

tangents, the angles they make, and the theorems about touching rather than cutting



A line and a circle: three possibilities

- compare the perpendicular distance d from the centre to the line against the radius r
- if $d > r$ the line misses the circle entirely and there is no common point
- if $d = r$ the line touches at exactly one point and is called a **tangent**, the point being the point of contact
- if $d < r$ the line cuts the circle at two points and is called a **secant**
- a **chord** is the part of a secant lying inside the circle, and the longest chord is the diameter
- so a tangent is the borderline case between missing and cutting, which is why $d = r$ is its defining test



a circle with lines at three different distances from the centre: one passing clear of it, one just grazing at a single point, and one cutting right through. The distance from the centre is the only thing that decides which

The tangent theorems *

Radius $\perp$ tangent

the radius drawn to the point of contact is perpendicular to the tangent there. This is the theorem that creates a right triangle in almost every question

Equal tangent segments

the two tangent segments drawn from an external point to a circle are equal in length, and they subtend equal angles at the centre

Only one tangent

through a point on the circle exactly one tangent can be drawn, through an external point exactly two, and through an interior point none at all

Tangent and chord

the angle between a tangent and a chord at the point of contact equals the inscribed angle in the alternate segment on the other side of that chord

the first theorem is the one to reach for first: the moment a tangent appears, draw the radius to the point of contact and a right angle is handed to you

