EXERCISE 3 GUIDED SOLUTION

To draw the object in Exercise 3 (BB→Learning Resources→LAB→ UNIT 6 - Pg 137 & Pg 138)

Launch AutoCAD 2020 and do all the 8 settings and insert the 6 frequently used toolbars (See Fig 1) as highlighted in **UNIT 1 & 1A in Blackboard (BB)→Learning Resources→ LAB accordingly:**

1. **Activate Snap, Grid & Object Snap in Status Toolbar**
2. **Set Grid & Snap spacing, Grid Style, Grid Behaviour according to UNIT 1**
3. **Use Default A3 size workspace. Leave it as A3 size paper (420 mm x 210mm) as shown in Fig 1, so no need to set LIMITS.**
4. **Set Text Style= Times New Roman**
5. **Set Dimension Scale = 1.5 (Keyboard shortcut, Type dimscale in AutoCAD command)**
6. **Set Dimension Style accordingly to UNIT 1**
7. **Set Layers: Text, Dimension, Solid, Center and Hidden according to UNIT 1**
8. **Set Linetype Scale (Keyboard shortcut =lts) = 0.5**

Insert all the **6 frequently used toolbars** shown in **UNIT 1A**:

1. **Draw**
2. **Modify**
3. **Draw Order**
4. **Dimension**
5. **Layers**
6. **Properties**

Next **open** the file **EXERCISE 1B** shown Fig 1:

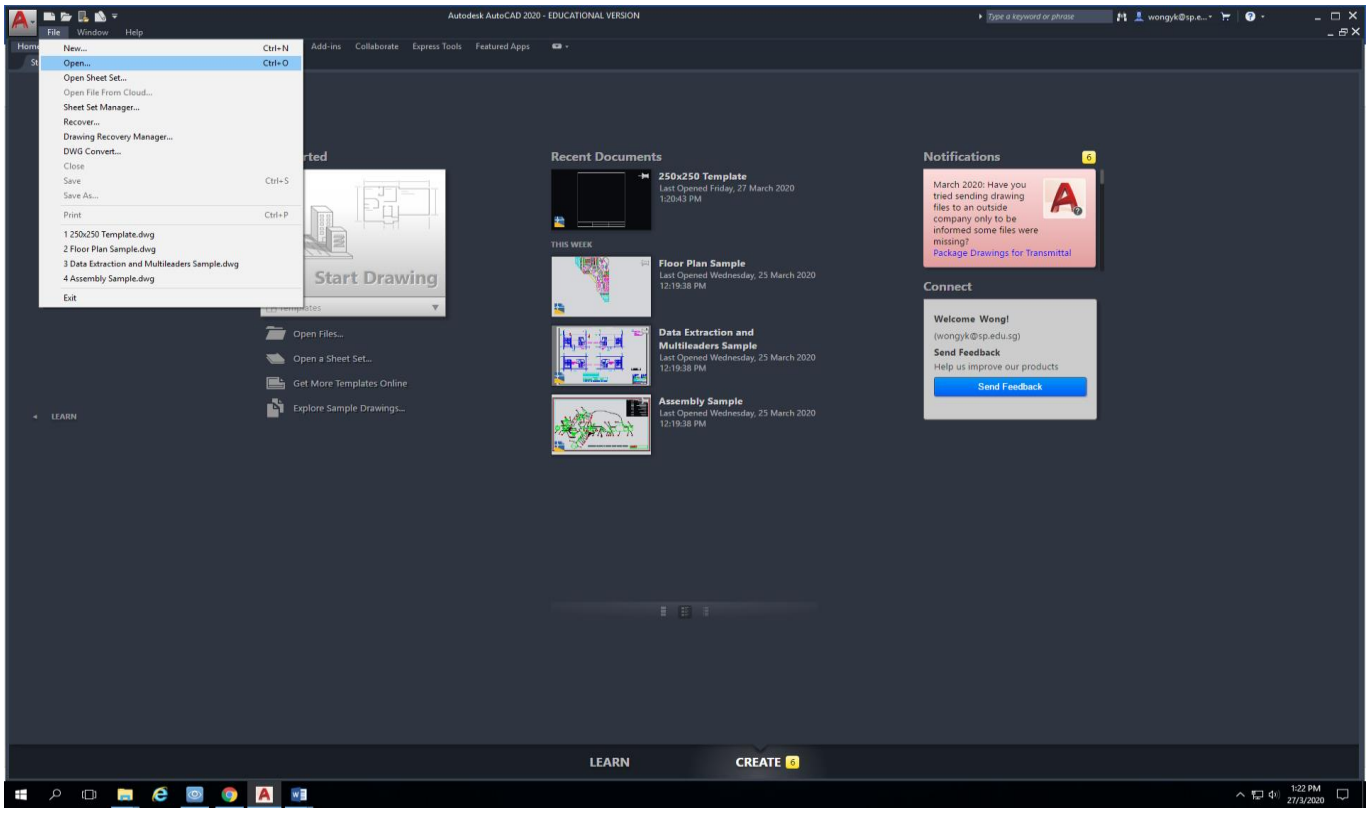

FIG 1

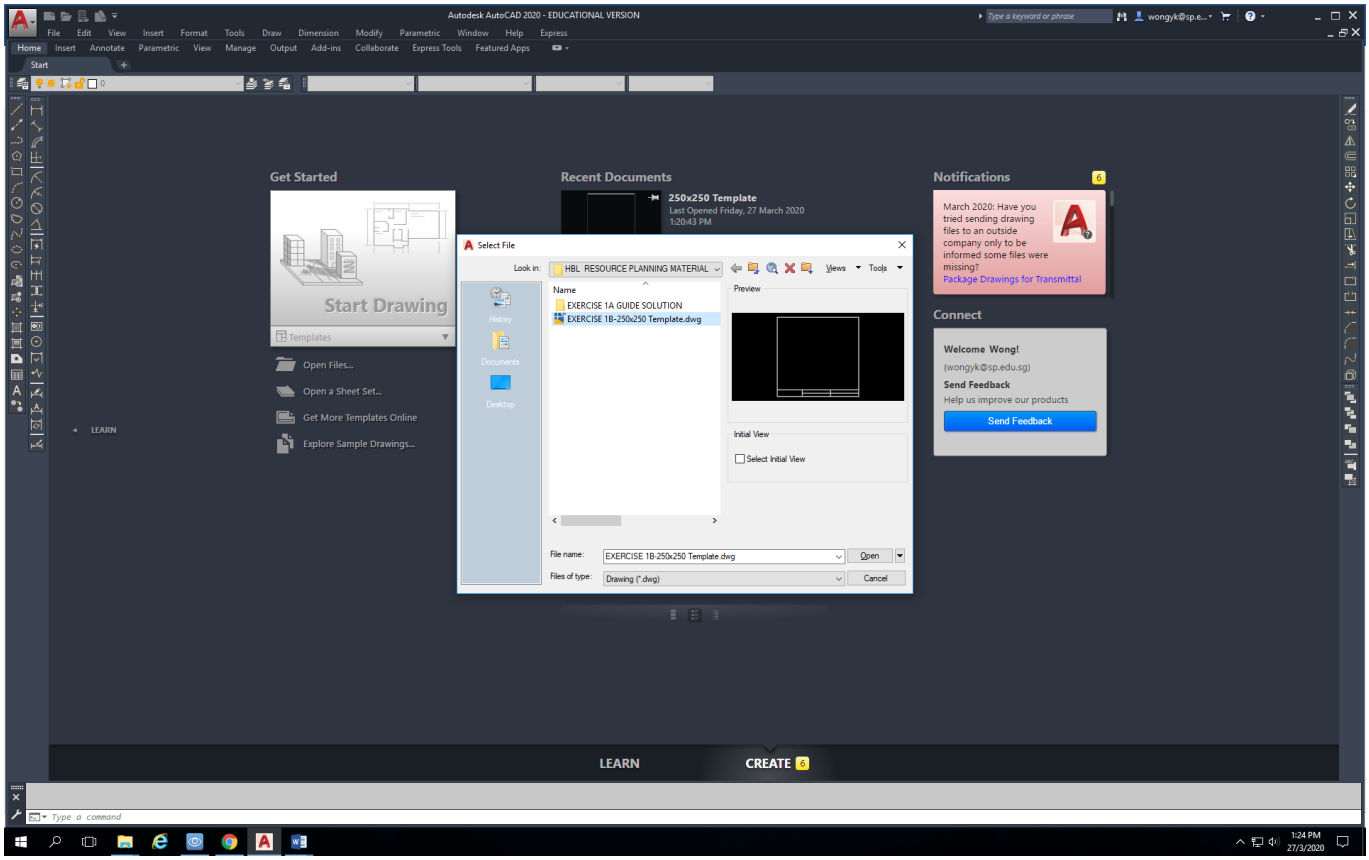

FIG 2

1. A dialog box appears, click the file: **EXERCISE 1B**, and then click **open**
2. See Fig 2 for the steps shown

EXERCISE 3

Before drawing the Exercise 3 object, complete the 2 center lines and insert the Text in Title Block as shown below.

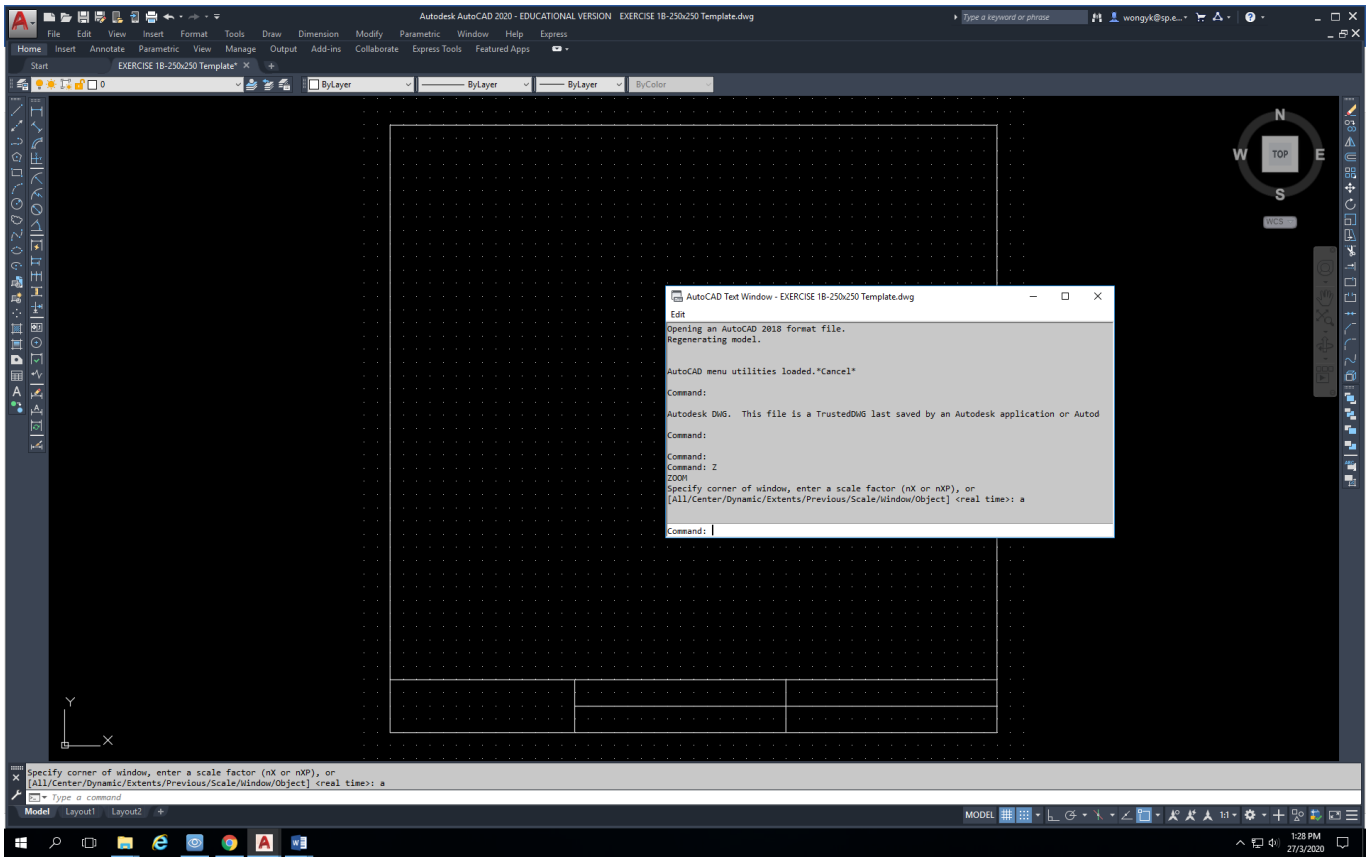

FIG 3

1. The file: **EXERCISE 1B** appears with the 250mm x 250mm Template drawing as done in Week 1
2. Next in command bar, Type **Zoom**, click=**All**, and then **enter** (To position the whole drawing at the centre)
3. The drawing will then be positioned centre of the workspace
4. See Fig 3 for the steps shown.

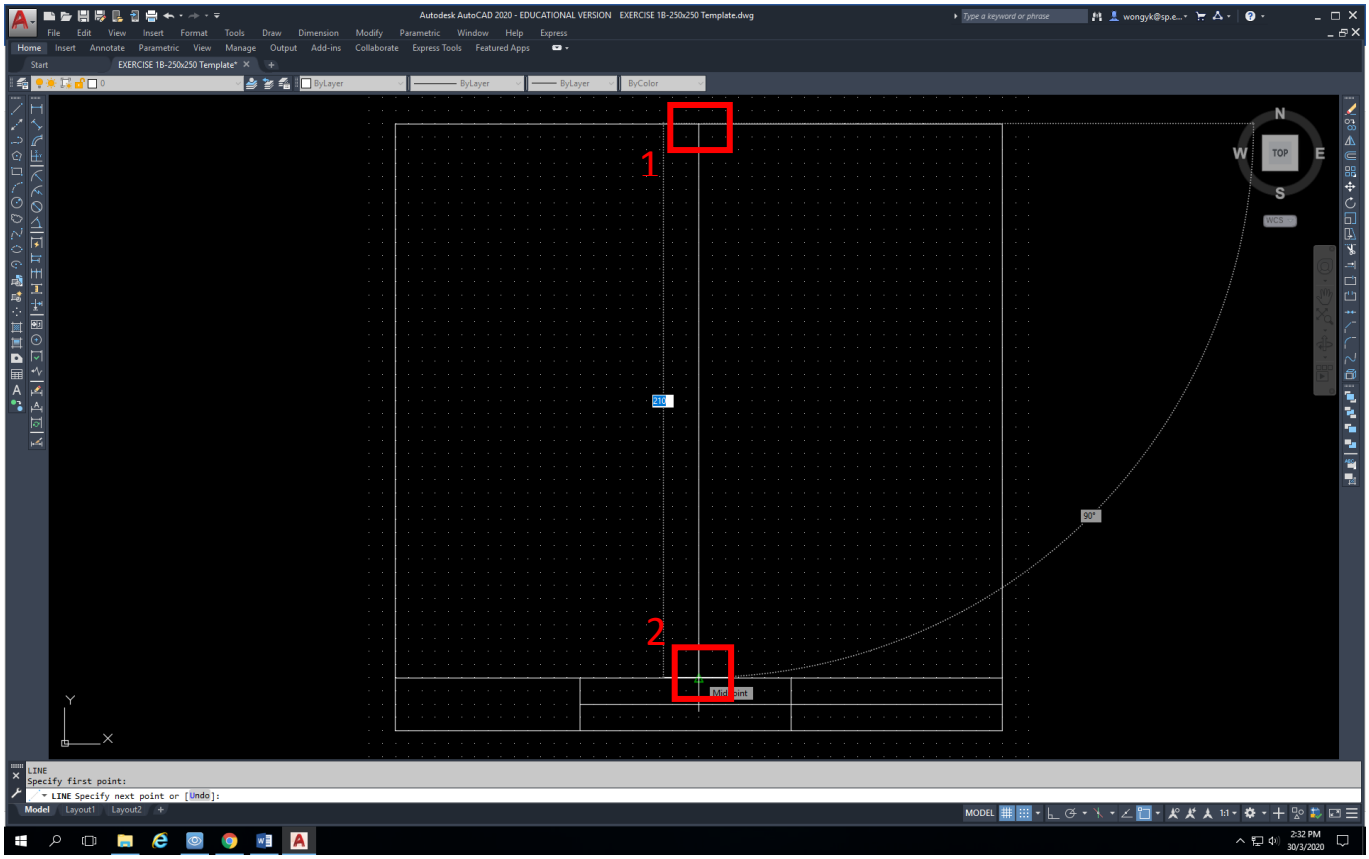

Fig 4

As the Exercise 3 object is circular form, we need to **create centre lines and locate the centre** of the **available drawing space** equal in area.

Draw a vertical line from midpoint top horizontal edge of rectangle (1) to the **top horizontal line of Title Block (2)** shown in Fig 4

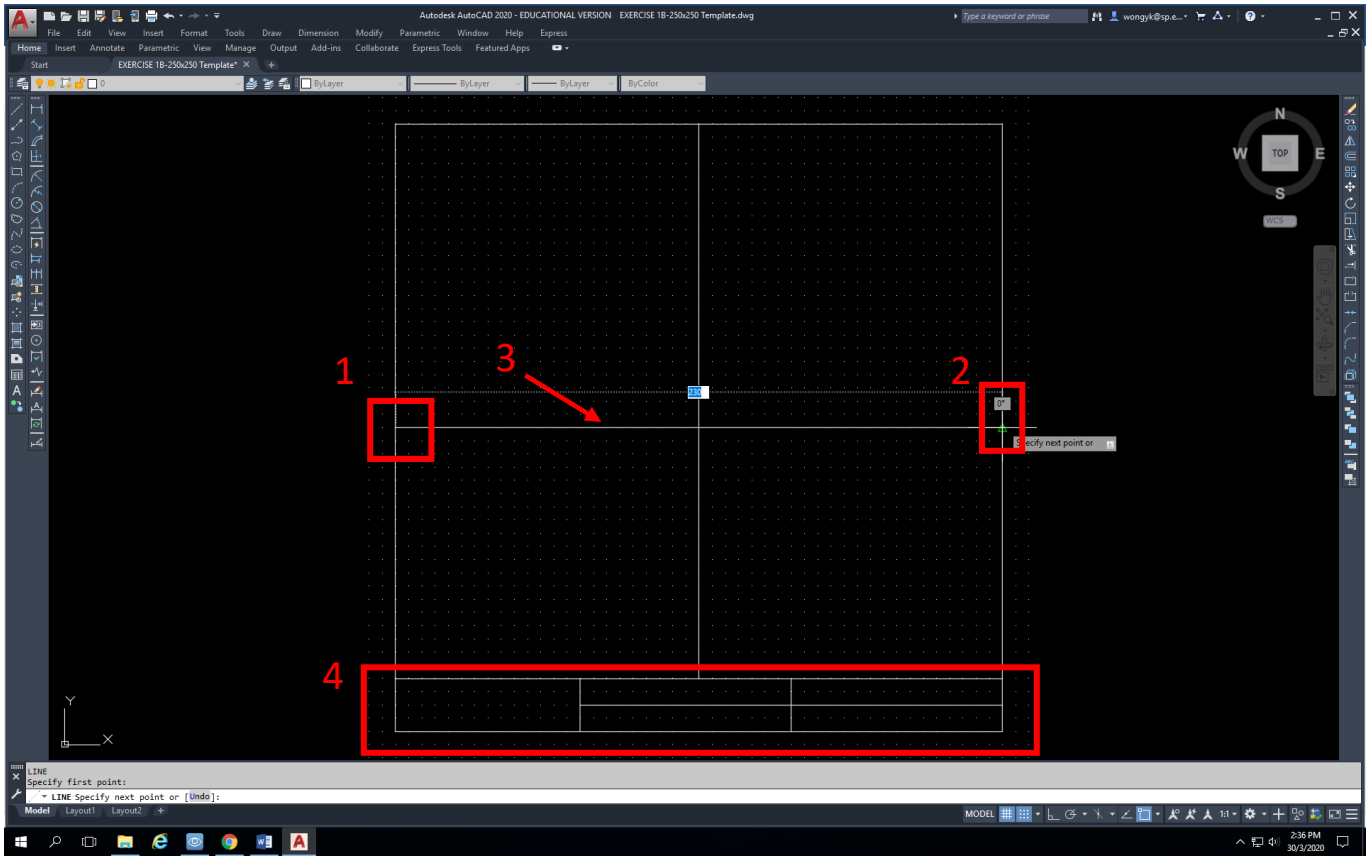

Fig 5

Next, draw a **horizontal line** across the working space from **midpoint of left vertical edge (1) to midpoint of right vertical edge (2)** Shown in Fig 5.

Notice that the **horizontal line created (3) is not exactly half of the drawing space** because the **bottom portion occupied 20mm by the Title Block (4).**

Hence horizontal line have to move 10mm upwards. Fig 6 shall show how to move the horizontal line upwards by 10mm

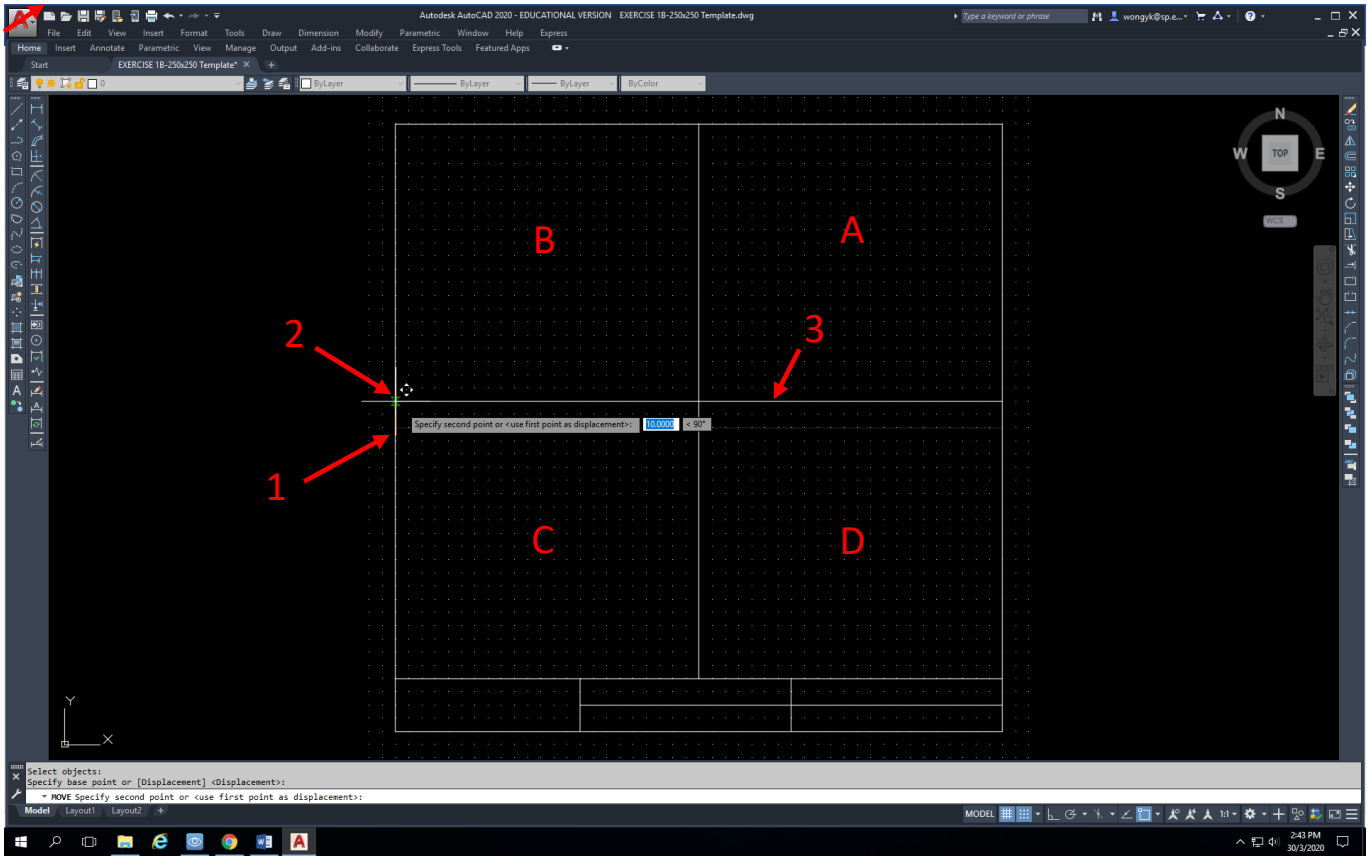

Fig 6

Type **m** (Move command)

Select Object: **click on the horizontal middle line in Fig 6 (3)**

Specify basepoint of displacement: Click at the left **endpoint (1)** of horizontal line,

Second point of displacement: **place cursor at the vertical edge (2)** and type **10** and **enter**

The horizontal line has been moved 10mm above the original position **(3)** as shown in Fig 6.

The **4 quadrants (A , B, C & D) in drawing space** excluding the Title Block are now **equal in area**.

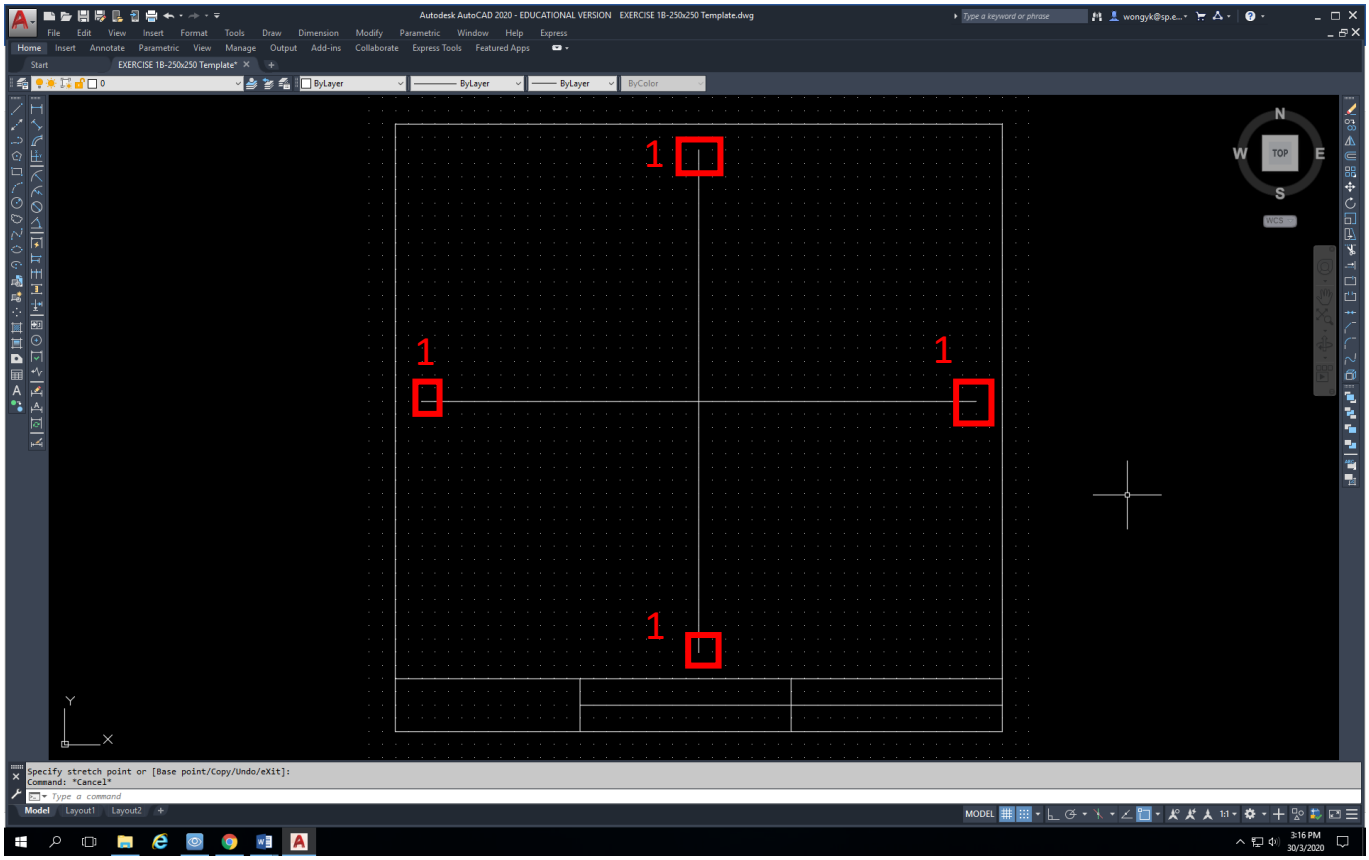

Fig 7

Next, use shortcut for **stretch** to shorten the two intersecting lines away from the border by 10mm.

Method:

i. **Click** on **the line**, **3 blue tiny squares** appears on the line at **both ends and middle point**.

ii. **Click on one end** and it **turns red.** Then **move 10mm** away from border and **click at the spot (1)**.

iii. Do it for all the other 3 ends **(1)** so that the intersecting lines is away from the border by 10mm as shown in Fig 7

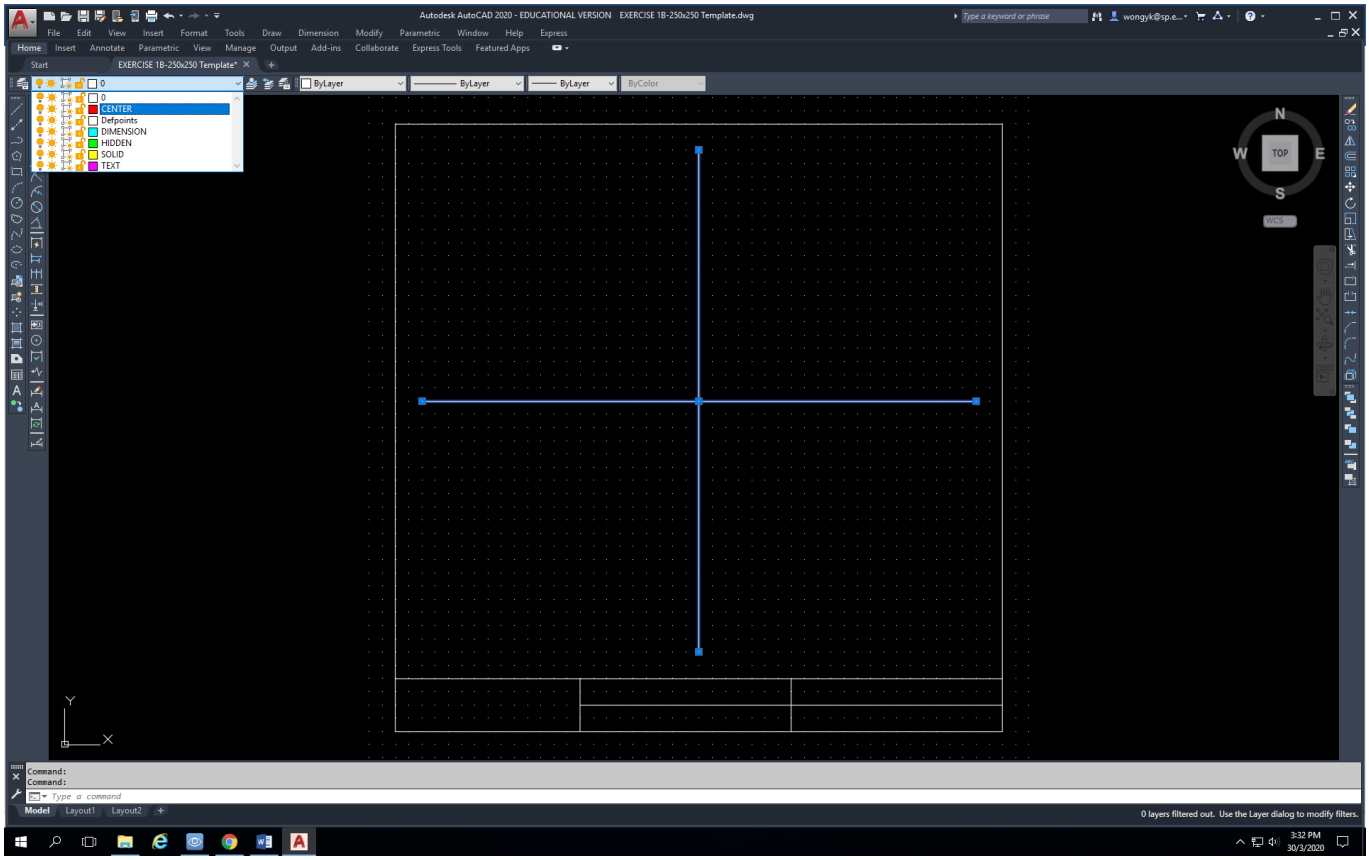

Fig 8

Next, convert two intersecting lines to Center Lines.

Method:

i. **Click on the two intersecting lines** and **turn blue**, then **click the arrow down** on **Upper right of Layers Toolbar**. **Layers Pull-down menu appears** and then **click Center and press Esc** to complete command**.**

ii. See Fig 8 as shown

iii. The lines will appear as **Center lines (1)** and **color red** as set in the beginning. See Fig 9 as shown.

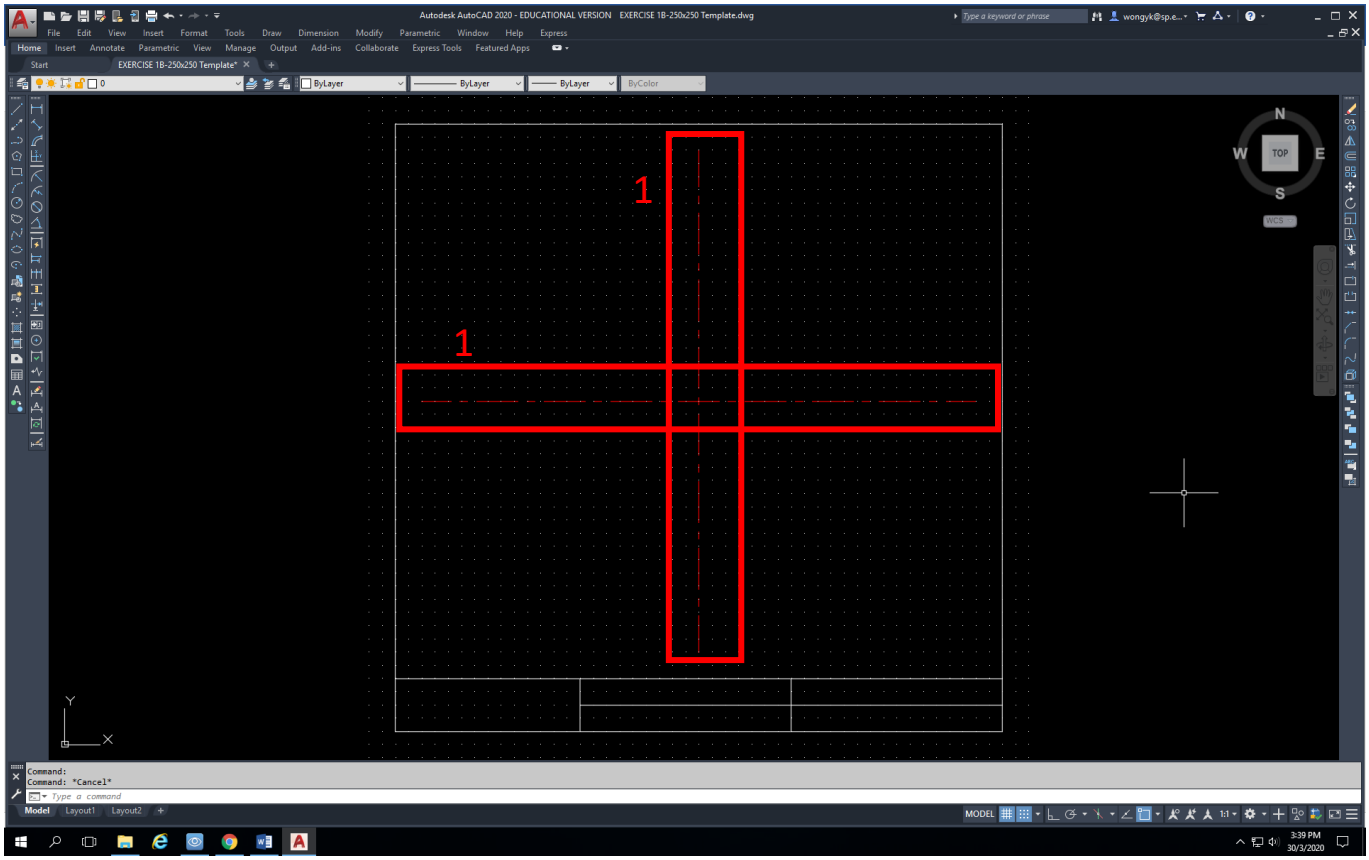

Fig 9

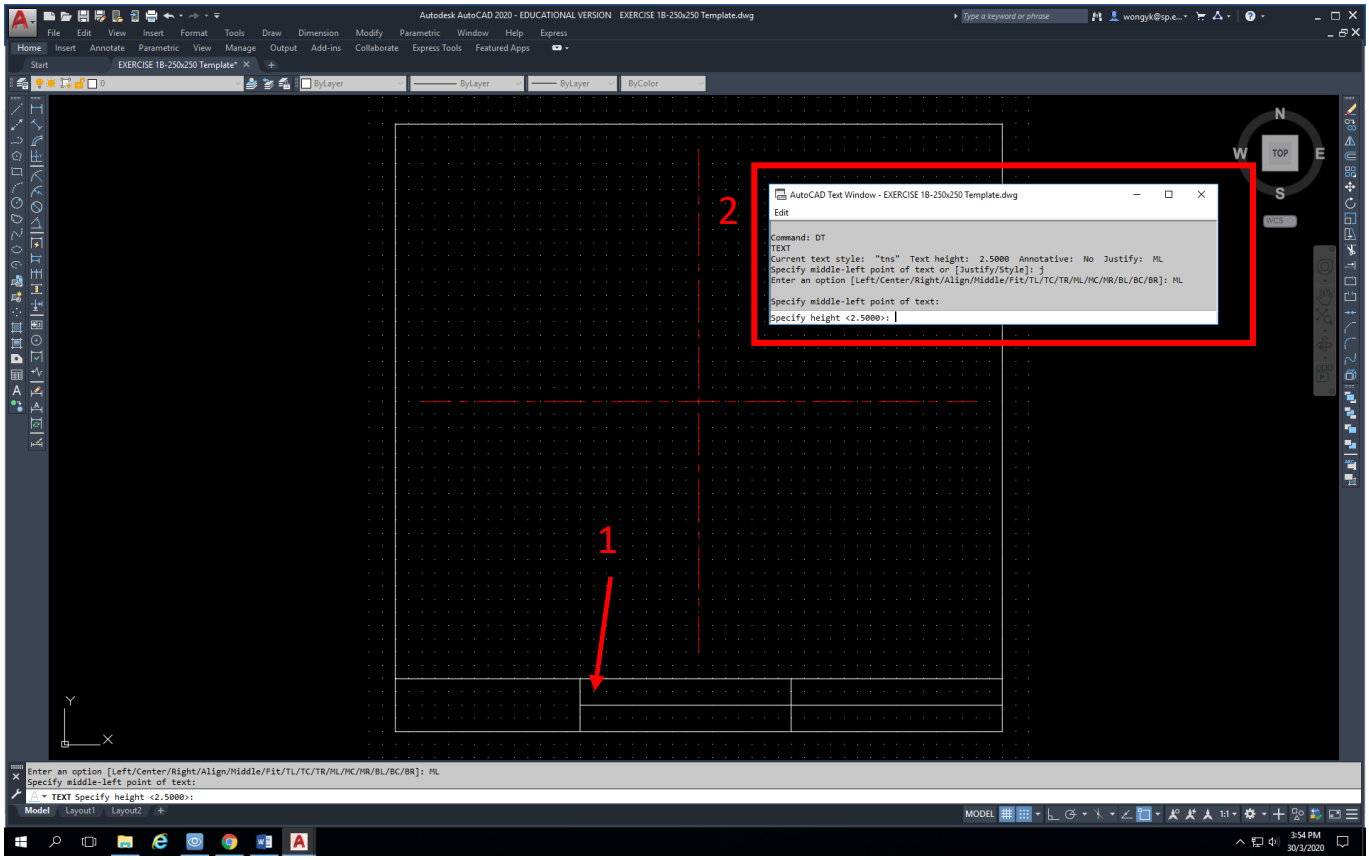

Fig 10

Next, to insert text in the Title Block.

Method:

i. Type: **dt** (represent dynamic Text)
ii. Type: **J** (Justify)
iii. Click **ML** (Menu bar appears at the screen, click ML=middle left point as starting point of text)
iv. Specify middle left point of text: **Click at the position (1)**= 5mm away from vertical partitioned line as seen in Fig 10. The Steps are shown in **box (2)**
v. Next, Specify Text Height = Type **5**mm
vi. Specify rotation angle of text = Type **0** (i.e typing text direction from left to right horizontally)
vii. Enter text: **NAME: FILL UP YOUR NAME** (If too long, then use Initials, E.g. Name: Tan Ah Kow = **NAME: TAN AK** so that it will fill up within the box limits)
viii. Next, **Enter twice** to complete the text in the middle box of Title Block.
ix. See Fig 11 for the completed text in the middle box of Title Block **(1).**

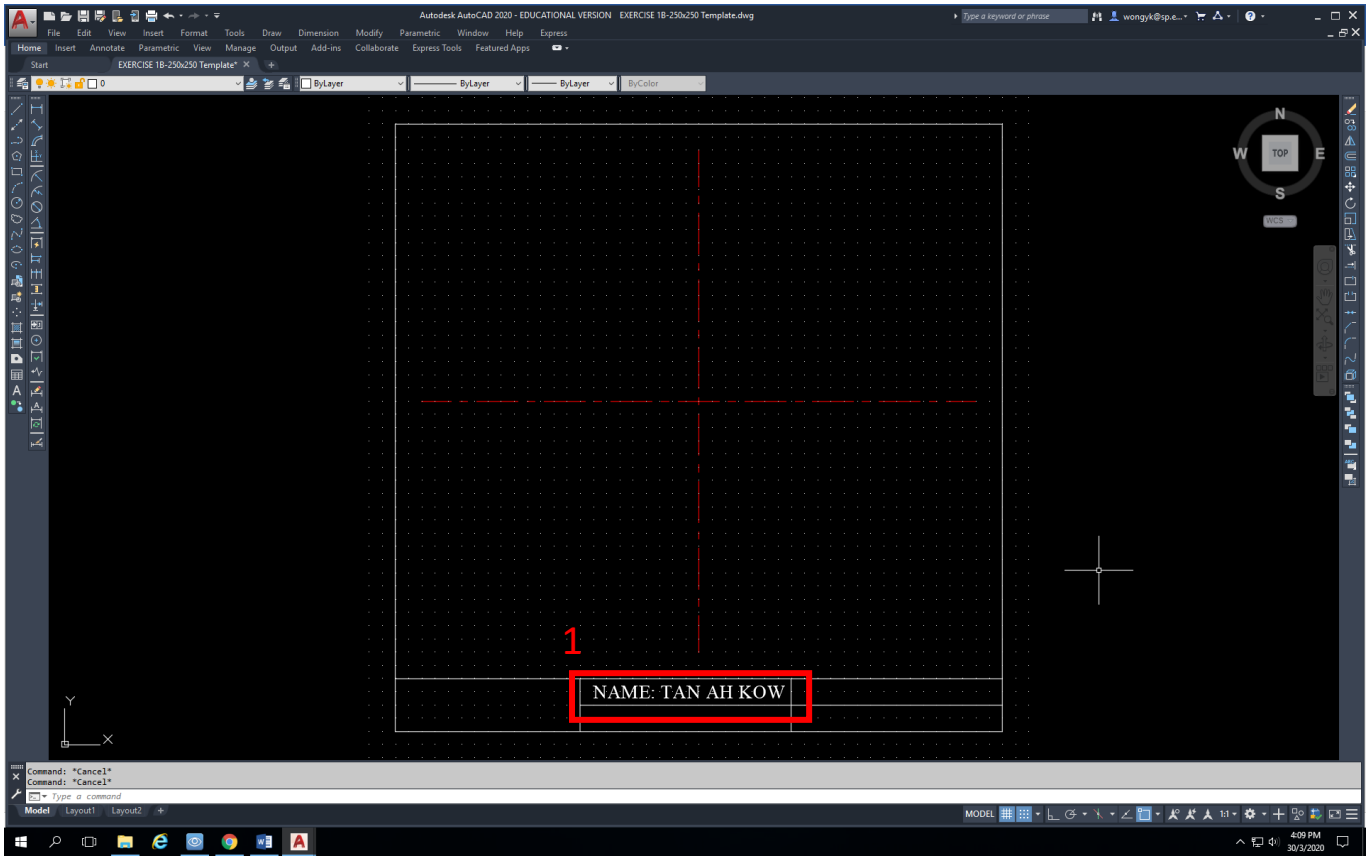
Autodesk AutoCAD 2020 - EDUCATIONAL VERSION EXERCISE 1B-250x250 Template.dwg
1
NAME: TAN AH KOW

Fig 11

x. Next, **Click on the Text** (Turn Light blue) and then **click on the arrow-down of Layers (1).**

xi. Then **click on the Text Layer (1) and press esc**.

xii. See Fig 12 where Text is deposited into Layer TEXT and colored **Magenta (2).**

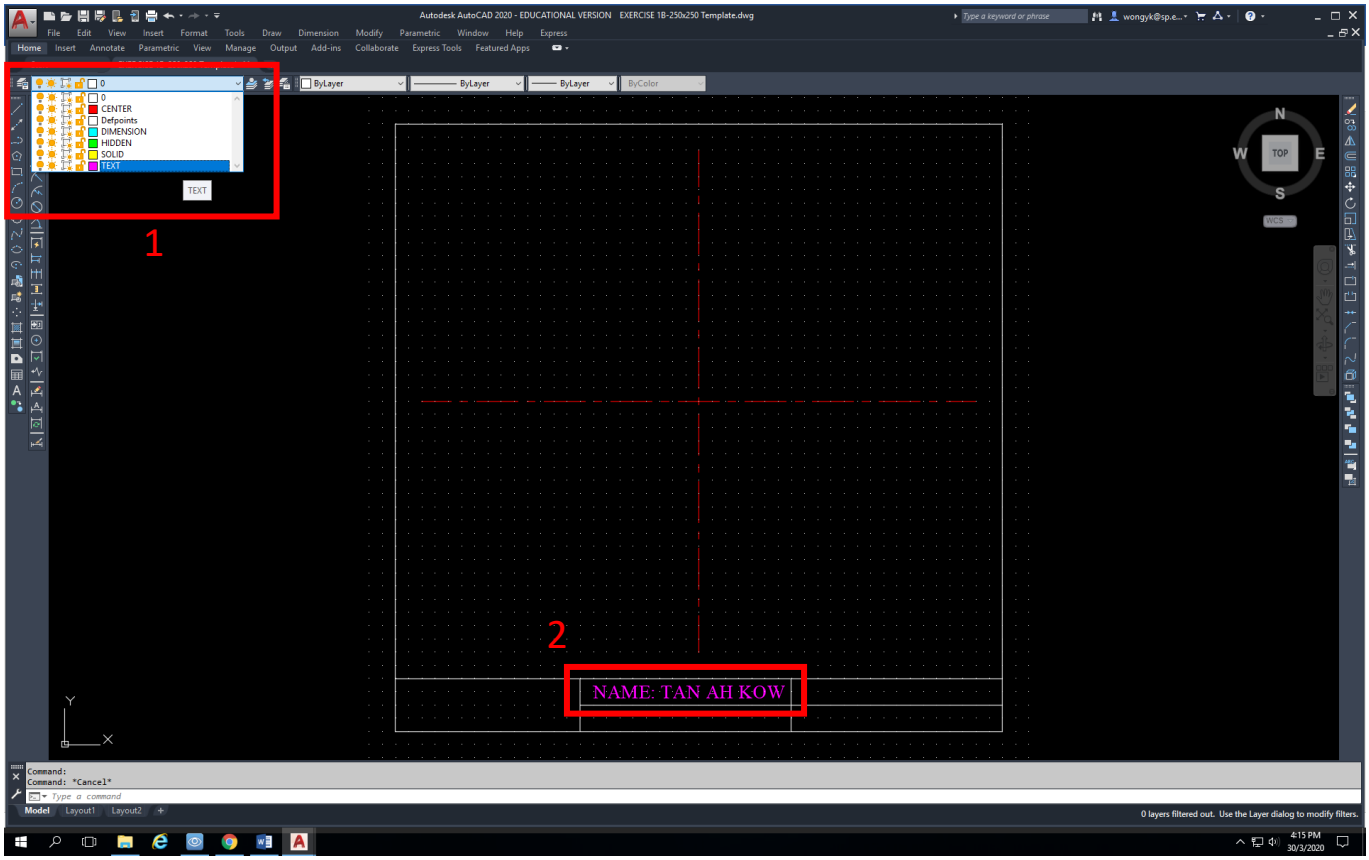

Fig 12

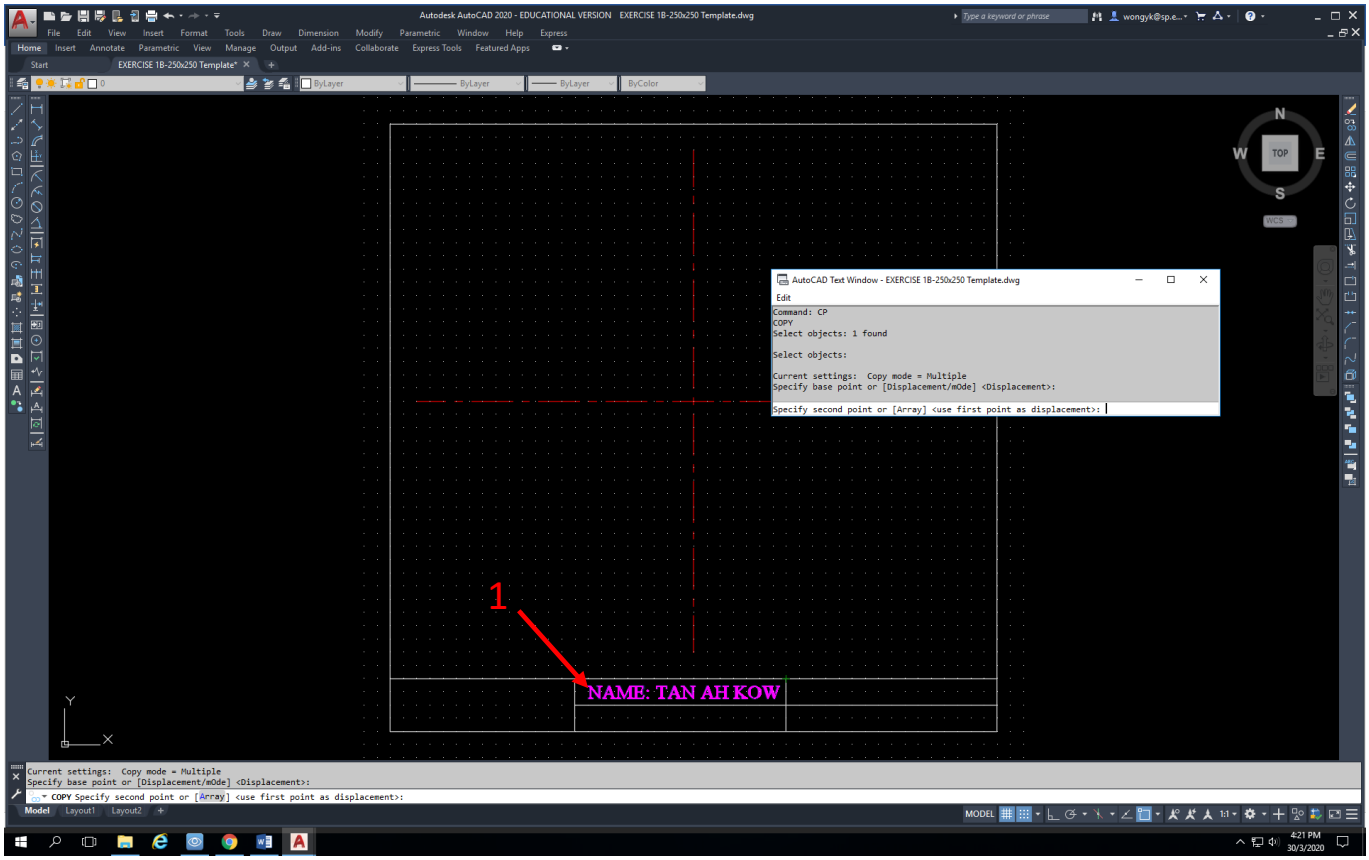

Fig 13

Next, copy text to the other 5 boxes.

Method:

i. Type= **cp** (Keyboard shortcut for copy)
ii. Select Object= **Click on the text** and then **enter**
iii. Specify Base point= **Click at the ML point** (That is starting point of Text) **(1) in Fig 13**
iv. Next, **move cursor and click 5mm away (2)** horizontally from vertical partition of adjacent box on the right shown in Fig 14

Fig 14

Fig 15

v. Continue **placing the text to the other boxes** placing them 5mm away from the vertical left edge of each box **(1).** See Fig 15.

vi. Next, **double click the text** in centre bottom box to change text (Keyboard shortcut).

vii. Type = **ADM NO: P2012345** (Your own admission number) **(1)** and **enter**

viii. See Fig 16 below.

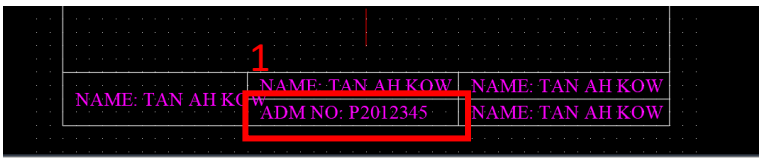

Fig 16

ix. Next, Just click once on the top right box and Type = **CLASS: DASE/FT/1A01** (Your own class)

x. Similar, Bottom right box, Type = **SCALE 1 : 1**

xi. Left box, type = **EX. 3**

xii. See Fig 17 below **(1)**

Fig 17

Next, Change the Text= **EX.3** with a **Text Height of = 10mm** as the box dimension is bigger and text is must be proportionately larger.

Method:

i. Type **Ch** (Keyboard shortcut to Change) and **enter**

ii. A Change dialog box appears **(1)**

iii. Click on the Text = **EX.3 (2)**and then click on **Text→Height→** type = **10 (3)** (To change to Text Height=10mm)
Next, press **Esc**

iv. See Fig 18 where EX.3 has a changed Text Height= 10mm **(2)**

v. Next, remove the dialog box by **clicking the x** at the top left hand corner.

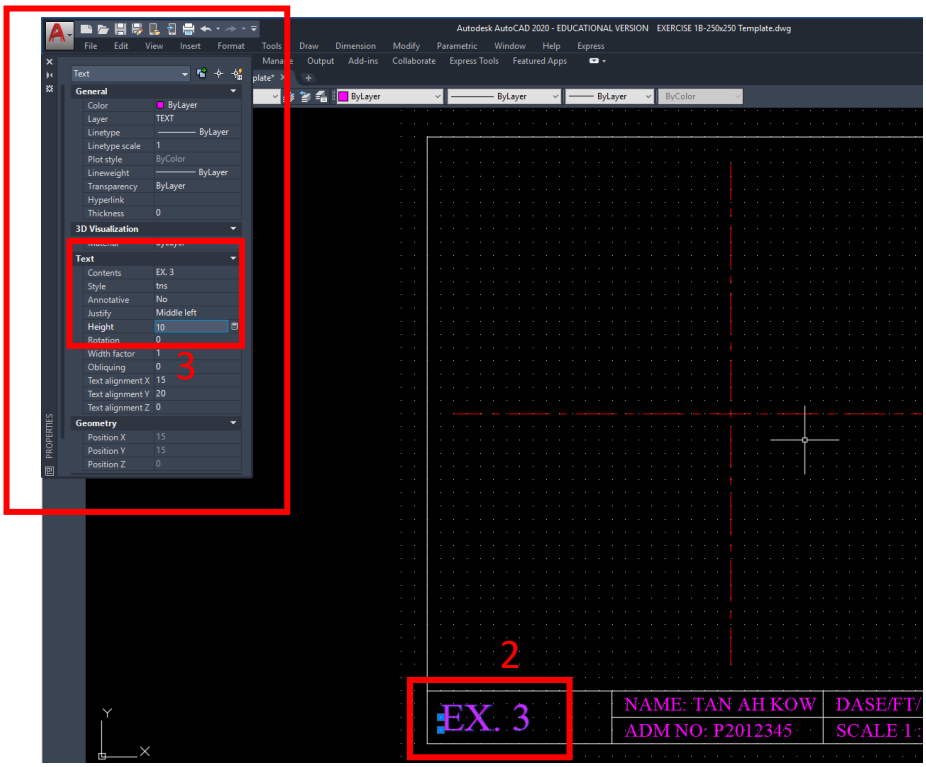

Fig 18

vi. The end result of inserting the text in Title Block is completed as shown in Fig 19 below. You can now start to draw the object in Exercise 3.

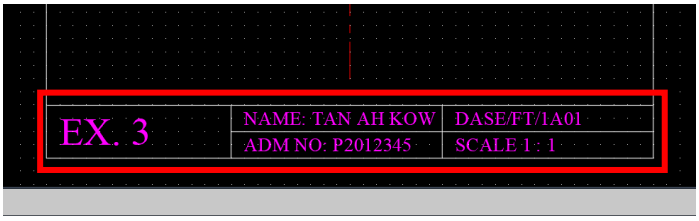

Fig 19

It is now ready to draw the object in Exercise 3 after completing the Title block text and centre lines positioning.

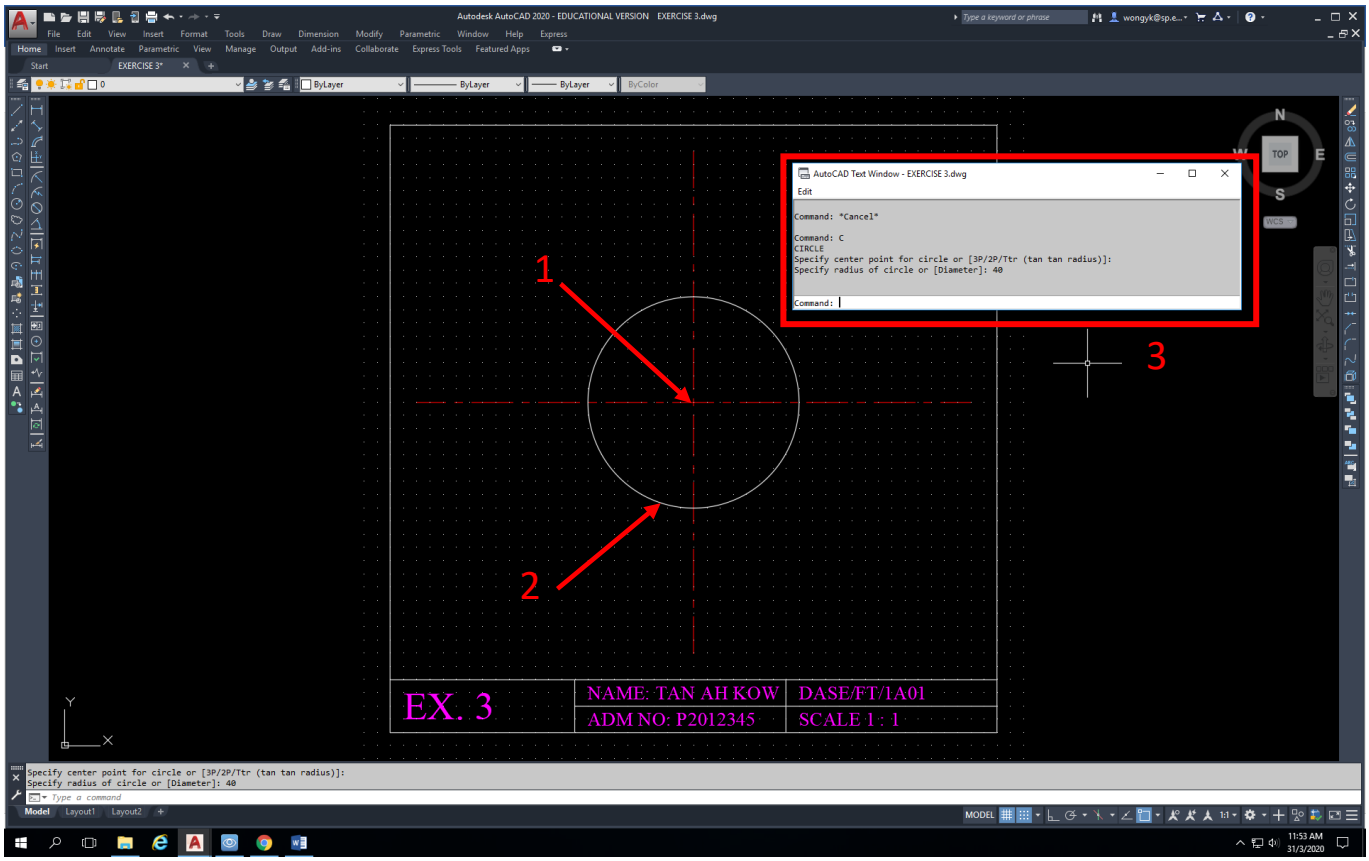

Fig 20

Method:

i. To draw a circle with radius 40mm (Inner Ring Gasket)
ii. Type = **c** (Keyboard shortcut for circle)
iii. Specify Center point for circle = **Click the centre lines intersection point (1)**
iv. Specify Radius of circle, type = **40 (2)**
v. Fig 20 shows the steps to draw the circle of radius 40mm **(3).**

vi. Next, using similar method, draw the outer ring gasket with radius of 60mm **(1)** and same centre as the 40mm inner ring gasket.

vii. Fig 21 shows the completed outer ring gasket and the completed steps **(2)**

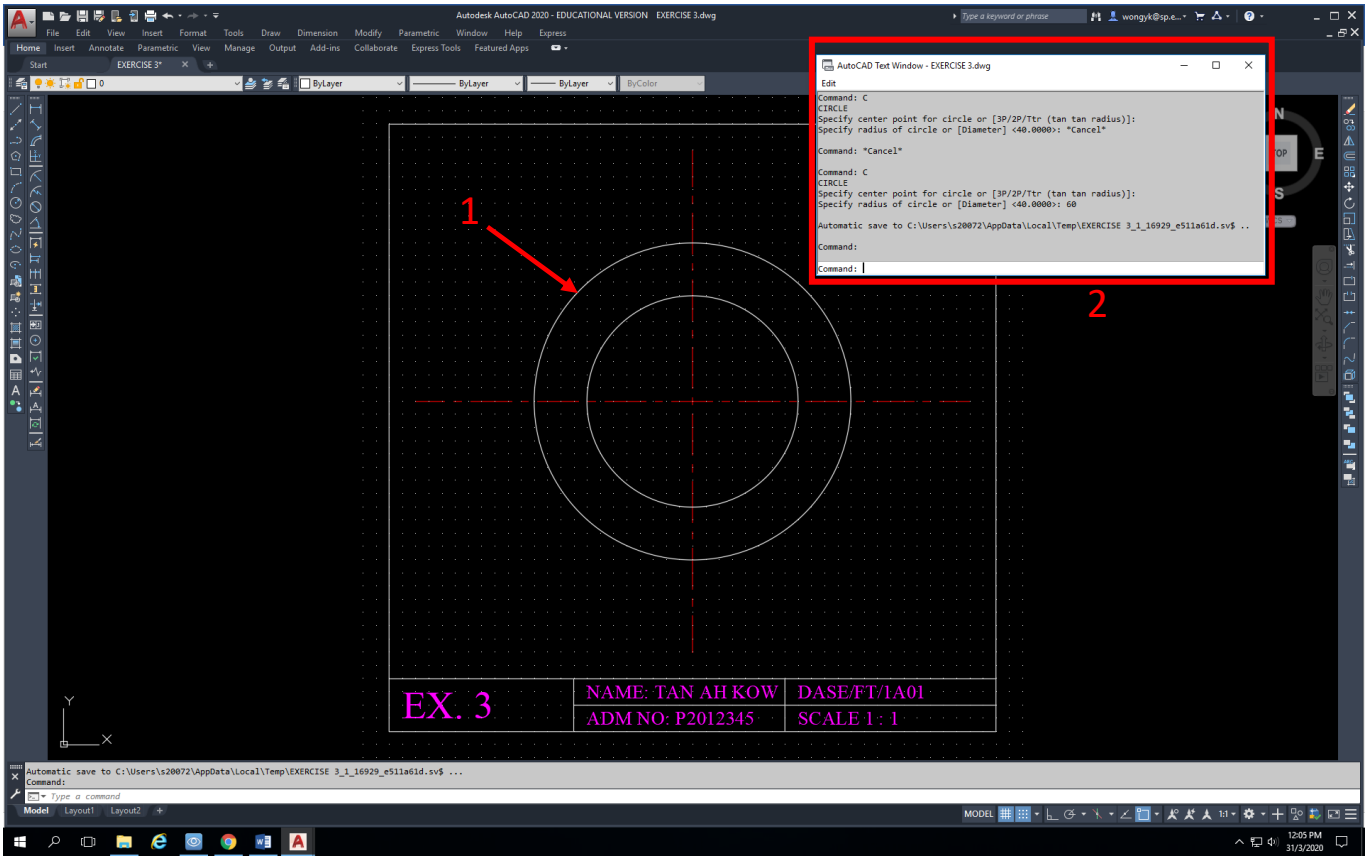

Fig 21

viii. Next draw **the inner ring bolt (Radius 10mm)** & **outer ring bolt (Radius 20mm)** using the same method as the inner ring and outer ring gasket.

ix. Draw both circles with centre at the top of outer ring gasket (1)

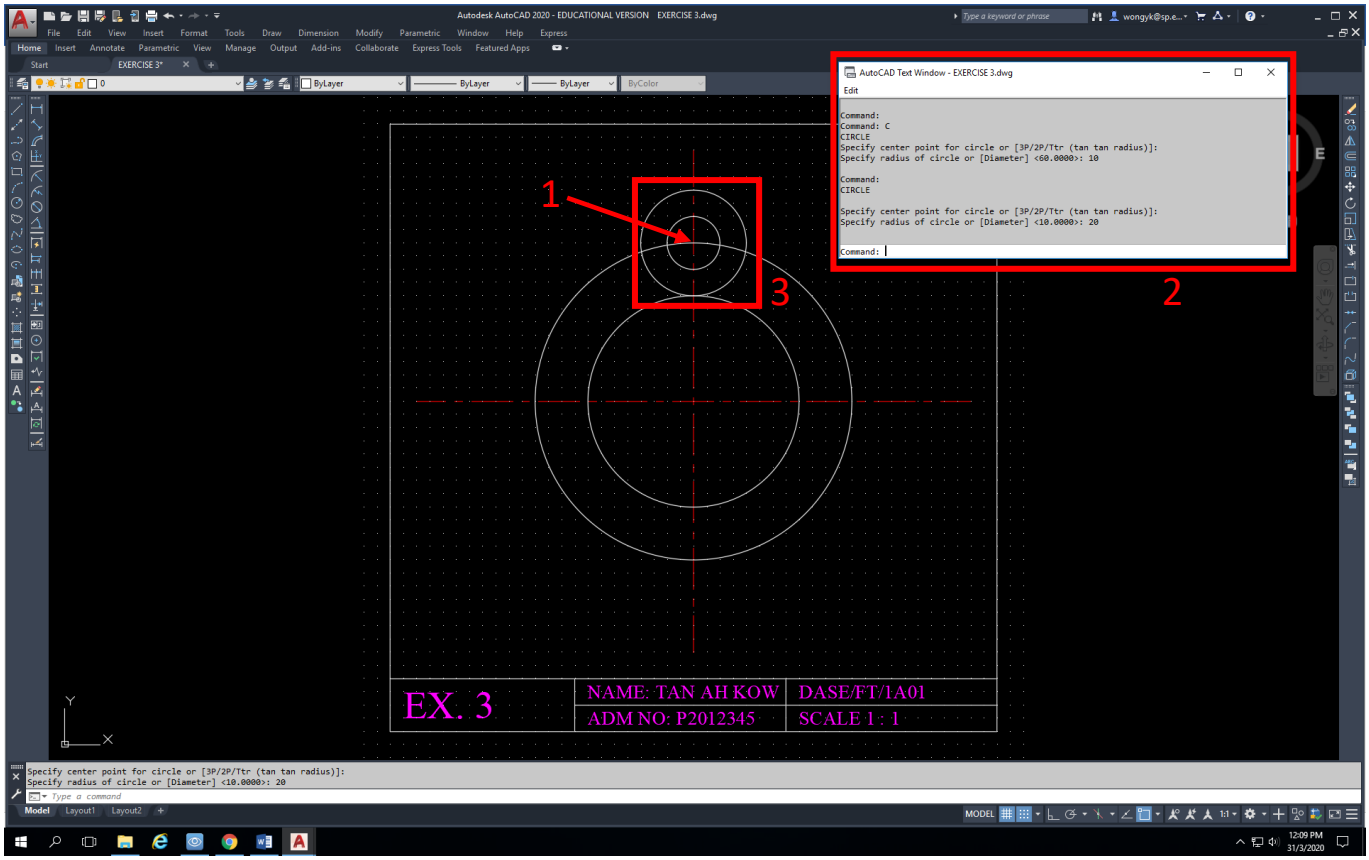

Fig 22

x. Fig 22 shows the guide steps **(2)** and the positioning of the inner & outer ring bolts **(3)**

xi. Next, Use trim in Modify command to remove unwanted portion of circle.

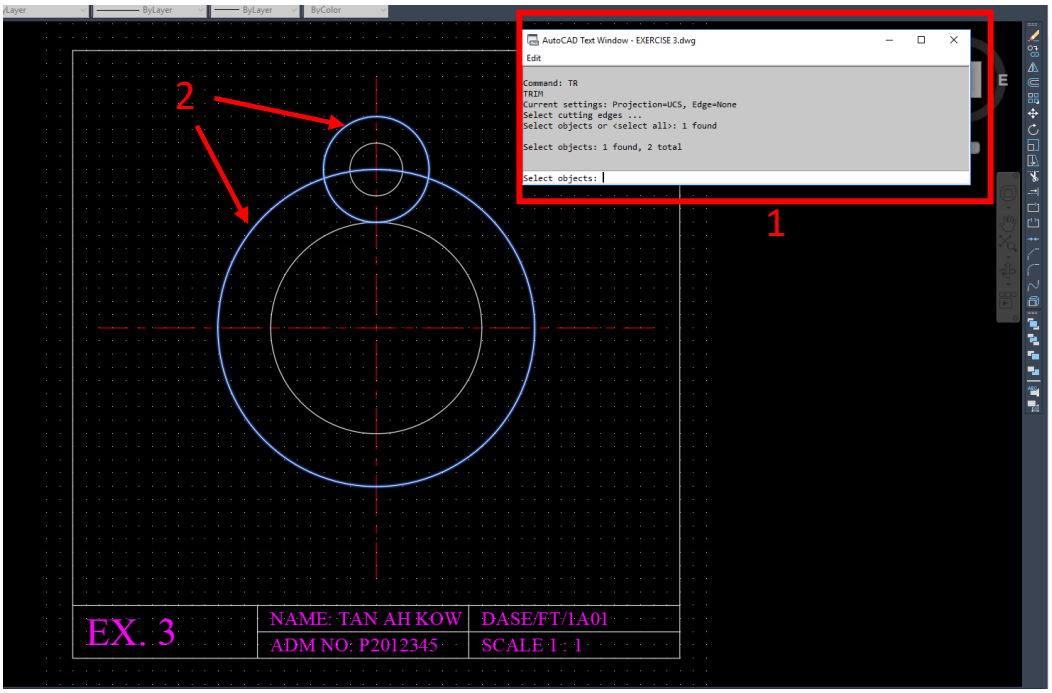

Fig 23

xii. Type = **tr** and **enter**

xiii. Select cutting edges, **click on the 2 circles** highlighted in blue

xiv. See Fig 23 shows the step **(1)** & on the selected cutting edges **(2)**

xv. Next, **enter** and select object to trim= **click on the unwanted portion of the circles** (Inner & outer ring bolt) and then **enter.**

xvi. Fig 24 shows the steps **(1)** and end result of trim on the inner & outer ring bolts **(2)**

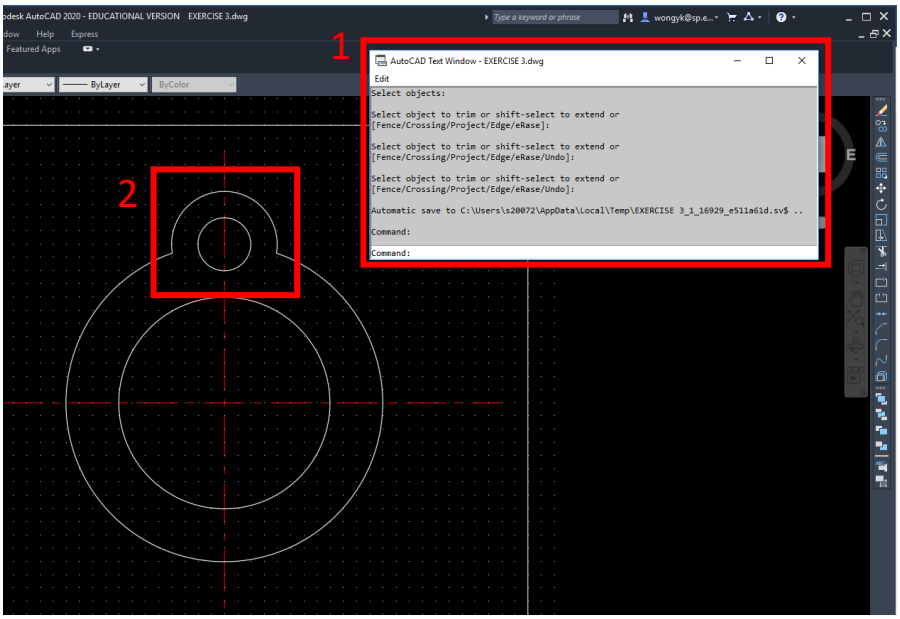

Fig 24

xvii. Next, use Polar Array to duplicate 6 similar inner & outer ring bolts holes around the outer ring gasket with centre at intersection of centre lines.

xviii. Type = **ar** (Keyboard shortcut for array)

xix. Select object = **click those portions (1)** for array as highlighted in blue. See Fig 25

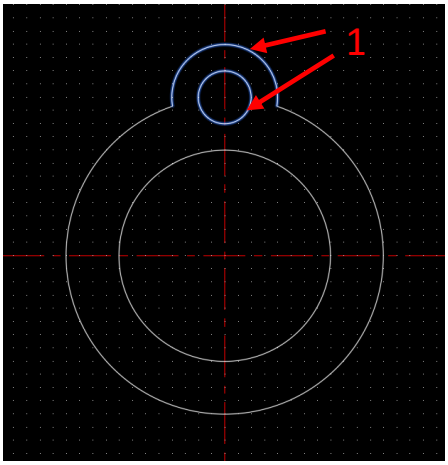

Fig 25

xx. Then **enter** and click **polar (1). See Fig 26**

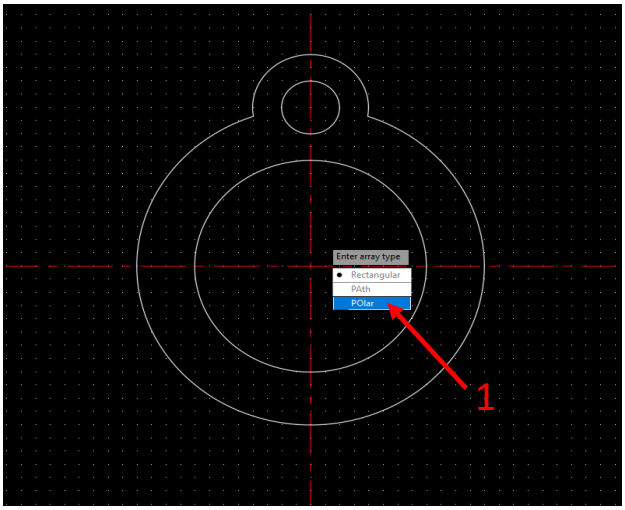

Fig 26

xxi. Specify center point of array = click at the intersection of center lines **(1)**

xxii. A default of 6 objects that are polar arrayed. E.g. if require to array 5 objects, just click= item and then change the no of items = 5 and enter.

xxiii. Since 6 objects is required, just **enter** and the 6 objects will be displayed.

xxiv. Fig 27 the steps **(2)** and the polar array of 6 objects

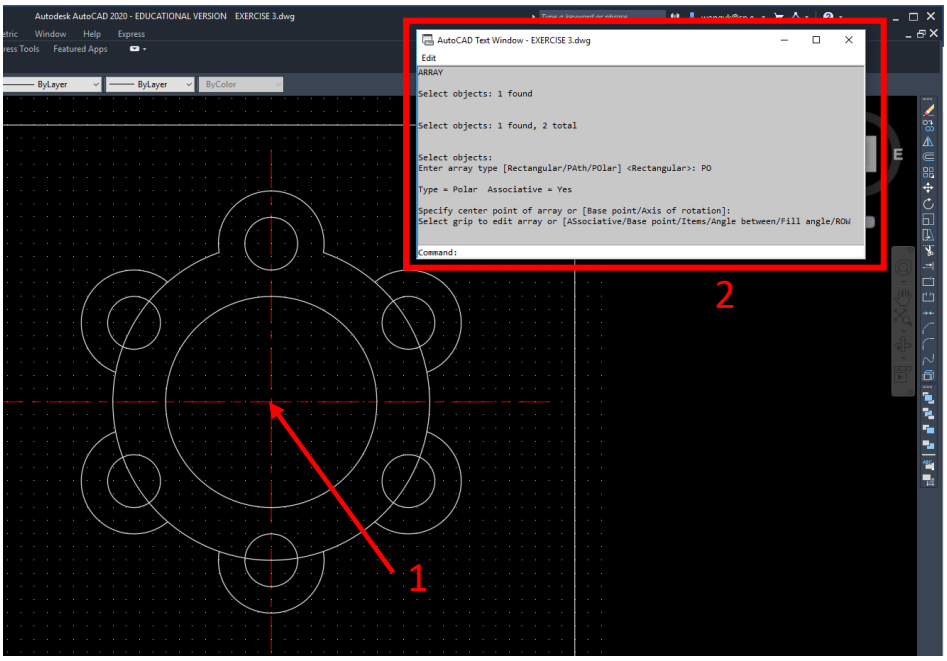

Fig 27

xxv. Before trimming off unwanted portion, use explode to breakup the arrayed bolt holes as shown in fig 28. Type = **x** (Keyboard shortcut for explode) and select objects= **click on one of the bolt holes** and the rest of the bolt holes are highlighted in blue. Then **enter** to complete the command explode.

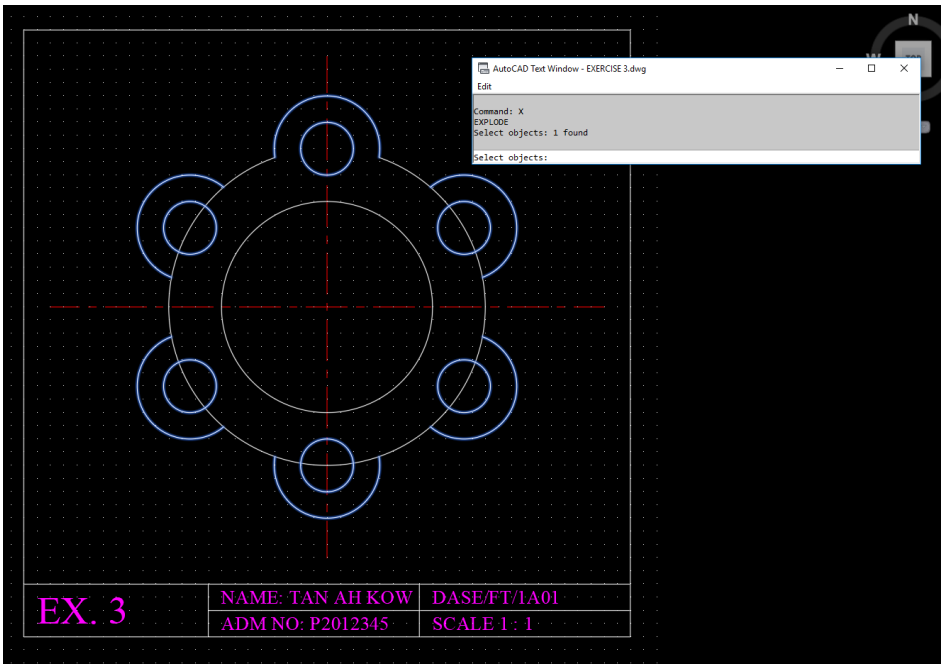

Fig 28

xxvi. After the bolt holes are exploded and form individual component, then use Modify command trim or remove the unwanted portion created by the polar array as shown in Fig 28.

xxvii. Type = **tr** and the select cutting edges=**click on the outer bolt hole** as shown in blue in Fig 29.

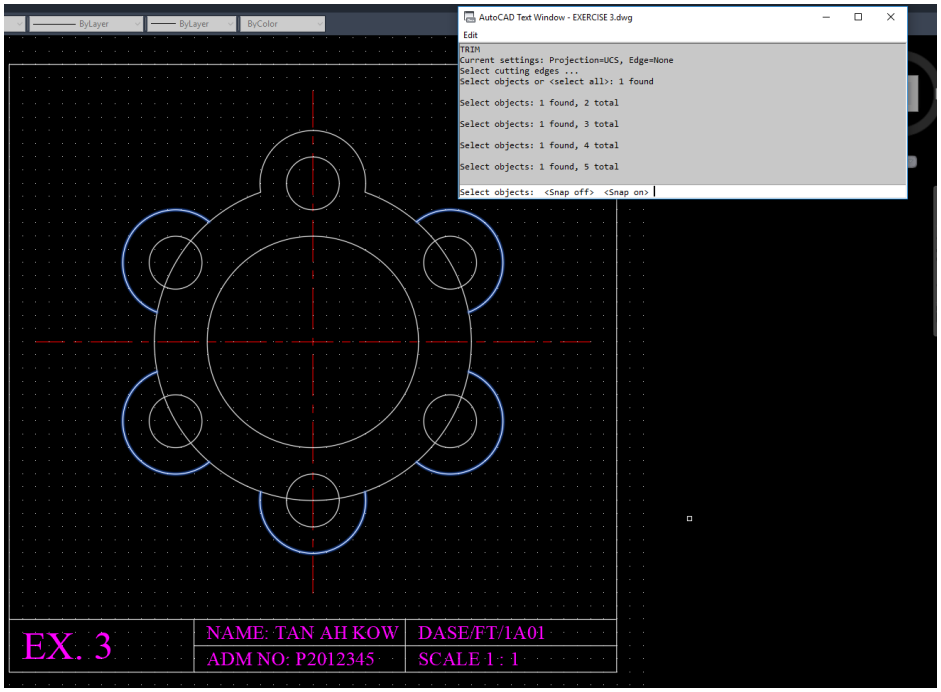

Fig 29

xxviii. Next, press **enter** and then select object to trim = **Click on those unwanted portions** to be removed and final drawing is shown in Fig 30. E.g. One of the unwanted portion has been trimmed **(1)**

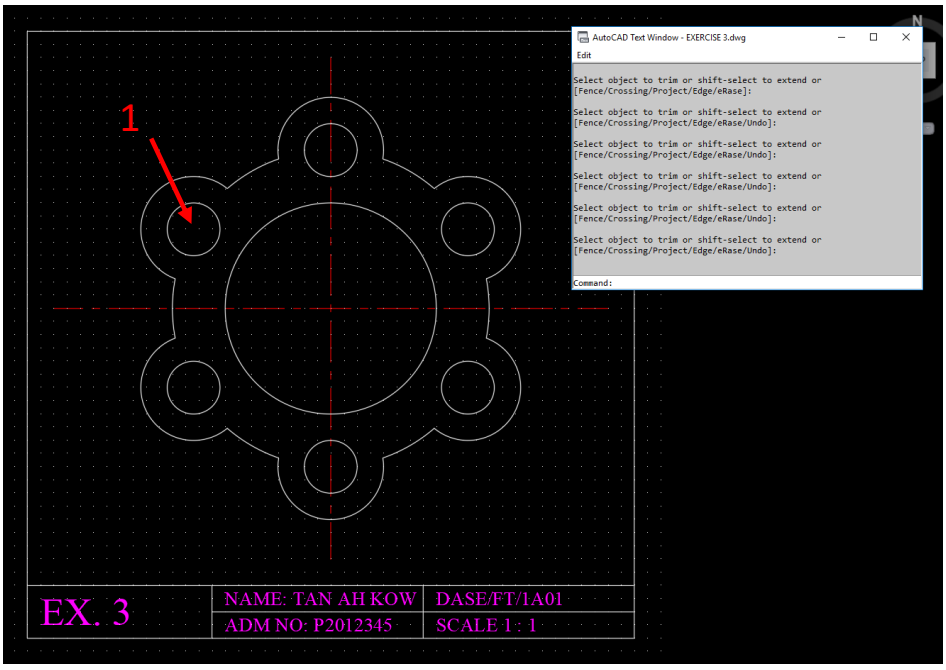

Fig 30

xxix. Finally, use Modify command Fillet to round the edges between outer bolt holts and outer ring gasket with a radius of curvature = 5mm.

xxx. Type = **f** (Keyboard shortcut for Fillet) and then **enter**.

xxxi. Click **radius** and command bar and specify fillet radius, type= **5**

xxxii. Select first object = click **multiple** in command bar

xxxiii. Select first object= **click outer bolt ring (1)**, select second object = **click outer ring gasket (2)** as indicated in blue and 5mm fillet **(3)** can be seen in fig 31

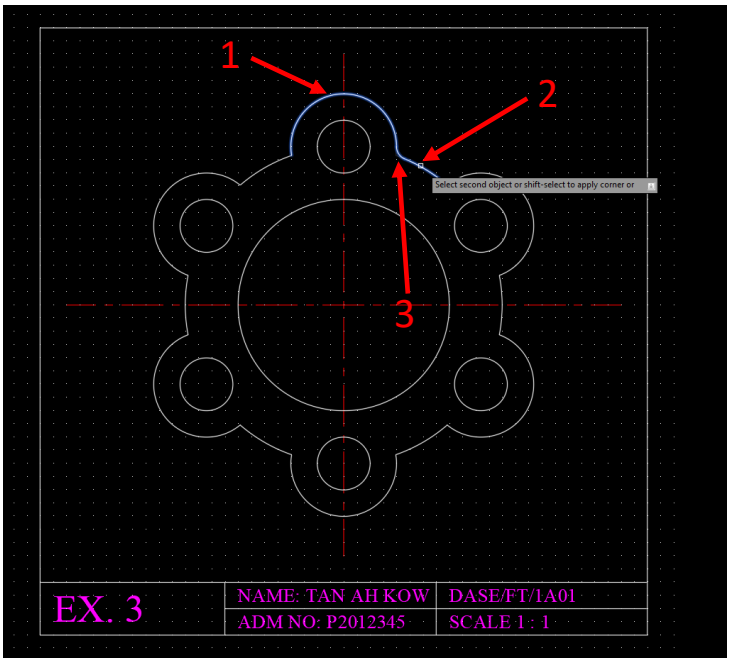

Fig 31

xxix. Continue fillet for the rest of the intersection between the outer ring bolts and the outer ring gaskets.

xxx. Fig 32 shows the final object drawn **(1)** and the steps for multiple fillets **(2)**.

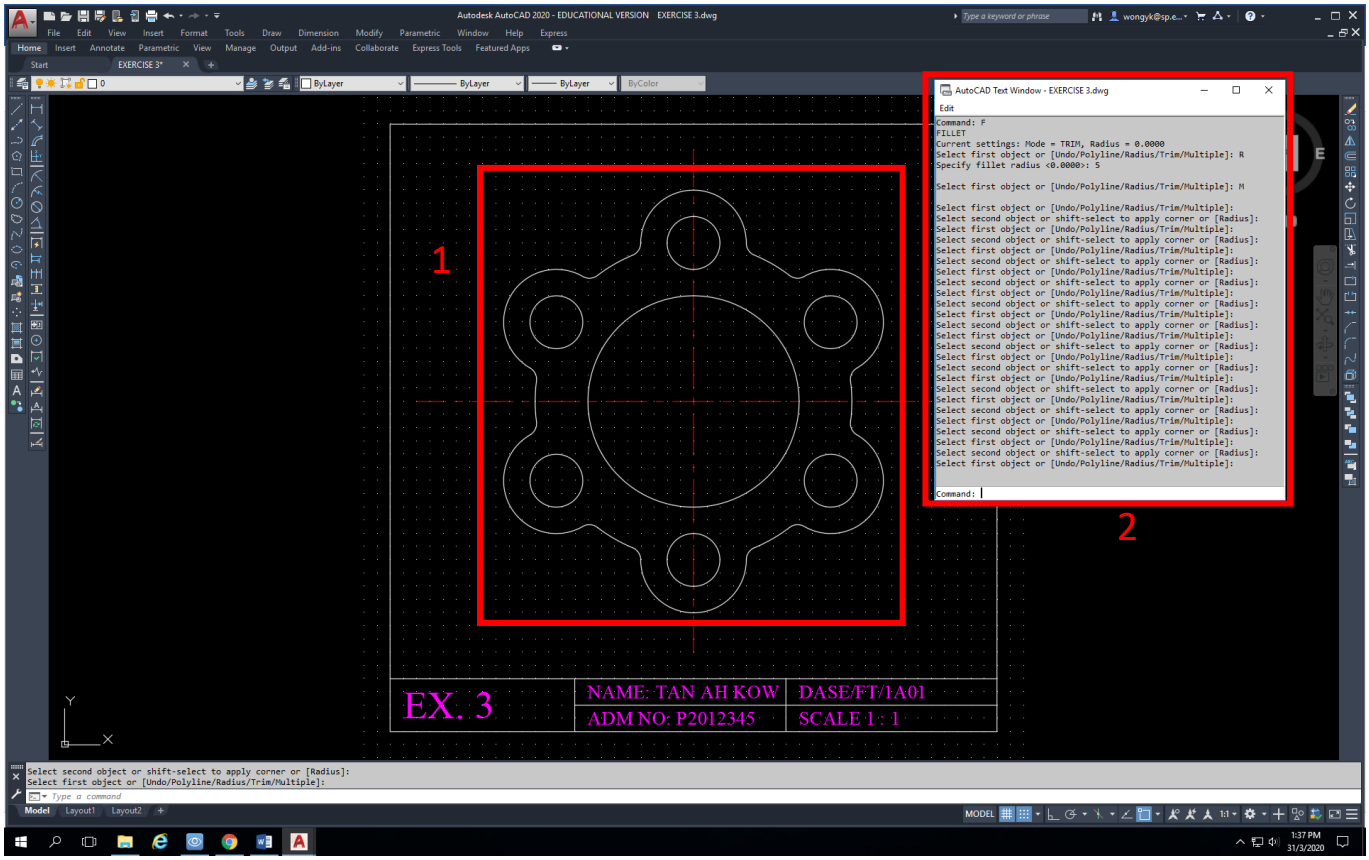

Fig 32

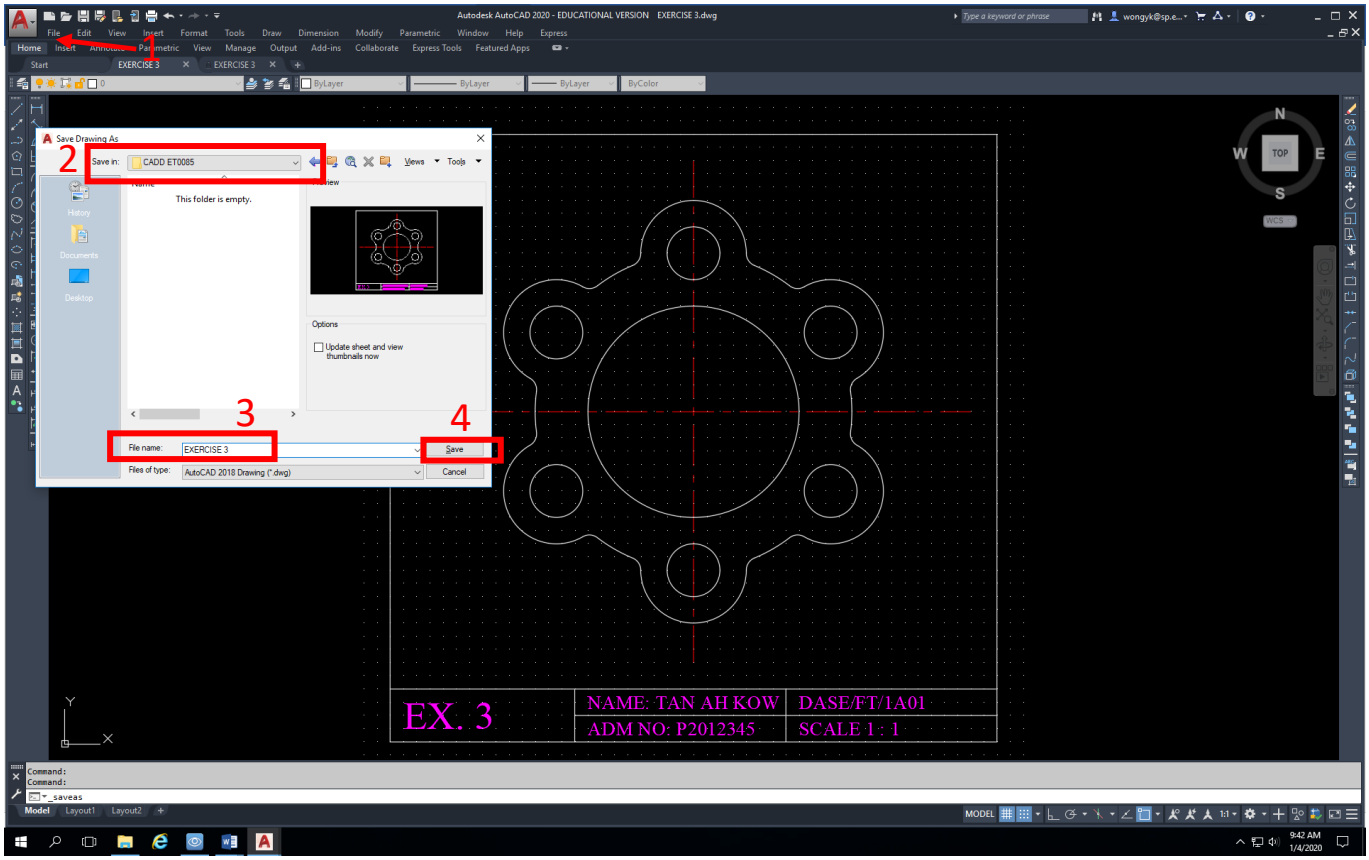

FIG 33

1. Save this drawing as shown in Fig 16:
   i. Click **File ….(1)**
   ii. Click **Saveas** (From File pull down menu)
   iii. Save in**: D Drive in your Notebook, create a folder= CADD ET0085 ….(2)** instead of default "Documents"
   iv. File Name **(3): EXERCISE 3,** then click **Save** …**(4)**
   v. See Fig 33 indicating steps to save accordingly.

THE END