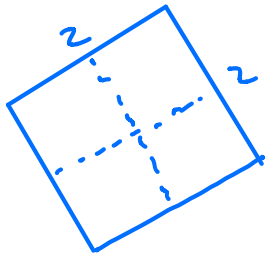
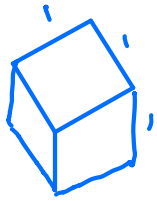
Similar 3D Figures

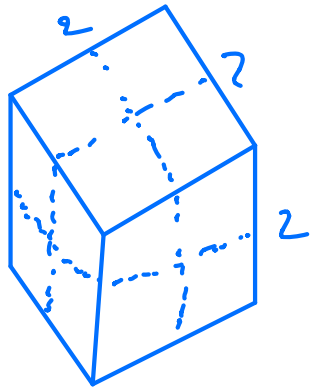
Length
1 : 2

Area
1 : 4
$= 1^2 : 2^2$



Volume
1 : 8
$= 1^3 : 2^3$





In general for similar figures

Length	$a : b$
Area	$a^2 : b^2$
Volume	$a^3 : b^3$

Warning In similar figures angles are preserved.
They are the same in both shapes

Simple examples

1) A model car is built based on real car with a scale 1:12

If real car has length 4m what length is the model car?

Model Length $= 4 \times \frac{1}{12} = \frac{1}{3}$ m

If model bonnet has area 240 cm^2, find area of real bonnet

Length	1 : 12		
Area	$1^2 : 12^2$	=	1 : 144
Vol	$1^3 : 12^3$	=	1 : 1728

Real bonnet = 240×144 cm^2

$= 34560 cm^2$

$= \frac{34560}{10000} m^2 = 3.456 m^2$

Exam type question.

Jugs A and B are mathematically similar

The base of Jug A has an area of 16 cm^2 and the base of Jug B has an area of 25 cm^2

If Jug A is 24 cm tall, find height of Jug B

If Jug B has a volume of 375 cm^3, find volume

of Jug A.

	A	:	B
Area ratio	16	:	25
Length ratio	$\sqrt{16}$	:	$\sqrt{25}$
	= 4	:	5
Volume ratio	= 4^3	:	5^3
	= 64	:	125

Height of Jug B = $24\text{cm} \times \frac{5}{4} = 30\text{cm}$

Volume of Jug A = $375 \times \frac{64}{125} = 192\text{cm}^3$

Exercise 14D Page 324 Blue Books

2) Length 4 : 7

a) Area $4^2 : 7^2 = 16 : 49$

b) Volume $4^3 : 7^3 = 64 : 343$

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4) a) Height ratio 1 : 2

b) Volume $1^3 : 2^3 = 1 : 8$

c) Volume of larger glass = $1 \times \frac{8}{1} = 8$ pints

d) Unfair since eyes perceive volume which

is 8 times bigger not 2 times bigger

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1)

Length	$2:5$	
Area	$2^2:5^2$	$= 4:25$
Volume	$2^3:5^3$	$= 8:125$

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3)

Lin Scale	Lin Ratio	Lin fraction	Area Scale factor	Volume Scale factor
2	1:2	$\frac{2}{1}$	4	8
3	1:3	$\frac{3}{1}$	9	27
$\frac{1}{4}$	4:1	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{64}$
5	1:5	$\frac{5}{1}$	25	125
$\frac{1}{10}$	10:1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
7	1:7	$\frac{7}{1}$	49	343
$\frac{1}{5}$	5:1	$\frac{1}{5}$	$\frac{1}{25}$	$\frac{1}{125}$
$\frac{1}{2}$	2:1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$