

Confusing the Wind

Learning Portfolio

Name: _____

Class: _____

School: _____

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School of Science and Technology
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Laboratory Safety

For safety reasons, students must read the following rules and regulations prior to enter the laboratory and follow them through inside the laboratory:

- (1) No eating or drinking in the laboratory
- (2) Always wear long trousers or dresses, and shoes with full coverage of toes and feet. No shorts or sandals.
- (3) Tie your hair if it is too long.
- (4) Wear your basic personal protective equipment (PPE) including a lab coat, and latex or nitrile gloves before handling any chemical or biological sample.
- (5) Wear additional PPE such as goggles as instructed by laboratory staff.
- (6) Do not touch any of your personal belongings, such as a worksheet, mobile phones, or electronic devices when wearing your gloves.
- (7) Wash your hands thoroughly after taking off your gloves or before leaving the laboratory.
- (8) Keep the lab bench clean and tidy. No personal belongings should be placed on the bench.
- (9) Dispose all solid waste in the designated container.
- (10) Discard all liquid biological wastes in 1:99 diluted bleach.
- (11) Discard syringe, sharp glasses, or broken glassware in a sharp box.
- (12) Do not leave any fire unattended.
- (13) Consult laboratory staff when in doubt.
- (14) Locate the Emergency Exits, evacuation path, and fire extinguishing devices.
- (15) Notify laboratory staff **IMMEDIATELY** in case of accidents or emergencies.

Handwashing is one of the most important and effective ways to avoid possible contact of infectious diseases. Students are required to follow the handwashing procedures recommended by the Centre for Health Protection, Department of Health, HKSAR as shown below:

- (1) Wet hands under running water.
- (2) Apply liquid soap and rub hands together to make a soapy lather.
- (3) Away from the running water, rub the palms, back of hands, between fingers, back of fingers, thumbs, fingertips and wrists. Do this for at least **20 seconds**.
- (4) Rinse hands thoroughly under running water.
- (5) Dry hands thoroughly with a clean cotton towel, a paper towel, or a hand dryer. Dispose paper towel properly.
- (6) The cleaned hands should not touch the water tap directly again.

- (7) Turn off the tap after splashing water to clean the faucet; or using the paper towel to wrap the faucet.



Source: Centre for Health Protection, Department of Health, HKSAR Government (2020). Perform Hand Hygiene Properly.

Unit 1 – Paper Airplane Design

1. Project Overview

You are invited to design a paper airplane that travels the furthest and has the longest flight time. You are given three sheets of A4 paper and a paper airplane launcher. You can design the paper airplane in any methods you want and you can choose the launching force and the launching angle for your flying test. You have a maximum of three trials of the flying test. Your improvement and the best fly test result will be used for your assessment.

2. Scope of the Project

- Design a paper airplane that able to hit the target landing spot
- Each student has three trials of flying test with their paper airplanes
- Students must record the design parameter of the paper airplane and launching data
- The final flying test result shall be better than the first flying test result

3. Learning Objectives

- Explain the concept of the engineering design process
- Apply the basic geometry to solve authentic problems
- Identify the type of force acting on a moving object
- To organise data for interpretation and evaluation

4. Procedures

- Task 1: Design the paper airplane based on the demonstration conducted by the teachers
- Task 2: Draw the free-body diagram of the paper airplane in the flying position
- Task 3: Record the design parameter and test result
- Task 4: Write down the observation
- Task 5: Fine-tune the design with scientific supporting
- Task 6: Test the Paper Airplane and record the test result

5. Equipment and Material

- (a) 1 book of learning portfolio for each student
- (b) 3 sheets of A4 paper for each student
- (c) 3 sets of paper airplane launcher
- (d) 3 sets of force sensor
- (e) 3 sets of A4 writing board for test record
- (f) 5 sets of measuring tap
- (g) 1 set of iPad for students to do research

6. Record your notes/research here:

Please write down the design process according to each task in the following column:

Task 1: Design the Paper Airplane based on the demonstration conducted by the teachers

Please review the flying performance to brainstorm the paper airplane design

Trial no.:	Observations:	Hypotheses:

Please write down the key design parameters and draw your design in the following:



Task 2: Draw the free-body diagram in flying position

Please draw the free-body diagram of your design in the flying position

Steps for drawing the free-body diagram	Free-body diagram
<ol style="list-style-type: none">1. Draw the object at the center of the space. (Bottom of the space should be earth)2. Draw the forces one by one using arrows pointing to the direction of the force3. Label the forces properly	

Task 3: Record the design parameter and test result

Please record the parameters of your paper airplane, launching data and the flying test result in the following table:

	Paper airplane design parameter					Launchin g data	Result	
Trial no.	Length (cm)	Width (cm)	Length / Width	Upper mass (g)	Lower mass (g)	Launchin g angle (°)	Flight distance (cm)	Flight time (sec)

Task 4: Write down the observation

Please write down your observations and design factor of your first set of flying test

Task 5: Fine-tune the design with scientific supporting

Please draw your design in the following column based on the previous design factors

Task 6: Test the Paper Airplane and record the test result

[illegible]

Conclusion:

Please kindly write down the take-away of the workshop:

Teacher initials _____

Please fill in the box on the right to reflect on what you learned over the lesson

Teacher's feedback:	Summarise what you learned

Unit 2 – Go against the Wind

1. Purpose

To use the basic engineering design process for designing a rocket car for drag force as Professional Engineers

2. Introduction

In this unit, students will continue their engineers' status in the company. Recently, the boss is not happy about the design of a vehicle and asks them to develop a better one that will reduce the effect of the wing force.

3. Objectives

By applying the concept of the engineering design process and the concept of aerodynamics, this unit introduce students to

- build a prototype of a rocket car,
- calculate the drag force formula's variables,
- conduct the drag force testing using the wind tunnel testing system, and
- record and report the testing results.

4. Scope

- Set a basic engineering design process plan for the group
- Each student design his/her rocket car that yields a low drag coefficient
- Conduct calculation on the drag force formula's variables
- Use the wind tunnel testing system to test and retest his/her rocket car (3 trials maximum)
- Interpret the drag coefficient of their rocket car based on the testing result of the wind tunnel testing
- All the design parameters and the corresponding testing data must be recorded in the Student Worksheet below
- The best test result and the corresponding records would need to be submitted afterwards

5. Equipment and Materials

- (a) Wind Tunnel Testing system (shared)
- (b) Foam block for each student
- (c) Rocket cars' accessory, including 4 sets of wheels, 2 sets of pins, etc. for each student
- (d) Sandpaper with different grit sizes
- (e) Computer for background searching, if required

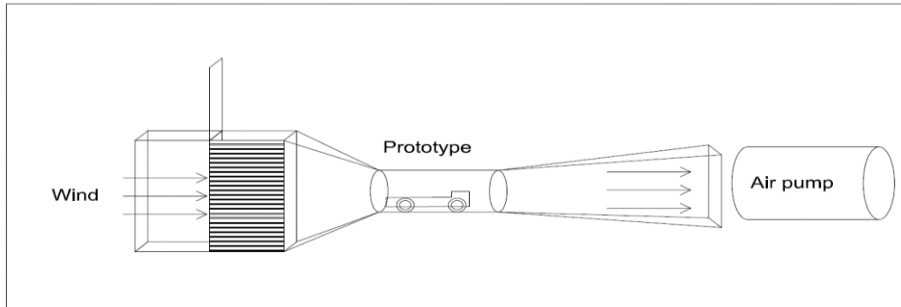
Confusing the Wind

Unit 2 – Go against the Wind

Student Worksheet

- (1) Go through the following information about the Wing Force, Drag Force Equation and its variables, Wind Tunnel Testing System, etc.

Wind Tunnel Testing System



$$F_D = C_D A \frac{\rho V^2}{2}$$

where

F_D is the drag force

C_D is the drag coefficient

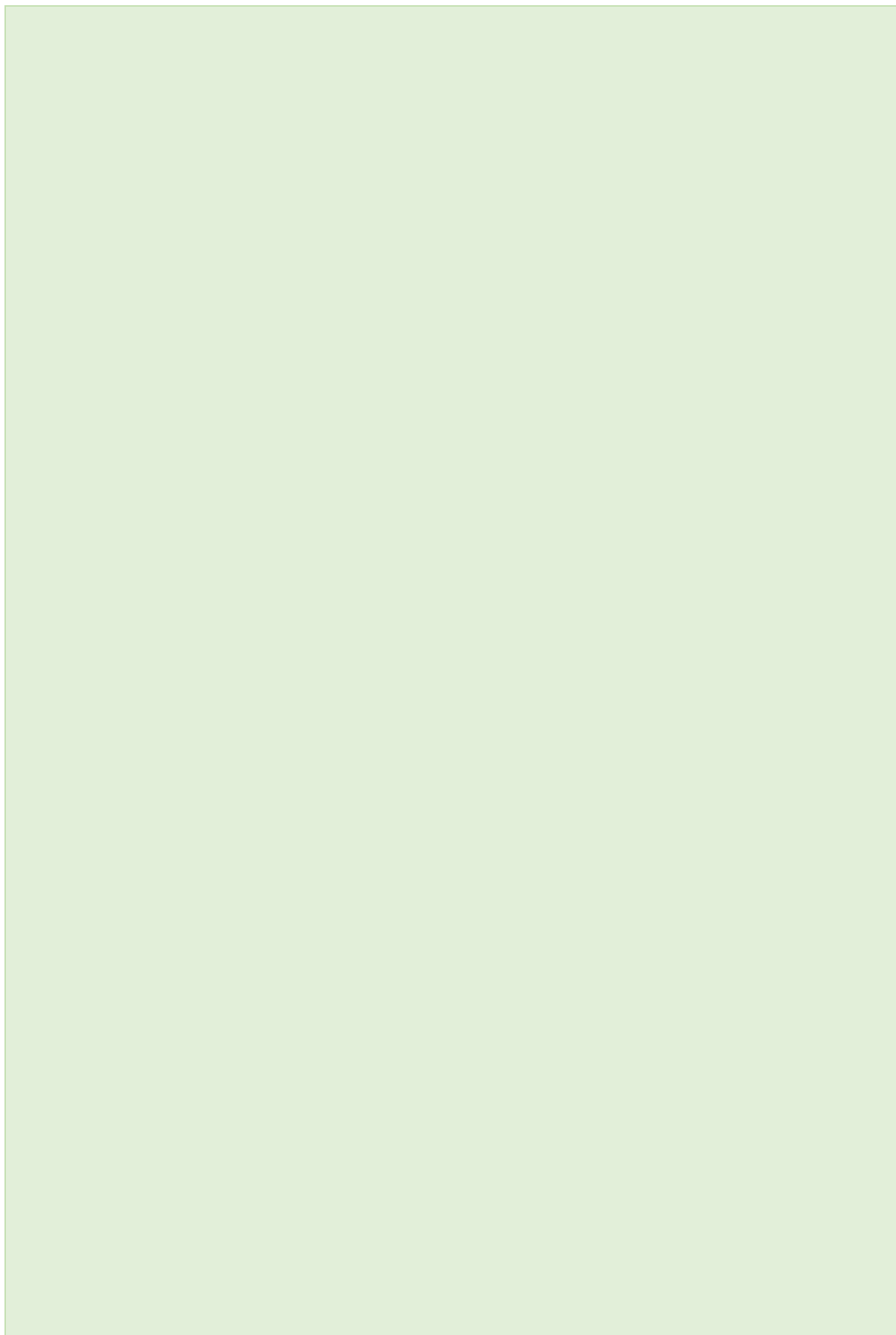
A is the reference area

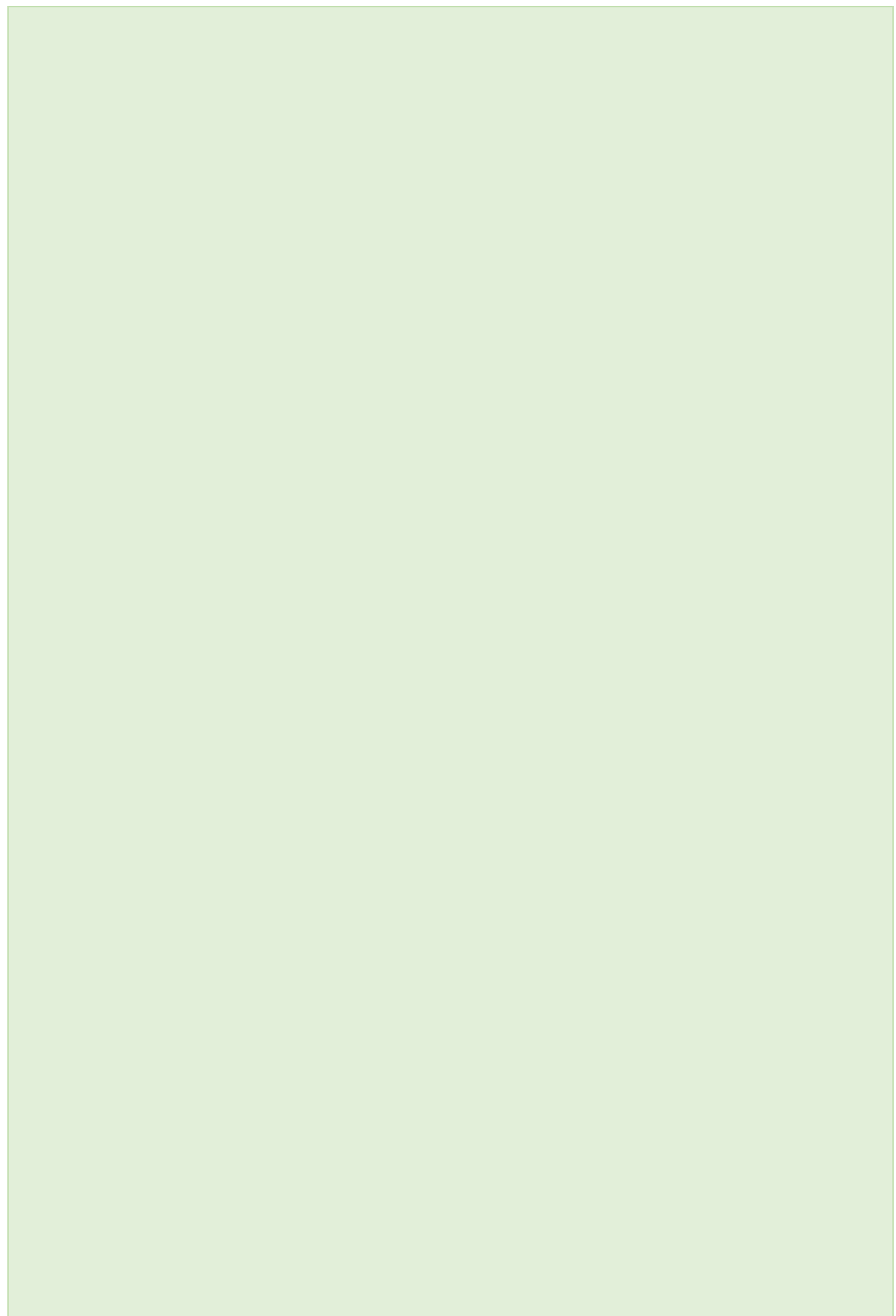
ρ is the density of the fluid

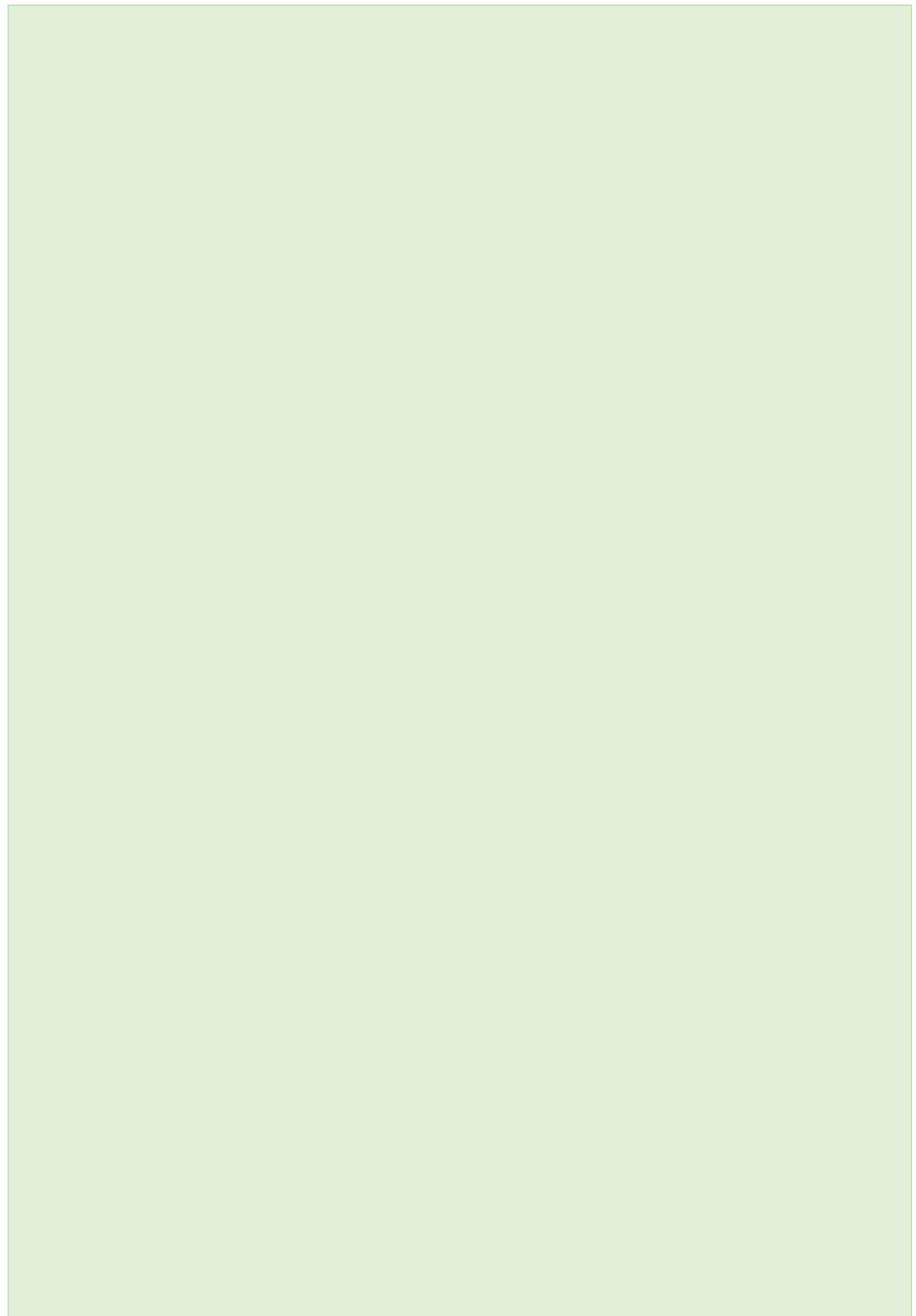
V is the flow velocity relative to the object

- (2) Based on the basic engineering design process, work with your group to prepare your own engineering design process plan for the design of a rocket car, e.g. first define the engineering problem and brainstorm possible solutions, etc.?
- (3) What is your desired outcome(s) for this activity?
- (4) Carry out the activity, e.g. fabricate a rocket car and calculate variables
- (5) Test the prototype using the Wind Tunnel Testing System
- (6) Design a record table to keep track of the testing data like what Professional Engineers do
- (7) Fine-tune the design of the prototype, etc., and do the test again until reaching the desired outcome.
- (8) Do the results agree with your predictions?
- (9) How do your results compare with other group members?
- (10) What conclusions could you draw from your data?
- (11) What is/are some of the important design criteria and constraints identified during the problem defining, designing, testing, and presenting result processes?
- (12) Summarise what you learned, e.g. what did you learn? what worked well? what was the most challenging aspect of this project? what will you do differently next time?

My Work:

A large, empty light green rectangular box with a thin black border, intended for a student to show their work.





Unit 3 – Pitching Day

1. Purpose

To use MS PowerPoint to communicate the testing results and recommendations from Unit 1 and 2 as Professional Engineers

2. Introduction

In this last unit, students will continue their engineers' status in the company. The customer has finally scheduled to come for a meeting with your boss for giving a big deal on the production of airplane and vehicle. You are assigned to do a 10 minutes presentation at the meeting to brief the customer on what has been tested and recommended as a Professional Engineer.

3. Objectives

This unit emphasises the last part of the basic engineering design process, “Communicate the Result” where students would learn how to effectively use MS PowerPoint and MS Excel to communicate the work and data.

4. Scope

- Design a 10-minute presentation to show the work and testing result of Unit 1 and 2 using MS PowerPoint
- One student from each group would be randomly selected to present his/her work in class
- The MS PowerPoint slideshow and this learning portfolio would need to be submitted afterwards

5. Equipment and Materials

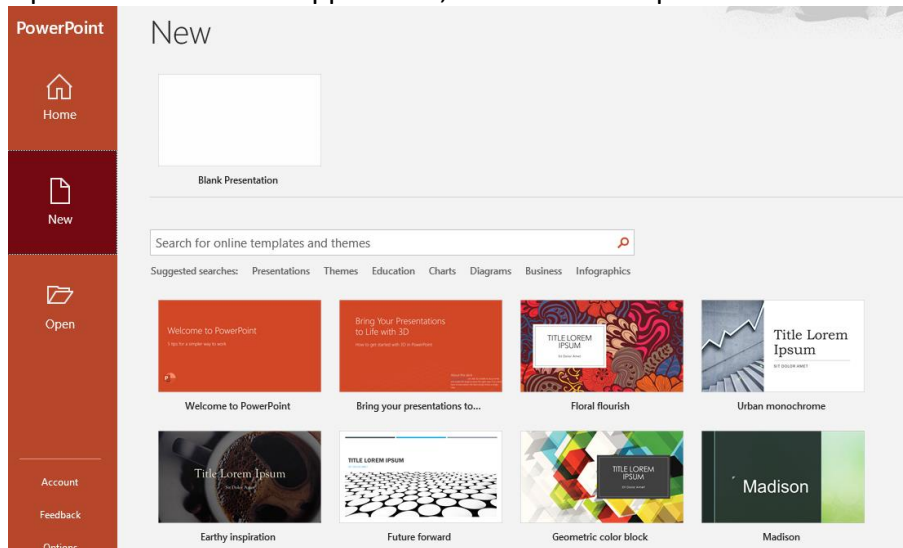
- Computer with MS Office application for each student
- Statistical graphs for Unit 1 and Unit 2 from each student

6. Tips for a Successful PowerPoint Slideshow

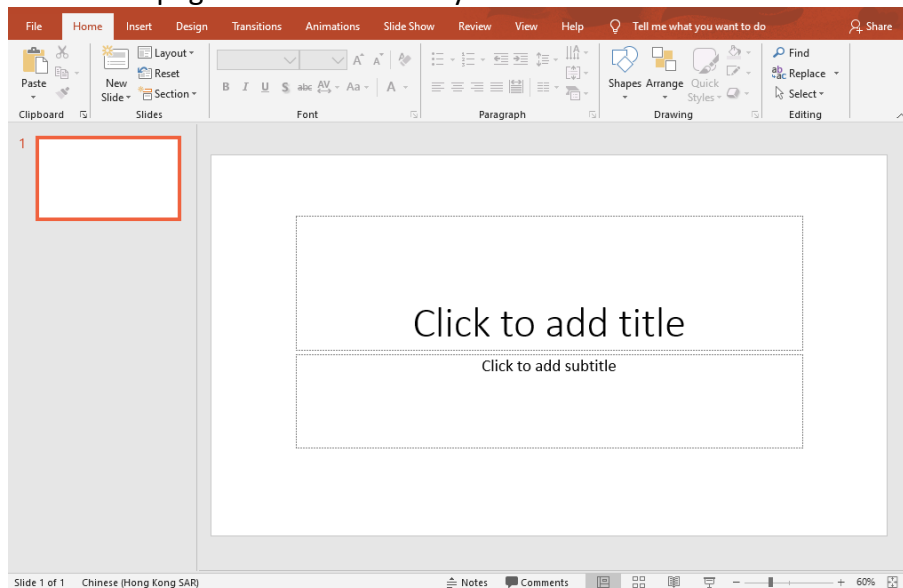
- (a) Define the target audience
- (b) Plan and organise presentation content
- (c) Put the message in point form, precisely and concisely
- (d) Maintain consistency, including font type, color tone, background, etc.
- (e) Keep it simple. Use key phrases and keywords
- (f) Easy to read. Use graphic, charts, and tables to illustrate your ideas when necessary; do not overuse special effect and animated

7. Create your PowerPoint

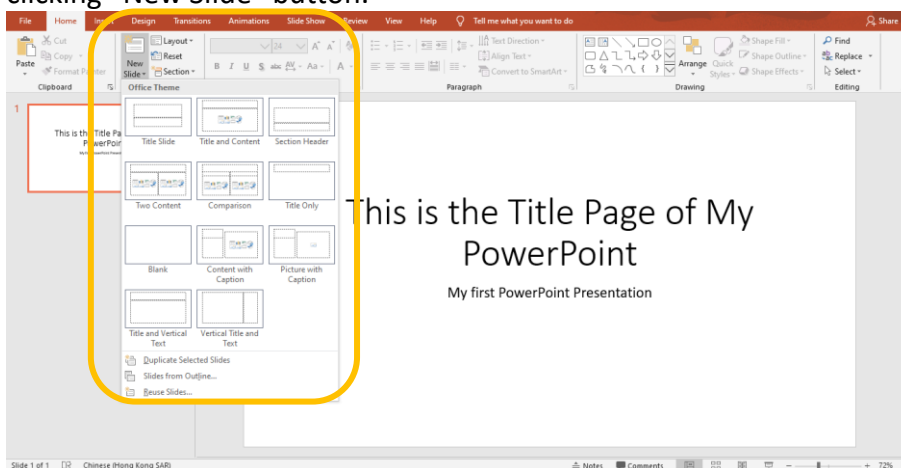
(a) Open the PowerPoint application, choose a blank presentation or a slide template.



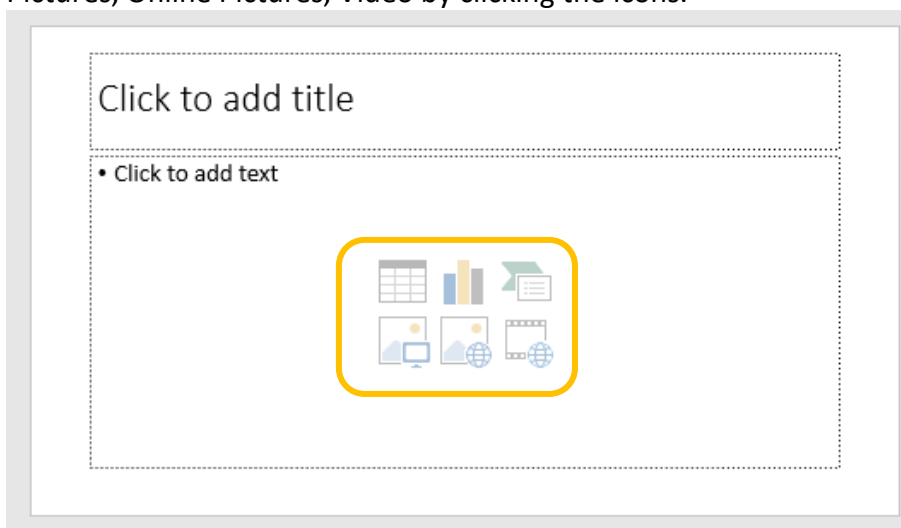
(b) A new title page will be selected by default.



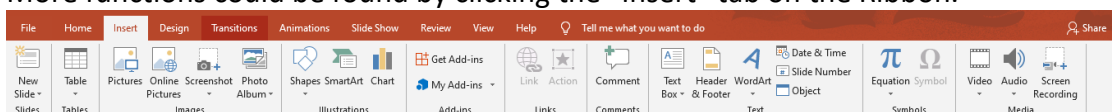
- (c) To insert a new slide, click “New Slide”. Select an appropriate page layout to fit your content. A new page with “Title and Content” layout will be selected by default when clicking “New Slide” button.



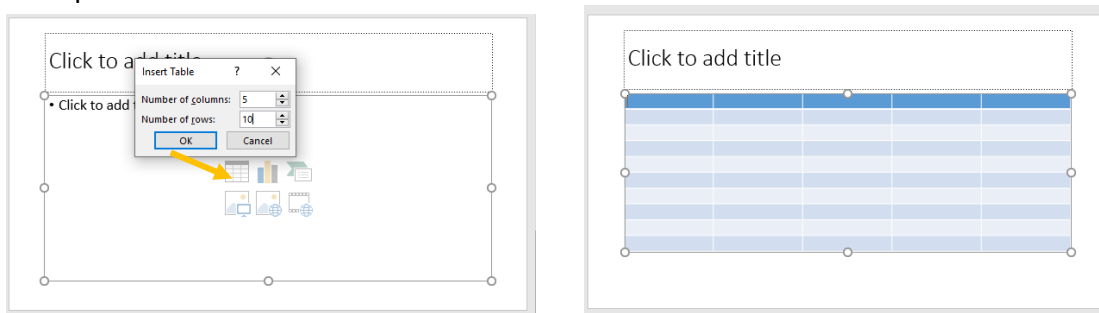
- (d) Input the page title and content. You could also insert Table, Chart, SmartArt Graphic, Pictures, Online Pictures, Video by clicking the icons.




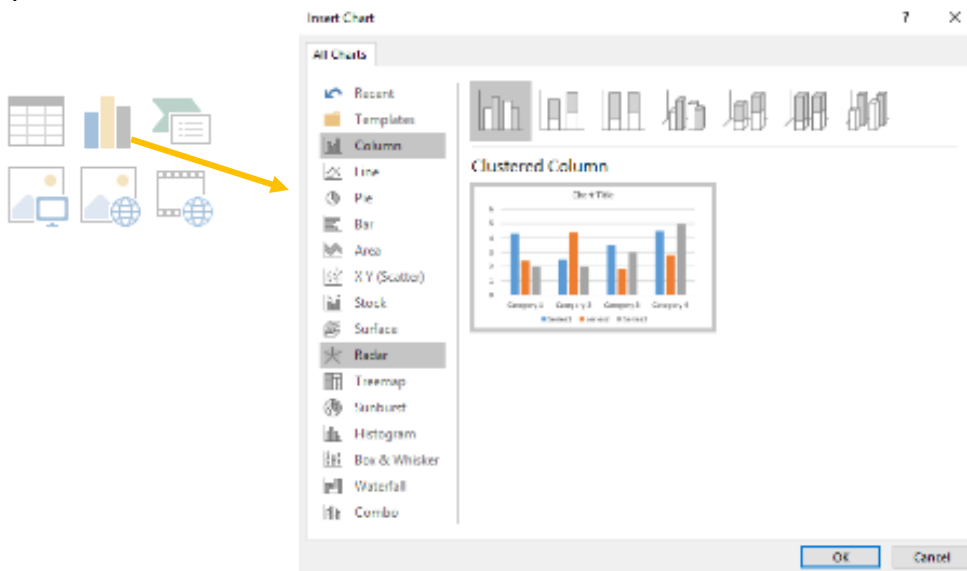
More functions could be found by clicking the “Insert” tab on the Ribbon.




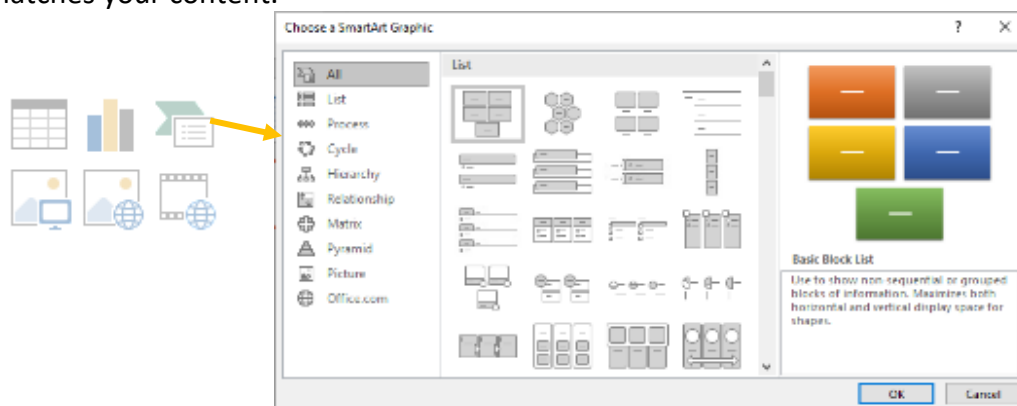
- (e) When you click the “Insert Table”  icon, input the number of columns and rows then press “OK”. A table will be created.





- (f) When you click “Insert Chart”  icon, different formats of charts will be available for your selection.

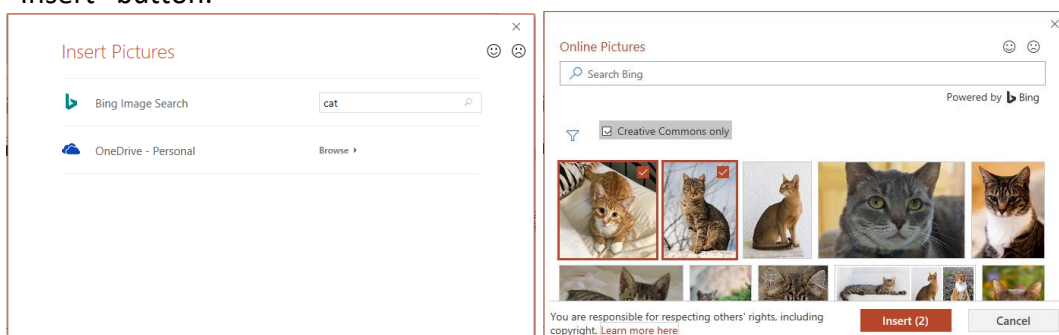



- (g) SmartArt Graphic is an easy and effective way to make a visual presentation of your information. Just click the “SmartArt Graphic”  icon and choose the format that matches your content.

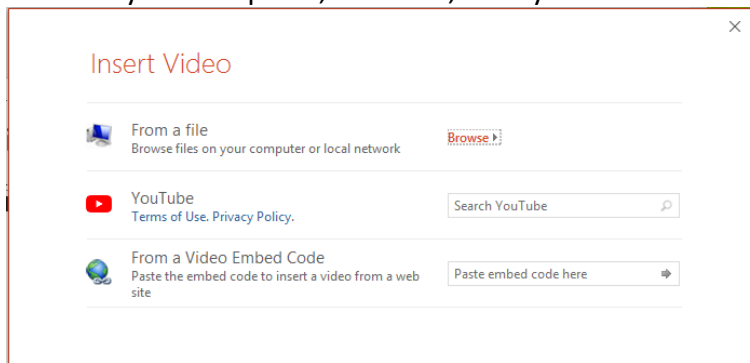


- (h) To add pictures into your slide, click the “Pictures”  icon and select the image file stored in your computer.

If you would like to add an online picture, you may click the “Online Pictures”  icon, input the keyword for images search. Select the picture(s) you preferred and click the “Insert” button.



- (i) To insert a video in your slide, click the “Insert Video”  icon, you may choose a video file from your computer, YouTube, or any other online sources.

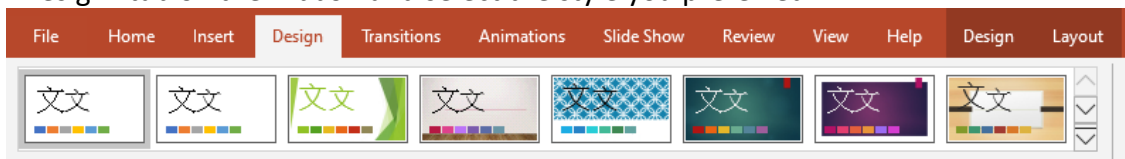


- (j) After the PowerPoint file is created, to save it, click the “Save” icon on the top left corner.

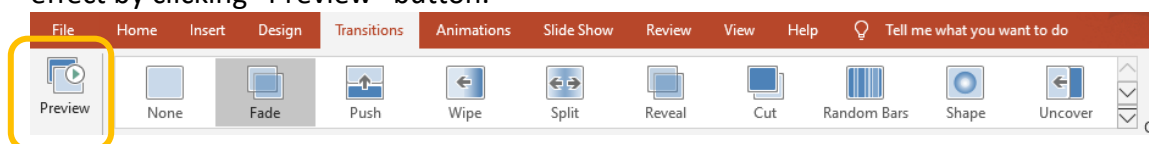
You may select “File”, “Save As” to choose the destination where you would like to keep the file, input the file name, then press “Save”.



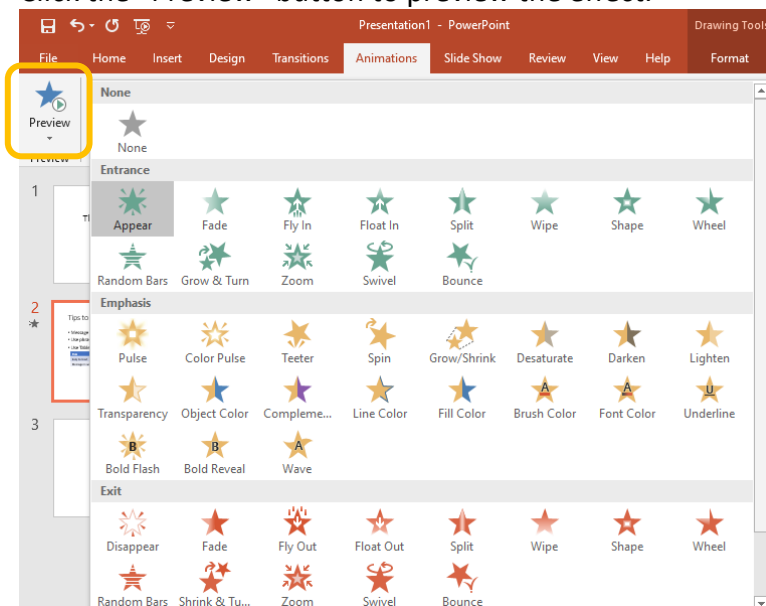
- (k) You may change your slide show design anytime by using different templates. Click “Design” tab on the Ribbon and select the style you preferred.



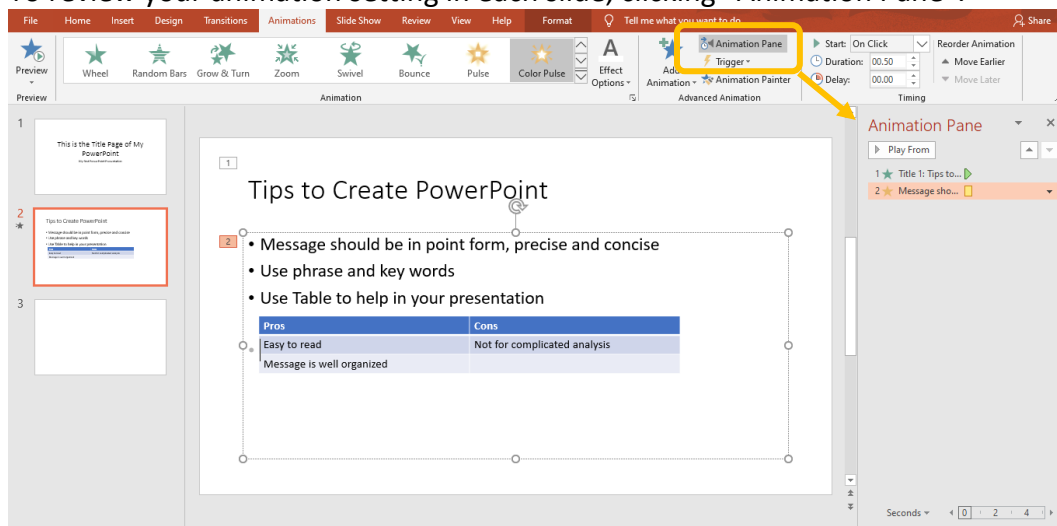
- (l) You could add the transition effect from one slide to another slide. Click the “Transitions” tab on the Ribbon, select the effect you preferred. You could preview the effect by clicking “Preview” button.



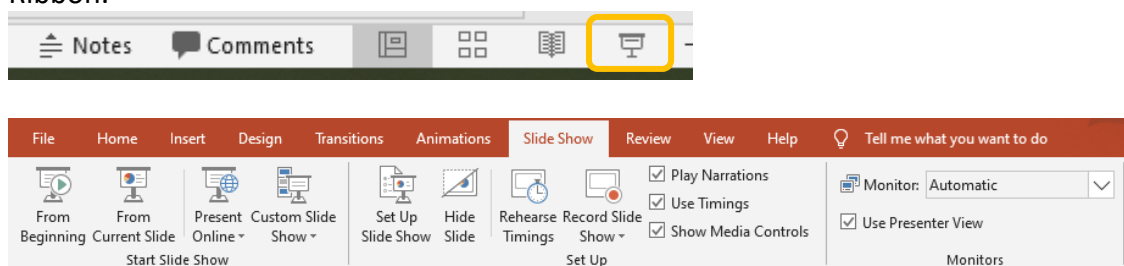
- (m) You may also add animation in an individual slide. Click the “Animation” tab on the Ribbon, various animations on text entrance, emphasis, and exit could be selected. Click the “Preview” button to preview the effect.



- (n) To review your animation setting in each slide, clicking “Animation Pane”.



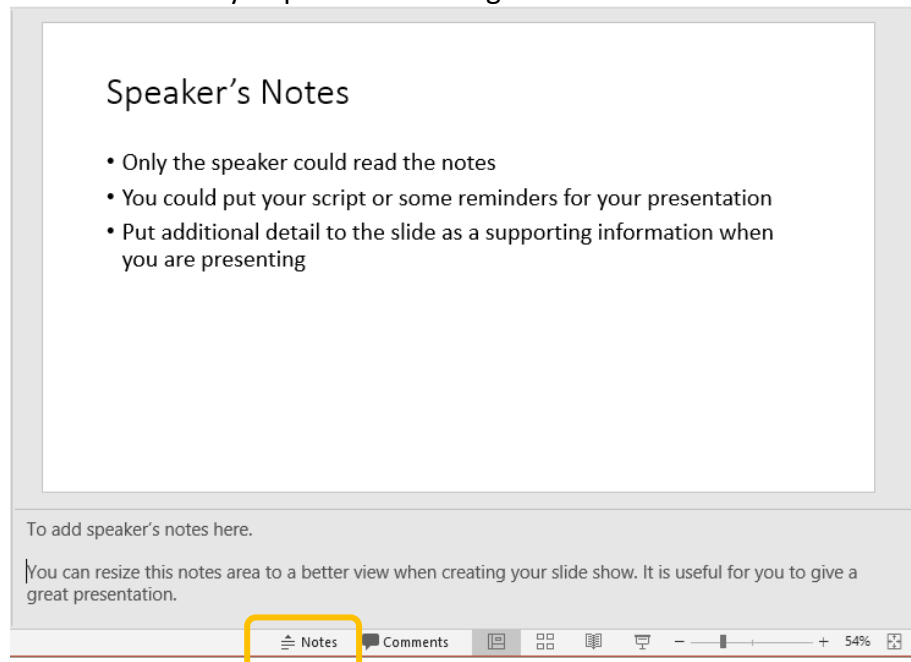
- (o) To preview your slide show, simply click the “Slide Show” icon in the bottom right corner. The same function could be found by clicking the “Slide Show” tab on the Ribbon.



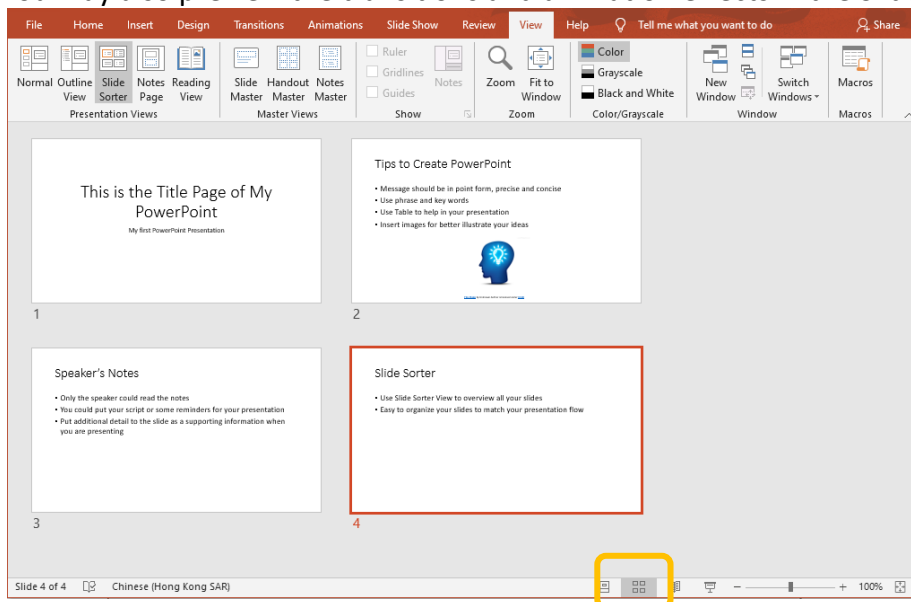
You could end the slide show anytime by pressing the “Esc” button on your keyboard.

- (p) You may add notes when creating your slide show, to add your script or reminders. The notes you added will not show to the audience.

Click “Notes” at the bottom, and input your text in the notes area. The notes area will be hidden when you press “Notes” again.



- (q) To better organise your slides, you could use “Slide Sorter” to overview all your slides and reorder the slide sequence by moving the slide to a destined location. You may also preview the transitions and animation effects in the Slide Sorter View.



More slide views are available by click the “View” tab on the Ribbon.

