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# Unit 5 · Angles and constructions — teaching slides

18 slides, formatted for printing.

## 5.1 A sum of 360°

### A full turn is 360°

- Turning all the way round and back to the start is 360°.
- So angles that meet at a point must add up to 360°.
- This is the single fact the whole section rests on.

```
120° + 95° + x = 360°
x = 360° − 215° = 145°
```

### Half a turn is 180°

- A straight line is half of a full turn.
- So angles on one side of a straight line add to 180°.
- Look for the straight line — it is often the quickest route.

```
65° + 40° + y = 180°
y = 180° − 105° = 75°
```

### Finding a missing angle

- Decide which total applies: 360° at a point, 180° on a line.
- Add the angles you are given.
- Subtract that from the total.
- Write the reason next to your working — Cambridge awards marks for it.

```
140° + 75° + x = 360°
215° + x = 360°
x = 145° (angles at a point)
```

### Triangles give 180°

- The three angles of any triangle total 180°.
- Tear the corners off a paper triangle and fit them together — they make a straight line.
- This fact is the key to the next slide.

```
55° + 72° + e = 180°
e = 53°
```

### So a quadrilateral gives 360°

- Draw one diagonal across a quadrilateral.
- It splits into two triangles.
- Each triangle has 180°, so the quadrilateral has 2 × 180° = 360°.
- You have **derived** the rule, not just been told it.

```
95° + 112° + 83° + d = 360°
290° + d = 360°
d = 70°
```

### Naming angles by size

- Knowing the name tells you roughly how big the answer should be.
- Use it to check: an answer of 300° for an acute angle is wrong.

```
acute < 90°
right = 90°
obtuse between 90° and 180°
straight = 180°
reflex > 180°
```

## 5.2 Intersecting lines

### Two lines crossing make four angles

- Where two straight lines cross, four angles are formed.
- They fill a full turn, so they add to 360°.
- But there is more structure than that — look at the pairs.

```
Four angles at a crossing
Two pairs, each pair equal
```

### Vertically opposite angles are equal

- The angles **opposite** each other are equal.
- They are called **vertically opposite** angles.
- This is a fact you may quote as a reason in an answer.

```
If one angle is 62°
the angle opposite it is also 62°
```

### Why they are equal

- Call one angle a.
- The angle beside it is on a straight line, so it is 180° − a.
- The angle beside *that* is 180° − (180° − a) = a.
- So the opposite angle comes back to a. That is the proof.

```
a, 180−a, a, 180−a
Total: 2a + 2(180−a) = 360° ✓
```

### Perpendicular lines

- If one of the four angles is 90°, all four are 90°.
- Such lines are **perpendicular**.
- Mark a right angle with a small square, not an arc.

```
90°, 90°, 90°, 90°
The little square means exactly 90°
```

### Parallel lines and a transversal

- **Parallel** lines stay the same distance apart and never meet.
- They are marked with matching arrows.
- A line crossing them is called a **transversal**.

```
Two arrows on each line means “these two are parallel”
The transversal cuts both of them
```

### Corresponding and alternate angles

- **Corresponding** angles sit in matching positions — an F shape. They are equal.
- **Alternate** angles sit on opposite sides of the transversal — a Z shape. They are equal.
- Look for the F and the Z hidden in the diagram.

```
F shape → corresponding → equal
Z shape → alternate → equal
One angle of 65° fixes every other angle in the diagram
```

## 5.3 Drawing lines and quadrilaterals

### Using a protractor

- Put the centre mark exactly on the vertex of the angle.
- Line one arm up with a zero on the scale.
- Read round on **that same scale** to the other arm.
- Then check: does the number match what you can see?

```
An angle that looks acute must read under 90°
If you read 130° for it, you used the wrong scale — it is 50°
```

## Drawing an angle

- Draw one arm with a ruler first.
- Put the protractor centre on the end of that arm.
- Mark the degree you want, then join it to the vertex.
- Label the angle so the reader knows what you drew.

```
To draw 65°: draw the base line, mark 65 on the scale, join up
```

## Parallel and perpendicular

- **Parallel** lines never meet and stay the same distance apart.
- Mark them with matching arrows.
- **Perpendicular** lines meet at 90°.
- Mark a right angle with a small square, never an arc.

```
→→ on two lines means they are parallel
⌐ in a corner means exactly 90°
```

## The quadrilateral family

- All of them have four straight sides and angles totalling 360°.
- They differ in which sides are equal and which are parallel.

```
square 4 equal sides, 4 right angles
rectangle 4 right angles
rhombus 4 equal sides
parallelogram 2 pairs of parallel sides
trapezium exactly 1 pair of parallel sides
kite 2 pairs of adjacent equal sides
```

## Overlapping families

- A square is also a rectangle, a rhombus and a parallelogram.
- A rectangle is not usually a square.
- Ask “does it satisfy the definition?”, not “does it look like one?”

```
Every square is a rectangle ✓
Every rectangle is a square ✗
Every rhombus is a parallelogram ✓
```

## Angles inside a parallelogram

- Opposite angles are equal.
- Adjacent angles lie between parallel lines, so they add to 180°.
- That is enough to find every angle from just one.

```
One angle 65°
Adjacent: 180° − 65° = 115°
Opposite: 65°, and the fourth is 115°
Check: 65 + 115 + 65 + 115 = 360 ✓
```