Year 9 · Geometry: Circles & Parallel Lines

Name: _____ Date: _____

Hi! This sheet gives you practice naming the parts of a circle and finding unknown angles when lines cross parallel lines. Draw a quick sketch for each question, it really helps you spot the equal angles.

Warm-up

1. Name the straight line that goes from one side of a circle to the other, passing through the centre.

2. A circle has a radius of 6 cm. What is its diameter?

3. Two parallel lines are cut by a transversal. One corresponding angle is 65°. What is the size of the matching corresponding angle?

4. Alternate angles between two parallel lines are equal. If one alternate angle is 110°, what is the other?

Practice

5. Match each word to its meaning: (a) chord, (b) radius, (c) circumference.

6. A transversal crosses two parallel lines. At the top intersection an angle of 72° is marked. Find the co-interior angle to it on the same side of the transversal.

7. Two parallel lines are crossed by a transversal. An angle x is alternate to a 48° angle, and an angle y forms a straight line with x. Find x and y.

8. Word problem: At the Avondale skate park, two long parallel handrails are crossed by a diagonal support beam. The beam makes a 63° angle with the top rail. Manaia says the beam makes the same 63° angle with the bottom rail as a corresponding angle. Is Manaia correct? Explain.

9. Word problem: A round garden bed at a school in Blockhouse Bay has a circumference path around it. A straight edging plank is laid across the bed touching the circle at two points but not passing through the centre. What part of the circle does the plank represent, and how does it compare in length to the diameter?

10. A transversal crosses two lines. At the first line an angle of 85° is measured, and at the second line the corresponding position measures 80°. Are the two lines parallel? Explain.

Challenge

11. A transversal crosses two lines. On one line the angle above the transversal is $(3a + 10)°$ and on the other line the co-interior angle on the same side is $(2a + 30)°$. Find the value of a that makes the two lines parallel, then state both angles.

12. In a circle with centre O, a chord AB has length 16 cm. A line from O meets AB at right angles at point M, the midpoint of AB. If OM = 6 cm, find the radius of the circle.

Answer key (for parents and tutors)

1. Name the straight line that goes from one side of a circle to the other, passing through the centre.
   The diameter. It is the longest chord in a circle and passes through the centre.

2. A circle has a radius of 6 cm. What is its diameter?
   Diameter = 2 × radius = 2 × 6 = 12 cm.

3. Two parallel lines are cut by a transversal. One corresponding angle is 65°. What is the size of the matching corresponding angle?
   Corresponding angles are equal, so the matching angle is also 65°.

4. Alternate angles between two parallel lines are equal. If one alternate angle is 110°, what is the other?
   The other alternate angle is also 110°, because alternate angles are equal.

5. Match each word to its meaning: (a) chord, (b) radius, (c) circumference.
   (a) A chord is a straight line joining any two points on the circle. (b) The radius is the fixed distance from the centre to any point on the circle. (c) The circumference is the total distance around the outside of the circle (its perimeter).

6. A transversal crosses two parallel lines. At the top intersection an angle of 72° is marked. Find the co-interior angle to it on the same side of the transversal.
   Co-interior (allied) angles add to 180°. So the co-interior angle = 180° − 72° = 108°.

7. Two parallel lines are crossed by a transversal. An angle x is alternate to a 48° angle, and an angle y forms a straight line with x. Find x and y.
   x is alternate to 48°, so x = 48°. y and x are on a straight line, so y = 180° − 48° = 132°.

8. Word problem: At the Avondale skate park, two long parallel handrails are crossed by a diagonal support beam. The beam makes a 63° angle with the top rail. Manaia says the beam makes the same 63° angle with the bottom rail as a corresponding angle. Is Manaia correct? Explain.
   Yes. Because the rails are parallel and the beam is a transversal, the corresponding angles are equal. So the beam meets the bottom rail at 63° as well.

9. Word problem: A round garden bed at a school in Blockhouse Bay has a circumference path around it. A straight edging plank is laid across the bed touching the circle at two points but not passing through the centre. What part of the circle does the plank represent, and how does it compare in length to the diameter?
   The plank represents a chord (it joins two points on the circle without passing through the centre). It is shorter than the diameter, because the diameter is the longest possible chord in any circle.

10. A transversal crosses two lines. At the first line an angle of 85° is measured, and at the second line the corresponding position measures 80°. Are the two lines parallel? Explain.
    No. If the lines were parallel, the corresponding angles would be equal. Here 85° ≠ 80°, so the lines are not parallel.

11. A transversal crosses two lines. On one line the angle above the transversal is $(3a + 10)°$ and on the other line the co-interior angle on the same side is $(2a + 30)°$. Find the value of a that makes the two lines parallel, then state both angles.
    For the lines to be parallel, co-interior angles add to 180°: $(3a + 10) + (2a + 30) = 180$. So $5a + 40 = 180$, giving $5a = 140$, $a = 28$. First angle = $3(28) + 10 = 94°$. Second angle = $2(28) + 30 = 86°$. Check: $94° + 86° = 180°$ ✓, so the lines are parallel.

12. In a circle with centre O, a chord AB has length 16 cm. A line from O meets AB at right angles at point M, the midpoint of AB. If OM = 6 cm, find the radius of the circle.
    Because OM is perpendicular to the chord AB and passes through the centre, it bisects the chord, so AM = 16 ÷ 2 = 8 cm. Triangle OMA has a right angle at M, so use Pythagoras: radius $OA^2 = OM^2 + AM^2 = 6^2 + 8^2 = 36 + 64 = 100$. Radius OA = $\sqrt{100} = 10$ cm.