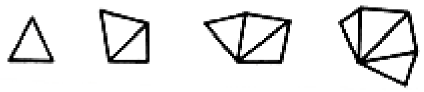
CHAPTER 15 Polygons

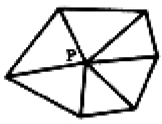
This chapter starts with the sum of the exterior angles and then deduces the sum of the interior angles. Some teachers may prefer to do this the other way round and here are two methods:

1. Building polygons up from triangles:



Number of triangles = number of sides – 2
So the sum of the interior angles of an n-sided polygon
= the sum of the interior angles of $(n-2)$ triangles
= $(n-2)\ 180^\circ$

2. Taking a point inside a polygon:



An n-sided polygon gives n triangles
So the sum of the interior angles of the polygon
= the sum of the interior angles of n triangles triangles – angle sum at P
= $(180n - 360)^\circ$

EXERCISE 15a (p. 254)

1. No, angles not equal

2. Yes

3. No, sides not equal

4. No, { sides not equal, angles not equal }

5. No, { sides not equal, angles not equal }

6. No, { sides not equal, angles not equal }

7. Yes

8. No, not bounded by straight lines

EXERCISE 15b (p. 256)

1. 180°
2. 360°

3. a) $p = 100^\circ$, $r = 135^\circ$, $x = 55^\circ$, $q = 125^\circ$ b) 360º
4. a) $w = 120^\circ$, $x = 60^\circ$, $y = 120^\circ$, $z = 60^\circ$ b) 360º
5. a) 180º b) 540º c) 180º d) 360º
6. 360º
7. a) equilateral b) 60º c) 120º d) 60º e) 360º

EXERCISE 15c (p. 258)
To demonstrate the sum of the exterior angles, a ruler can be placed along one side and the slid and turned until it is back to its original position.

1. 60º
2. 90º
3. 50º
4. 50º
5. 60º
6. 90º
7. 95º
8. 55º
9. 30º
10. 125º
11. x = 50º
12. x = 30º
13. x = 24º
14. a) 5 b) 8

EXERCISE 15d (p. 261)

1. 36º
2. 45º
3. 30º
4. 60º
5. 24º
6. 20º
7. 40º
8. 22.5º
9. 18º

EXERCISE 15e (p. 262)

1. 720º
2. 540º
3. 1440º
4. 360º
5. 900º
6. 1800º
7. 2880º
8. 1260º
9. 2340º

EXERCISE 15f (p. 263)

1. a) 2440º b) 2520º c) 1620º
2. 80º
3. 120º
4. 110º
5. 105º
6. 85º
7. 110º
8. 108º
9. 120º
10. 135º
11. 144º
12. 150º
13. 162º
14. a) 18 b) 24
15. a) 12 b) 20

16. a) yes, 12 b) yes, 9 c) no d) yes, 6 e) no f) yes, 4
17. a) yes, 4 b) yes, 6 c) no d) yes, 72 e) yes, 36 f) yes, 8

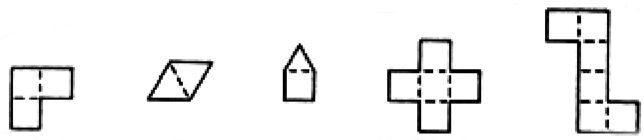
EXERCISE 15g (p. 265)
In Numbers 15–20 the most able should give reasoned answers. In many cases the teacher may decide that appeal to symmetry is acceptable.

1. 54º
2. 45º
3. 150º
4. 72º
5. 60º
6. 50º
7. 80º
8. 135º

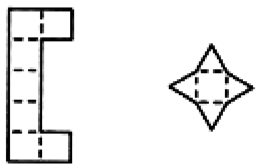
9. 100°
10. 60°
11. 72°
12. 45°
13. 60°
14. 36°
15. a) 36° b) 36°
16. a) 128.6° b) 25.7°
17. 77.1°
18. a) 22.5° b) 22.5°
19. 22.5°
20. 45°

EXERCISE 15h (p. 271)

Number 6 can be used to take the idea of tessellations further, i.e. some shapes built up from squares and equilateral triangles will tessellate. For example:



After tessellations with shapes that *do* work, pupils can try these two shapes (which do not tessellate)



and then investigate some shapes of their own.

1. a) The interior angles (135°) do not divide exactly into 360° b) A square
2. a) No b) A regular ten-sided polygon
4. Square, equilateral triangle