Year 9 · Measurement: Circles, Triangles and Speed

Name: _____ Date: _____

Kia ora! This sheet gives you practice with metric units, areas and perimeters (including circles), Pythagoras' theorem, and speed–distance–time. Show your working and check your units.

Warm-up

1. Convert 3.6 km into metres.

2. Convert 4500 mm into metres.

3. Find the area of a parallelogram with base 7 cm and perpendicular height 4 cm.

4. Find the circumference of a circle with diameter 10 cm. Use $\pi \approx 3.14$.

Practice

5. Find the area of a trapezium with parallel sides 6 m and 10 m and a perpendicular height of 4 m.

6. A right-angled triangle has two shorter sides of 6 cm and 8 cm. Find the length of the hypotenuse.

7. Aroha cycles the 12 km from Avondale to New Lynn and back in 40 minutes. What is her average speed in km/h?

8. A van travels along the motorway at a steady 90 km/h for 2.5 hours. How far does it travel?

9. A semicircular (half-circle) garden edge has a diameter of 14 cm on a plan. Find the perimeter of the half circle. Use $\pi \approx 3.14$.

10. A rectangular deck is measured as 3.2 m by 2.5 m. Calculate its area, giving the answer to the correct precision.

Challenge

11. The numbers (5, 12, 13) form a Pythagorean triple. Use them to write down another Pythagorean triple, and verify that your new triple satisfies Pythagoras' theorem.

12. A quarter-circle path curves around the corner of Heron Park with radius 6 m. Starting from the full-circle formula, work out the total perimeter of the quarter-circle region (the curved part plus the two straight radii). Use $\pi \approx 3.14$, and give your answer to 3 significant figures.

Answer key (for parents and tutors)

1. Convert 3.6 km into metres.
   1 km = 1000 m, so 3.6 km = 3.6 × 1000 = 3600 m.

2. Convert 4500 mm into metres.
   1 m = 1000 mm, so 4500 mm = 4500 ÷ 1000 = 4.5 m.

3. Find the area of a parallelogram with base 7 cm and perpendicular height 4 cm.
   Area of a parallelogram = base × height (just like a rectangle). Area = 7 × 4 = 28 cm².

4. Find the circumference of a circle with diameter 10 cm. Use $\pi \approx 3.14$.
   Circumference = π × diameter = 3.14 × 10 = 31.4 cm.

5. Find the area of a trapezium with parallel sides 6 m and 10 m and a perpendicular height of 4 m.
   Area of a trapezium = ½ × (sum of parallel sides) × height. Area = ½ × (6 + 10) × 4 = ½ × 16 × 4 = 32 m².

6. A right-angled triangle has two shorter sides of 6 cm and 8 cm. Find the length of the hypotenuse.
   By Pythagoras: $c^2 = a^2 + b^2 = 6^2 + 8^2 = 36 + 64 = 100$. So $c = \sqrt{100} = 10$ cm.

7. Aroha cycles the 12 km from Avondale to New Lynn and back in 40 minutes. What is her average speed in km/h?
   40 minutes = 40 ÷ 60 = ⅔ hour. Speed = distance ÷ time = 12 ÷ ⅔ = 12 × 3/2 = 18 km/h.

8. A van travels along the motorway at a steady 90 km/h for 2.5 hours. How far does it travel?
   Distance = speed × time = 90 × 2.5 = 225 km.

9. A semicircular (half-circle) garden edge has a diameter of 14 cm on a plan. Find the perimeter of the half circle. Use $\pi \approx 3.14$.
   Radius r = 14 ÷ 2 = 7 cm. Perimeter of a semicircle = half the circumference + the diameter = (2πr ÷ 2) + 2r = πr + 2r. Perimeter = (3.14 × 7) + 14 = 21.98 + 14 = 35.98 ≈ 36.0 cm.

10. A rectangular deck is measured as 3.2 m by 2.5 m. Calculate its area, giving the answer to the correct precision.
    Area = 3.2 × 2.5 = 8.0 m². Each measurement has 2 significant figures, so the answer cannot be more precise than 2 significant figures: 8.0 m².

11. The numbers (5, 12, 13) form a Pythagorean triple. Use them to write down another Pythagorean triple, and verify that your new triple satisfies Pythagoras' theorem.
    Multiply each number by a positive integer k. Taking k = 3 gives (15, 36, 39). Check: $15^2 + 36^2 = 225 + 1296 = 1521$, and $39^2 = 1521$. Since $15^2 + 36^2 = 39^2$, the triple (15, 36, 39) works. (Any k, e.g. k = 2 giving (10, 24, 26), is also correct.)

12. A quarter-circle path curves around the corner of Heron Park with radius 6 m. Starting from the full-circle formula, work out the total perimeter of the quarter-circle region (the curved part plus the two straight radii). Use $\pi \approx 3.14$, and give your answer to 3 significant figures.
    A full circle's circumference is 2πr. A quarter circle uses one quarter of this: (2πr) ÷ 4 = πr ÷ 2. The region is also bounded by two straight radii, so perimeter = (πr ÷ 2) + 2r. Substituting r = 6: perimeter = (3.14 × 6 ÷ 2) + (2 × 6) = 9.42 + 12 = 21.42 ≈ 21.4 m.