# Answers and mark guide

| Q | Answer | Working | Marks |
|---|---|---|---|
| 1 | **See working** | Join the circumference point C to the centre O and extend to D. Triangles OAC and OBC are isosceles (radii). The exterior angle AOD = 2 × angle ACO and BOD = 2 × angle BCO. So angle AOB = 2 × angle ACB. | 6 |
| 2 | **See working** | The angle at the centre on the diameter is 180°. The angle at the circumference is half the angle at the centre, so it is 90°. | 6 |
| 3 | **See working** | Each angle at the circumference on the same arc is half the angle at the centre on that arc, so they are equal. | 6 |
| 4 | **See working** | Let the angles at the circumference be x and y. The angles at the centre on the two arcs are 2x and 2y and 2x + 2y = 360°, so x + y = 180°. | 6 |
| 5 | **See working** | Any other point on the tangent is outside the circle, so is further from O than the radius. The shortest distance from O to the tangent is the radius, so the radius meets the tangent at 90°. | 6 |
| 6 | **See working** | In triangles OAP and OBP: OA = OB (radii), OP is common, and angles OAP = OBP = 90°. By RHS the triangles are congruent, so PA = PB. | 6 |
| 7 | **See working** | Let the tangent and chord make angle x. The radius to the point of contact is perpendicular to the tangent, giving angle 90° − x in the isosceles triangle; the angle at the centre is 2x; the angle at the circumference in the alternate segment is x. | 6 |
| 8 | **See working** | Join the centre to both ends of the chord. The two right-angled triangles have equal hypotenuses (radii) and a common side, so are congruent (RHS) and the two halves are equal. | 6 |
| 9 | **30°** | The angle at the centre is twice the angle at the circumference. | 4 |
| 10 | **60°** | Opposite angles in a cyclic quadrilateral add up to 180°. | 4 |
| 11 | **90°** | The tangent is perpendicular to the radius at the point of contact. | 3 |
| 12 | **45°** | The angle in a semicircle is 90°, so angle ACB = 90° and angle ABC = 180 − 90 − 45 | 5 |
| 13 | **60°** | The angle at the centre is twice the angle at the circumference. | 4 |
| 14 | **140°** | Opposite angles in a cyclic quadrilateral add up to 180°. | 4 |
| 15 | **90°** | The tangent is perpendicular to the radius at the point of contact. | 3 |
| 16 | **60°** | The angle in a semicircle is 90°, so angle ACB = 90° and angle ABC = 180 − 90 − 30 | 5 |
| 17 | **55°** | The angle at the centre is twice the angle at the circumference. | 4 |
| 18 | **100°** | Opposite angles in a cyclic quadrilateral add up to 180°. | 4 |
| 19 | **90°** | The tangent is perpendicular to the radius at the point of contact. | 3 |

| Q | Answer | Working | Marks |
|---|---|---|---|
| 20 | **65°** | The angle in a semicircle is 90°, so angle ACB = 90° and angle ABC = 180 − 90 − 25 | 5 |

**My score: _____ / 96** Questions 1–15 = 75 marks (Foundation focus)