IDEA

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FINDING SOME CENTRES OF TRIANGLES 1

These tasks can utilize or recycle those pieces of sugar paper or card where students have previously cut out a net of a shape right from the middle. The idea here is to cut the 'waste' up into different shaped triangles big enough to do some paper folding with.

THE INSCRIBED CENTRE

Take a triangle and fold each angle in half (this is, obviously, the process of bisecting each angle). Providing upon the accuracy of the folding (and the triangle-ness of the triangle), the three fold lines will intersect at a single point. This point is the centre of the inscribed circle which just touches the three sides of the triangle. Another way to describe this situation is the three sides of the triangle are tangents to a circle whose radii are perpendicular to the sides of the triangle.

THE CIRCUMSCRIBED CENTRE

We can find another centre of a triangle as follows. Ask students to join or fold together pairs of corners. Each of the three folds made becomes the perpendicular bisectors of the sides and again, accuracy allowing, these three lines will intersect at a single point which is the centre of a circle that just touches the three corners of the triangle; this is the circumscribed circle.

THE CENTRE OF GRAVITY

This centre is found by creating folds from the mid-point of each edge to each opposite angle. These three lines intersect at a point and this is the centre of gravity or the centroid; students might check their accuracy by trying to balance their triangle on the end of a pencil at this point of intersection.

IDEA

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FINDING SOME CENTRES OF TRIANGLES 2

The more traditional way of finding the inscribed and the circumscribed centres of triangles are to construct them using a compass (c), pencil (p) and a straight edge (se).

Helping students develop such construction skills is important and in the first instance requires them to practise and develop basic skills of angle and line bisection. There are other technical drawing type skills, such as forming triangles and dividing a line up into any number of equal segments that students can gain pleasure discovering and developing.

Using the more traditional p, c, se approach, alongside paper folding methods, as well as working within a dynamic geometry environment, such as *Cabri Géomètre*, are all important ways for learners to engage in geometric thinking.

Through p, c, se type construction students have opportunities to appreciate geometric properties of bisection and perpendicularity; these form the basis of further knowledge about circle and angle theorems and properties relating to tangents, radii, diameters and chords.

The problem below is one to challenge older students and through its solution students have opportunities to appreciate, or connect together, some of the skills associated with circle theorems and centres of triangles. The problem requires the following construction:

- Draw a circle.
- Mark three points A, B, C 'widely' (though not equally) spaced on the circumference.
- Join these points together to form triangle ABC.
- Draw tangents to the circle at each point A, B, C.
- Where these tangents intersect each other (in pairs) mark points P, Q, R.

We now have two triangles, ABC and PQR. The challenge is to find relationships between the angles in triangle ABC and the angles in triangle PQR.