

**Task E: Construction of a Pyramid**

To construct the 3D representation of a pyramid according to a question in Paper 1 of Compulsory Part, HKDSE 2014.

17. Figure 6(a) shows a solid pyramid  $VABCD$  with a rectangular base, where  $AB=18\text{ cm}$ ,  $BC=10\text{ cm}$ ,  $VB=VC=30\text{ cm}$  and  $\angle VAB = \angle VDC = 110^\circ$ .

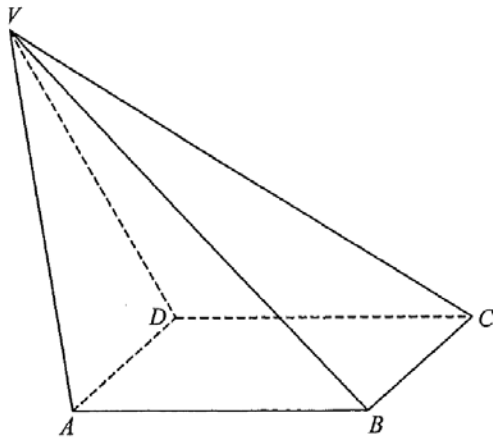


Figure 6(a)

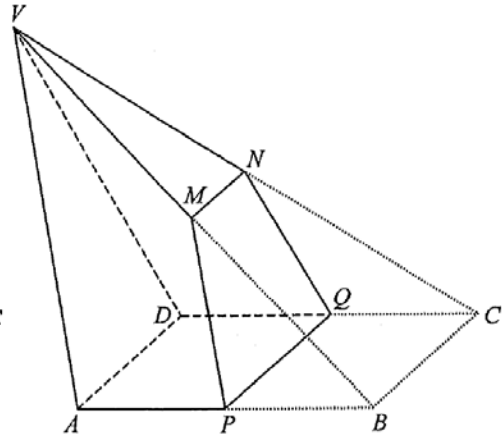
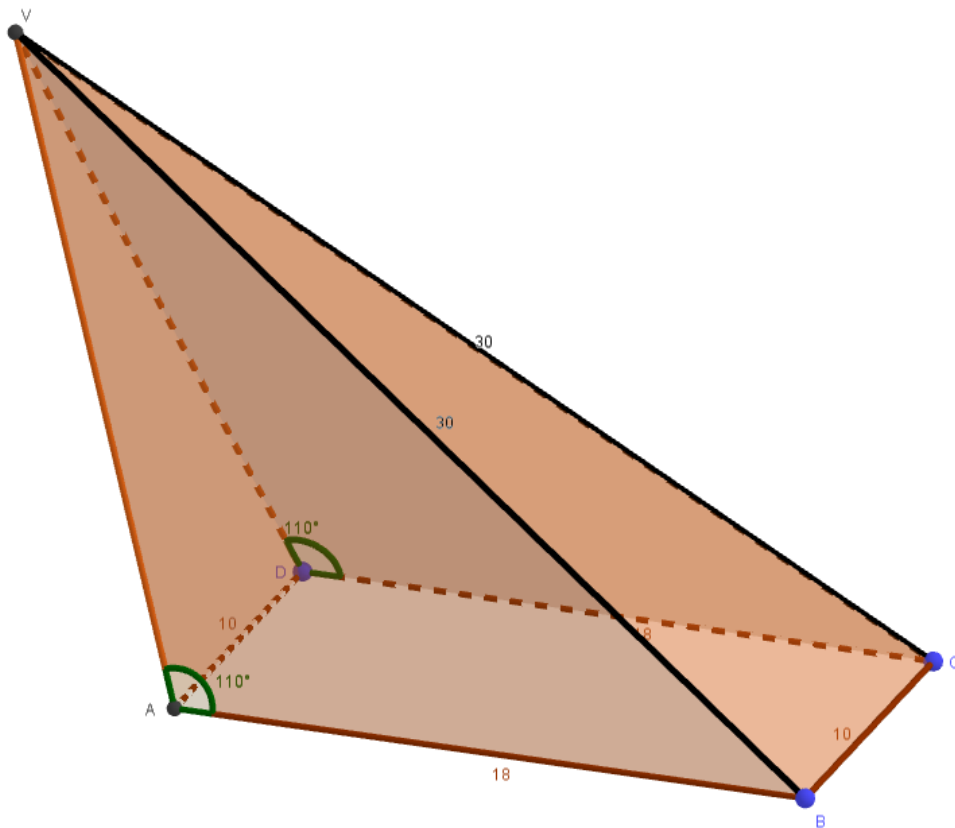


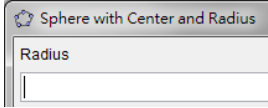

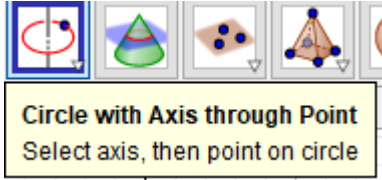






Figure 6(b)

(Q. 17, Paper 1, Compulsory Part, Mathematics, HKDSEE 2014)



Steps	Objects to be created	Action
1.	The base of the pyramid and appropriate construction.	<ul style="list-style-type: none"> <li>◆ In the “Graphics” window, add 4 points <math>A</math>, <math>B</math>, <math>C</math> and <math>D</math> at coordinates <math>(0, 0)</math>, <math>(18, 0)</math>, <math>(18, 10)</math> and <math>(0, 10)</math> respectively, then use the “Polygon” tool  to join <math>A</math>, <math>B</math>, <math>C</math> and <math>D</math> to form the base of the pyramid.</li> <li>◆ Create a point <math>E</math> on segment <math>AB</math>.</li> <li>◆ Rotate <math>E</math> about <math>A</math> through <math>110^\circ</math> in clockwise direction to <math>E'</math>.</li> <li>◆ Construct the ray <math>AE'</math>.</li> <li>◆ Construct the circle with centre <math>B</math> and radius 30.</li> <li>◆ Create the intersecting point of the ray and the circle as <math>F</math>.</li> </ul>
2.	Locate the vertex $V$ according to the description of the question	<ul style="list-style-type: none"> <li>◆ In “View” menu, choose “3D Graphics”</li> <li>◆ Click the bottom-right corner of the “Sphere” tool  and choose “Sphere with centre and radius”. Click the bottom and point <math>B</math> in “3D Graphics” window. Type “30” in the “Radius” window.</li> </ul> <div data-bbox="794 1178 1062 1285" style="border: 1px solid gray; padding: 5px; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>◆ Similarly, construct another sphere with centre at point <math>C</math> and radius of 30 units.</li> <li>◆ Click the “Intersect Two Surfaces” button , then choose the two spheres in the “Algebra” window. Hide the spheres. The intersection of the spheres is a circle.</li> <li>◆ Construct the line <math>AB</math>.</li> <li>◆ Construct the circle with axis <math>AB</math> and through <math>F</math> from the menu.</li> </ul> <div data-bbox="794 1738 1177 1917" style="border: 1px solid gray; padding: 5px; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>◆ Construct the intersecting points of the two circles constructed. Rename the appropriate point as <math>V</math> and hide the other one.</li> </ul>

Steps	Objects to be created	Action
3.	Construct the pyramid $VABCD$	<ul style="list-style-type: none"> <li>◆ Click the “Pyramid” button , then click the point <math>V</math> and the base rectangle <math>ABCD</math> in the “Graphics” view to construct the pyramid <math>VABCD</math>.</li> <li>◆ Display appropriate lengths and angles if necessary.</li> </ul>
4.	(Optional) Construct trapezium $MNQP$ and the height of $VABCD$ .	<ul style="list-style-type: none"> <li>◆ In “Point” tools, choose “Midpoint or Centre”  to locate the midpoint of <math>VB</math> by clicking <math>V</math> and <math>B</math> in “Graphics” window. Rename the point as <math>M</math>.</li> <li>◆ Similarly, construct <math>N, P</math> and <math>Q</math> accordingly. Use “Polygon” tool to construct trapezium <math>MNQP</math>.</li> <li>◆ Click “Plane through 3 Points” button  and then click <math>A, B</math> and <math>C</math> to create the base plane.</li> <li>◆ Click “Perpendicular Line” button  and then click <math>V</math> and the base plane to construct the perpendicular from <math>V</math> to the base of <math>VABCD</math>.</li> </ul>