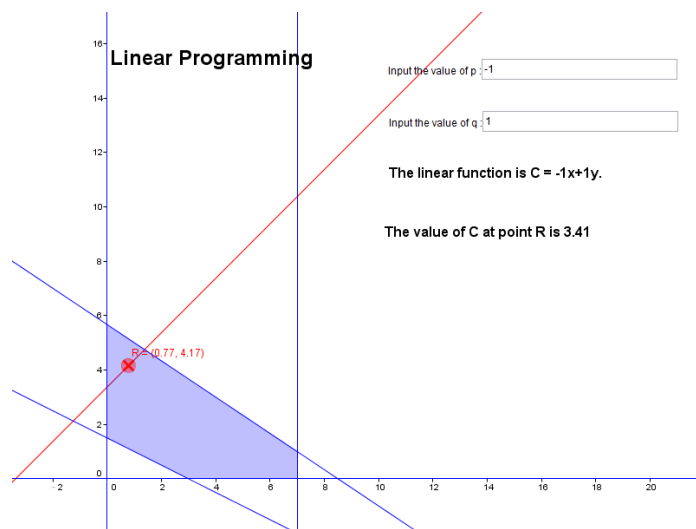










**Task A: Linear programming**

To create a dynamic worksheet that illustrates constructing the solution set of linear inequalities and the process of linear programming.



Create objects on the Graphics window as follows:

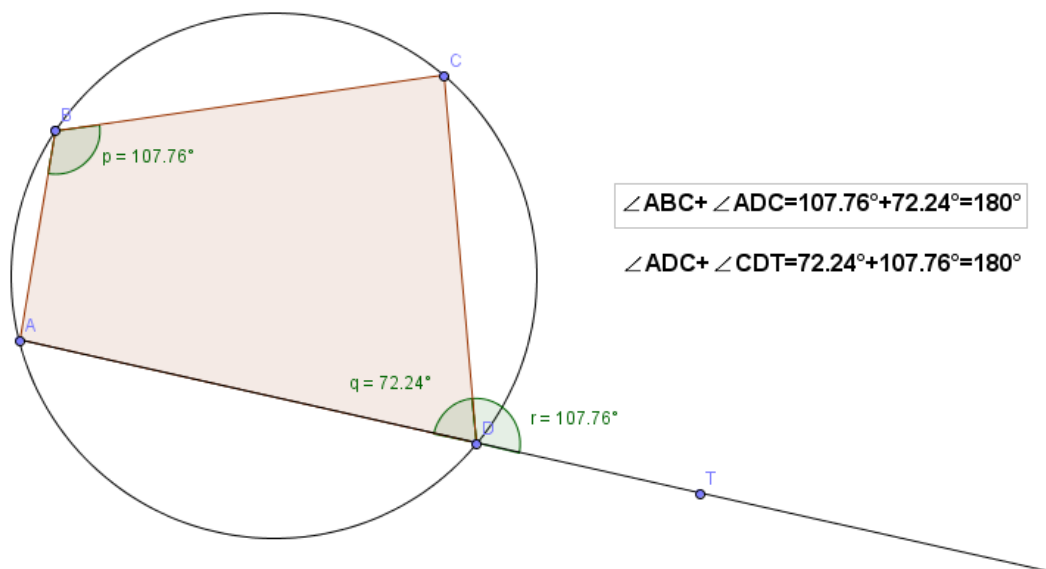
Steps	Objects to be created	Action
1.	The solution set of the linear inequality $x + 2y \geq 3$	<ul style="list-style-type: none"> <li>◆ Type “<math>x + 2y \geq 3</math>” in the input field</li> <li>◆ Select  “Point on object”, add a point in the solution set of the inequality and rename the point as A</li> <li>◆ Type “<math>k=x(A)+2*y(A)</math>” in the input field</li> <li>◆ Select  “Text box” and type “Substituting A into the inequality, <math>x + 2y = k</math>” where <math>k</math> is selected from “Objects”</li> <li>◆ Select  “New Point”, add a point outside the solution set of the inequality and rename the point as B</li> <li>◆ Type “<math>k'=x(B)+2*y(B)</math>” in the input field</li> <li>◆ Select  “Text box” and type “Substituting B into the inequality, <math>x + 2y = k'</math>” where <math>k'</math> is selected</li> </ul>

Steps	Objects to be created	Action
		from “Objects”
2.	<p>The constrained solution set of the system of linear inequalities:</p> $\begin{cases} x + 2y \geq 3 \\ 2x + 3y \leq 17 \\ 0 \leq x \leq 7 \\ 0 \leq y \end{cases}$	<ul style="list-style-type: none"> <li>◆ Hide points A and B, and the text boxes</li> <li>◆ Key in the inequalities one by one in the input field</li> <li>◆ Type “a&amp;&amp;b&amp;&amp;c&amp;&amp;d” in the input field (by default, a, b, c and d are the assigned names of the inequalities)</li> <li>◆ Hide the solution sets of each of the individual inequalities</li> </ul>
3.	<p>The optimal solution <math>C</math> of a linear function <math>C = px + qy</math> within the constrained solution set</p>	<ul style="list-style-type: none"> <li>◆ Type “p=0” and “q=0” in the input field</li> <li>◆ Select  “Input box”, select “p = 0” in “linked object” and type “Input the value of p” in the caption field</li> <li>◆ Select  “Input box”, select “q = 0” in “linked object” and type “Input the value of q” in the caption field</li> <li>◆ Select  “Point on object”, add a point in the constrained solution set and rename the point as R</li> <li>◆ Type “C=p*x(R)+q*y(R)” in the input field</li> <li>◆ Type “p*x+q*y=C” in the input field</li> <li>◆ Select  “Text box” and type “The value of C at point R is <input type="text"/>.” where <input type="text"/> is selected from “Objects”</li> </ul>





**Task B: Exterior Angle of Quadrilateral**






To create a dynamic worksheet that illustrates an exterior angle of cyclic quadrilateral equals the interior opposite angle.

Exterior angle equals interior opposite angle of a cyclic quadrilateral.



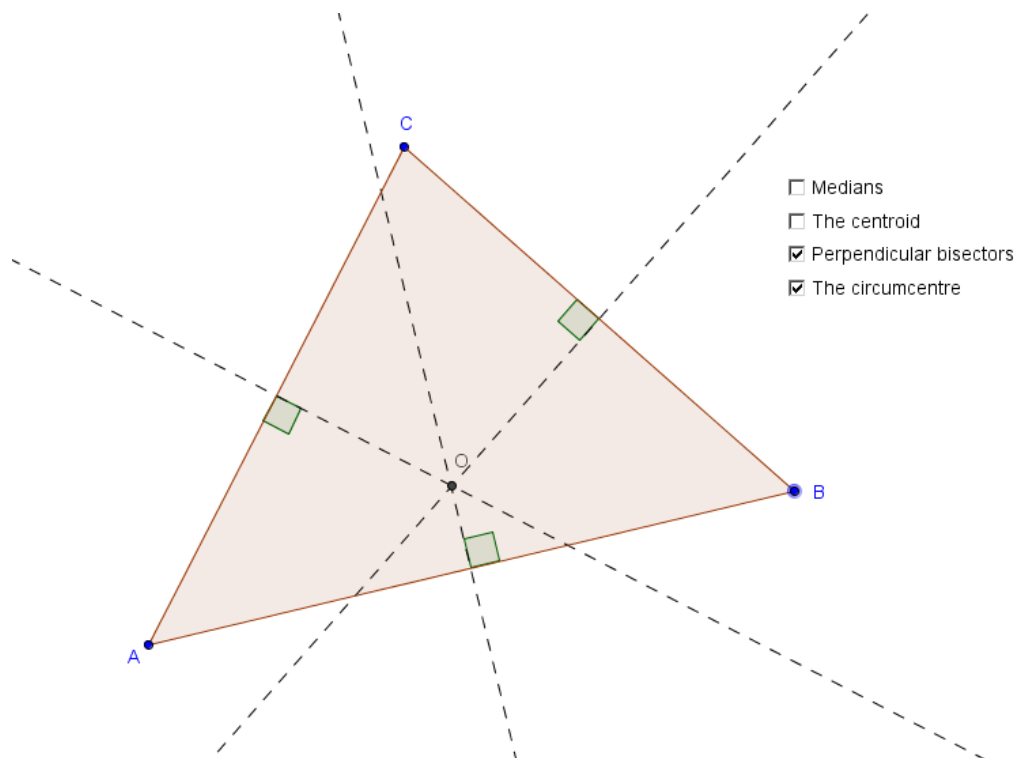
Create objects on the Graphics window as follows:

Steps	Objects to be created	Action
1.	A circle	<ul style="list-style-type: none"> <li>Select  “Circle with center through point” and click on the Graphics window for two times to create a circle</li> <li>Rename A and B as O and M respectively</li> <li>Right click on points O and M and deselect “Show Object” to hide the points</li> </ul>
2.	Four points A,B,C and D on the circle	<ul style="list-style-type: none"> <li>Select  “New Point”</li> <li>Click on the circle for four times in a clockwise direction to create the points</li> </ul>
3.	Polygon ABCD	<ul style="list-style-type: none"> <li>Select  “Polygon”</li> <li>Click on points A, B, C, D and then A again</li> <li>Right click on the polygon and deselect “Show label” if you see the label of the polygon</li> </ul>
4.	Ray from A through D	<ul style="list-style-type: none"> <li>Select  “Ray through Two Points”</li> </ul>




Steps	Objects to be created	Action
		<ul style="list-style-type: none"> <li>Click on points A and D</li> </ul>
5.	Point T	<ul style="list-style-type: none"> <li>Select  “New Point”</li> <li>Click on the part of the ray outside the circle and rename the point as T</li> </ul>
6.	Angles p, q and r	<ul style="list-style-type: none"> <li>Select  “Angle”</li> <li>Click on points A, B, C, then C, D, A, and then T, D, C (all in clockwise direction)</li> <li>Rename the angles as p, q and r respectively</li> <li>Right click on the angles and choose “Object Properties”, then check the option “Show Label” and select “Name and Value”</li> </ul>
7.	Text T1	<ul style="list-style-type: none"> <li>Select  “Insert text:”</li> <li>Click on the Graphics window</li> <li>Type <math>\angle ABC + \angle ADC = p + q = \boxed{p} + \boxed{q} = \boxed{p+q}</math></li> </ul> <p>Remarks:</p> <ul style="list-style-type: none"> <li>Select “<math>\angle</math>” from “Symbols”</li> <li>Select <math>\boxed{p}</math> and <math>\boxed{q}</math> from “Objects”</li> <li>To type <math>\boxed{p+q}</math>, start from <math>\boxed{p}</math> and click beside p to bring the cursor into the box, then type “+q”</li> </ul>
8.	Text T2	<ul style="list-style-type: none"> <li>Select  “Insert text:”</li> <li>Click on the Graphics window</li> <li>Type <math>\angle ADC + \angle CDT = q + r = \boxed{q} + \boxed{r} = \boxed{q+r}</math></li> </ul>
9.	Text T3	<ul style="list-style-type: none"> <li>Select  “Insert text:”</li> <li>Click on the Graphics window and type “Exterior angle equals interior opposite angle of a cyclic quadrilateral”</li> <li>Right click on the text, click “Object Properties” and click on “Position” and check the box “Absolute Position on Screen”</li> </ul>



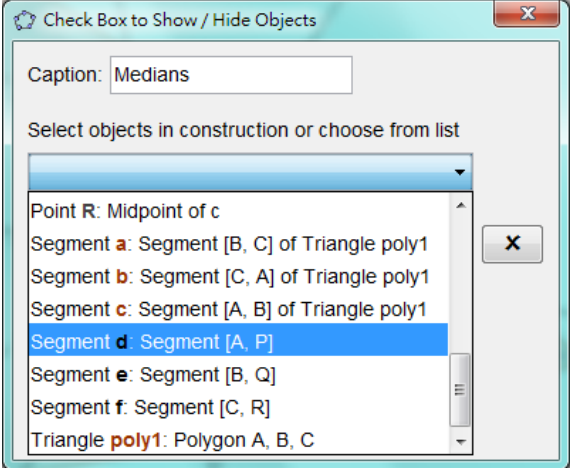
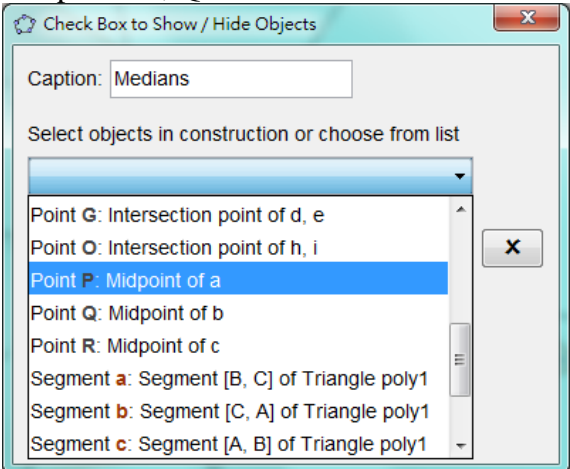
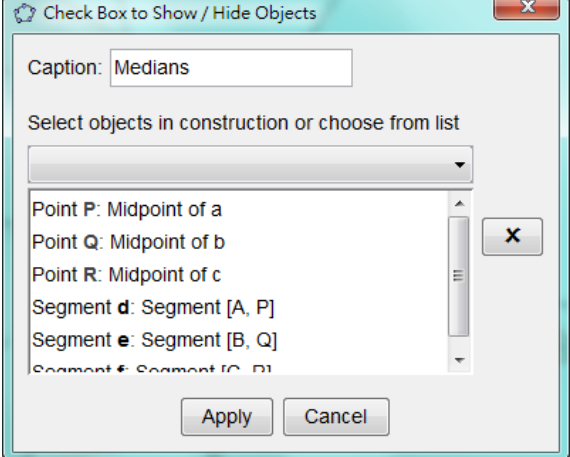
**Task C: Centers of Triangle**


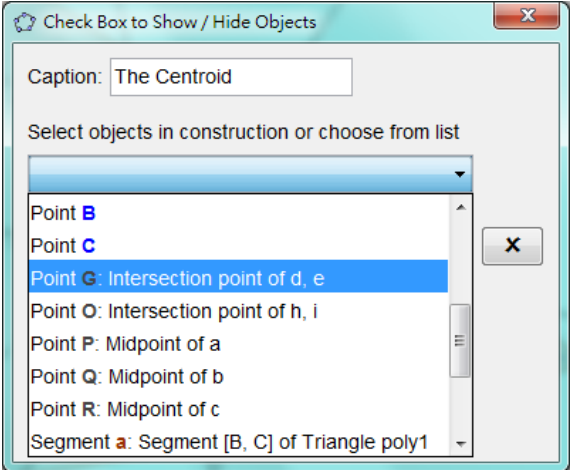
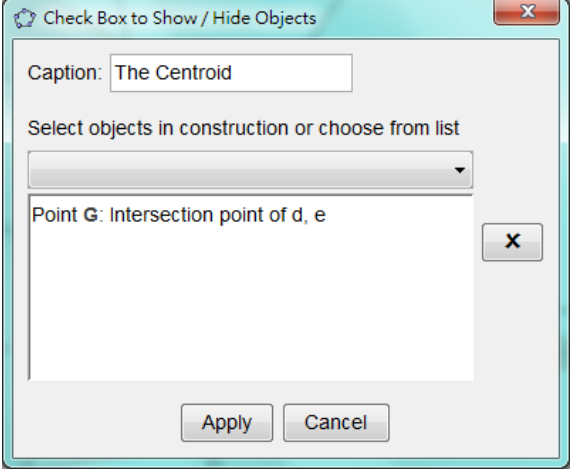

To create a dynamic worksheet that shows the collinearity of the centroid and circumcenter of an arbitrary triangle.







Create objects on the Graphics window as follows:

Steps	Objects to be created	Action
1.	Triangle ABC	<ul style="list-style-type: none"> <li>Select  "Polygon"</li> </ul>
2.	Medians AP, BQ and CR and the centroid G	<p>Medians:</p> <ul style="list-style-type: none"> <li>Select <input type="checkbox"/> "Midpoint or Center"</li> <li>Click on segments AB, BC and CA to create the mid-points of the three sides</li> <li>Right click on the mid-points of BC, CA, and AB and rename the points as P, Q and R</li> <li>Select  "Segment between Two Points"</li> <li>Click on points A and P, B and Q, C and R to create the medians</li> <li>Select  "Move"</li> <li>While holding the <input type="checkbox"/> <b>Ctrl</b> key, click on AP, BQ and CR</li> <li>Right click on any one of the lines and click "Object properties"</li> <li>Click on "Style" and change the line type to dashed line, then click the cross button to close the dialog box</li> </ul>


Steps	Objects to be created	Action
		<p>Centroid:</p> <ul style="list-style-type: none"> <li>◆ Select  “Intersect Two Objects”</li> <li>◆ Click on the intersection point of the lines AP, BQ and CR</li> <li>◆ Right click on the new point and rename it as G</li> </ul>
3.	Check boxes to show/hide the medians and centroid	<p>Show/hide Medians</p> <ul style="list-style-type: none"> <li>◆ Select  “Check Box to Show/Hide Objects”</li> <li>◆ In the “Caption” field, enter “Medians”</li> <li>◆ Click on the small black triangle and select segments AP, BQ and CR</li> </ul>  <p>and points P, Q and R</p>  

Steps	Objects to be created	Action
		<ul style="list-style-type: none"> <li>◆ Click “Apply”</li> <li>◆ Right click on the text of the check box and click “Object Properties”</li> <li>◆ Check the box “Fix Checkbox”</li> </ul> <p>Show/hide the Centroid</p> <ul style="list-style-type: none"> <li>◆ Select  “Check Box to Show/Hide Objects”</li> <li>◆ Click on the Graphics window</li> <li>◆ In the “Caption” field, enter “The centroid”</li> <li>◆ Click on the small black triangle and select Point G</li> </ul> <div style="display: flex; flex-direction: column; align-items: center;">   </div> <ul style="list-style-type: none"> <li>◆ Click “Apply”</li> <li>◆ Right click on the text of the check box and click “Object Properties”</li> <li>◆ Check the box “Fix Checkbox”</li> </ul>
4.	Perpendicular bisectors and the circumcentre O	<p>Perpendicular Bisectors:</p> <ul style="list-style-type: none"> <li>◆ Select  “Perpendicular Bisector”</li> <li>◆ Click on the segments AB, BC and CA to create the perpendicular bisectors</li> </ul>

Steps	Objects to be created	Action
		<ul style="list-style-type: none"> <li>◆ Select  “Move”</li> <li>◆ While holding <input type="checkbox"/> Ctrl key, click on the three perpendicular bisectors</li> <li>◆ Right click on any one of the lines and click “Object properties”</li> <li>◆ Click on “Style” and change the line type to dashed line, then click the cross button to close the window</li> </ul> <p>Circumcentre:</p> <ul style="list-style-type: none"> <li>◆ Select  “Intersect Two Objects”</li> <li>◆ Click on the intersection point of the perpendicular bisectors</li> <li>◆ Right click on the new point and rename it as O</li> </ul> <p>Mark the right angles:</p> <ul style="list-style-type: none"> <li>◆ Select  “Angle”</li> <li>◆ Click on segment AB and then its perpendicular bisector</li> <li>◆ Click on segment BC and then its perpendicular bisector</li> <li>◆ Click on segment CA and then its perpendicular bisector</li> <li>◆ Right click on the right angles and deselect “Show Label”</li> </ul>
5.	Check box to show/hide the perpendicular bisectors and the circumcentre	<p>Show/hide Perpendicular Bisectors</p> <ul style="list-style-type: none"> <li>◆ Select  “Check Box to Show/Hide Objects”</li> <li>◆ Click on the Graphics window</li> <li>◆ In the “Caption” field, enter “Perpendicular bisectors”</li> </ul>



Steps	Objects to be created	Action
		<div data-bbox="769 203 1342 674" style="border: 1px solid gray; padding: 5px; margin-bottom: 10px;"> </div> <ul style="list-style-type: none"> <li>◆ Click on the small black triangle and select Bisector a, b and c</li> </ul> <div data-bbox="769 779 1342 1249" style="border: 1px solid gray; padding: 5px; margin-bottom: 10px;"> </div> <p>and angles <math>\alpha</math>, <math>\beta</math> and <math>\gamma</math></p> <div data-bbox="769 1305 1342 1776" style="border: 1px solid gray; padding: 5px;"> </div>

Steps	Objects to be created	Action
		<div data-bbox="767 203 1342 674" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> </div> <ul style="list-style-type: none"> <li>◆ Click “Apply”</li> <li>◆ Right click on the text of the check box and click “Object Properties”</li> <li>◆ Check the box “Fix Checkbox”</li> </ul> <p>Show/hide the Circumcentre</p> <ul style="list-style-type: none"> <li>◆ Select  “Check Box to Show/Hide Objects”</li> <li>◆ Click on the Graphics window</li> <li>◆ In the “Caption” field, enter “The circumcentre”</li> <li>◆ Click on the small black triangle and select Point O</li> <li>◆ Click “Apply”</li> <li>◆ Right click on the text of the check box and click “Object Properties”</li> <li>◆ Check the box “Fix Checkbox”</li> </ul>