●●○○○ Level 2 · Mathematics M2.5

Shapes and angles

Draw shapes exactly, and measure the angles between their sides.

Draw straight and parallel lines, name polygons, test right angles with folded paper, measure angles in degrees, sort shapes, find lines of symmetry, fold nets and find your way on a grid.

YOU ARE READY FOR THIS BOOK IF

You can name a triangle, a square and a rectangle and count their corners.

One step up	M3.5 Angles, triangles and symmetry
This book	**M2.5 Shapes and angles**
One step down	M1.5 Shapes around us

Contents

M2.5.1 Straight lines and parallel lines

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M2.5.4 Measuring angles in degrees

M2.5.5 Triangles and four sided shapes

M2.5.6 Lines of symmetry

M2.5.7 Solid shapes and nets

M2.5.8 Grids and directions

Key words, A to Z

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M2.5.1 CHAPTER 1

Straight lines and parallel lines

How do I draw a line that is exactly 6 cm long?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Put the end of the ruler on the start of the line. Stop at 6.
- ☐ **B** Put the 0 mark on the start of the line. Stop at 6.
- ☐ **C** Put the 1 mark on the start of the line. Stop at 6.

BY THE END YOU CAN

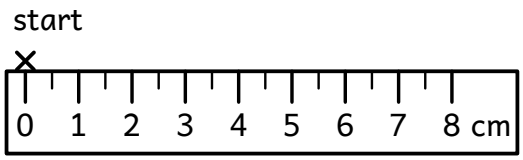
- Draw a straight line of a given length with a ruler
- Find parallel lines around you, like the two sides of a door

A **straight line** does not bend. You draw one along the edge of a ruler.

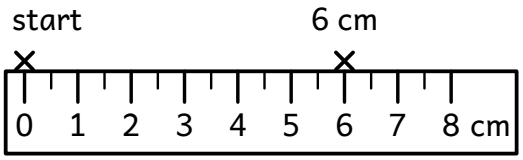
The **length** of a line is how long it is. A ruler shows length in centimetres, written cm.

DRAW IT FIRST

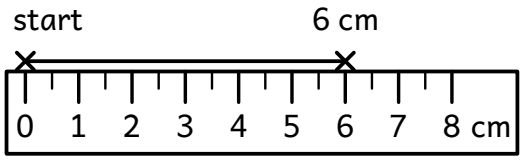
Draw a line 6 cm long



1 Make a small cross where the line starts. Put the 0 mark of the ruler under it.

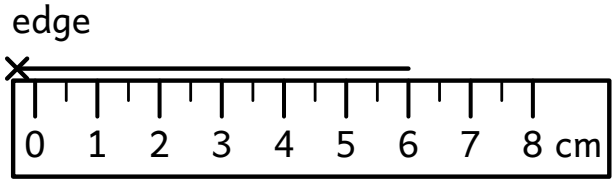


2 Find 6 on the ruler. Make a second cross above it.



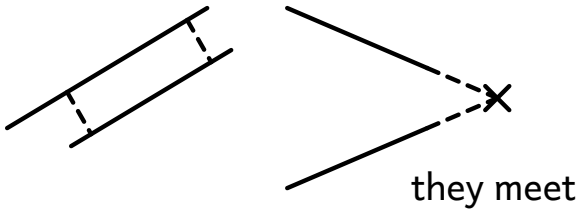
3 Hold the ruler still. Draw from cross to cross.

Do not start at the end of the ruler. Many rulers have a small gap before the 0 mark.



This line starts at the edge, not at 0. It is longer than 6 cm.

Look at a door. Its two long sides are **parallel**. Parallel lines always stay the same distance apart. They never meet.



parallel **not parallel**

The left pair stay the same distance apart. The right pair get closer, so they will meet.

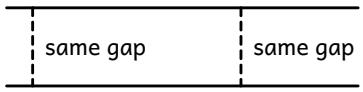
Parallel lines can be different lengths. They can point across, up or slanted.

SEE IT THREE WAYS

With things

Lay two sticks on the ground. Make the gap the same at both ends.

As a picture



In symbols

The gap at one end = the gap at the other end. So the lines are parallel.

TRY IT

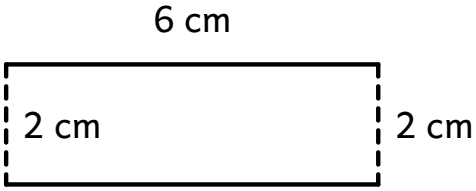
Draw two parallel lines

You need: a sheet of paper, a pencil, a ruler, or a book with straight sides.

1. Draw a line 6 cm long. Put the 0 mark at the start.
2. Measure 2 cm straight down from each end. Make a dot each time.
3. Join the two dots with the ruler.
4. Measure the gap in the middle. It is 2 cm too.
5. No ruler? Draw round a book. Its two long sides are parallel.
6. Now look around. Find parallel lines in the room.

What you will see: The gap is 2 cm at both ends and in the middle. So the lines are parallel.

If you cannot try it, this is what happens.



A WRONG IDEA MANY PEOPLE HAVE

~~Two lines that do not touch on the page are parallel.~~

Why it feels right: On a small drawing, two lines can seem to never meet.

The test that breaks it: Draw both lines longer with a ruler. If they get closer, they will meet. Then they are not parallel.

What is true: Parallel lines stay the same distance apart, however long you draw them.

KEY WORDS

straight line

a line that does not bend.

length
how long a line is.

parallel
lines that stay the same distance apart and never meet.

BACK TO YOUR GUESS

The answer is B: Put the 0 mark on the start of the line. Stop at 6.

Length starts at the 0 mark. Many rulers have a small gap before 0. The end of the ruler is not the start.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. You draw a line 8 cm long. Where do you put the 0 mark of the ruler?

   A On the start of the line

   B On the end of the ruler

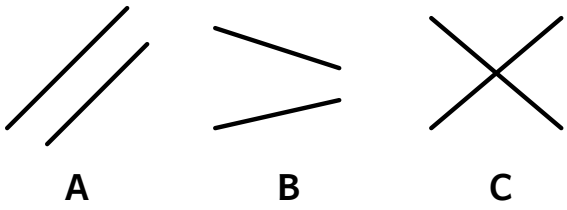
   C On the 1 mark

   Answer at the back of the book.

2. Mei wants a line 6 cm long. She starts at the 1 mark and stops at the 6 mark. How long is her line, in cm?

   Answer at the back of the book.

3. Which pair of lines is parallel?



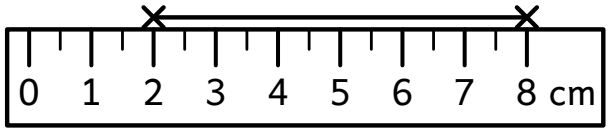
A Pair A

B Pair B

C Pair C

Answer at the back of the book.

4. How long is the line on the ruler, in cm?

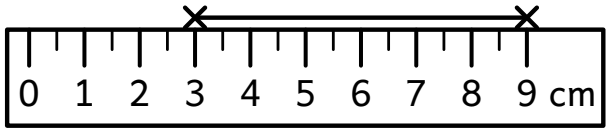


Answer at the back of the book.

5. Name two pairs of parallel lines you can see around you.

Answer at the back of the book.

6. A line starts at the 3 mark on a ruler. It stops at the 9 mark. How long is it, in cm?



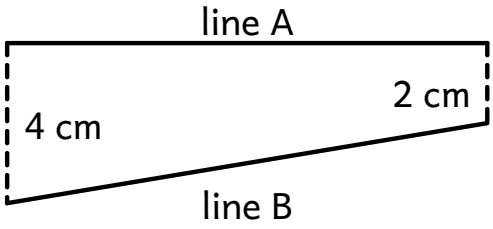
A 9 cm

B 7 cm

C 6 cm

Answer at the back of the book.

7. Look at the picture. Are line A and line B parallel?



A Yes. They look almost parallel.

B No. The gap is not the same at both ends.

C Yes. The lines are about the same length.

Answer at the back of the book.

8. Amina draws two lines that do not touch. She makes both longer and they cross. What does that show?

A The lines were not parallel.

B The lines were parallel, because they did not touch at first.

C All lines cross if you draw them long enough.

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Put the 0 mark on the start of the line. Parallel lines stay the same distance apart and never meet.

Draw: A line 6 cm long. Draw a parallel line 2 cm below it. Mark the gap.

M2.5.2 CHAPTER 2

Polygons

Is a circle a polygon?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Yes. It is a closed shape.
- ☐ **B** No. A polygon has only straight sides.
- ☐ **C** Yes. It has one very long side.

BY THE END YOU CAN

- Name shapes with 3 to 8 straight sides
- Sort polygons by their sides and corners
- Tell a regular polygon from one that is not regular

A **polygon** is a flat, closed shape with straight sides. Closed means there is no gap.

A circle is not a polygon. Its edge is curved.

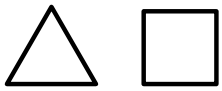
DRAW IT FIRST

Join straight sides to close a shape



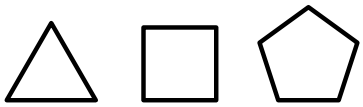
3 sides

1 Join 3 straight lines so they close. You make a shape with 3 sides.



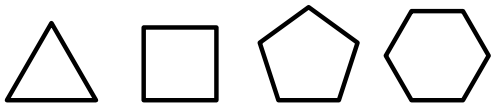
3 sides 4 sides

2 Use 4 lines. Now the shape has 4 sides.



3 sides 4 sides 5 sides

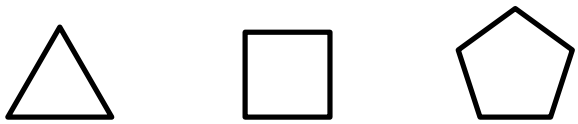
3 Use 5 lines. The shape has 5 sides.



3 sides 4 sides 5 sides 6 sides

4 Use 6 lines. The shape has 6 sides.

A shape with 4 sides is a **quadrilateral**. Every polygon is named by its sides.



triangle 3 sides

quadrilateral 4 sides

pentagon 5 sides



hexagon 6 sides

heptagon 7 sides

octagon 8 sides

The names of polygons with 3 to 8 sides.

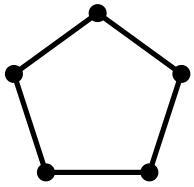
Count the corners too. A polygon has as many corners as sides.

SEE IT THREE WAYS

With things

Lay 5 sticks end to end to make a closed shape. Count the sticks. Count the corners.

As a picture

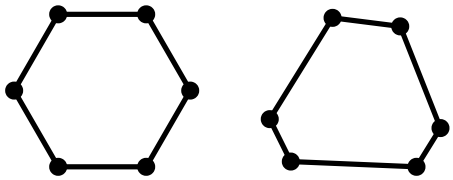


5 sides, 5 corners

In symbols

Sides = corners. 5 sides, 5 corners.

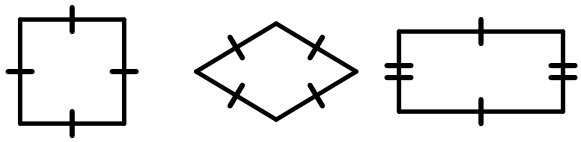
Some polygons are **regular**. All their sides are equal. All their corners are the same size.



regular not regular

Both shapes are hexagons. Only one is regular.

Equal sides are not enough. The corners must match too. Small ticks mark sides of equal length.



square **rhombus** **rectangle**

Only the square is regular. A square turned on its corner is still a square.

TRY IT

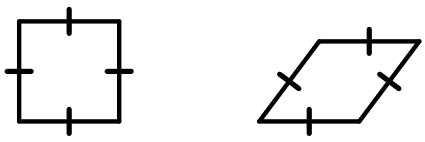
Make shapes from sticks

You need: 4 sticks of the same length, 2 more sticks, or strips of paper.

1. Lay 4 sticks of the same length to make a square.
2. Count the sides. Count the corners.
3. Push one corner sideways so the shape leans.
4. Look at the sides. They are all still equal.
5. Look at the corners. They are no longer the same.
6. Now use 6 sticks. Make a closed shape and name it.

What you will see: The sides stay equal, but the corners change. Equal sides alone do not make a regular shape.

If you cannot try it, this is what happens.



before after

A WRONG IDEA MANY PEOPLE HAVE

~~If all the sides are equal, the shape is regular.~~

Why it feels right: Equal sides look fair and even, so the shape seems regular.

The test that breaks it: Make a square with 4 equal sticks. Push it so it leans. The sides stay equal. The corners do not.

What is true: Regular needs equal sides and equal corners. Both must be true.

KEY WORDS

polygon
a flat, closed shape with straight sides.

quadrilateral

a polygon with 4 sides.

regular
all sides equal and all corners the same size.

BACK TO YOUR GUESS

The answer is B: No. A polygon has only straight sides.

A polygon has straight sides only. A circle has a curved edge, so it is not a polygon.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. A shape has 6 straight sides. What is it called?

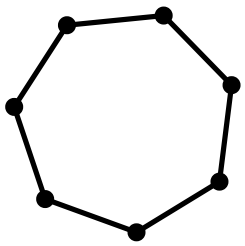
   A Pentagon

   B Hexagon

   C Octagon

   Answer at the back of the book.

2. How many sides does this polygon have? What is it called?



   Answer at the back of the book.

3. Which of these is not *a* polygon?

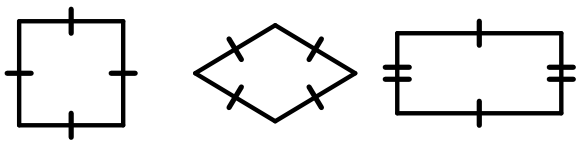
   A A triangle

   B A circle

   C A pentagon

   Answer *a*t the back of the book.

4. Which shape is *a* regular polygon?



A **B** **C**

   A Shape A

   B Shape B

   C Shape C

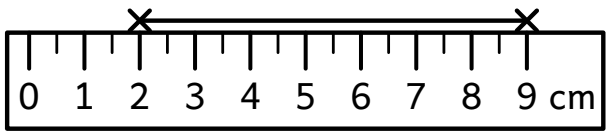
   Answer *a*t the back of the book.

5. A regular octagon has 8 equal sides. Each side is 3 cm long. How far is it *a*ll the w*a*y round, in cm?

   Answer *a*t the back of the book.

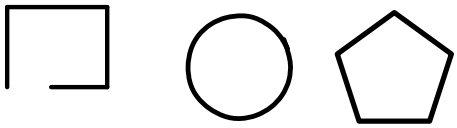
6. **From an earlier chapter**

   A line runs from the 2 mark to the 9 mark. How long is it, in cm?



   Answer *a*t the back of the book.

7. Which shape is *a* polygon?



A **B** **C**

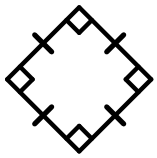
A Shape A

B Shape B

C Shape C

Answer at the back of the book.

8. Ravi turns *a* square so that it stands on *a* corner. Is it still *a* square?



Ravi's shape

A No. It leans, so its corners have changed.

B Yes. Turning *a* shape does not change its sides or corners.

C No. A square must have *a* flat bottom.

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A polygon is *a* flat, closed shape with straight sides. It has *as* many corners *as* sides. Regular means equal sides *and* equal corners.

Draw: A hexagon. Mark each corner with *a* dot *and* count them.

M2.5.3 CHAPTER 3

Right angles and turns

How can I tell if a corner is a right angle?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Look at it. If it looks square, it is a right angle.
- ☐ **B** Fold paper twice to make a tester. Lay it in the corner.
- ☐ **C** Measure the lines of the corner with a ruler.

BY THE END YOU CAN

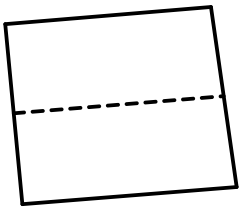
- Make a right angle tester by folding paper twice
- Compare an angle with a right angle: smaller, equal or bigger
- Find lines that meet at a right angle

An angle is how much one line turns away from another. Think of a door. The wider it opens, the bigger the angle.

A **right angle** is a square corner, like a book corner.

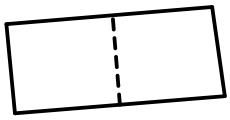
DRAW IT FIRST

Fold a right angle tester



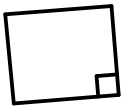
first fold

1 Fold any piece of paper once. The fold is a straight edge.



second fold

2 Fold it again. Make the folded edge lie exactly along itself.



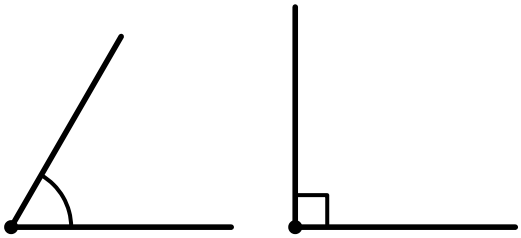
right angle

3 Press it flat. The corner you made is a right angle.

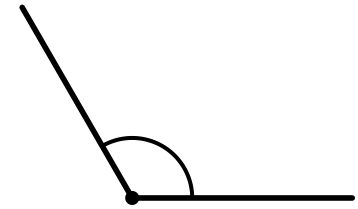
This is your right angle tester. It works on any piece of paper.

Lay the tester in a corner. Is the corner smaller than the tester, equal to it, or bigger?

A corner smaller than a right angle is ***acute***. A corner bigger than a right angle is **obtuse**.



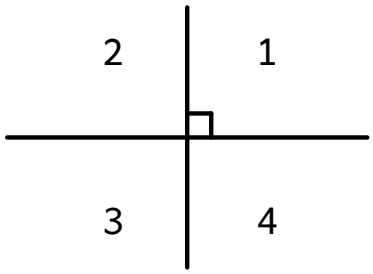
acute right angle



obtuse

Lay your tester on each corner. Acute is smaller. Obtuse is bigger.

Turns are angles too. A quarter turn is one right angle. A half turn is two. A full turn is four.



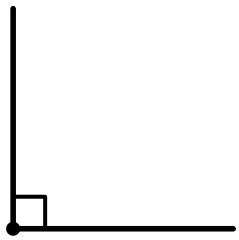
All four angles are right angles. Four fill a full turn. Two fill a half turn.

SEE IT THREE WAYS

With things

Face a wall. Turn a quarter turn to the right. You have turned one right angle.

As a picture

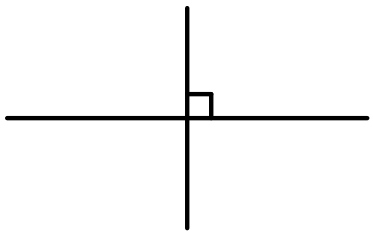


quarter turn

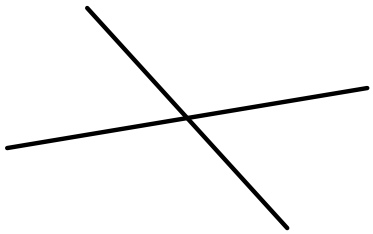
In symbols

2 quarter turns = 1 half turn. 4 quarter turns = 1 full turn.

Two lines that meet at a right angle are **perpendicular**.



perpendicular



not perpendicular

Perpendicular lines make a right angle. Check with your tester.

TRY IT

Make a tester and use it

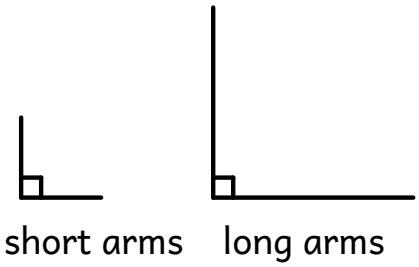
You need: any piece of paper, things with corners, such as a book, a door and a window.

1. Fold the paper once.
2. Fold it again. Make the first fold lie along itself.
3. Press the folds flat. The corner is your tester.
4. Lay the tester in the corner of a book. Does it fit?
5. Try a door, a window and a table. Say smaller, equal or bigger.

What you will see: The tester fits the corners of a book and a door. It does not fit a corner that is wider or narrower.

If you cannot try it, this is what happens.





Both angles are right angles. Your tester fits both.

A WRONG IDEA MANY PEOPLE HAVE

~~An angle with longer lines is a bigger angle.~~

Why it feels right: A picture with long lines looks bigger on the page.

The test that breaks it: Draw a right angle with short lines. Draw another with long lines. Lay your tester on both. It fits both.

What is true: The size of an angle is how much it turns. The length of the lines does not matter.

KEY WORDS

right angle
a square corner. It is a quarter turn.

acute
smaller than a right angle.

obtuse
bigger than a right angle, but smaller than a straight line.

perpendicular
lines that meet at a right angle.

BACK TO YOUR GUESS

The answer is B: Fold paper twice to make a tester. Lay it in the corner.

A tester checks every corner the same way. Your eyes can be fooled. A ruler measures length, not the corner.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. How do you make a right angle tester?

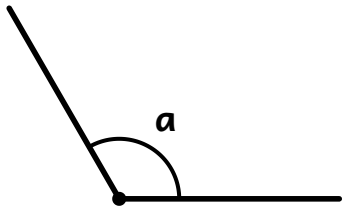
   A Fold paper twice. Make the first fold lie along itself.

   B Fold paper once.

   C Tear a corner off a page.

   Answer at the back of the book.

2. Compare this angle with a right angle. Is it smaller, equal or bigger?



   A Smaller

   B Equal

   C Bigger

   Answer at the back of the book.

3. Ravi draws a right angle with lines 5 cm long. Mei draws one with lines 10 cm long. Whose angle is bigger?

   A Mei, because her lines are longer

   B Ravi, because his lines are shorter

   C They are the same size

   Answer at the back of the book.

4. Mei turns a half turn. Then she turns a quarter turn. How many right angles has she turned in all?

   Answer at the back of the book.

5. **From an earlier chapter**

   Which of these is a polygon?

   A A circle

   B A hexagon

   C A shape with a gap in one side

   Answer at the back of the book.

6. Find two pairs of perpendicular lines in your room. Check them with your tester.

   Answer at the back of the book.

7. What is true of two perpendicular lines?

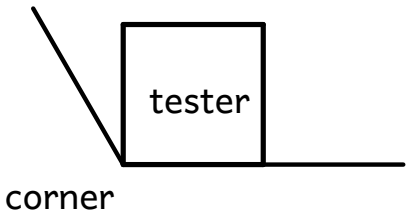
   A They meet at a right angle.

   B They never meet.

   C One is flat and one stands straight up.

   Answer at the back of the book.

8. Hana lays her tester in a corner. It fits inside, with space left beside it. Is the corner smaller, equal or bigger?



   A Smaller than a right angle

   B Bigger than a right angle

   C Equal to a right angle

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Fold paper twice to make a right angle tester. Acute is smaller than a right angle. Obtuse is bigger. The size of an angle is how much it turns.

Draw: A right angle with a small square. Beside it, an acute angle and an obtuse angle.

M2.5.4 CHAPTER 4

Measuring angles in degrees

How can I say how big an angle is, with a number?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Measure its lines with a ruler.
- ☐ **B** Count how many degrees it turns, with a protractor.
- ☐ **C** Count its corners.

BY THE END YOU CAN

- Say a right angle is 90° and a full turn is 360°
- Measure an angle with a protractor
- Draw an angle of 60° with a protractor

We measure angles in **degrees**. The sign for degrees is °.

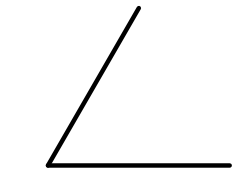
A right angle is 90°. A straight line is two right angles, so it is 180°.

A **full turn** goes all the way round. It is four right angles, so it is 360°.

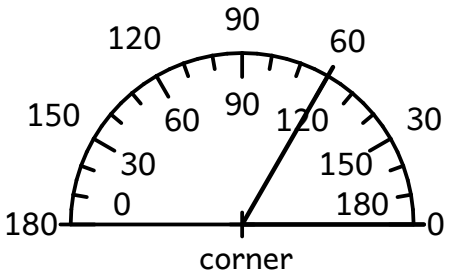
A **protractor** measures angles. Most are a half circle with two scales of numbers.

DRAW IT FIRST

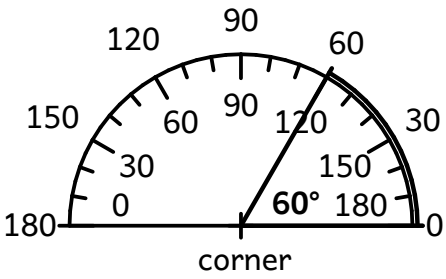
Measure an angle with a protractor



1 Find the corner of the angle. Its two arms are the lines.



2 Put the centre of the protractor on the corner. Put its 0 line along one arm.



3 Read the scale that starts at 0 on that arm. Here it says 60°.

There are two scales. Read the one that starts at 0 on your arm.

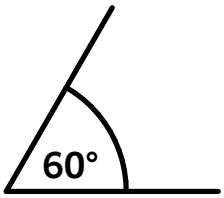
Check your number. Ask: is the angle smaller than a right angle? If it is, the number must be less than 90.

WORKED EXAMPLE

Draw an angle of 60°.

1. Draw a line with a ruler. Mark a dot on it for the corner.
2. Put the centre of the protractor on the dot. Put its 0 line along your line.
3. Find 60 on the scale that starts at 0 on your line. Mark a dot there.
4. Take the protractor away. Join the corner to the new dot.
5. Check: the angle should be smaller than a right angle.

Answer: An angle of 60°. It is smaller than a right angle.



corner

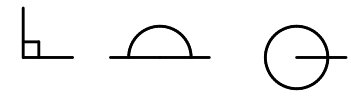
The angle after step 4. It is smaller than a right angle.

SEE IT THREE WAYS

With things

Face a wall. Turn right by a quarter turn, four times. You are back where you began.

As a picture



In symbols

90° + 90° = 180°. 4 × 90° = 360°.

TRY IT

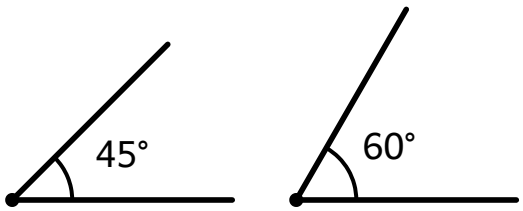
Make angles with no protractor

You need: your right angle tester, 3 sticks or strips of paper of the same length, a pencil and paper.

1. Fold your tester so one arm lies on the other.
2. The new corner is 45°. It is half of 90°.
3. Lay it twice in a right angle. Two fit exactly.
4. Lay 3 equal sticks end to end to make a triangle.
5. Each corner of this triangle is 60°. Draw round one corner.
6. Is 60° bigger or smaller than 45°? Is it smaller than 90°?

What you will see: Two 45° corners fill a right angle. The 60° corner is bigger than 45° and smaller than 90°.

If you cannot try it, this is what happens.



folded tester equal sticks

A WRONG IDEA MANY PEOPLE HAVE

~~You can read an angle from either scale on a protractor.~~

Why it feels right: Both scales have the same numbers, so either one looks right.

The test that breaks it: Look at the 60° angle in the picture. It is smaller than a right angle. So its number must be less than 90.

What is true: Read the scale that starts at 0 on your arm. Then check it against a right angle.

KEY WORDS

degrees
the unit we use to measure an angle. It is written °.

full turn
all the way round. It is 360°.

protractor
a tool with a scale for measuring angles.

BACK TO YOUR GUESS

The answer is B: Count how many degrees it turns, with a protractor.

We measure angles in degrees. A protractor shows how many degrees an angle turns.

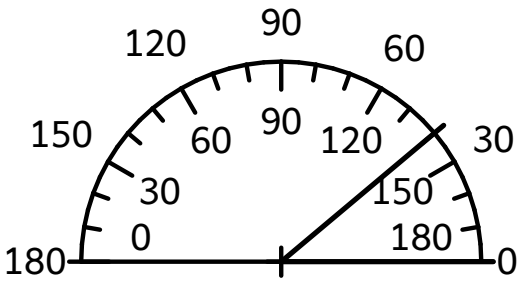
CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. How many degrees are in 2 right angles?

   Answer at the back of the book.

2. The 0 line of the protractor lies along the right hand arm. What is the angle?



   A 40°

   B 140°

   C 50°

   Answer at the back of the book.

3. Joseph turns a quarter turn. Then he turns a half turn. How many degrees has he turned in all?

   Answer at the back of the book.

4. You fold a right angle in half to make a 45° corner. How many of these corners fill one right angle?

   Answer at the back of the book.

5. Draw an angle of 60° with a protractor. Is it acute or obtuse?

   Answer at the back of the book.

6. **From an earlier chapter**

   An angle is 120°. Is it acute, a right angle or obtuse?

   A Acute

   B A right angle

   C Obtuse

   Answer at the back of the book.

7. Ana turns all the way round, to face the way she began. How many degrees has she turned?

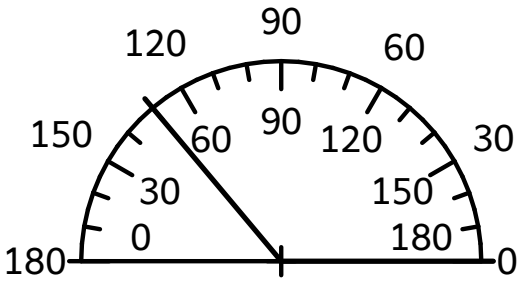
   A 180°

   B 90°

   C 360°

   Answer at the back of the book.

8. The 0 line of the protractor lies along the right hand arm. What is the angle?



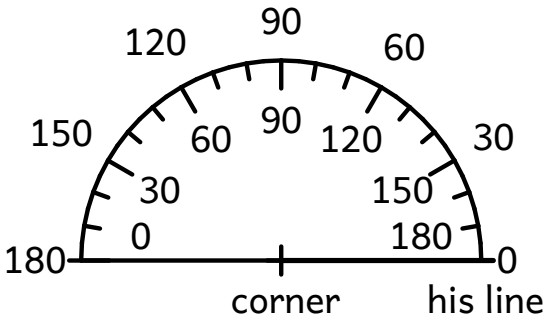
A 50°

B 130°

C 120°

Answer at the back of the book.

9. Ravi draws a line and a corner dot. The protractor centre is on the dot. Its 0 is on his line. Which mark does he join to the dot to make 60°?



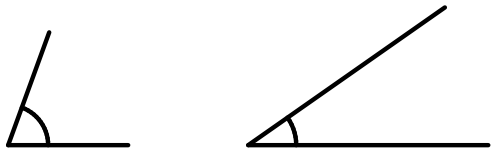
A The 60 on the outer scale

B The 60 on the inner scale

C The 30 on the outer scale

Answer at the back of the book.

10. Look at the two angles. Which one is bigger?



angle P angle Q

A Angle Q, because its arms are longer

B Angle P

C They are the same size

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A right angle is 90°. A straight line is 180°. A full turn is 360°. Put the protractor centre on the corner. Put its 0 line on one arm. Read the scale from 0.

Draw: A protractor with a 60° angle. Mark where you read the number.

M2.5.5 CHAPTER 5

Triangles and four sided shapes

Is a square also a rectangle?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** No. A square is a square and a rectangle is a rectangle.
- ☐ **B** Yes. A square has everything a rectangle needs.
- ☐ **C** Only when the square is big.

BY THE END YOU CAN

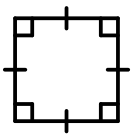
- Name a square, rectangle, rhombus, parallelogram and trapezium
- Sort four sided shapes by their sides and angles
- Sort triangles by how many sides are equal

You know shapes with 4 straight sides. Some of them have special names.

The name comes from the sides and the corners. Look for three things: equal sides, right angles and parallel sides.

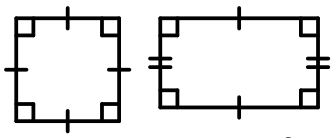
DRAW IT FIRST

Five shapes with four sides



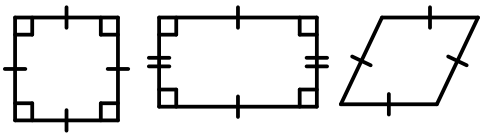
square

1 A square has 4 equal sides and 4 right angles. Ticks and small squares show this.



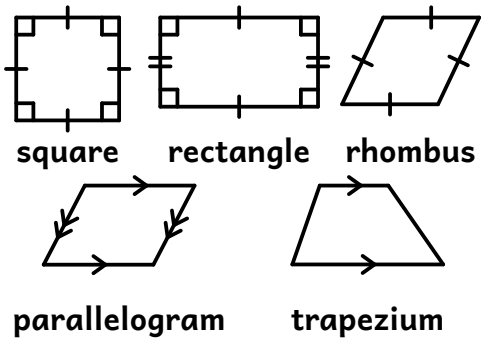
square rectangle

2 A rectangle has 4 right angles. Its opposite sides are equal.



square rectangle rhombus

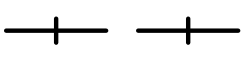
3 Push the square sideways. You get a **<u>rhombus</u>**. It has 4 equal sides.



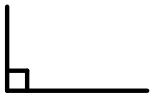
square rectangle rhombus

parallelogram trapezium

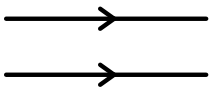
4 A **<u>parallelogram</u>** has two pairs of parallel sides. A **<u>trapezium</u>** has one pair.



equal sides



right angle



parallel sides

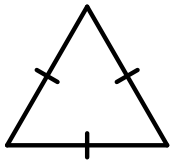
Use these marks to read any shape in this chapter.

In a rhombus, the corners opposite each other are equal. In a parallelogram, the opposite sides are equal.

In some countries a trapezium is called a trapezoid. There, the word trapezium can mean a shape with no parallel sides. Ask which one your book uses.

Now test a square. It has 4 equal sides, so it is a rhombus. It has 4 right angles, so it is a rectangle.

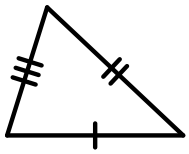
Triangles have 3 sides. Count the sides that are equal.



equilateral
3 equal sides



isosceles
2 equal sides



scalene
no equal sides

Matching ticks mark equal sides. Each corner of the equilateral triangle is 60°.

Look at the ticks. Equal sides have the same number of ticks.

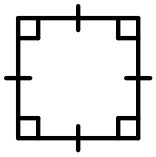
Equilateral means 3 equal sides. Isosceles means 2 equal sides. Scalene means no equal sides.

SEE IT THREE WAYS

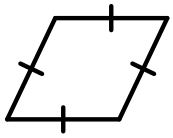
With things

Lay 4 equal sticks end to end in a loop. Make a square. Then push it sideways.

As a picture



square



rhombus

In symbols

Square: 4 equal sides and 4 right angles. This rhombus: 4 equal sides and no right angles.

TRY IT

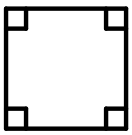
Push a square into a rhombus

You need: 4 sticks of the same length, such as pencils or straws, your right angle tester from chapter 3.

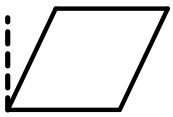
1. Lay the sticks in a loop so the ends touch. Make a square.
2. Check each corner with your tester. All four fit.
3. Push the loop sideways. Keep every end touching.
4. Check the corners again. Two are smaller than your tester. Two are bigger.

What you will see: The sticks did not change, so the 4 sides stay equal. Only the corners changed. The square became a rhombus.

If you cannot try it, this is what happens.



tester fits



gap shows

A WRONG IDEA MANY PEOPLE HAVE

~~A square is not a rectangle.~~

Why it feels right: Each shape has one name. So people think it is only one thing.

The test that breaks it: Check the rules of a rectangle: 4 right angles, equal opposite sides. Test a square with your tester. All four corners fit. Its opposite sides match.

What is true: A square follows every rule of a rectangle. It is a special rectangle. It is also a rhombus.

KEY WORDS

rhombus
a shape with 4 equal sides.

parallelogram
a shape with two pairs of parallel sides.

trapezium
a shape with one pair of parallel sides.

BACK TO YOUR GUESS

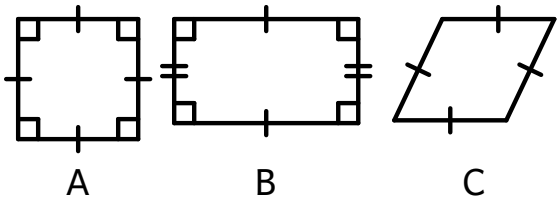
The answer is B: Yes. A square has everything a rectangle needs.

A rectangle has 4 right angles and equal opposite sides. A square has both, so a square is a special rectangle. Size does not matter.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Which shape has 4 equal sides and no right angles?



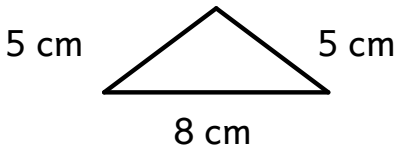
A Shape A

B Shape B

C Shape C

Answer at the back of the book.

2. A triangle has sides of 5 cm, 5 cm and 8 cm. What is it called?



A equilateral

B isosceles

C scalene

Answer at the back of the book.

3. Each corner of a triangle with 3 equal sides is 60°. What do the three corners add up to?

Answer at the back of the book.

4. Which sentence is true?

A A square is a rectangle.

B A rectangle is always a square.

C A rhombus always has 4 right angles.

Answer at the back of the book.

5. A shape has 4 sides. Only one pair of sides is parallel. What is it?

   A parallelogram

   B trapezium

   C rectangle

   Answer at the back of the book.

6. **From an earlier chapter**

   A corner is bigger than a right angle. It is smaller than a straight line. What is it called?

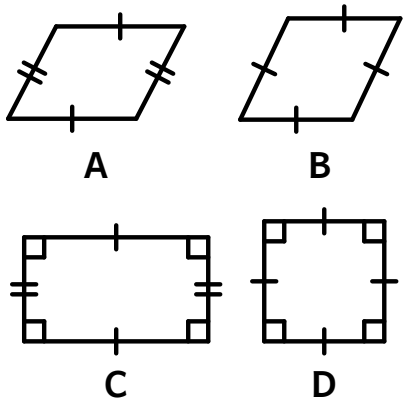
   A acute

   B right

   C obtuse

   Answer at the back of the book.

7. Which shape is both a rhombus and a rectangle?



   A Shape A

   B Shape B

   C Shape C

   D Shape D

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Square: 4 equal sides, 4 right angles. Rectangle: 4 right angles. Rhombus: 4 equal sides. Parallelogram: two pairs of parallel sides. Trapezium: one pair.

Draw: A square, a rectangle and a rhombus. Mark equal sides with ticks and right angles with small squares.

M2.5.6 CHAPTER 6

Lines of symmetry

When do the two halves of a folded shape match?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Any line through the middle of a shape works.
- ☐ **B** Only a line that makes two halves that match when folded.
- ☐ **C** Only a line from corner to corner.

BY THE END YOU CAN

- Find lines of symmetry by folding paper
- Complete a drawing so both sides of a mirror line match

Fold a leaf down its middle. Often the two halves almost match. A shape is **symmetrical** when its two folded halves match exactly.

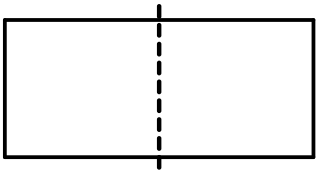
Fold a paper rectangle in different ways. Some folds work. Some do not.

DRAW IT FIRST

Fold *a* rectangle three ways

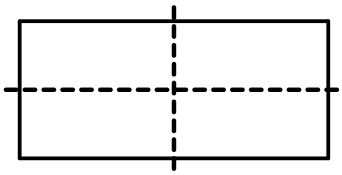


1 Draw *a* rectangle that is not *a* square.



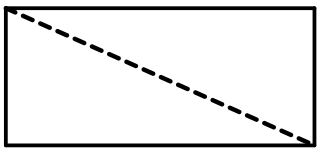
fold 1: halves match

2 Fold it down the middle. The halves match. The fold is *a* **line of symmetry**.



2 lines of symmetry

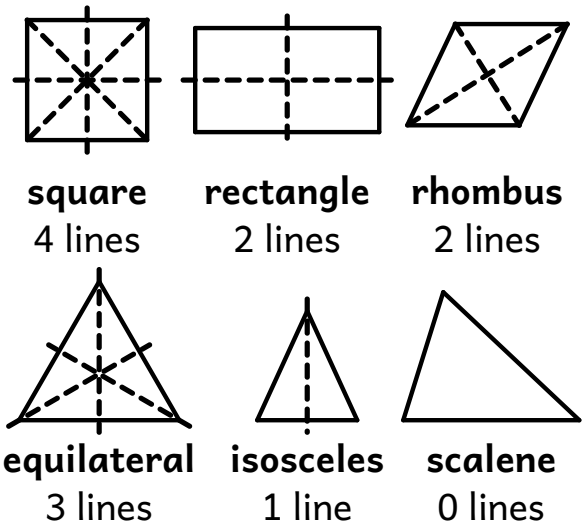
3 Fold it the other way. The halves match *again*. So it has 2 lines.



diagonal: no match

4 Fold from one corner to the opposite corner. This fold is *a* diagonal. The corners do not meet. It is not *a* line of symmetry.

A **line of symmetry** is *a* fold. The two halves match exactly.



Dashed lines are lines of symmetry. A scalene triangle has none.

A regular hexagon has 6 lines of symmetry. A circle has more than you can count.

Look at the rhombus. Its two diagonals are lines of symmetry. A rectangle is different.

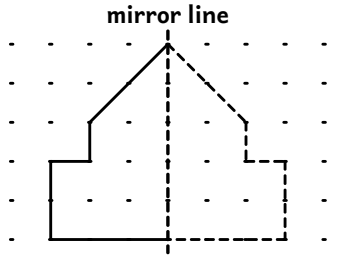
A line of symmetry also works as a **mirror line**. What is on one side is a mirror picture of the other.

SEE IT THREE WAYS

With things

Fold a sheet in half and open it. Draw half a house on one side. Count the steps from each corner to the fold. Count the same steps on the other side.

As a picture



In symbols

A corner 2 steps left of the line has a twin. The twin is 2 steps right, at the same height.

TRY IT

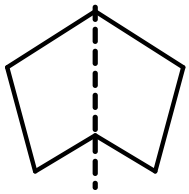
Tear a symmetrical shape

You need: a sheet of paper, a pencil.

1. Fold the paper in half. Press the fold flat.
2. Draw half of a leaf or a tree. Its middle must touch the fold.
3. Tear along your line through both layers. Tear, do not cut.
4. Open the shape. Look at the fold.

What you will see: The two halves match. The fold is a line of symmetry. You made a symmetrical shape.

If you cannot try it, this is what happens.



fold line

A WRONG IDEA MANY PEOPLE HAVE

~~The diagonal of a rectangle is a line of symmetry.~~

Why it feels right: The diagonal cuts the rectangle into two triangles. They are the same size.

The test that breaks it: Fold a paper rectangle corner to corner. One corner sticks out past the edge. The corners do not meet.

What is true: Halves that are the same size are not enough. They must match when you fold. A rectangle that is not a square has 2 lines.

KEY WORDS

symmetrical
a shape with at least one line of symmetry.

line of symmetry

a fold line where the two halves match exactly.

mirror line
a line of symmetry, used to draw a mirror picture.

BACK TO YOUR GUESS

The answer is B: Only a line that makes two halves that match when folded.

A line works only when the two halves match when you fold. Many lines through the middle fail the test. The fold decides.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. How many lines of symmetry does a square have?

   A 2

   B 4

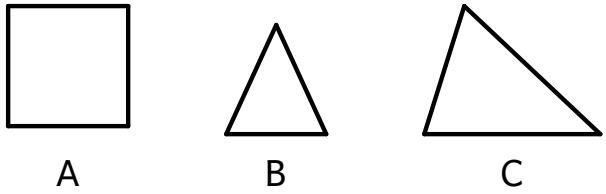
   C 8

   Answer at the back of the book.

2. A rectangle is 8 cm long and 4 cm wide. How many lines of symmetry does it have?

   Answer at the back of the book.

3. Which shape has no line of symmetry?



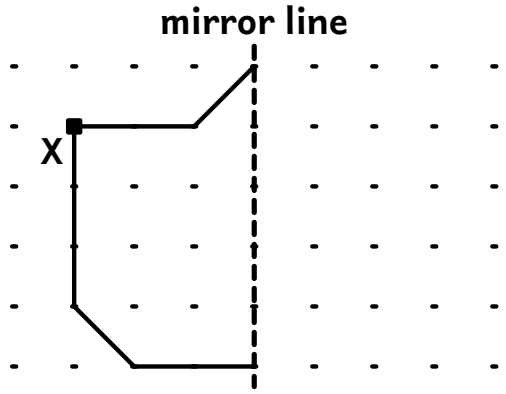
A Shape A

B Shape B

C Shape C

Answer at the back of the book.

4. Corner X is 3 steps left of the mirror line. How many steps right is its twin?



Answer at the back of the book.

5. Ana folds a paper rectangle corner to corner. The corners do not meet. What does this show?

A The diagonal is not a line of symmetry.

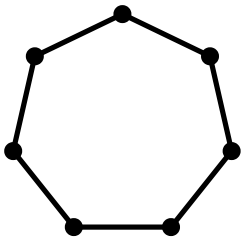
B The rectangle has no lines of symmetry.

C The fold is wrong, so try again.

Answer at the back of the book.

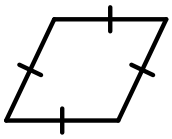
6. **From an earlier chapter**

How many corners does this polygon have?



Answer at the back of the book.

7. Look at the rhombus. How many lines of symmetry does it have?



rhombus

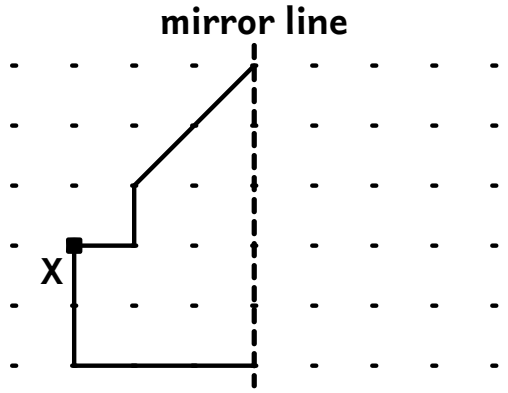
A 2

B 0

C 4

Answer at the back of the book.

8. Corner X is 3 steps left of the mirror line. Where is its twin?



A 1 step right, at the same height as X

B 3 steps right, at the same height as X

C 3 steps right, but lower down than X

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A line of symmetry is a fold where the halves match. A square has 4. A rectangle has 2. A scalene triangle has 0. A diagonal of a rectangle fails.

Draw: A rectangle with its 2 lines of symmetry dashed. Add its diagonal and write "no".

M2.5.7 CHAPTER 7

Solid shapes and nets

Will any 6 squares joined together fold into a cube?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Yes. A cube has 6 faces, so any 6 squares work.
- ☐ **B** No. Only some joined squares fold into a cube.
- ☐ **C** No. You cannot make a cube from paper.

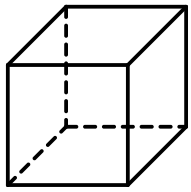
BY THE END YOU CAN

- Count the faces, edges and corners of a cube and a prism
- Fold a net into an open box
- Match a solid shape to its net

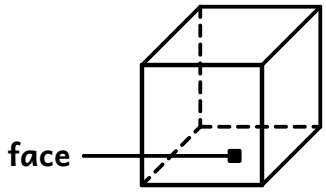
Pick up a box. It has flat sides, straight lines and sharp points.

DRAW IT FIRST

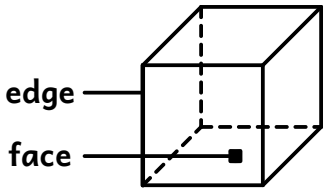
Faces, edges and corners of a cube



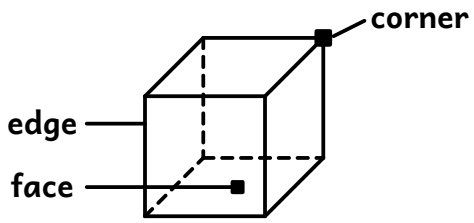
1 Draw a cube. Dashed lines are edges you cannot see.



2 A flat side is a **face**. A cube has 6 faces.

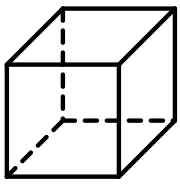


3 A line where two faces meet is an **edge**. A cube has 12 edges.

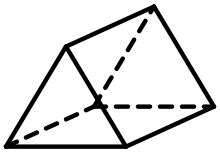


4 A point where edges meet is a **corner**. A cube has 8 corners.

Some books call a corner a vertex. Two or more are vertices.



cube
6 faces
12 edges
8 corners



triangular prism
5 faces
9 edges
6 corners

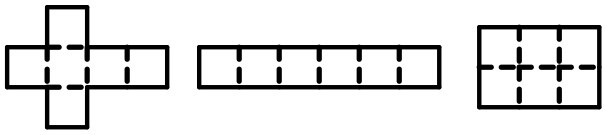
A box like a matchbox has the same counts as a cube.

A prism has the same shape all along its length. A triangular prism has 2 triangle faces and 3 rectangle faces.

A square based pyramid has 5 faces, 8 edges and 5 corners.

Take a box apart and lay it flat. The flat shape is a **net**. A net folds up into the solid.

Only some shapes of 6 squares are nets of a cube. Look at these three.



yes **no** **no**

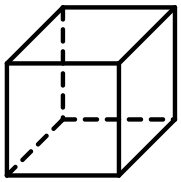
Dashed lines are folds. The row of 6 wraps round into a tube.

SEE IT THREE WAYS

With things

Hold a box, such as a matchbox. Touch each face, edge and corner as you count.

As a picture



6 faces
12 edges
8 corners

In symbols

Faces 6. Edges 12. Corners 8. The top has 4 edges and the bottom has 4. Four edges go up.

TRY IT

Fold a net into an open box

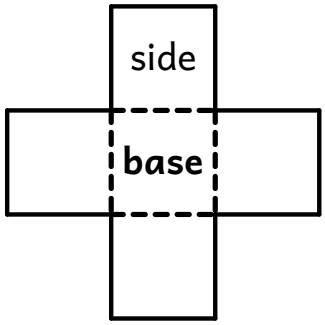
You need: a square of paper that is 15 cm wide, a ruler, a pencil, scissors.

Be safe: Ask a grown up to help with the scissors.

1. Mark every 5 cm along each side. Join the marks with a ruler. You get 9 squares.
2. Cut out the 4 corner squares. A cross of 5 squares is left.
3. Fold up along the 4 sides of the middle square. The 4 arms stand up.
4. Hold the upright sides together at the corners. You have an open box.

What you will see: The net has 5 squares, and the box has 5 faces. It is open on top, so it has no sixth face.

If you cannot try it, this is what happens.



A WRONG IDEA MANY PEOPLE HAVE

~~Any 6 squares joined edge to edge fold into a cube.~~

Why it feels right: A cube has 6 faces. A net has 6 squares.

The test that breaks it: Draw 6 squares in a row. Fold them. Four squares make a tube. The last two land on top of the first two.

What is true: No two faces may land in the same place. A cube has 11 different nets. A row of 6 is not one of them.

KEY WORDS

face
a flat side of *a* solid shape.

edge
a line where two faces meet.

corner
a point where edges meet.

net
a flat shape that folds up into *a* solid.

BACK TO YOUR GUESS

The answer is B: No. Only some joined squares fold into *a* cube.

Only some work. When you fold, no two squares may land in the same place. A cube has 11 different nets.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

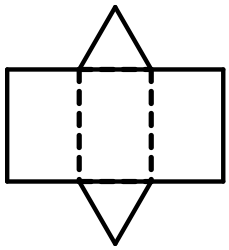
1. A cube has 6 faces. Each face has 4 edges. Each edge joins 2 faces. How many edges does *a* cube have?

   Answer at the back of the book.

2. A triangular prism has two triangle ends. A triangle has 3 corners. How many corners does the prism have?

   Answer at the back of the book.

3. Which solid folds up from this net?



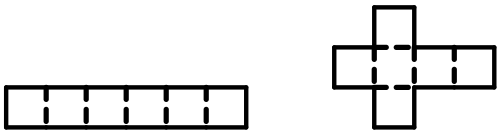
A a cube

B a triangular prism

C a square based pyramid

Answer at the back of the book.

4. Which shape folds into a cube?



A Shape A

B Shape B

C Both shapes

Answer at the back of the book.

5. A square based pyramid has a square base with 4 edges. 4 more edges go up to the top corner. How many edges?

Answer at the back of the book.

6. **From an earlier chapter**

Mei measures a line with a ruler. Where should the start of the line be?

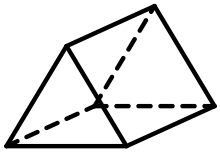
A At the 0 mark

B At the end of the ruler

C At the 1 mark

Answer at the back of the book.

7. How many faces does this triangular prism have?



triangular prism

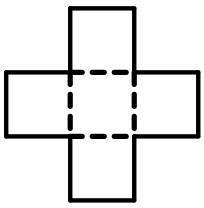
A 5

B 3

C 6

Answer at the back of the book.

8. Lucía folds this net into a box with no lid. How many faces does the box have?



net

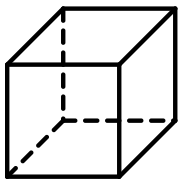
A 4

B 6

C 5

Answer at the back of the book.

9. How many corners does this cube have?



cube

A 12

B 8

C 6

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A cube has 6 faces, 12 edges and 8 corners. A triangular prism has 5, 9 and 6. A net is a solid laid flat. Not every 6 squares make a cube net.

Draw: A cube with its hidden edges dashed. Label a face, an edge and a corner.

M2.5.8 CHAPTER 8

Grids and directions

How do I tell a friend which box to look in?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Say a word, like "near the tree".
- ☐ **B** Say only the column, like B.
- ☐ **C** Say the column and the row, like B3.

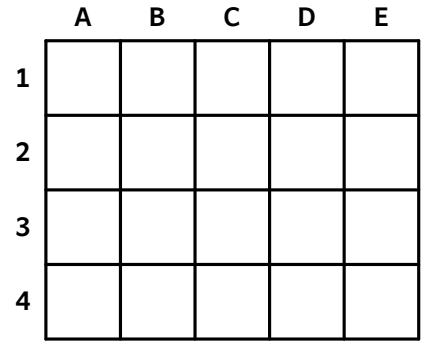
BY THE END YOU CAN

- Give a position on a grid by column and row
- Use north, south, east and west to describe a route

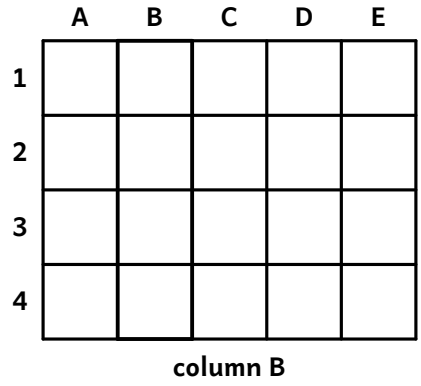
A grid is a set of boxes in rows and columns. It names a place exactly.

DRAW IT FIRST

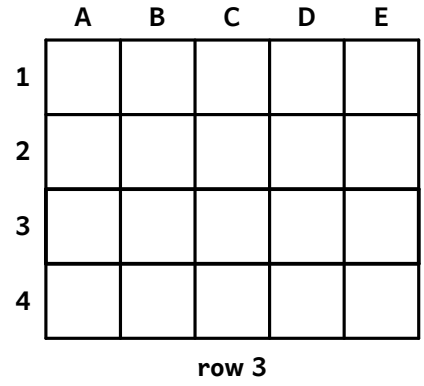
Find the box B3



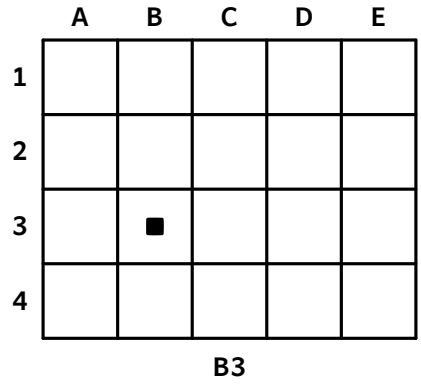
1 Letters name the boxes across. Numbers name the boxes down.



2 A **column** goes up and down. This is column B.



3 A **row** goes across. This is row 3.

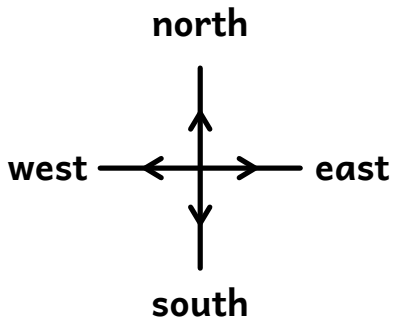


4 Column B and row 3 meet in one box. Its name is B3.

Say the column first, then the row. B3 means column B, row 3.

Maps show direction too. North is at the top of a map. South is at the bottom.

East is on the right. West is on the left. These four are the **compass points**.

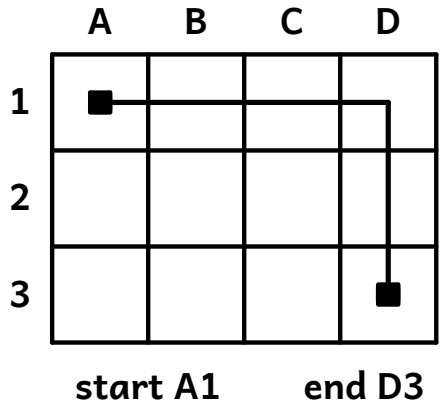


Go round the way a clock hand turns: north, east, south, west.

Face north. East is on your right. West is on your left. South is behind you.

To find north where you live, use a map or a compass. Ask a neighbour if you are not sure.

A **route** is the path you follow from one box to another. Say it in boxes and compass points.



East 3 boxes, then south 2 boxes.

WORKED EXAMPLE

Start at A1. Go east 3 boxes. Then go south 2 boxes. Which box are you in?

1. East is to the right, along the letters. From A, go 3 boxes: B, C, D.
2. You are in column D. You are still in row 1.
3. South is down, along the numbers. From row 1, go 2 boxes: 2, 3.
4. Column D and row 3 make the box D3.

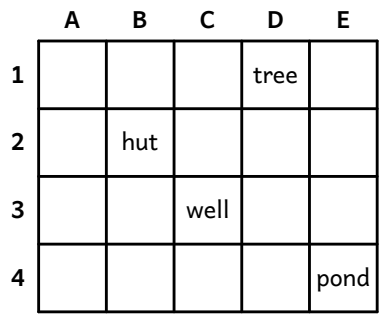
Answer: D3

SEE IT THREE WAYS

With things

Draw a grid on paper. Put a bean in one box. Tell a friend its name, column first.

As a picture



In symbols

The well is in column C and row 3. Its name is C3.

TRY IT

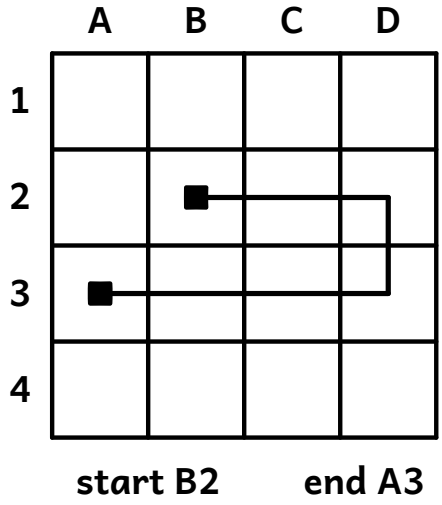
Walk a route on a floor grid

You need: floor tiles, or chalk or a stick for drawing boxes, a stone to mark north.

1. Make a grid 4 boxes wide and 4 boxes long.
2. Put the stone by one edge. That edge is north, like the top of a map.
3. Face the stone. Write A to D along that edge, from left to right.
4. Write 1 to 4 along a side. Start next to the stone. East is on your right.
5. Stand in B2. Walk east 2 boxes. Say your box. You are in D2.
6. Walk south 1 box, then west 3 boxes. Say your box each time. You end in A3.

What you will see: Each step changes one thing. East and west change the column letter. North and south change the row number.

If you cannot try it, this is what happens.



A WRONG IDEA MANY PEOPLE HAVE

~~The order of a grid position does not matter.~~

Why it feels right: Adding can swap places. 2 + 3 and 3 + 2 are equal.

The test that breaks it: Draw a grid. Count 2 boxes across and 3 down. Mark the box. Now count 3 across and 2 down. Mark that box too. They are different boxes.

What is true: A position has a fixed order. Say the column first, then the row. 2 across and 3 down is B3. 3 across and 2 down is C2.

KEY WORDS

column
boxes in a line going up and down.

row
boxes in a line going across.

compass points
north, east, south and west.

route
the path you follow from one place to another.

BACK TO YOUR GUESS

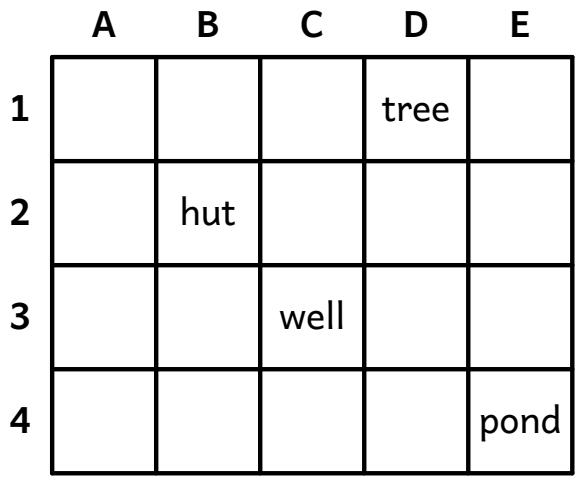
The answer is C: Say the column and the row, like B3.

A column alone names a whole stripe of boxes. A column and a row meet in one box. Everyone must say them in the same order. This book gives the column first.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Which box has the well?



A C3

B 3C

C B3

Answer at the back of the book.

2. Start at B1. Go east 2 boxes. Then go south 3 boxes. Which box are you in?

Answer at the back of the book.

3. Mei is in box E3. She walks west 2 boxes. Which box is she in?

Answer at the back of the book.

4. You face north. Where is east?

A On your right

B On your left

C Behind you

Answer at the back of the book.

5. **From an earlier chapter**

Ravi faces north. He turns a quarter turn clockwise, so he faces east. How many degrees did he turn?

Answer at the back of the book.

6. Tariq is in box B2. He walks east 2 boxes. Which box is he in?

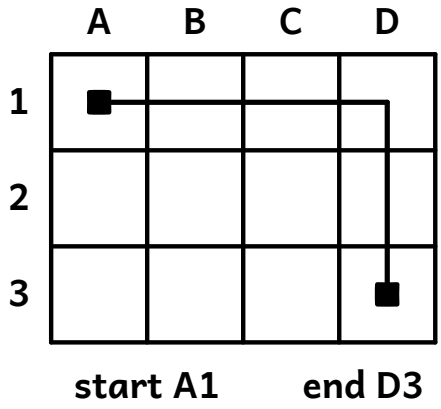
   A C2

   B B4

   C D2

   Answer at the back of the book.

7. Ana walked from A1 to D3. She went east 3 boxes, then south 2 boxes. How does she walk back?



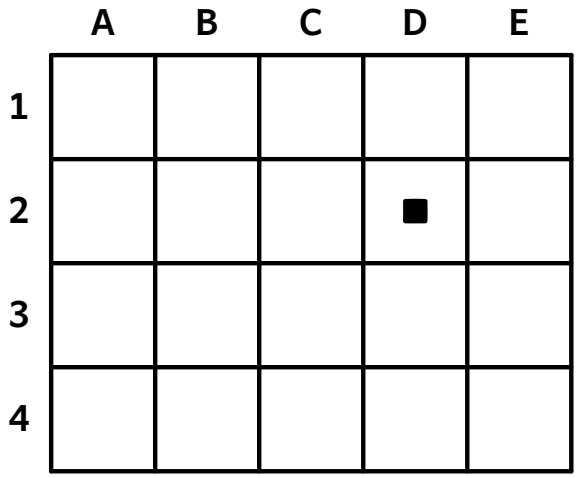
   A North 2 boxes, then west 3 boxes

   B South 2 boxes, then east 3 boxes

   C North 3 boxes, then west 2 boxes

   Answer at the back of the book.

8. Which name tells where the dot is?



A 2D

B D2

C D3

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Name a box by column, then row: B3. North is up, east is right, south is down, west is left. East and west change the letter. North and south change the number.

Draw: A grid of 4 columns and 3 rows. Label it A to D and 1 to 3. Mark B2 with a dot.

Key words, A to Z

Every key word in this book, what it means, and the chapter that teaches it.

acute
smaller than a right angle. M2.5.3

column
boxes in a line going up and down. M2.5.8

compass points
north, east, south and west. M2.5.8

corner
a point where edges meet. M2.5.7

degrees
the unit we use to measure an angle. It is written °. M2.5.4

edge
a line where two faces meet. M2.5.7

face
a flat side of a solid shape. M2.5.7

full turn
all the way round. It is 360°. M2.5.4

length
how long a line is. M2.5.1

line of symmetry
a fold line where the two halves match exactly. M2.5.6

mirror line
a line of symmetry, used to draw a mirror picture. M2.5.6

net
a flat shape that folds up into a solid. M2.5.7

obtuse
bigger than a right angle, but smaller than a straight line. M2.5.3

parallel
lines that stay the same distance apart and never meet. M2.5.1

parallelogram
a shape with two pairs of parallel sides. M2.5.5

perpendicular
lines that meet at a right angle. M2.5.3

polygon
a flat, closed shape with straight sides. M2.5.2

protractor
a tool with a scale for measuring angles. M2.5.4

quadrilateral
a polygon with 4 sides. M2.5.2

regular
all sides equal and all corners the same size. M2.5.2

rhombus
a shape with 4 equal sides. M2.5.5

right angle
a square corner. It is a quarter turn. M2.5.3

route
the path you follow from one place to another. M2.5.8

row
boxes in a line going across. M2.5.8

straight line
a line that does not bend. M2.5.1

symmetrical
a shape with at least one line of symmetry. M2.5.6

trapezium
a shape with one pair of parallel sides. M2.5.5

Answers

M2.5.1. Straight lines and parallel lines

1. **On the start of the line**

   Length starts at the 0 mark. Put it on the start of the line and stop at 8.

   - **If you chose B:** Many rulers have a gap before 0. The end of the ruler is not the start of length.
   - **If you chose C:** Then you would count from 1. A line from 1 to 8 is only 7 cm long.

2. **5 cm**

   From 1 to 6 is 6 − 1 = 5 cm. She should have started at 0.

3. **Pair A**

   Both lines in A slope the same way. The gap stays the same.

   - **If you chose B:** The lines do not touch here, but they get closer. Draw them longer and they meet.
   - **If you chose C:** These lines cross, so they meet. Parallel lines never meet.

4. **6 cm**

   The line starts at 2, not at 0. From 2 to 8 is 8 − 2 = 6 cm.

5. **The long sides of a door. The lines on a page.**

   Each pair stays the same distance apart and never meets.

6. **6 cm**

   From 3 to 9 is 9 − 3 = 6 gaps of 1 cm. The line is 6 cm long.

   - **If you chose A:** You read the end mark only. The line starts at 3. The first 3 cm of the ruler are not in it.
   - **If you chose B:** You counted the marks 3, 4, 5, 6, 7, 8, 9. Count the gaps between marks instead. Each gap is 1 cm.

7. **No. The gap is not the same at both ends.**

   The gap is 4 cm at the left. It is 2 cm at the right. The lines get closer, so they will meet.

   - **If you chose A:** Almost is not enough. The gap is 4 cm at one end. It is 2 cm at the other.
   - **If you chose C:** Parallel lines can have different lengths. What counts is the gap. Here the gap changes.

8. **The lines were not parallel.**

   Parallel lines stay the same distance apart and never meet. Lines that cross were never parallel.

   - **If you chose B:** On a small page, lines can seem never to meet. Parallel lines never cross, however long you draw them.
   - **If you chose C:** Parallel lines never cross, however long they run. Two lines that cross were not parallel.

M2.5.2. Polygons

1. **Hexagon**

   A hexagon has 6 sides. A pentagon has 5. An octagon has 8.

   - **If you chose A:** A pentagon has 5 sides. You may have missed one side when you counted.
   - **If you chose C:** An octagon has 8 sides. You may have mixed up two names.

2. **7 sides, a heptagon**

   Count the dots. There are 7 corners, so there are 7 sides. A polygon with 7 sides is a heptagon.

3. **A circle**

   A circle has a curved edge. A polygon has only straight sides.

   - **If you chose A:** A triangle is closed with 3 straight sides. It is a polygon.
   - **If you chose C:** A pentagon is closed with 5 straight sides. It is a polygon.

4. **Shape A**

   A has equal sides and equal corners. B has only equal sides. C has only equal corners.

   - **If you chose B:** Its sides are equal. Its corners are not all the same size.
   - **If you chose C:** Its corners match. Its sides are not all equal.

5. **24 cm**

   8 sides of 3 cm each. 8 × 3 = 24 cm.

6. **7 cm**

   The line starts at 2, not at 0. From 2 to 9 is 9 − 2 = 7 cm.

7. **Shape C**

   C is closed and has only straight sides. A has a gap, and B has a curved edge.

   - **If you chose A:** Its sides are straight, but the shape has a gap. A polygon must be closed.
   - **If you chose B:** A circle is closed, but its edge is curved. A polygon has straight sides only.

8. **Yes. Turning a shape does not change its sides or corners.**

   Turning does not change the sides or the corners. A square on its corner is still a square.

   - **If you chose A:** Turning moves the whole shape. Each side keeps its length. Each corner keeps its size.
   - **If you chose C:** A square is named by 4 equal sides and 4 equal corners. How it sits does not matter.

M2.5.3. Right angles and turns

1. **Fold paper twice. Make the first fold lie along itself.**

   The second fold makes the folded edge lie along itself. That makes a square corner.

   - **If you chose B:** One fold makes a straight edge. It does not make a corner.
   - **If you chose C:** A torn corner can be any size. It may not be a right angle.

2. **Bigger**

   The angle opens wider than a right angle. It is an obtuse angle.

   - **If you chose A:** Lay a tester on it. The angle is wider than the tester, so it is bigger.
   - **If you chose B:** A right angle is a square corner. This angle opens wider than that.

3. **They are the same size**

   Both are right angles. The size of an angle is how much it turns.

   - **If you chose A:** Long lines do not make a bigger angle. A tester fits both.
   - **If you chose B:** Both angles turn a quarter turn. The length of the lines does not change that.

4. **3 right angles**

   A half turn is 2 right angles. A quarter turn is 1. 2 + 1 = 3.

5. **A hexagon**

   A hexagon is flat and closed, and it has 6 straight sides.

   - **If you chose A:** A circle has a curved edge. A polygon has only straight sides. Go to M2.5.2.
   - **If you chose C:** A polygon must be closed. It has no gaps. Go to M2.5.2.

6. **The two sides of a book corner. The edge of a door and the floor.**

   In each pair the lines meet at a right angle. Your tester fits the corner.

7. **They meet at a right angle.**

   Perpendicular lines meet at a right angle. It does not matter which way the page is turned.

   - **If you chose B:** That describes parallel lines. Perpendicular lines meet at a right angle. Go to M2.5.1.
   - **If you chose C:** Turn the page and both lines turn. The corner is still a right angle, so they are still perpendicular.

8. **Bigger than a right angle**

   The corner opens wider than the tester. A corner wider than a right angle is obtuse.

   - **If you chose A:** The tester fits inside with room to spare. So the corner opens wider than the tester.
   - **If you chose C:** If it were equal, the tester would touch both lines. Here it does not.

M2.5.4. Measuring angles in degrees

1. **180°**

   A right angle is 90°. 2 × 90° = 180°. That is a straight line.

2. **40°**

   The scale starts at 0 on the right hand arm. The other arm is one small mark after 30. So it is 40°.

   - **If you chose B:** You read the other scale. This angle is smaller than a right angle. It must be less than 90°.
   - **If you chose C:** You counted the 30 mark as a step. Start at 30. The arm is one small mark on, so add 10 once: 40°.

3. **270°**

   A quarter turn is 90°. A half turn is 180°. 90° + 180° = 270°.

4. **2**

   90° ÷ 45° = 2. Two 45° corners fill a right angle.

5. **It is acute. 60° is smaller than a right angle.**

   An acute angle is smaller than 90°. 60° is less than 90°.

6. **Obtuse**

   An obtuse angle is bigger than 90° and smaller than 180°. 120° is in between.

   - **If you chose A:** Acute angles are smaller than 90°. 120° is more than 90°. Go to M2.5.3.
   - **If you chose B:** A right angle is exactly 90°. 120° is bigger. Go to M2.5.3.

7. **360°**

   All the way round is four right angles. 4 × 90° = 360°.

   - **If you chose A:** That is a half turn. After 180° she would face the opposite way.
   - **If you chose B:** That is a quarter turn, one right angle. All the way round is four of them.

8. **130°**

   The scale starts at 0 on the right hand arm. The other arm is one small mark after 120. So it is 130°.

   - **If you chose A:** You read the other scale. This angle is bigger than a right angle. It must be more than 90°.
   - **If you chose C:** You stopped at the last number you could see. The arm is one small mark after it.

9. **The 60 on the outer scale**

   His line lies along 0 on the outer scale. It counts up from 0 on his line. So he joins its 60.

   - **If you chose B:** That scale starts at 0 on the left. From his line it is 120°, not 60°.
   - **If you chose C:** You counted 60° down from the 90° mark. Count 60° up from 0 on his line.

10. **Angle P**

    Angle P opens wider than angle Q. Angle size is how far an angle turns. Arm length does not matter.

    - **If you chose A:** Long arms do not make a bigger angle. What counts is how far the angle opens.
    - **If you chose C:** Arm length does not change an angle, but these two open differently. One opens wider.

M2.5.5. Triangles and four sided shapes

1. **Shape C**

   C is a rhombus. Its 4 sides are equal and it has no right angles.

   - **If you chose A:** A has 4 equal sides, but it also has 4 right angles. Look for the shape with no small squares.
   - **If you chose B:** B has right angles, and its sides are not all equal. Check the ticks.

2. **isosceles**

   Two sides are equal, 5 cm and 5 cm. The third side is different. That makes it isosceles.

   - **If you chose A:** Equilateral means all 3 sides are equal. The 8 cm side is longer.
   - **If you chose C:** Scalene means no sides are equal. Two sides here are both 5 cm.

3. **180°**

   60 + 60 + 60 = 180. That is the same turn as a straight line.

4. **A square is a rectangle.**

   A square has 4 right angles and equal opposite sides. That is all a rectangle needs.

   - **If you chose B:** A rectangle can have long sides and short sides. Only some rectangles have 4 equal sides.
   - **If you chose C:** A rhombus can lean over, and then it has no right angles. A square is the rhombus with 4 right angles.

5. **trapezium**

   A trapezium has exactly one pair of parallel sides.

   - **If you chose A:** A parallelogram has two pairs of parallel sides, not one.
   - **If you chose C:** A rectangle has two pairs of parallel sides, not one.

6. **obtuse**

   Obtuse is bigger than a right angle. It is smaller than a straight line.

   - **If you chose A:** Acute is smaller than a right angle. Test the corner with your tester. Go to M2.5.3.
   - **If you chose B:** A right angle matches your tester exactly. This corner is bigger. Go to M2.5.3.

7. **Shape D**

   D has 4 equal sides, so it is a rhombus. It has 4 right angles, so it is a rectangle. It is a square.

   - **If you chose A:** A has equal opposite sides, but not all four are equal. It has no small squares, so no right angles.
   - **If you chose B:** B has 4 equal sides, so it is a rhombus. It has no right angles, so it is not a rectangle.
   - **If you chose C:** C has 4 right angles, so it is a rectangle. Its sides are not all equal, so it is not a rhombus.

M2.5.6. Lines of symmetry

1. **4**

   A square folds 4 ways. Down the middle, across the middle, and along each diagonal.

   - **If you chose A:** You found the two folds through the middle. A square also has two diagonal folds. Fold paper to check.
   - **If you chose C:** You counted both ends of each line. One line is one fold. Count each fold once.

2. **2**

   The sides are not equal, so it is not a square. It folds down the middle and across the middle. The diagonals do not work.

3. **Shape C**

   C is a scalene triangle. Its sides all differ, so no fold makes the halves match.

   - **If you chose A:** A square folds 4 ways. Try the folds on paper.
   - **If you chose B:** An isosceles triangle folds down its middle. The halves match.

4. **3 steps**

   The twin is as far from the mirror line as X. It is on the other side. X is 3 steps away, so its twin is 3 steps away.

5. **The diagonal is not a line of symmetry.**

   The two triangles are the same size. They do not match when folded. A line of symmetry needs a match.

   - **If you chose B:** The diagonal fails. Folds down the middle and across the middle work.
   - **If you chose C:** The fold was fine. Halves of the same size do not always match when folded.

6. **7**

   A polygon has as many corners as sides. Count the dots. There are 7. It is a heptagon.

7. **2**

   A rhombus folds along each diagonal and the halves match. Folds across the middle of its sides do not match.

   - **If you chose B:** It leans, but a lean does not stop a fold. Fold a paper rhombus corner to corner. The halves match.
   - **If you chose C:** This rhombus has 4 equal sides, but only 2 folds match. A square has 4 lines.

8. **3 steps right, at the same height as X**

   The twin is as far from the mirror line as X. It is on the other side. It keeps the same height.

   - **If you chose A:** You counted 1 from the left edge of the grid. Count steps from the mirror line instead.
   - **If you chose C:** This mirror line stands up. It flips left and right only. The twin stays at the same height.

M2.5.7. Solid shapes and nets

1. **12**

   6 faces with 4 edges each is 24. Each edge was counted twice, so 24 ÷ 2 = 12.

2. **6**

   Each triangle end has 3 corners. 3 + 3 = 6. There are no other corners.

3. **a triangular prism**

   The net has 2 triangles and 3 rectangles. That is 5 faces, the faces of a triangular prism.

   - **If you chose A:** A cube net has 6 squares. This net has triangles and rectangles.
   - **If you chose C:** A pyramid net has a square and 4 triangles. This net has 3 rectangles.

4. **Shape B**

   B folds so every square lands in a different place. A does not.

   - **If you chose A:** Six in a row wrap into a tube. The last squares land on the first ones. Two faces are missing.
   - **If you chose C:** Both have 6 squares. But a row of 6 wraps into a tube.

5. **8**

   4 edges on the base and 4 edges going up. 4 + 4 = 8.

6. **At the 0 mark**

   Put one end of the line at the 0 mark. Read the number at the other end.

   - **If you chose B:** Many rulers have a gap before 0. Start at the 0 mark, not at the edge. Go to M2.5.1.
   - **If you chose C:** The line would read 1 cm too long. Measuring starts at 0. Go to M2.5.1.

7. **5**

   It has 2 triangle ends and 3 rectangle sides. 2 + 3 = 5 faces.

   - **If you chose B:** You counted the 3 rectangle sides. The 2 triangle ends are faces too.
   - **If you chose C:** A cube has 6 faces. A prism with triangle ends has 2 triangles and 3 rectangles.

8. **5**

   Each square of the net becomes one face. The net has 5 squares, so the box has 5 faces.

   - **If you chose A:** You counted the sides only. The middle square is the base, and it is a face too.
   - **If you chose B:** A box with a lid has 6 faces. This net has no square for a lid.

9. **8**

   The front face has 4 corners and the back face has 4. 4 + 4 = 8.

   - **If you chose A:** That is the number of edges. A corner is a point where edges meet.
   - **If you chose C:** That is the number of faces. A corner is a point, not a flat side.

M2.5.8. Grids and directions

1. **C3**

   The well is in column C and row 3. Column first, then row, so C3.

   - **If you chose B:** This book says the column letter comes first, then the row number. Write C3.
   - **If you chose C:** Look at the letter above the well. It is C, not B. Box B3 is under the hut.

2. **D4**

   East 2 from B is C, D. South 3 from row 1 is 2, 3, 4. So you are in D4.

3. **C3**

   West is left, along the letters. From E, go back 2 boxes: D, C. The row stays 3.

4. **On your right**

   Face north. East is on your right. West is on your left. South is behind you.

   - **If you chose B:** West is on your left when you face north. East is the other side.
   - **If you chose C:** South is behind you when you face north. East is to the side.

5. **90°**

   A quarter turn is one right angle. A full turn is 360°, and 360 ÷ 4 = 90.

6. **D2**

   East is to the right, along the letters. From B, go 2 boxes: C, D. The row stays 2.

   - **If you chose A:** You counted the box you stand in as 1. Step 2 boxes away from B: C, then D.
   - **If you chose B:** That changes the row number. East and west change the letter. North and south change the number.

7. **North 2 boxes, then west 3 boxes**

   Going back, the last walk comes first. South 2 becomes north 2. Then east 3 becomes west 3.

   - **If you chose B:** Those are the same directions as the way there. To go back, turn each direction round.
   - **If you chose C:** The directions are right, but the numbers are swapped. She went south 2 boxes and east 3.

8. **D2**

   The dot is in column D. It is in row 2, counting down from the top. Column first, so D2.

   - **If you chose A:** You read the row first. This book says the column letter comes first, then the row number.
   - **If you chose C:** You counted the rows from the bottom. Rows are numbered from the top, so this is row 2.

About this book

For learners who can name a triangle, a square and a rectangle and count their corners. In many schools this fits children of about 8 to 10, and older learners can start here too. Activities use paper, a pencil, a ruler and scissors. A protractor helps in one chapter, and the chapter says what to do without one. A learner can work alone: every exercise has its answer and the reason for it.

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