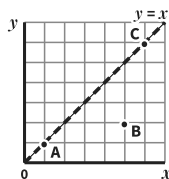


1 Lines of symmetry

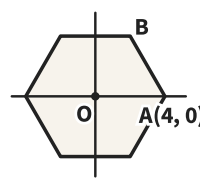
- a) The line $y = x$ is a line of symmetry of the kite ABCD. Find the coordinates of D.
- b) An isosceles triangle has a base from $(-1, 3)$ to $(5, -1)$. Find its line of symmetry.



- a) D is the mirror image of B : $D(2, 5)$
 b) midpoint $(2, 1)$, base gradient $-\frac{2}{3}$, so $\frac{3}{2}$
 $y - 1 = 1.5(x - 2)$, so $2y = 3x - 4$

2 Rotational symmetry

- a) Each interior angle of a regular polygon is 7 times each exterior angle. Find its order of rotational symmetry.
- b) The regular hexagon has centre O . Find the exact coordinates of B .

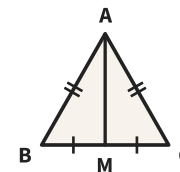


- a) $8 \times \text{exterior} = 180^\circ$, exterior 22.5°
 $360 \div 22.5 = 16$, order 16
 b) $B(4 \cos 60^\circ, 4 \sin 60^\circ) = (2, 2\sqrt{3})$

3 Congruent triangles

$AB = AC$ and M is the midpoint of BC .

- a) Prove that triangles ABM and ACM are congruent.
- b) Hence prove that AM is perpendicular to BC .

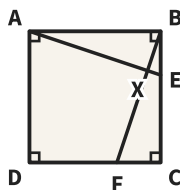


- a) $AB = AC$, $BM = CM$, AM is common, so SSS
 b) angle $AMB = \text{angle } AMC$ (congruent)
 they add to 180° , so each is 90°

4 Congruent triangles

ABCD is a square with $BE = CF$.

- a) Prove that triangles ABE and BCF are congruent.
- b) Hence prove that AE is perpendicular to BF .



- a) $AB = BC$, $BE = CF$, right angles at B and C : SAS
 b) $\angle BAE = \angle CBF = a$, so $\angle ABX = 90 - a$
 $\angle AXB = 180 - a - (90 - a) = 90^\circ$

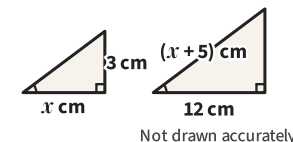
Congruence, symmetry and similarity

revision mat answers

5 Similar shapes: missing lengths

The two triangles are similar.

- a) Find x .
- b) The large triangle's longest side is 15 cm. Find the small triangle's perimeter.

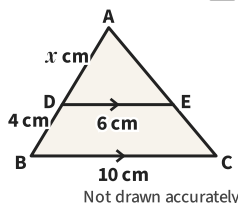


- a) $\frac{12}{x} = \frac{x+5}{3}$, $x^2 + 5x - 36 = 0$
 $(x+9)(x-4) = 0$, $x = 4$
 b) $15 \div 3 = 5$, so $4 + 3 + 5 = 12$ cm

6 Similar shapes: missing lengths

DE is parallel to BC .

- a) Find x .
- b) Find the ratio of the area of triangle ADE to the area of $DBCE$.



- a) $\frac{x}{x+4} = \frac{6}{10}$, $10x = 6x + 24$, $x = 6$
 b) areas $6^2 : 10^2 = 36 : 100$, so $36 : 64 = 9 : 16$

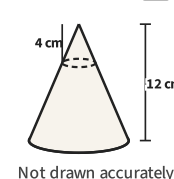
7 Area and volume scale factors

- a) Two similar shapes have areas in the ratio 16 : 25. The small one has a perimeter of 28 cm. Find the large one's perimeter.
- b) Two similar solids have surface areas of 48 cm^2 and 108 cm^2 . The larger has a volume of 540 cm^3 . Find the smaller's volume.

- a) lengths $4 : 5$, $28 \div 4 \times 5 = 35$ cm
 b) areas $\times 2.25$, lengths $\times 1.5$, volumes $\times 3.375$
 $540 \div 3.375 = 160 \text{ cm}^3$

8 Area and volume scale factors

- a) A cone 12 cm tall is cut 4 cm from its top, parallel to the base. The bottom part has a volume of 520 cm^3 . Find the cone's volume.
- b) Each length of a solid goes up by 10%. Show that the volume goes up by 33.1%.



- a) volumes $1 : 27$, so $520 \div 26 \times 27 = 540 \text{ cm}^3$
 b) $1.1^3 = 1.331$, an increase of 33.1%