Angles in Parallel Lines

Foundation / Higher tier | Written solutions

ANGLE RELATIONSHIPS

Question 1

a) x = 42°. b) The 42° angle and x are alternate interior angles on parallel lines, so they are equal.

c) y = 42°. d) y is vertically opposite x, so the angles are equal. (Alternatively, y corresponds to the 42° angle.)

Question 2

a) x = 125°. b) The 55° angle and x are co-interior angles: 55° + x = 180°, hence x = 180° − 55° = 125°.

Question 3

a) x = 63°. b) The two marked angles occupy the same position at each crossing of the transversal. Corresponding angles are equal on parallel lines.

Question 4

a) x = 70°. b) The 70° angle and x are alternate interior angles between the parallel lines, so they are equal.

Question 5

a) Alternate to d: e (inside the lines, on the opposite side of the transversal).

b) Corresponding to b: e (same relative position at the lower crossing).

c) Co-interior to a: e (inside the parallel lines on the same side).

d) Vertically opposite h: f.

e) Corresponding to g: d.

MULTI-STEP QUESTIONS

Question 6

Consider the small triangle formed by the upper parallel line and the two crossing transversals. Its right-hand base angle is $180° - 112° = 68°$, since adjacent angles on a straight line add to 180°.

The other base angle is 48°. The triangle angle at the crossing is $180° - 48° - 68° = 64°$. This is vertically opposite x, so $x = 64°$.

Question 7

At F, the angle inside the small upper triangle is $180° - 115° = 65°$ (straight line).

The angle at B in that triangle equals the 66° angle at D because they are corresponding angles on parallel lines.

Angle FEB = $180° - 65° - 66° = 49°$.

Question 8

The angle at A inside triangle EAB is 127°. The angle at B equals the 32° angle at D because AB is parallel to CD and EBD is a transversal (corresponding angles).

Angles in triangle EAB add to 180°, so angle AEB = $180° - 127° - 32° = 21°$.

Question 9

The interior angle EGF is $180° - 111° = 69°$ (straight line FGD).

EF = EG, so triangle EFG is isosceles. Its base angle EFG also measures 69°.

AB is parallel to CD: angle AEF and angle EFG are alternate interior angles, so angle AEF = 69°.

Question 10

At G, angle CGE = $180° - 110° = 70°$ because CD is a straight line. The 47° angle EGF lies within it, so angle CGF = $70° - 47° = 23°$.

The 55° angle is EFG. Since AB is parallel to CD, the angle between FE and the rightward horizontal at F is $55° - 23° = 32°$. Corresponding angles give angle AEF = 32°.