Chapter 14: Transformation and similarity

Starter 14 (page 247)
Seven of the nine monkeys are “the same”, i.e. congruent; one other is “too long” and one is “too thin”. Of the seven congruent monkeys, six are rotationally equivalent and one is flipped – or, if you like, there are six right-handed and one left-handed version of the same picture.

Exercise 14.1 (page 249)
8 a) Two shapes are congruent if they are the same shape and size.
   b) $y = -1$
   c) $y = -x$
   d) $y = x$
   e) $y = -x$
9 T and V are coincident (they are, in effect, the same triangle)

Exercise 14.2 (page 255)

1

2

3 a) $y = -1$
   b) $y = -x$
   c) $T_1 \rightarrow T_3$: a rotation of $90^\circ$ clockwise about O.

4 a) $y = -1$
   b) $y = -x$
   c) $C \rightarrow A$: a rotation of $90^\circ$ clockwise about $(0, 1)$.

5 a) $y = -1$
   b) $y = -x$
6  a) b)

7  a) 90° anticlockwise.  b) (2, 0)
8 Anita is wrong (for example, 90° anticlockwise and then 90° clockwise using two different centres is equivalent to a translation). Bella is (very) wrong. Therefore Cat is wrong too!

Exercise 14.3  [page 259]
1  a), b), c)

d) \(\begin{pmatrix} 0 \\ 7 \end{pmatrix}\)
Exercise 14.4 (page 264)

1. a), b), c)

2. d) They are similar but not congruent.

3. a), b)

4. a) 3
   b) (2, 5)
Exercise 14.5 (page 267)
1 a) 17.6 cm  b) 1 : 1.6  c) 1 : 2.56
2 54 cm
3 8.64 kg
4 a) RT = 11.25 cm, RQ = 20.25 cm  b) 10.4 cm
5 a) 185 m  b) 10 350 tonnes (4 s.f.)
6 \(x = 12\) cm, \(y = 12\) cm
7 13.0 kg
8 a) Angle \(\text{RPQ} = \text{angle RST}\) (corresponding angles), and angle \(\text{RQP} = \text{angle RTS}\) (same reason), so each angle in one triangle is equal to the corresponding angle in the other one.
   b) 12 cm
c) 15 cm
9 a) 1.64 m  b) 14.8 m²
10 15.1 cm (3 s.f.)

Review Exercise 14 (page 270)
1 270 cm³
2 a) b)
3 6
4 10 248 cm²
5
6 a)

b) Rotation of 180° about (0, 1).
7 a) i) 

\[
\begin{array}{c}
\text{A} \\
\text{C} \\
\text{B} \\
\text{O} \\
\end{array}
\]

ii) \(x = 1\)

b) Rotation of 90° anticlockwise about (0, 0)
8 a) Reflection in the \(y\) axis
   b) Rotation of 90° clockwise about (0, 0)
9 8.25 cm
10 a) 2
   b), c)

11 23.4 buckets of sand to 3 s.f.
12 a) 13.5 cm  b) 2.5 cm
13 317 mm
14 a) 12.5 cm  b) 7.2 cm

Internet Challenge 14 (page 275)
1 Icosahedron  2 Cylinder
3 Congruent  4 Similar
5 Alternate  6 Parallel
7 Torus  8 Octagon
9 Hemisphere  10 Apex
11 Tetrahedron  12 Rhombus
13 Minute of arc  14 Radian
15 Truncated cone = frustum