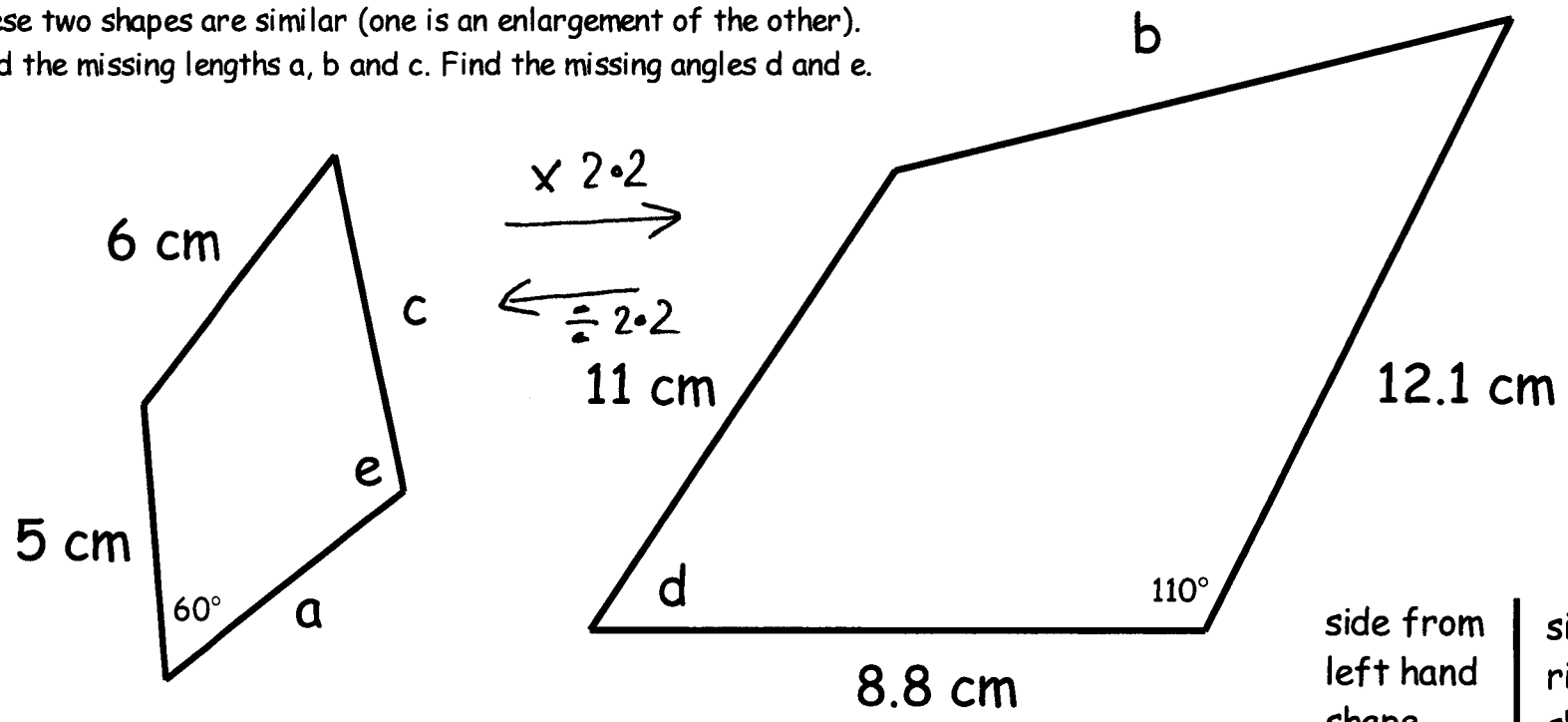
SIMILAR SHAPES and CONGRUENCE

# Similar Shapes

These two shapes are similar (one is an enlargement of the other).
Find the missing lengths a, b and c. Find the missing angles d and e.




| | side from left hand shape | side from right hand shape | |
|---|---|---|---|
| 8·8 ÷ 2·2 = | 4 a | 8·8 | |
| | 5 | 11 | |
| | 6 | b | 6 x 2·2 = 13·2 |
| 12·1 ÷ 2·2 = 5·5 | c | 12·1 | |

→ x 2·2

÷ 2·2 ←

First - identify corresponding sides and angles.
Second - Find the scale factor.
Third - Calculate the missing values.

Length scale factor = 11 ÷ 5 = 2·2

a = 4cm

b = 13·2 cm

c = 5·5 cm

The angles remain the same

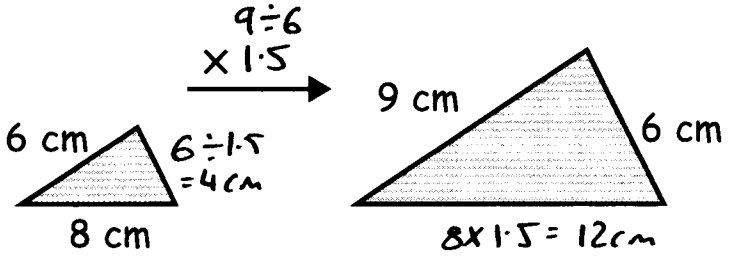
d = 60°

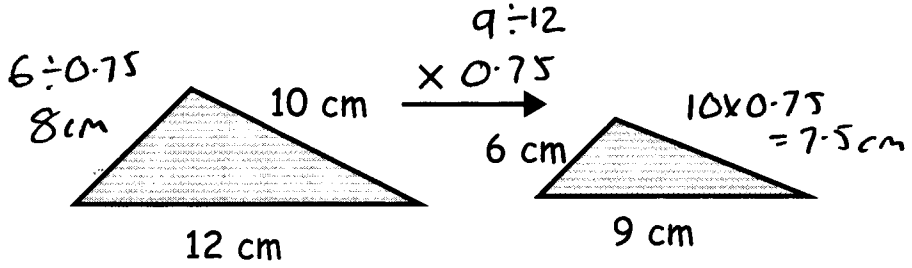
e = 110°

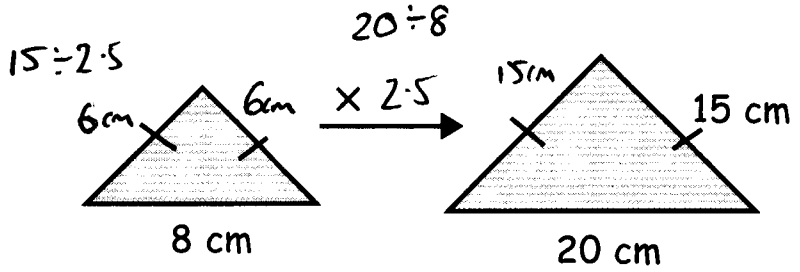
# Similar Shapes

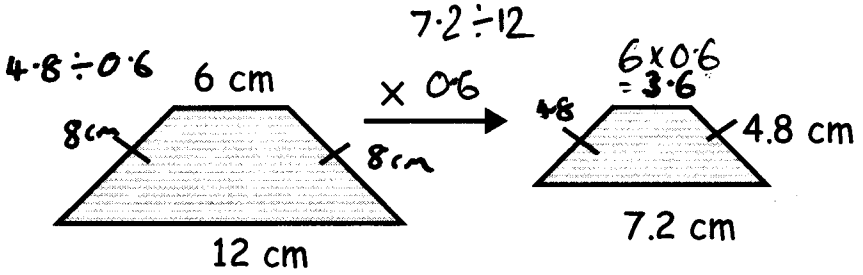
Find the scale factors LEFT to RIGHT. Write them on the arrows.

Find all the missing lengths. Write them on the shapes.

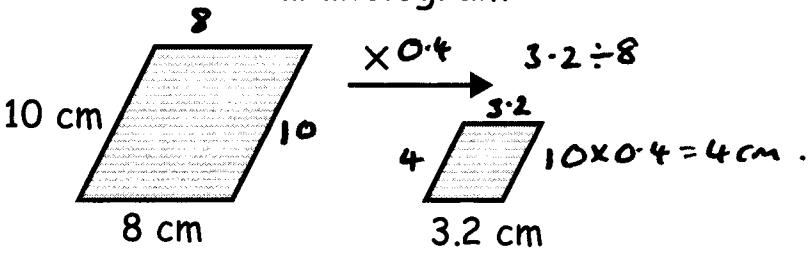


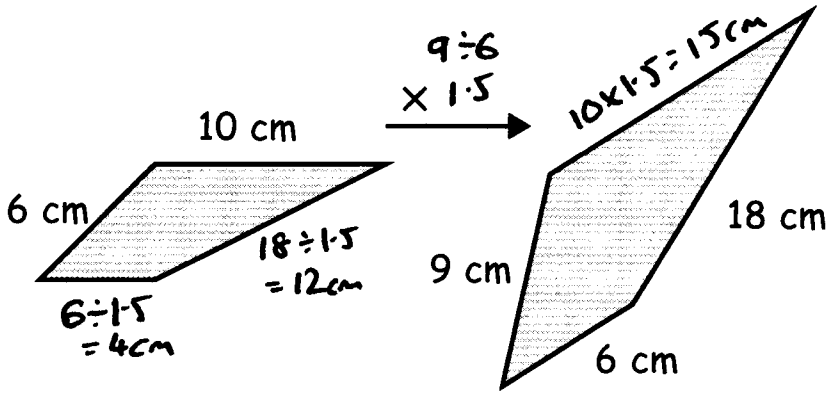



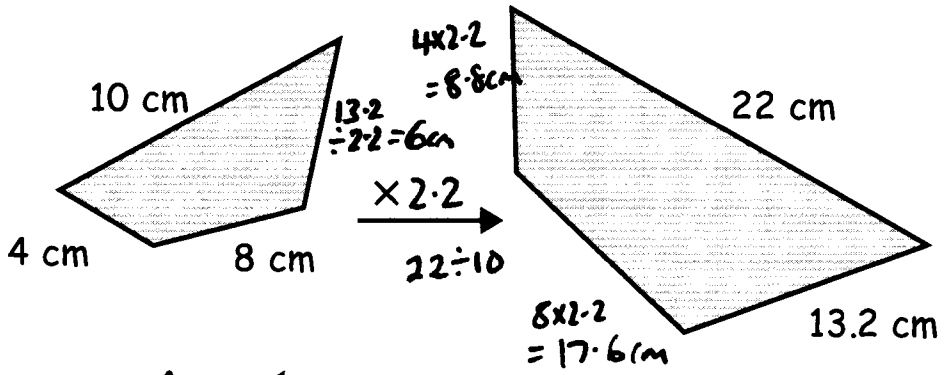



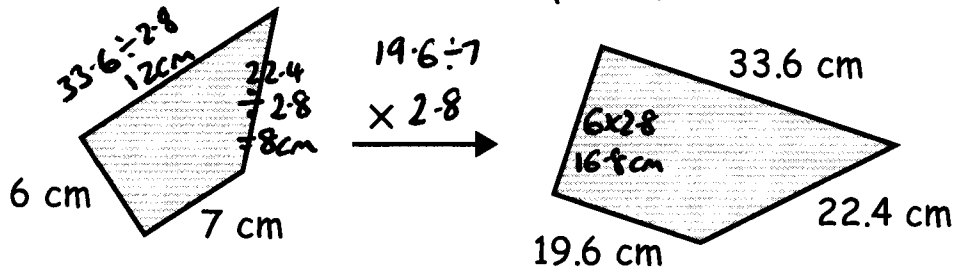




Parallelogram

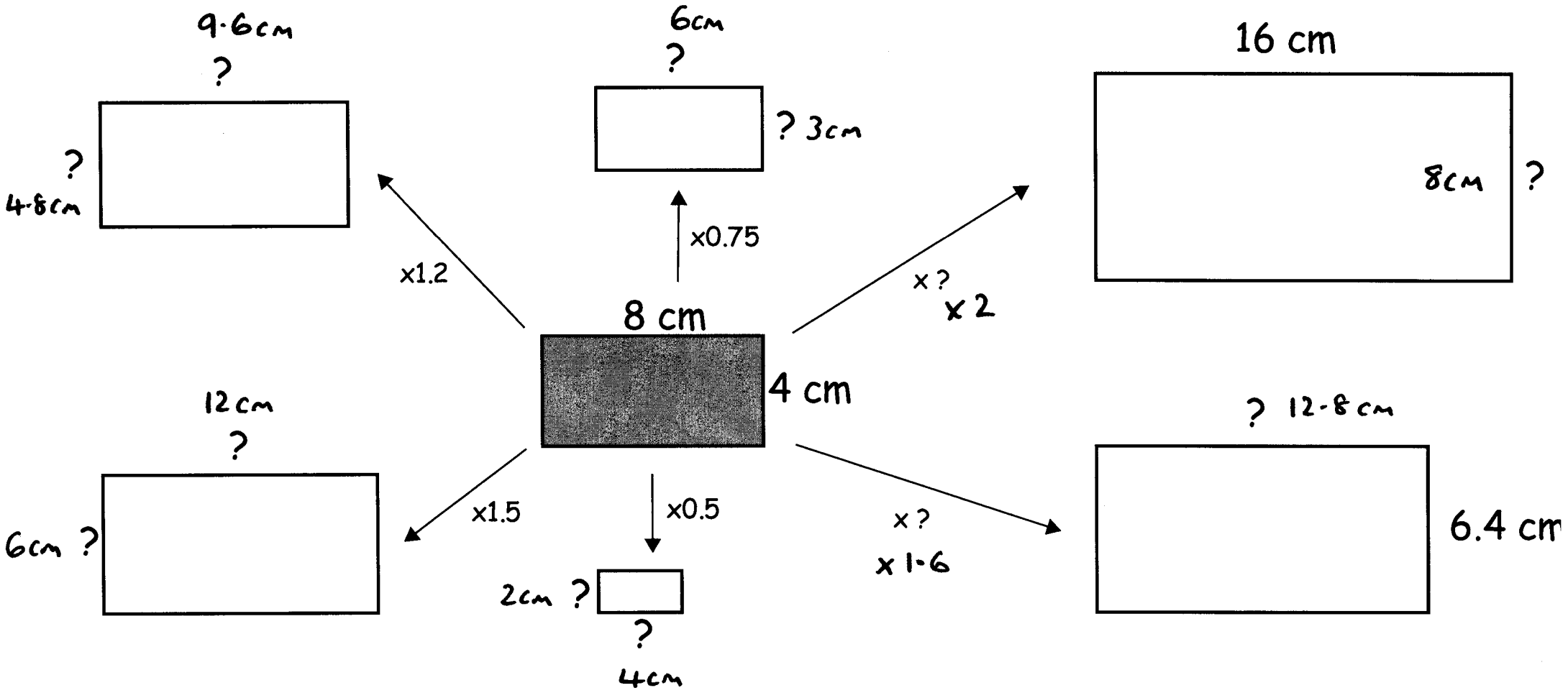


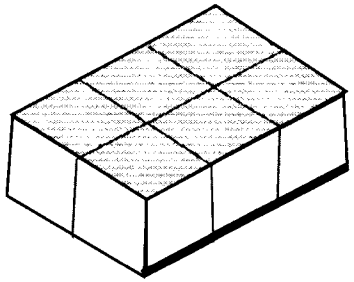



These rectangles are all SIMILAR to the shaded rectangle. Find the missing lengths and multipliers



# Scale Factors in similar figures

These cuboids are similar. Fill in the missing lengths, areas, volumes and scale factors.



Length of thick black line

3cm

length factor

×2

Length of thick black line

6cm

Shaded area

2×3

$= 6cm^2$

area factor

×4 $(2^2)$

Shaded area

4×6

$= 24cm^2$

Volume

1×2×3

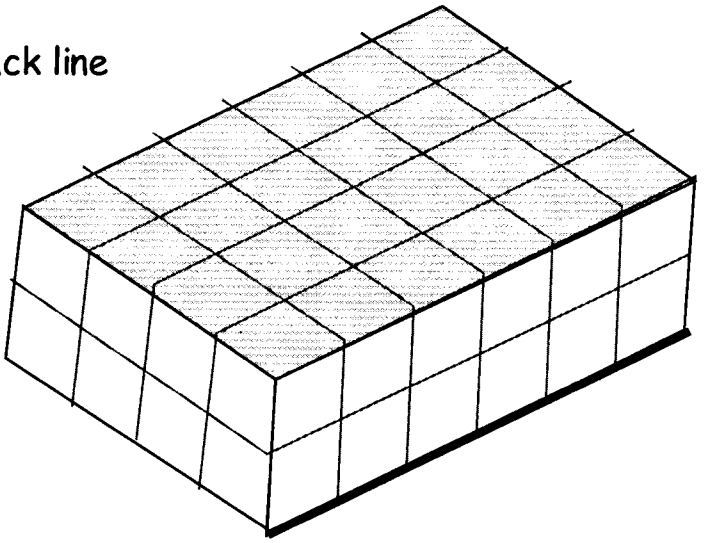
$= 6cm^3$

volume factor

×8 $(2^3)$

Volume

$2 \times 4 \times 6 = 48cm^3$



Remember Area scale factor = (length scale factor)$^2$

Length scale factor = $\sqrt{(\text{area scale factor})}$

Volume scale factor = (length scale factor)$^3$

Length scale factor = $\sqrt[3]{(\text{volume scale factor})}$

Remember this also applies to units

1 m = 100 cm

1 m$^2$ = 10000 cm$^2$

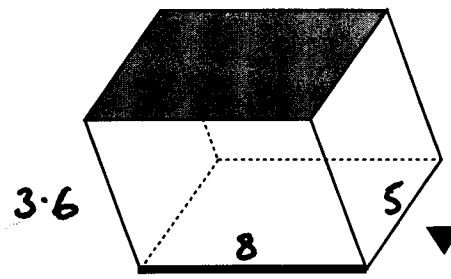
1 m$^3$ = 1000000 cm$^3$

1 cm = 10 mm

1 cm$^2$ = 100 mm$^2$

1 cm$^3$ = 1000 mm$^3$

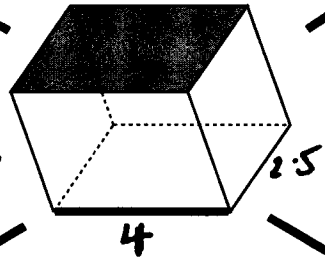
These cuboids are all similar. The length scale factors are shown on the diagram. Find the missing values and for each cuboid find its dimensions.

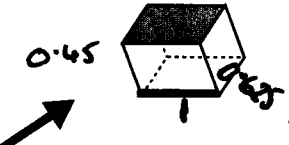



LF x2
AF $2^2 = 4$
VF $2^3 = 8$

Bold length = $4 \times 2 = 8$cm
Shaded Area = 40 $cm^2$
Volume $18 \times 8 = 144 cm^3$

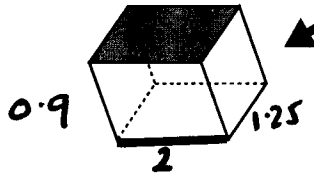
Bold length = 4cm
Shaded Area $40 \div 4 = 10$ $cm^2$
Volume $486 \div 27 =$ 18 $cm^3$




LF x0.25
AF $0.25^2 = 0.0625$
VF $0.25^3 = 0.015625$

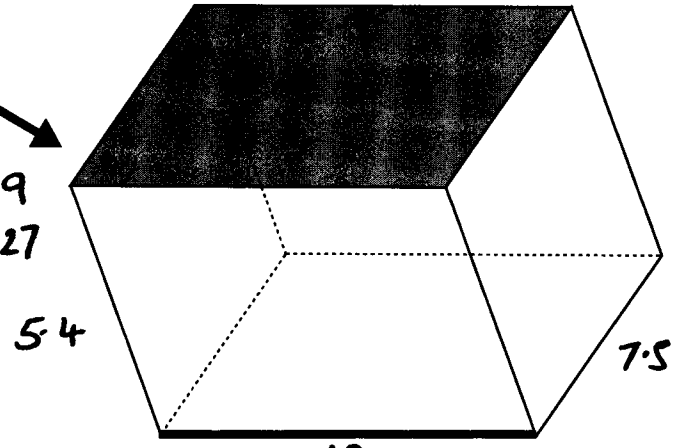
Bold length $4 \times 0.25 = 1$cm
Shaded Area $10 \times 0.0625 = 0.625 cm^2$
Volume $18 \times 0.015625 =$ $0.28125 cm^3$




LF x0.5
AF $0.5^2 = 0.25$
VF $0.5^3 = 0.125$

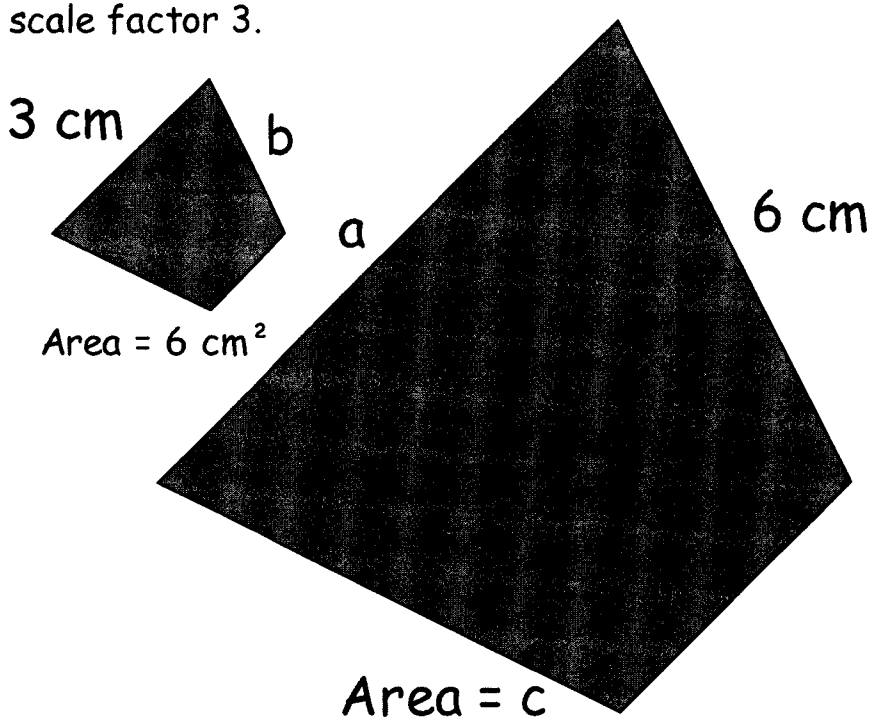
Bold length $4 \times 0.5 = 2$cm
Shaded Area $10 \times 0.25 = 2.5 cm^2$
Volume $18 \times 0.125 = 2.25$

LF x3
AF $= 3^2 = 9$
VF $= 3^3 = 27$



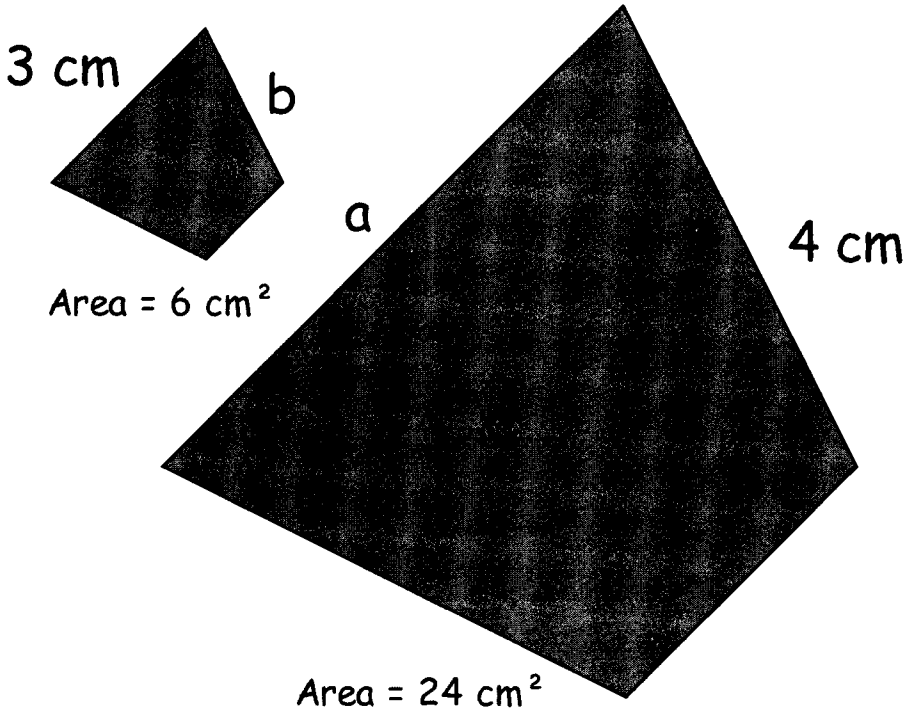

Bold length $4 \times 3 = 12$cm
Shaded Area $10 \times 9 = 90 cm^2$
Volume = 486 $cm^3$

1) These drawings represent an enlargement of scale factor 3.



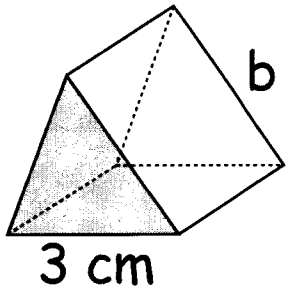

Length scale factor = 3
Area scale factor = $3^2 = 9$
length a = $3 \times 3 = 9$cm
length b = $6 \div 3 = 2$cm
area c = $6 \times 9 = 54$ cm²

2) These drawings represent an enlargement of scale factor ? (small to large)

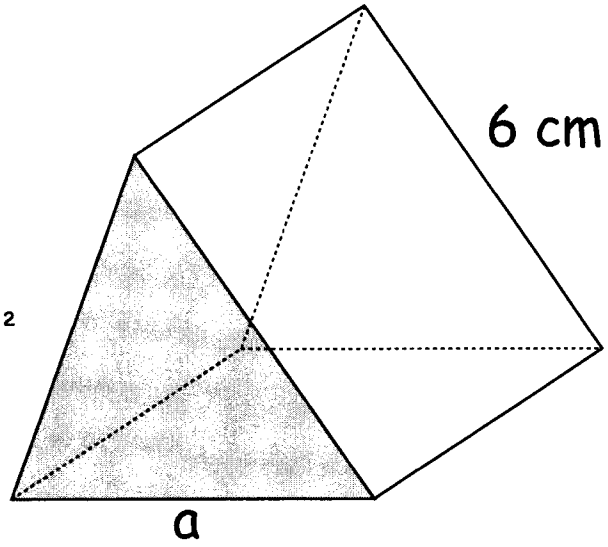



Length scale factor = $\sqrt{4} = 2$
Area scale factor = $24 \div 6 = 4$
length a = $3 \times 2 = 6$cm
length b = $4 \div 2 = 2$cm

3) These drawings represent an enlargement of scale factor 2.



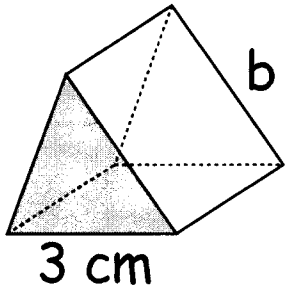

shaded area = 5 cm²
volume = 10 cm³



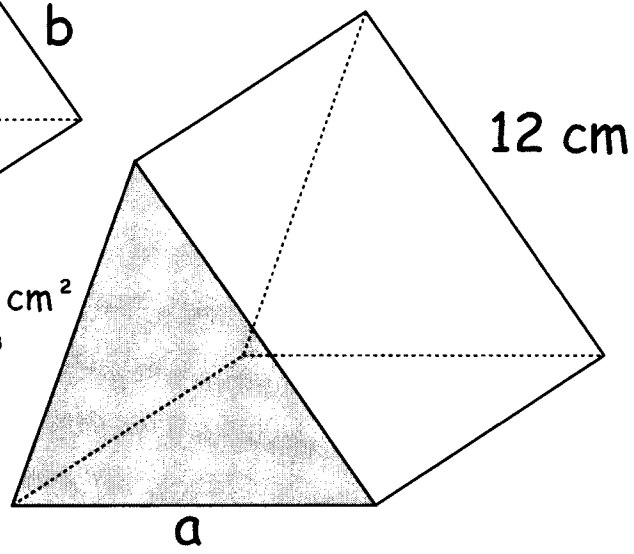

shaded area = c
volume = d

Length scale factor = 2
Area scale factor = $2^2 = 4$
Volume scale factor = $2^3 = 8$
length a = $3 \times 2 = 6$ cm
length b = $6 \div 2 = 3$ cm
area c = $5 \times 4 = 20$ cm²
volume d = $10 \times 8 = 80$ cm³

4) These drawings represent an enlargement of scale factor ?



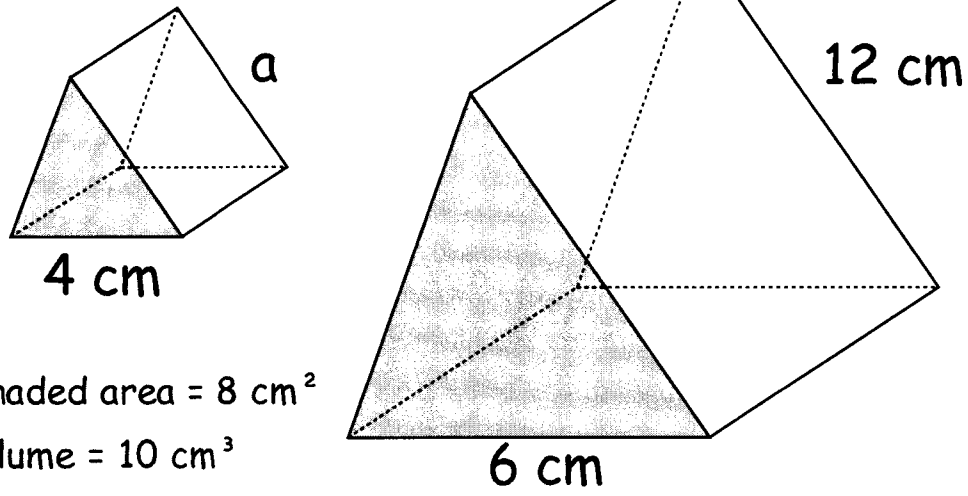

shaded area = 5 cm²
volume = 10 cm³




shaded area = 45 cm²
volume = c

Length scale factor = $\sqrt{9} = 3$
Area scale factor = $45 \div 5 = 9$
Volume scale factor = $3^3 = 27$
length a = $3 \times 3 = 9$ cm
length b = $12 \div 3 = 4$ cm
volume c = $10 \times 27 = 270$ cm³

1) These two shapes are SIMILAR.




shaded area = 8 $cm^2$

volume = 10 $cm^3$

shaded area = b $cm^2$

volume = c $cm^3$

Length factor = $6 \div 4 = 1.5$

Area factor = $1.5^2 = 2.25$

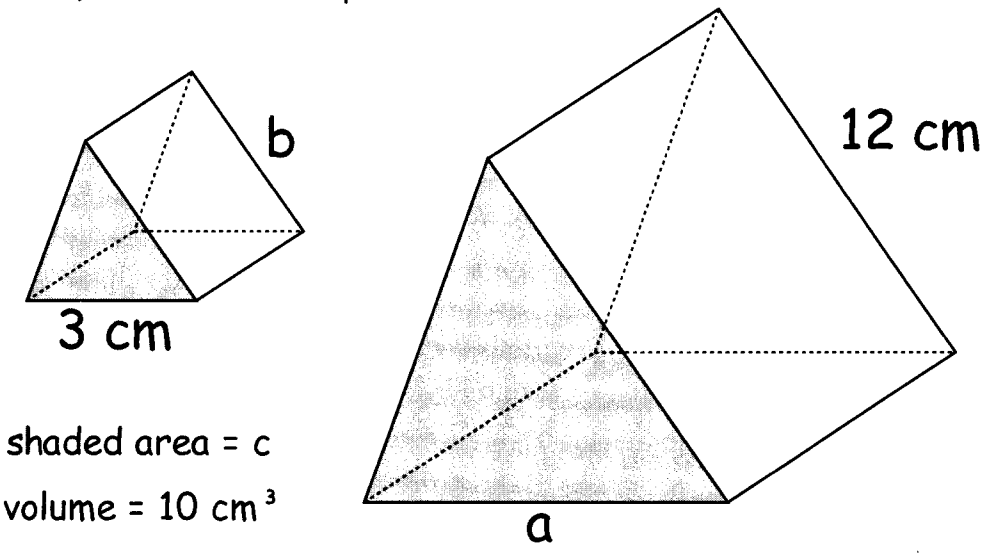
Volume factor = $1.5^3 = 3.375$

length a = $12 \div 1.5 = 8$ cm

area b = $8 \times 2.25 = 18$ $cm^2$

volume c = $10 \times 3.375 = 33.75$ $cm^3$

2) These two shapes are SIMILAR.




shaded area = c

volume = 10 $cm^3$

shaded area = 20 $cm^2$

volume = 80 $cm^3$

Length factor = $\sqrt[3]{8} = 2$

Area factor = $2^2 = 4$

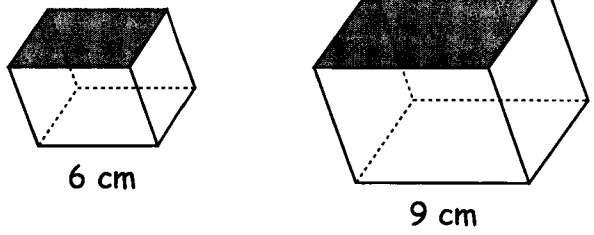
Volume factor = $80 \div 10 = 8$

length a = $3 \times 2 = 6$ cm

length b = $12 \div 2 = 6$ cm

area c = $20 \div 4 = 5$ $cm^2$

1) These two cuboids are similar




a) Length $9 \div 6 = 1.5$

Area $1.5^2 = 2.25$

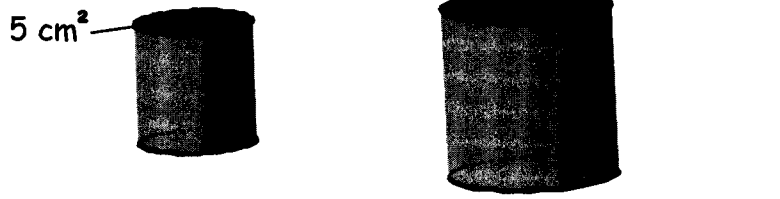
Volume $1.5^3 = 3.375$

a) Find the length, area and volume scale factors

b) The shaded area of the smaller cuboid is 15 $cm^2$. Find the corresponding shaded area in the larger cuboid. $15 \times 2.25 = 33.75 cm^2$

c) The volume of the larger cuboid is 202.5 $cm^3$. Find the volume of the smaller cuboid. $202.5 \div 3.375 = 60 cm^3$

2) These two cylinders are similar




a) Find the length, area and volume scale factors

b) The radius of the larger cylinder is 1.56 cm. Find the radius of the smaller cylinder. $1.56 \div 1.2 = 1.3 cm$

c) The volume of the larger cylinder is 86.4 $cm^3$. Find the volume of the smaller cylinder. $86.4 \div 1.728 = 50 cm^3$

a)

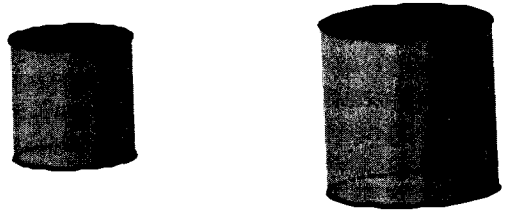
Length $\sqrt{1.44} = 1.2$

Area $7.2 \div 5 = 1.44$

Volume $1.2^3 = 1.728$

3) These two cylinders are similar

Volume 80 $cm^3$



Volume 1250 $cm^3$

a) Find the length, area and volume scale factors

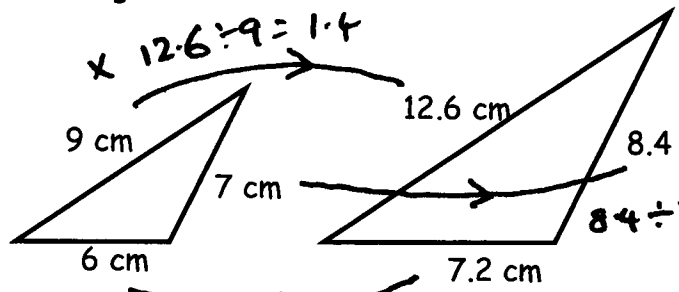
b) The radius of the smaller cylinder is 4 cm. Find the radius of the larger cylinder. $4 \times 2.5 = 10 cm$

c) The shaded area of the larger cylinder is 312.5 $cm^2$. Find the corrsponding shaded area in the smaller cylinder. $312.5 \div 6.25 = 50 cm^2$

a) Length $\sqrt[3]{15.625} = 2.5$ Area $2.5^2 = 6.25$ Volume $1250 \div 80 = 15.625$

Are these triangles similar?

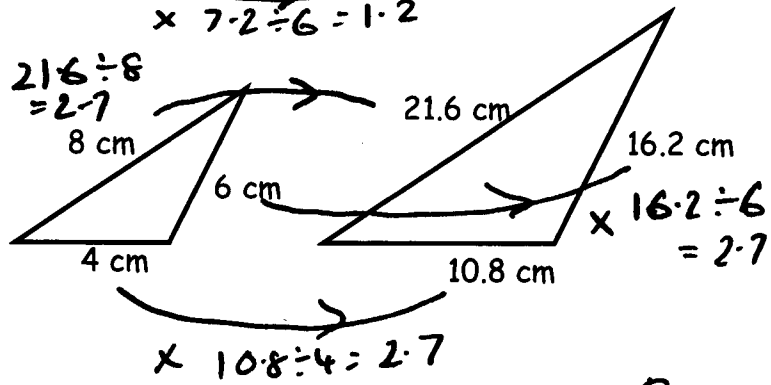
4)




$84 \div 7 = 1.2$

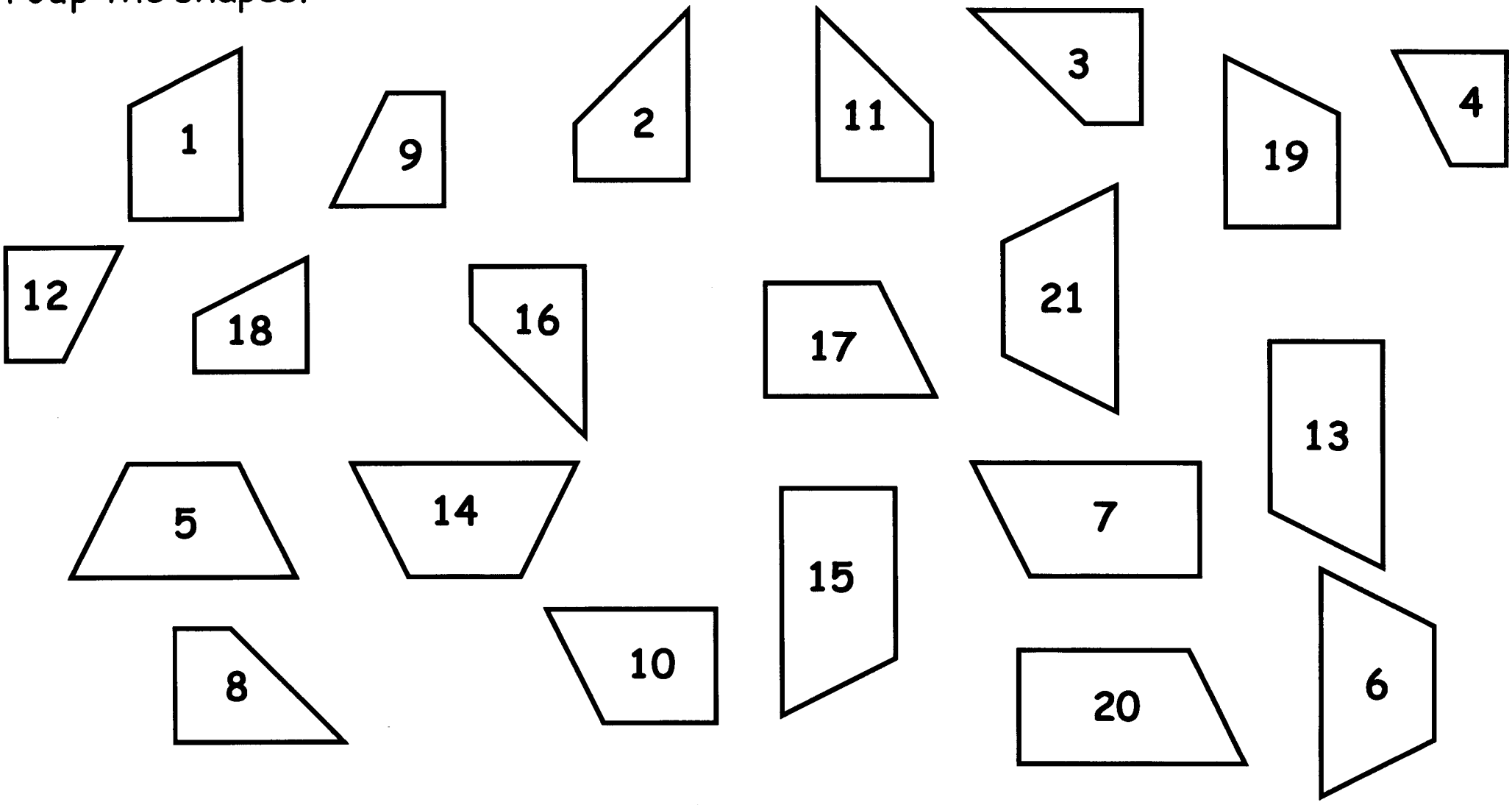
Not similar. Not all factors are the same.

5)




Yes they are similar. All the scale factors are the same.

Congruent Shapes are IDENTICAL. They may be rotated or reflected.
Group the shapes.




1, 10, 17, 19

2, 3, 8, 11, 16

4, 9, 12, 18

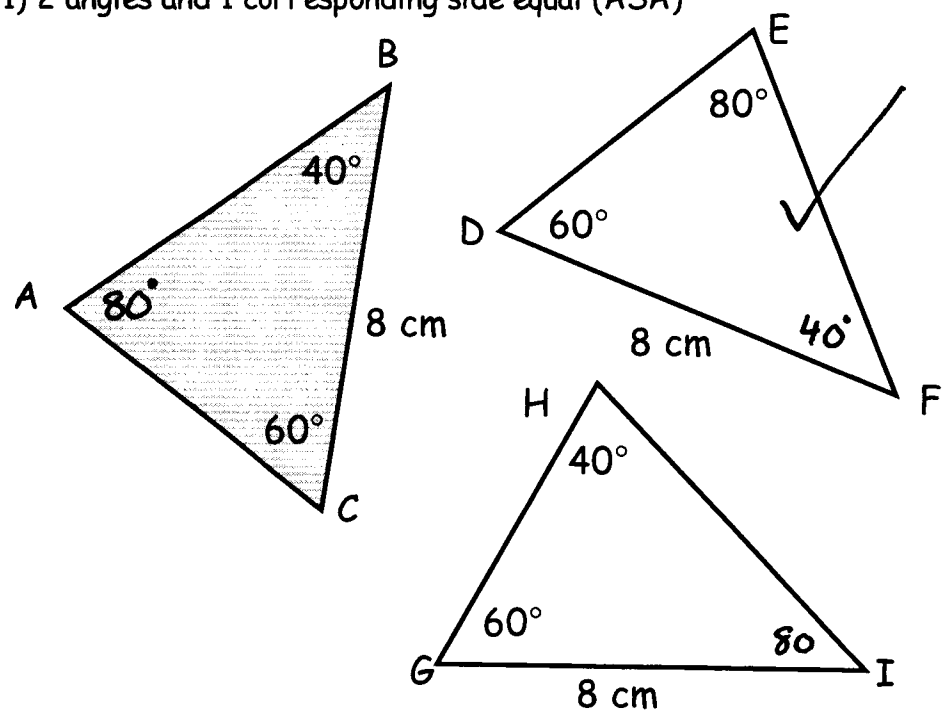
5, 6, 14, 21

7, 13, 15, 20

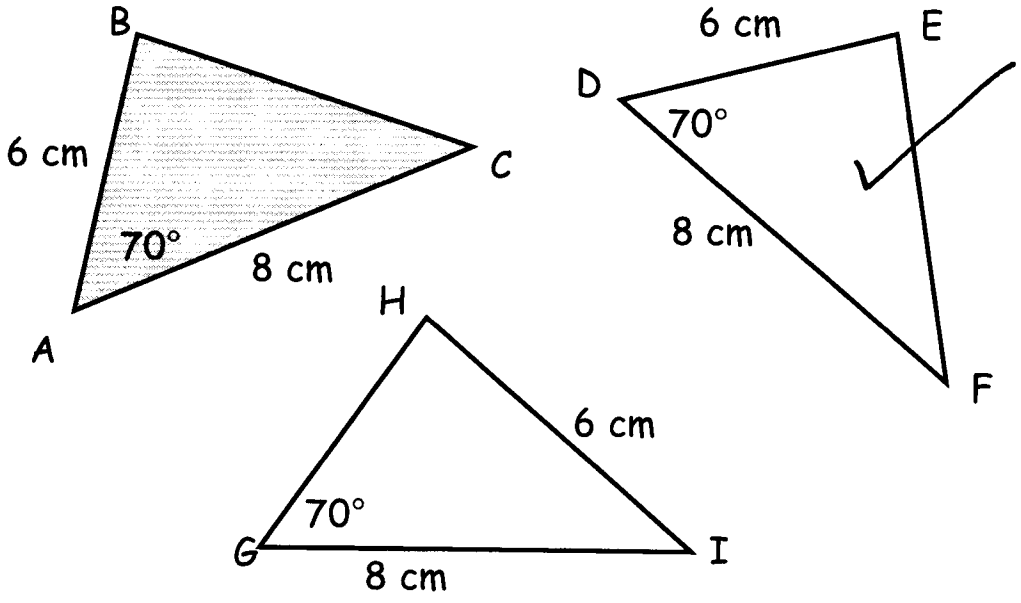
## Conditions/Reasons for CONGRUENCE in Triangles

In each question state which triangle is congruent to the shaded one?

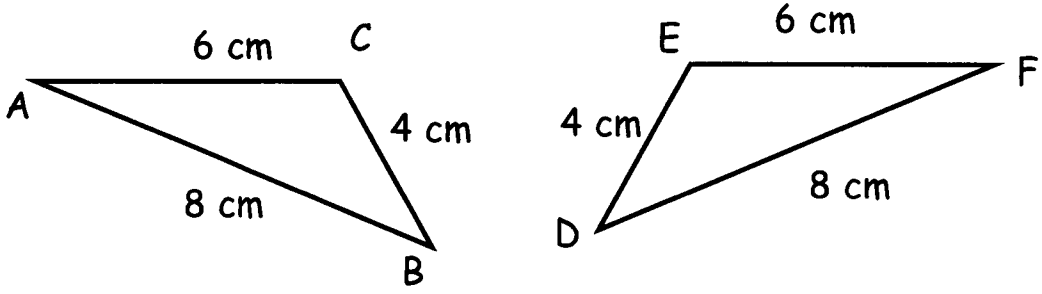
1) 2 angles and 1 corresponding side equal (ASA)



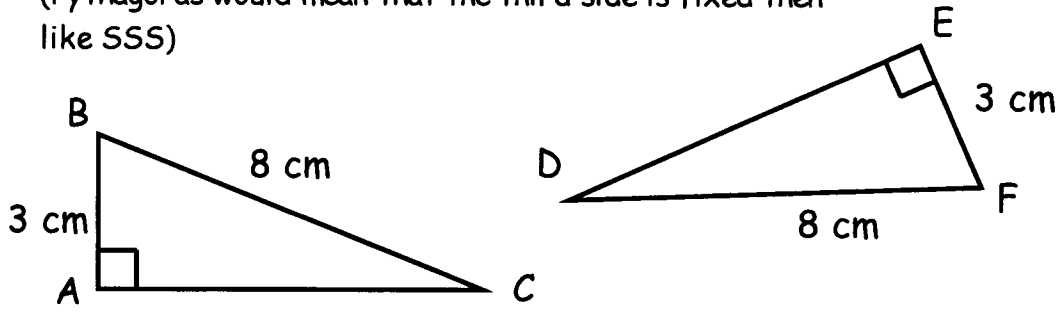

2) 2 corresponding sides and the angle between the sides equal (SAS)




3) 3 corresponding sides equal (SSS)



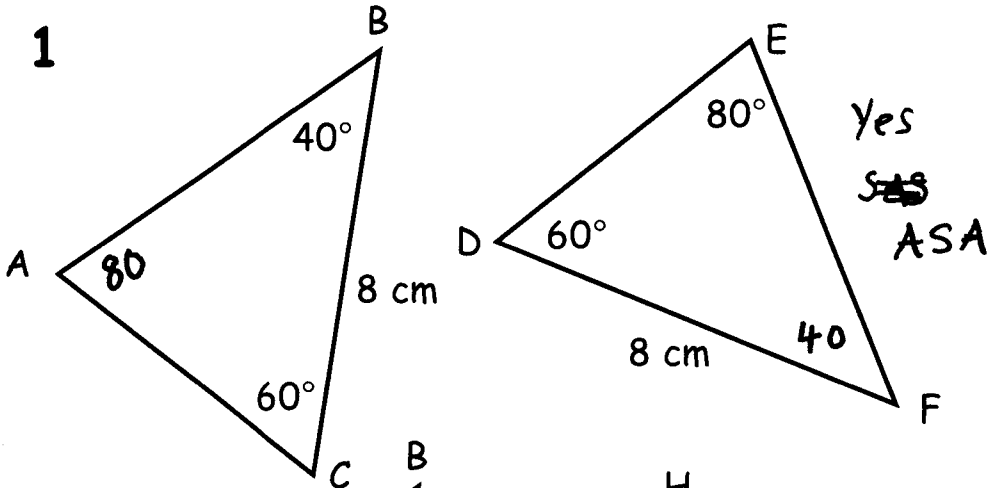

4) A right angle, the hypotenuse and another side equal. (RHS)
(Pythagoras would mean that the third side is fixed then like SSS)



Are the pairs of triangles congruent? Give a reason if they are. SSS, SAS, ASA, RHS

Label every ANGLE and SIDE that you can.

**1**

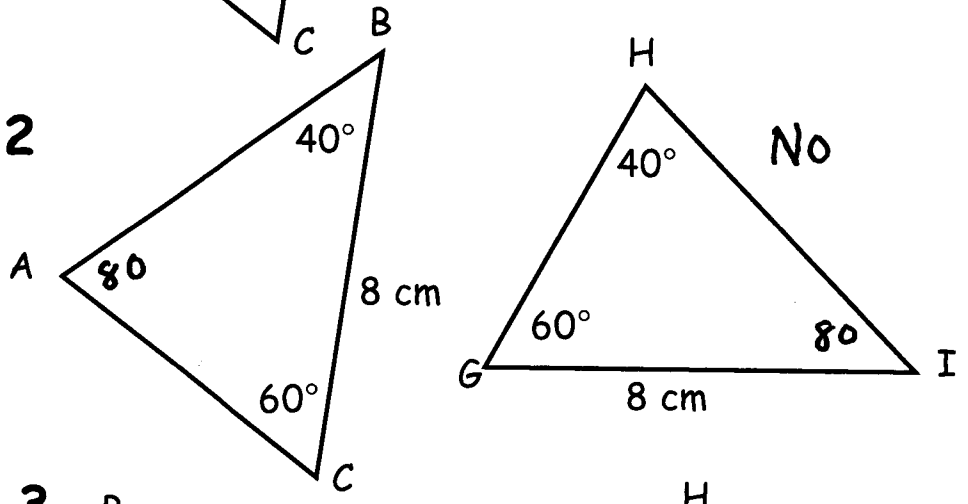



Yes

~~SAS~~

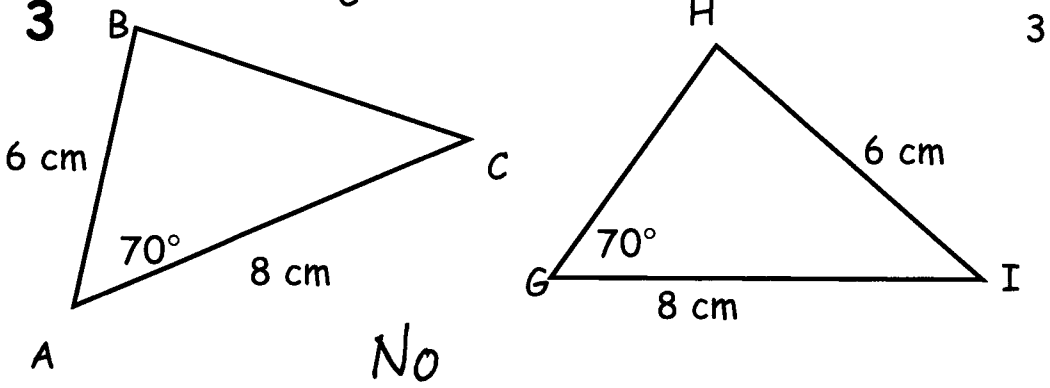
ASA

**2**



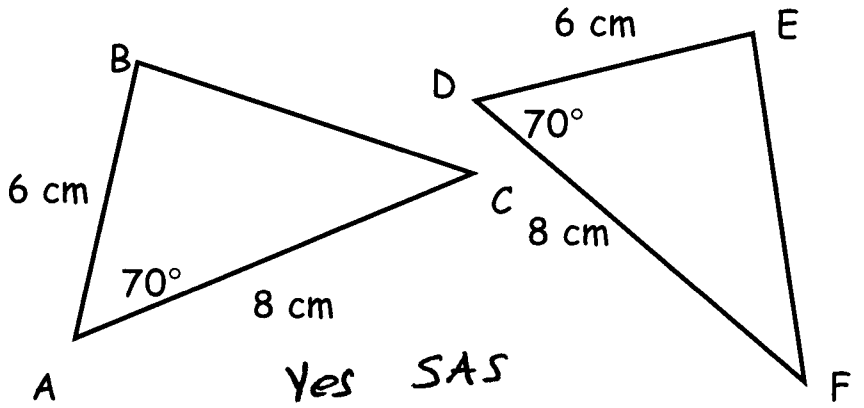

No

**3**



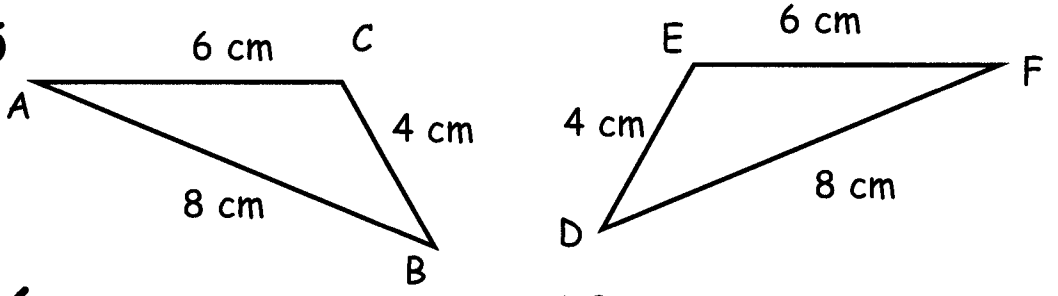

No

**4**



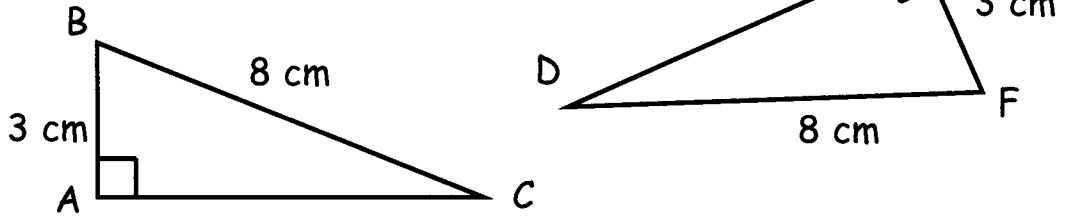

Yes SAS

**5**




Yes SSS

**6**




Yes RHS