and financial Bills.<br>It cannot pass the vote of no-confidence against the government.<br>Members are apolitical (non-partisan). | Money and financial Bills can be originated only in this house.<br>It has the power to pass the vote of no-confidence against the government.<br>Members belong to political parties. |

### Activity 2

1. Think of some similarities between the Gyalyong Tshogde and the Gyalyong Tshogdu.
2. If you were to choose between the National Assembly and the National Council, which one would you choose and why?

## Powers and Functions of the Legislature

1. **Legislative Power:**

It is the main law-making body. It enacts new laws, amends and repels them as and when required.

2. **Financial Power:**

The legislature has control over the country's finances as all the expenses and collections in the forms of taxes and fees are made only with its approval.

3. **Control over Executive:**

The legislature has control over the executive as the *Lhengye Zhungtshog* is accountable to it. The budget prepared by the Lhengye Zhungtshog has to get the endorsement from the legislature. The executive can issue an executive order or circular or notifications as per the provisions of laws enacted by the legislature.

**4. Judicial Function:**

The legislature has the sole authority to impeach the Constitutional post holders on the ground of violation of laws with the concurrence of not less than two-thirds of the total members in the Parliament.

**5. Amending Power:**

The legislature has the power to amend the laws whenever necessary with the approval of the Druk Gyalpo.

**6. Passing of Bills:**

One of the important roles of the legislature is passing of the bills. The ordinary bills originate either from the National Assembly or the National Council, but the money and financial Bills can originate only in the National Assembly.

## The Executive

It is the branch of the government responsible for the implementation of laws and the execution of plans and policies. The two types of executives relevant to our system of government are as given below:

**(a) Hereditary Executive:**

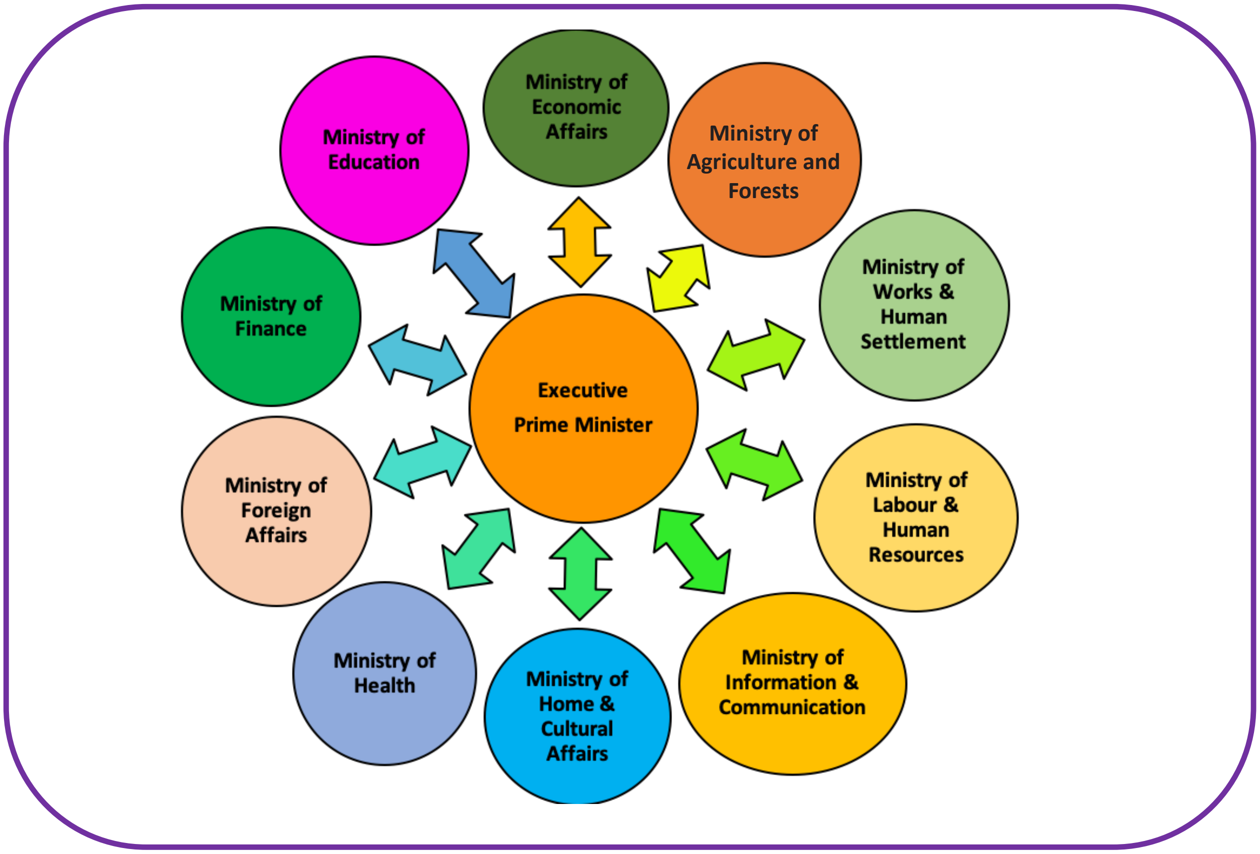
It is the executive where the head of the state is the King or the Queen. In this system the executive assumes office by the law of hereditary succession. After the demise of the King or the Queen, his or her heir apparent ascends to the throne. Britain, Japan and Bhutan are examples of this system.

**(b) Political or Temporary Executive:**

It is the system in which the chief executive such as President, Prime Minister or other minister is directly or indirectly elected by the people for a fixed period. They are called temporary executives because they can be removed after losing the election or on passing the vote of no-confidence by the legislature. Some of the countries having this system are India, the USA and Germany.

The executive power is exercised by the Lhengye Zhungtshog (Cabinet) consisting of the Ministers headed by the Prime Minister. As the highest executive body, it is responsible for the implementation of laws and government policies.

## The Lhengye Zhungtshog (Council of Ministers)




## Appointment of Cabinet Ministers

The Druk Gyalpo confers *Dakyen* to the Prime Minister who is usually the President of the political party that wins the majority seats in the Parliament. A person can hold the post of Prime Minister for two terms only. The Prime Minister recommends to the Druk Gyalpo the candidates for the post of Ministers from the ruling party. The Druk Gyalpo awards *Dakyen* and appoints Ministers for different ministries.

## Functions of the Lhengye Zhungtshog

1. **Administrative Function:** It is the responsibility of the Lhengye Zhungtshog to promote an efficient civil administration based on the democratic values and principles enshrined in the Constitution. Thus, the work of the government is divided and delegated to different Ministries headed by Ministers for an effective running of the country.
2. **Policy Formulation:** All the government policies are formulated, coordinated and implemented by the Lhengye Zhungtshog. It plans for the requisition of resources for the implementation of government plans and policies.
3. **Financial Function:**The Lhengye Zhungtshog prepares the budget and submits it to the legislature for its endorsement.

4. **Domestic and Foreign Policy:** The Lhengye Zhungtshog represents the country at home and in foreign countries. Following the Constitution, it assesses the affairs of the state arising from developments in the state and society and from events occurring at home and abroad.

### Activity 3

1. Think of all people with different responsibilities working in your school. Explain how these different people work together to make the administration and management of school more effective.
2. As a student, what privileges do you enjoy and what responsibilities do you shoulder?

## Interim Government

Interim Government refers to the temporary government formed after the dissolution of the government upon the completion of its five years tenure or after the dismissal of government through a vote of no-confidence by the National Assembly against the government.

The Interim Government, also known as the provisional government, consists of a Chief Advisor and other Advisors appointed by the Druk Gyalpo within fifteen days after the dissolution of the National Assembly. The Chief Justice of Bhutan is appointed as the Chief Advisor. As mandated by the Constitution of Bhutan (Article 19), it carries out the routine functions of the Government but it cannot take any policy decisions or enter into any agreement with foreign governments or organizations. It shall function for a period not exceeding ninety days.

### Summary

- Each branch of the government is independent of the others. They have their specific responsibilities and powers.
- They are equally important for an efficient and effective administration and management of the country.

### Self-check for Learning

1. Read the passage carefully from the Bhutan Civics text book given in Box 3.1.2 about Passing of Bills. Evaluate the process of law-making in the Parliament.
2. Explore and find the similarities between the legislature and the executive.
3. In your opinion, which of the two branches of government is the most important? Give any three reasons to justify your answer.

འཆར་གཞི་ཨང་ ༡ ཆོས་ཚན་ རྫོང་ཁ། སློབ་རིམ་ ༤-༡༠ དུས་ཚོད་ སྐར་མ་༤༥

## དོན་ཚན་ ཡི་གུའི་སྦྱོར་བ།

## ནང་དོན་ བྱེད་མེད་ལས་ཚིག་དང་སྣོན་ཚིག།

**ལས་དོན།**

- བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་ གོ་དོན་ལེགས་ཤོམ་འབད་ཧ་གོ་ཚུགས།
- བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་ དབྱེ་བ་དང་ དཔེར་བརྗོད་བྲི་སླབ་འབད་ཚུགས།
- བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་དཔེར་བརྗོད་བྲི་ནིའི་ རིག་པ་འཐོབ་ཚུགས།

## ངོ་སྤྲོད།

བརྡ་སྦྱོར་རྣམ་གཞག་ལས་ **བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག**་གཉིས་ཀྱི་སྐོར་ལས་ ལྷབ་ནི། དོན་ཚན་གཉིསཔ་འདི་ཡང་ རིག་གནས་བཅུའི་ནང་ལས་ སྨྲ་རིག་པའི་སྐབས་(བརྡ་སྤྲོད་རིག་པའམ)་ རྫོང་ཁའི་སྐབས་ཡི་གུ་སྦྱོར་བ་ལུ་གོ་ནི་ཨིན། **ཡི་གུ་སྦྱོར་བ་ཞེས་པའི་དགོས་པ་ཡང་** སྨྲ་ཚད་བཟོ་ནང་དོན་དང་། །སྔན་ངག་མངོན་བརྗོད་སྡེབ་སྦྱོར་རྩིས། །བློས་གར་བཅས་ཏེ་བཅུ་པོ་དག །ཤེས་ན་མཁས་པའི་གོ་སར་བསྐྱེགས། །ཟེར་བཤད་དེ་ཡོདཔ་ཨིན།

### ༡༽ བྱེད་མེད་ལས་ཚིག་གི་གོ་དོན།

བྱེད་མེད་ལས་ཚིག་ཟེར་མི་འདི་ བྱེད་པ་པོ་གིས་འབད་ཚར་བའི་ ལཱ་ཤུལ་ཅིག་ཨིན་རུང་ ཡང་ཅིན་ བྱེད་པ་པོ་མེད་པར་ རང་བཞིན་ཤུགས་ཀྱིས་འབད་དེ་ ཐོན་སོ་པའི་ལཱ་ཅིག་ཨིན་རུང་ ད་ལྟོ་བྱེད་པ་པོ་མེད་པར་ རང་བཞིན་གྱིས་ འབད་འགྱོ་བའི་ ལཱ་ཅིག་སྟོན་མི་ལུ་ བྱེད་མེད་ལས་ཚིག་ཟེར་སླབ་ཨིན། བྱེད་མེད་ལས་ཚིག་ཟེར་མི་འདི་ བྱ་བའི་ལཱ་ཅིག་སྟོན་པའི་ཚིག་ཅིག་བྲི་དགོཔ་ད་ ལཱ་འདི་འབད་མི་གི་བྱེད་པ་པོ་ཅིག་ དོན་ལུ་ཡོད་དེ་ར་འབད་རུང་ བྱེད་པ་པོ་དངོས་སུ་ཡོདཔ་ ཚིག་གིས་མ་སྟོན་མི་ཅིག་ལུ་ བྱེད་མེད་ལས་ཚིག་ཟེར་སླབ་ཨིན།

**དཔེར་ན།**

༡༽ མེ་ཤི། ༢༽ ཆུ་ཆད། ༣༽ ས་ཁར་འགྱེལ། ༤༽ དོན་འགྲུབ། ༥༽ ས་ཁར་བུད།

## བྱེད་མེད་ལས་ཚིག་གི་དབྱེ་བ།

༡། དུས་གསུམ་ལུ་ ཡིག་སྡེབ་སོ་སོར་ཡོད་མི་ བྱེད་མེད་ལས་ཚིག།

༢། དུས་གསུམ་ལུ་ ཡིག་སྡེབ་སོ་སོར་མེད་མི་ བྱེད་མེད་ལས་ཚིག།

## དུས་གསུམ།

༡། དུས་མ་འོངས་པ། ༢། དུས་ད་ལྟ་བ། ༣། དུས་འདས་པ།

### ༡། དུས་གསུམ་ལུ་ ཡིག་སྡེབ་སོ་སོར་ཡོད་མི་ བྱེད་མེད་ལས་ཚིག། དཔེར་ན།

| བྱ་བའི་ལྷ། | མ་འོངས་པ། | ད་ལྟ་བ། | འདས་པ། |
|---|---|---|---|
| དུས་ | འགྱུར། | འགྱུར། | གྱུར། |
| ཕྱི་ཁར་ | འཐོན། | འཐོན། | ཐོན། |
| དཔོན་ | འབྱོན། | འབྱོན། | བྱོན། |
| ལྷུག་གུ་དང་ཨ་ལོ་ཚུ་ | སྐྱེ་ | སྐྱེ་ | སྐྱེས |
| ཁེ་སང་ | འཐོབ། | འཐོབ། | ཐོབ། |

### བྱ་ཚིག་ ཚིག་གྲོགས།

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ཅི། | ཡི། | ནུག། | དོ། | དེས། | ནི། | འོང་། | གེ། |

### དུས་གསུམ་ལུ་ བྱ་ཚིག་ ཚིག་གྲོགས་འཇུག་ཚུལ།

| འདས་པ། | ད་ལྟ་བ། | མ་འོངས་པ། |
|---|---|---|
| ཅི། ཡི། ནུག། | དོ། དེས། | ནི། འོང་། གེ། |

### ༢། དུས་གསུམ་ལུ་ ཡིག་སྡེབ་སོ་སོར་མེད་མི་ བྱེད་མེད་ལས་ཚིག། དཔེར་ན།

| བྱ་བའི་ཡུལ། | མ་འོངས་པ། | ད་ལྟ་བ། | འདས་པ། |
|---|---|---|---|
| གཡུས་ཁར་ | ལྡོད་འོང་། | ལྡོད་དོ། | ལྡོད་ཅི། |
| ཆུ་ | གང་འོང་། | གང་དོ། | གང་ཡི། |
| ཐུགས་ | དགྱེས་འོང་། | དགྱེས་དོ། | དགྱེས་ཡི། |
| སེམས་ | དགའ་འོང་། | དགའ་དོ། | དགའ་ཡི། |
| ཁ་ | བགའ་འོང་། | བགའ་འོང་། | བགའ་ཡི། |
| ཡོན་ཏན་ | ཤེས་འོང་། | ཤེས་དོ། | ཤེས |

## ༢༽ སྔོན་ཚིག་གི་གོ་དོན།

སྔོན་ཚིག་ཟེར་མི་འདི་ དོན་ག་ཅི་ར་འབད་རུང་ འཐོབ་བཅུག། འོང་བཅུག། འགྲུབ་བཅུག། འགྲུབ་པར་ཤོག། འཐོབ་པར་ཤོག། ཟེར་བའི་སྔོན་ལམ་བཏབ་པའི་ཚིག་ལུ་ སྔོན་ཚིག་ཟེར་སླབ་ཨིན། སྔོན་ཚིག་ཟེར་མི་འདི་ དོན་ག་ཅི་རང་འབད་རུང་ སེམས་ཀྱིས་ སྔོན་ལམ་བཏབ་ནི་དང་ འོང་བཅུག་ཟེར་བའི་ ཡིད་སྨོན་གྱི་ཚིག་ལུ་ སྔོན་ཚིག་ཟེར་སླབ་ཨིན།

### དཔེར་ན།

༡༽ དཔེ་ཆ་ཤེས་བཅུག།

༢༽ ལེགས་ཤོམ་འབྱུང་བཅུག།

༣༽ སྐྱིད་པའི་ཉིམ་ཤར་བར་ཤོག།

### སྔོན་ཚིག་གི་དབྱེ་བ།

༡༽ བཟང་སེམས་ཀྱི་རེ་སྨོན།

༢༽ ངན་སེམས་ཀྱི་དམོད་ཚིག།

### སྔོན་ཚིག་དང་ དམོད་ཚིག་གི་དཔེར་བརྗོད།

### དཔེར་ན།

| གཞི་ཚིག། | སྔོན་ཚིག། | དམོད་ཚིག། |
|---|---|---|
| སྐྱེ་ | ཞིང་ཁམས་ལུ་སྐྱེ་བཅུག། | དམྱལ་བར་སྐྱེ་བཅུག་ཅིག། |
| འཐོབ་ | འཐོབ་པར་ཤོག། | འཐོབ་མ་བཅུག་ཅིག། |
| གནོད་ | ག་ལུ་ཡང་གནོད་མ་བཅུག་ཞིག། | མི་ལུ་གནོད་བཅུག་ཅིག། |
| འཁྲུལ་ | སེམས་འཁྲུལ་མ་བཅུག། | སེམས་འཁྲུལ་བཅུག་ཅིག། |
| དཀྲིས་ | ཕ་མའི་ཐུགས་དཀྲིས་བཅུག། | ཕ་མའི་ཐུགས་བཀྲིས་མ་བཅུག་ཅིག། |

## སྦྱོང་ལཱ།

| སྦྱོང་ལཱ་བཅད་ཐིག་༡ པ། | སྦྱོང་ལཱ་བཅད་ཐིག་༢ པ། |
|---|---|
| སྦྱོང་ལཱའི་བཀོད་བྱ།<br><br>༡༽ སྦྱོང་ལཱ་རྩ་རང་སོའི་འབྲི་དེབ་ནང་ལུ་ བྲི་ནི། | ༡༽ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་གོ་དོན།<br>༢༽ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་དབྱེ་བ།<br>༣༽ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་ དཔེར་བརྗོད།<br>༤༽ སྣོན་ཚིག་ལག་ལེན་འཐབ་སྟེ་ རྩོམ་ཚིགས་བཅད་ཅིག་བརྩམ།<br>༥༽ དམོད་ཚིག་ལག་ལེན་འཐབ་སྟེ་ བློ་ཚིག་ཅིག་བྲི། |

## བཅུད་བསྡུས།

ཡི་གུ་སྦྱོར་བའི་དོན་ཚན་ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་གོ་དོན་དང་ དབྱེ་བ་ དེ་ལས་ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་དཔེར་བརྗོད་འབྲི་ཐངས་ཚུ་ སློབ་དེབ་དཔེ་སློབ་འབད་ནི། དེ་ལས་ ཁྱེད་**སློབ་རིམ་དགུ་**པའི་སློབ་ཕྲུག་ཚུ་ ཨིན་པ་ཅིན་ **ཇོང་ཁ་༡ པའི་ སློབ་དེབ་ནང་ ཤོག་གྲངས་༣༥ ལས་ ༣༨ ཚུན་**དང་ **སློབ་རིམ་བཅུ་པའི་སློབ་ཕྲུག་ཚུ་** ཨིན་པ་ཅིན་ **ཤོག་གྲངས་༡༥ ལས་ ༣༠ ཚུན་** ག་དེ་དྲག་དྲག་ལྷག་སྟེ་ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་གི་དབྱེ་བ་རེ་རེ་བཞིན་དུ་གི་ དཔེར་བརྗོད་ཅུང་ཤོས་ར་ ལཱ་རེ་བྲི་སྟེ་ ཁྱེད་རའི་ཆ་རོགས་དྲག་ཤོས་ཡང་ན་ ཆོས་ཚན་སློབ་དཔོན་དང་གཅིག་ཁར་གྲོས་མཐུན་འབད་ནི་ལུ་བལྟ་གནང་ཟེར་ཞུ་ནི་ཨིན།

## རང་ཉིད་ལྷབ་སྦྱང་ དབྱེ་ཞིབ།

༡༽ ཡི་གུ་སྦྱོར་བ་ལྷབ་སྦྱང་ལས་བརྟེན་པའི་ ཕན་ཐོགས་ཚུ་ ག་ཅི་ར་ཡོདཔ་སྨོ? གནད་དོན་ལྔ་ཐོ་ བཀོད་ནི།

༢༽ བྱེད་མེད་ལས་ཚིག་དང་ སྣོན་ཚིག་དོན་ཚན་གཉིས་ཀྱིས་ མི་ཚེ་གནས་སྐངས་ཀྱི་ལཱ་གཡོག་ནང་ལུ་ ཕན་ཐོགས་འོང་ག? ག་དེ་སྦེ? འོས་འབབ་ཡོད་པའི་དཔེ་ལྔ་བྲི།