

Circumcentre Guided Investigation

Student Investigation

7 8 9 10 11 12



Introduction

A circumcircle passes through each vertex of a polygon. This investigation focuses on the specific case of the circumcircle as it applies to a triangle. The concept of a circumcircle and other similar geometric problems underpin concepts associated with electronic navigation. The circumcentre is the centre of the circumcircle and therefore, a point that is equidistant from each of the vertices.

Scan the QR code or use the link to watch a video to help set up the diagram on your calculator and to help check your answers.



<https://bit.ly/Circumcentre>

Geometry

Open a New TI-Nspire Document and insert a **Graphs Application**.

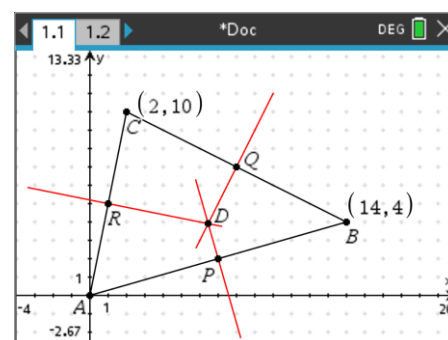
Draw a triangle with vertices:

A:(0, 0) B:(14, 4) C:(2, 10)

Construct perpendicular bisectors to sides: AB, BC and AC.

The aim is to determine the point where all three perpendicular bisectors intersect, the circumcentre of the triangle.

Note: Points P, Q & R have been labelled for reference only.



Question: 1.

Determine the gradient of side AB and hence the gradient of the perpendicular bisector (PD)

Question: 2.

Determine the coordinates of the midpoint on side AB. (Point P)

Question: 3.

Determine the equation of the perpendicular bisector to side AB. (Line PD)

Tip!



The translational form of a straight line is useful when the gradient and a point are known:

$y = m(x - h) + k$ is a straight line with gradient m passing through the point (h, k) .

Remember to use your calculator to check your answers.

Question: 4.

Determine the gradient of side AC and hence the gradient of the perpendicular bisector (RD)

Question: 5.

Determine the coordinates of the midpoint on side AC. (Point R)

Question: 6.

Determine the equation of the perpendicular bisector to side AC. (Line RD)

Question: 7.

Determine the gradient of side BC and hence the gradient of the perpendicular bisector (QD)

Question: 8.

Determine the coordinates of the midpoint on side BC. (Point R)

Question: 9.

Determine the equation of the perpendicular bisector to side BC. (Line QD)

Question: 10.

Use simultaneous equations to determine the point of intersection for the perpendicular bisectors: QD and RD.

Question: 11.

Verify the point of intersection (circumcentre) using the perpendicular bisectors QD and PD.

Question: 12.

Verify that distances AD, BD and CD are equal.

Question: 13.

Determine the equation to the circle that passes through the three vertices.