# Quadrilaterals: Thinking Puzzles

Standard difficulty · 20 questions · 40 marks · Time: 38 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

## Section A — Choose the correct answer — 8 × 1 = 8 marks

**1.** The angles of any quadrilateral add up to:
**(a)** 270° **(b)** 540° **(c)** 180° **(d)** 360°

**2.** Which of these always has at least one line of symmetry but does not always have diagonals that bisect each other? (A kite here is not a rhombus.)
**(a)** rhombus **(b)** parallelogram **(c)** square **(d)** kite

**3.** A grid of 4 × 2 unit squares is drawn. How many rectangles of any size are there in it (squares count as rectangles)?
**(a)** 30 **(b)** 8 **(c)** 11 **(d)** 22

**4.** How many squares of any size are there in a grid of 3 × 5 unit squares?
**(a)** 26 **(b)** 90 **(c)** 15 **(d)** 27

**5.** A parallelogram, a square, a rhombus and a rectangle are coloured red, green, yellow and blue, one colour each.
• The blue shape has at least one line of symmetry.
• The rectangle is not blue.
• The yellow shape has two pairs of equal neighbouring sides.
• The red shape has all four angles right angles.
• The yellow shape has equal diagonals.
Which shape is green?
**(a)** rectangle **(b)** square **(c)** parallelogram **(d)** rhombus

**6.** How many lines of symmetry do a square and a parallelogram have altogether? (A kite here is not a rhombus.)
**(a)** 4 **(b)** 5 **(c)** 3 **(d)** 6

**7.** How many of these always have two pairs of equal neighbouring sides: kite, parallelogram, rhombus, rectangle? (A kite here is not a rhombus.)
**(a)** 2 **(b)** 1 **(c)** 3 **(d)** 4

**8.** The angles of a quadrilateral are in the ratio 4 : 5 : 5 : 1. What is the largest angle?
**(a)** 130° **(b)** 24° **(c)** 60° **(d)** 120°

## Section B — Short answer — 8 × 2 = 16 marks

**9.** Why is every square a rectangle but not every rectangle a square?

**10.** How many rectangles (including squares) are there in a grid of 8 × 6 unit squares?

**11.** Which shapes always have both at least one line of symmetry and diagonals that cross at right angles? Choose from square, rectangle, rhombus, parallelogram, kite, and write them in that order. (A kite here is not a rhombus.)

**12.** A rectangle, a parallelogram, a rhombus and a square are coloured yellow, orange, green and red, one colour each.

- The rhombus is not red.
- The red shape has all four sides equal.
- The yellow shape has two pairs of equal neighbouring sides.
- The parallelogram is not orange.

What colour is the parallelogram?

**13.** One angle of a parallelogram is 40°. Find (a) an angle next to it (b) the angle opposite it.

**14.** Clicking a circle on board Y switches it between ● and ○. What is the fewest clicks that turns board Y into the mirror image (left to right) of board X?

Board X:

○○○●

○○○○

Board Y:

●●○○

○●○○

**15.** How many squares of all sizes are there in a grid of 6 × 7 unit squares?

**16.** The angles of a quadrilateral are in the ratio 3 : 2 : 5 : 2. What is the smallest angle?

## Section C — Word problems — 4 × 4 = 16 marks

**17.** A kite, a rhombus, a square and a parallelogram are coloured blue, yellow, orange and red, one colour each. (A kite here is not a rhombus.)

- The kite is not yellow.
- The red shape has all four sides equal.
- The blue shape has diagonals that bisect each other.
- The yellow shape has all four sides equal.
- The yellow shape has equal diagonals.

What colour is (a) the parallelogram (b) the rhombus?

**18.** A window has a grid of 4 × 6 square panes. Count (a) all the rectangles of any size (b) all the squares of any size (c) the rectangles that are not squares.

**19.** Clicking a circle on board Y switches it between ● and ○.

Board X:

●○●○

●○○○

○●●●

Board Y:

●●○●

○●○○

●○○●

(a) What is the fewest clicks that makes Y the mirror image (left to right) of X? (b) How many ● will Y then have?

**20.** Property cards: (1) at least one line of symmetry; (2) all four angles right angles; (3) equal diagonals; (4) both pairs of opposite angles equal; (5) two pairs of equal neighbouring sides. A card goes to a shape family if every shape of that family has the property. How many cards go to (a) the rhombus family (b) the parallelogram family (c) the kite family (d) the rectangle family? (A kite here is not a rhombus.)

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# Answer key

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| Q | Answer | Working |
|---|---|---|
| 1 | **(d) 360°** | — |
| 2 | **(d) kite** | at least one line of symmetry: square, rectangle, rhombus, kite; diagonals that bisect each other: square, rectangle, rhombus, parallelogram |
| 3 | **(a) 30** | choose 2 of the 5 horizontal lines and 2 of the 3 vertical lines: 10 × 3 |
| 4 | **(a) 26** | 15 of size 1, 8 of size 2, 3 of size 3 |
| 5 | **(c) parallelogram** | parallelogram: green, square: yellow, rhombus: blue, rectangle: red |
| 6 | **(a) 4** | square 4, parallelogram 0 |
| 7 | **(a) 2** | kite, rhombus |
| 8 | **(d) 120°** | 360° ÷ 15 = 24° per part; 5 × 24° |
| 9 | **A square has all the properties of a rectangle (four right angles) and also equal sides, which a rectangle need not have.** | — |
| 10 | **756** | 36 × 21 |
| 11 | **square, rhombus, kite** | at least one line of symmetry: square, rectangle, rhombus, kite; diagonals that cross at right angles: square, rhombus, kite |
| 12 | **green** | rectangle: orange, parallelogram: green, rhombus: yellow, square: red |
| 13 | **(a) 140°; (b) 40°** | neighbouring angles add up to 180°; opposite angles are equal |
| 14 | **2** | mirror of X: ●○○○ / ○○○○; count the circles of Y that differ |
| 15 | **112** | 42 + 30 + 20 + 12 + 6 + 2 |
| 16 | **60°** | 360° ÷ 12 = 30°; × 2 |
| 17 | **(a) blue; (b) red** | kite: orange, rhombus: red, square: yellow, parallelogram: blue |
| 18 | **(a) 210; (b) 50; (c) 160** | 10 × 21; sum over sizes; subtract |
| 19 | **(a) 6; (b) 6** | mirror of X: ○●○● / ○○○● / ●●●○ |
| 20 | **(a) 3; (b) 1; (c) 2; (d) 4** | rhombus: 1, 4, 5; parallelogram: 4; kite: 1, 5; rectangle: 1, 2, 3, 4 |