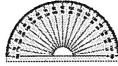
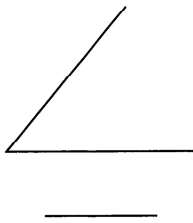


4.3 Warm Up

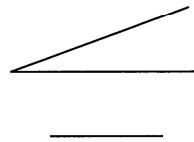
1. Measure the angles.



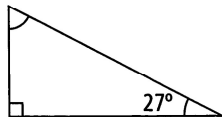
a)



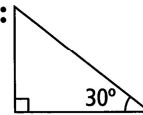
b)



2. Find the missing angle.



Example:



The sum of the angles in a triangle = 180° .
 To find the missing angle, subtract the 2 given angles from 180° .
 $x = 180 - 90 - 30$
 $x = 60^\circ$

3. Divide.

a) $\frac{64}{8} = \underline{\hspace{2cm}}$

b) $\frac{62.4}{0.2} = \underline{\hspace{2cm}}$

M•E 4. Find the missing numbers.

a) $\frac{\boxed{\hspace{1cm}}}{5} = 6$

b) $\frac{28}{\boxed{\hspace{1cm}}} = 7$

5. Use equivalent fractions to complete each proportion.

a) $\frac{18}{2} = \frac{\boxed{\hspace{1cm}}}{6}$

× _____

× _____

b) $\frac{35}{14} = \frac{\boxed{\hspace{1cm}}}{2}$

÷ _____

÷ _____

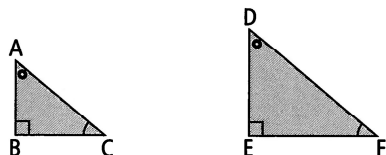
4.3 Similar Triangles

Link the Ideas

Working Example 1: Identify Similar Triangles

corresponding angles and corresponding sides

- angles and sides that are in matching positions
- example:

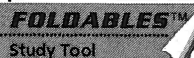


corresponding angles:

- $\angle A$ and $\angle D$
- $\angle B$ and $\angle E$
- $\angle C$ and $\angle F$

corresponding sides:

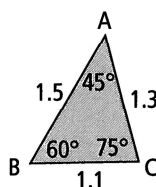
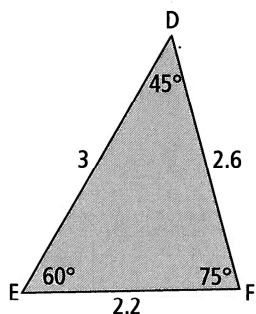
- AB and DE
- BC and EF
- AC and DF



similar figures

- have the same shape but different size
- all corresponding angles are equal
- all corresponding sides are proportional
- example:

Proportional means the ratio of the corresponding sides is equal.



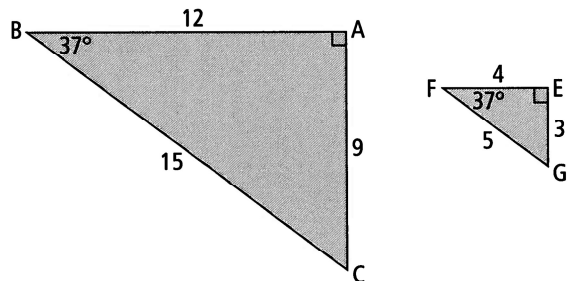
equal angles:

- $\angle A = \angle D$
- $\angle B = \angle E$
- $\angle C = \angle F$

proportional sides:

- $DE = 2 \times AB$
- $DF = 2 \times AC$
- $EF = 2 \times BC$

Is $\triangle EFG$ similar to $\triangle ABC$?



Solution

Compare corresponding angles:

$\angle A = \underline{\hspace{2cm}}^\circ$ and $\angle E = \underline{\hspace{2cm}}^\circ$

$\angle B = \underline{\hspace{2cm}}^\circ$ and $\angle F = \underline{\hspace{2cm}}^\circ$

$\angle C = 180 - 37 - 90 = \underline{\hspace{2cm}}^\circ$ and $\angle G = \underline{\hspace{2cm}}^\circ$

The sum of the angles in a triangle = 180° .
To find the missing angle, subtract the 2 given angles from 180° .

Are the corresponding angles equal? Circle YES or NO.

Compare corresponding sides:

$\frac{AB}{EF} = \frac{12}{4}$

$\frac{BC}{FG} = \frac{15}{\boxed{\hspace{2cm}}}$

$\frac{AC}{EG} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$

= 3

= _____

= _____

The corresponding sides are proportional with a scale factor of 3.
 $\triangle EFG \sim \triangle ABC$

~ means *is similar to*

Web Link

To learn more about properties of similar triangles, go to www.mathlinks9.ca and follow the links.

Literacy Link

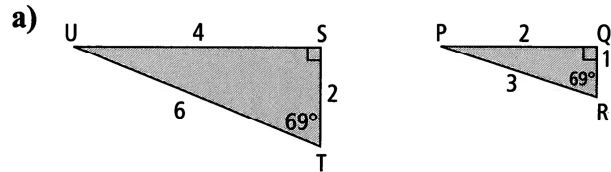
naming an angle

- use 3 capital letters; the middle letter must be the point where the 2 lines meet
- or
- use only the middle letter
- example:

$\angle KLM$ or $\angle L$

Show You Know

Is each pair of triangles similar? Show how you know.



$\angle U = 180^\circ - 90^\circ - \underline{\hspace{2cm}}^\circ$
 $= \underline{\hspace{2cm}}^\circ$

$\angle P$ and $\angle U$ measure $\underline{\hspace{2cm}}^\circ$.

$\angle Q = \underline{\hspace{2cm}}^\circ$ and $\angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$

$\angle R = \underline{\hspace{2cm}}^\circ$ and $\angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$

Corresponding angles are _____.
(equal or not equal)

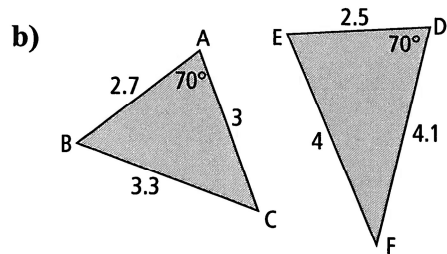
$\frac{PQ}{US} = \frac{2}{\boxed{\hspace{2cm}}}$
 $= \underline{\hspace{2cm}}$

$\frac{QR}{ST} = \frac{1}{\boxed{\hspace{2cm}}}$
 $= \underline{\hspace{2cm}}$

$\frac{PR}{\boxed{\hspace{2cm}}} = \frac{3}{6}$
 $= \underline{\hspace{2cm}}$

The scale factor is _____.

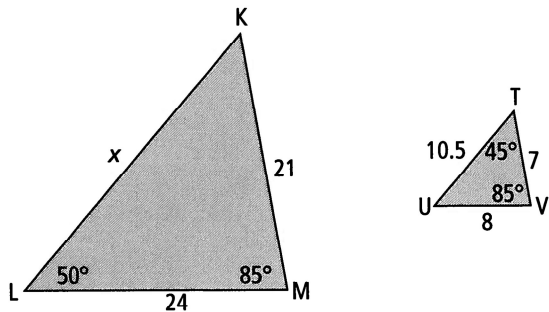
Are the triangles similar? Circle YES or NO. Give 1 reason for your answer.



Are the triangles similar? Circle YES or NO. Give 1 reason for your answer.

Working Example 2: Use Similar Triangles to Determine a Missing Side Length

Kyle is drawing triangles for a math puzzle.



a) Are the triangles similar?

Solution

Check to see if the corresponding angles are equal.
The measures of $\angle K$ and $\angle U$ are missing.

$$\begin{aligned} \angle K &= 180^\circ - 50^\circ - 85^\circ \\ &= \underline{\hspace{2cm}}^\circ \end{aligned}$$

$$\begin{aligned} \angle U &= 180^\circ - \underline{\hspace{2cm}}^\circ - \underline{\hspace{2cm}}^\circ \\ &= \underline{\hspace{2cm}}^\circ \end{aligned}$$

The sum of the angles in a triangle = 180° .

$$\angle K = \underline{\hspace{2cm}}^\circ \text{ and } \angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$$

$$\angle L = \underline{\hspace{2cm}}^\circ \text{ and } \angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$$

$$\angle M = \underline{\hspace{2cm}}^\circ \text{ and } \angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$$

Are the corresponding angles equal? Circle YES or NO.
Are the triangles similar? Circle YES or NO.

To prove the shapes are similar, show that the corresponding *angles* are similar *or* the corresponding *sides* are similar. You do not need to show both.

b) What is the missing side length?

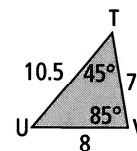
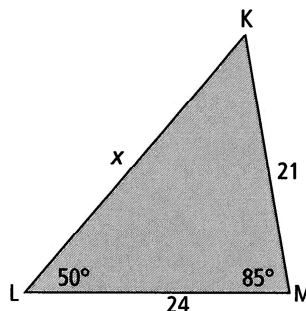
Solution

Compare corresponding sides to find the scale factor.

$$\frac{LM}{UV} = \frac{24}{8}$$

$$\frac{KM}{TV} = \frac{21}{7}$$

$$\frac{KL}{TU} = \frac{\boxed{}}{10.5}$$



= _____ = _____ = ?

The scale factor is _____.

Solve for the unknown side length.

Method 1: Use a Scale Factor

Since the triangles are similar, use the scale factor to find the missing side length.

$$\frac{x}{10.5} = 3$$

? + 10.5 = 3
Think of the opposite: 3 × 10.5 = ?

The missing side length is _____ units.

Method 2: Use a Proportion

Since the triangles are similar, use equal ratios to set up a proportion.

$$\frac{KM}{TV} = \frac{x}{TU}$$

$$\frac{21}{7} = \frac{\boxed{}}{10.5}$$

× 1.5 (above the box)
× 1.5 (below the box)

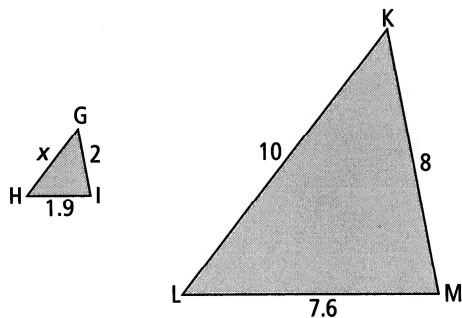
$\frac{10.5}{7} = 1.5$

x = _____

The missing side length is _____ units.

Show You Know

$\triangle GHI \sim \triangle KLM$.



a) Find the missing side length using a scale factor.

$$\frac{KM}{GI} = \frac{\boxed{}}{\boxed{}}$$

$$\frac{LM}{HI} = \frac{\boxed{}}{\boxed{}}$$

$$\frac{KL}{GH} = \frac{\boxed{}}{\boxed{}}$$

= _____

= _____

= ?

The scale factor is _____.

$$\frac{10}{\boxed{}} = \underline{\hspace{2cm}}$$

The missing side length is _____ units.

b) Find the missing side length using a proportion.

$$\frac{KM}{GI} = \frac{KL}{x}$$

$$\frac{8}{2} = \frac{10}{\boxed{}}$$

$\times 1.25$
 $\times 1.25$

$x =$ _____

The missing side length is _____ units.

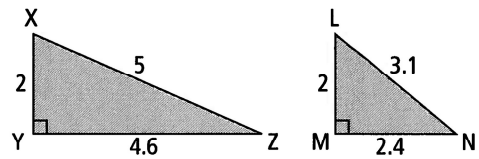
Check Your Understanding

Communicate the Ideas

1. If 2 triangles are similar,
 a) what do you know about the angles of the triangles?

- b) what do you know about the sides of the triangles?

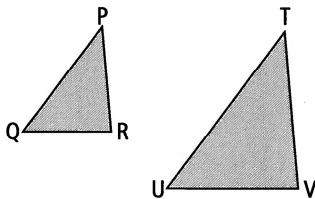
2. Amanda says these triangles are similar. Is she correct? Circle YES or NO. Give 1 reason for your answer.



Practise

3. List the corresponding angles and the corresponding sides for each pair of triangles.

- a) $\triangle PQR$ and $\triangle TUV$



$\angle P$ corresponds to \angle _____.

_____ corresponds to \angle _____.

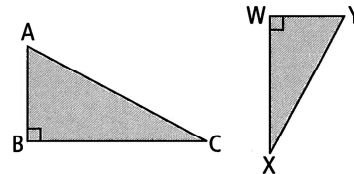
_____ corresponds to \angle _____.

PQ corresponds to _____.

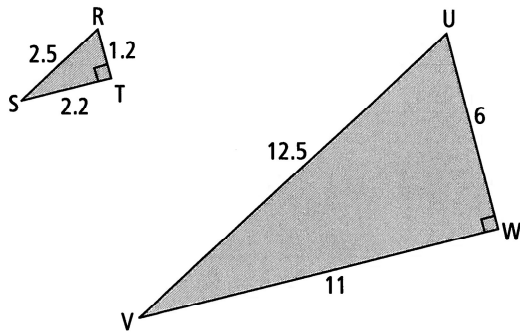
_____ corresponds to _____.

_____ corresponds to _____.

- b) $\triangle ABC$ and $\triangle WXY$



4. Use a scale factor to determine if these triangles are similar.



$$\frac{RS}{UV} = \frac{2.5}{12.5}$$

= _____

$$\frac{ST}{VW} = \frac{\boxed{}}{\boxed{}}$$

= _____

$$\frac{RT}{UW} = \frac{\boxed{}}{\boxed{}}$$

= _____

Are the triangles similar? Circle YES or NO. Give 1 reason for your answer.

5. Use a scale factor to find the missing side length. Show how you know.

$$\frac{UV}{SR} = \frac{\boxed{}}{\boxed{}}$$

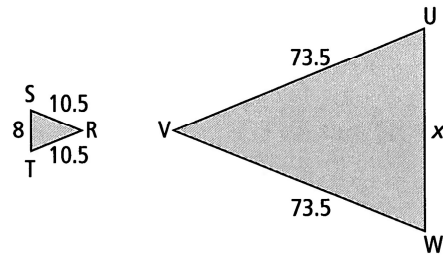
= _____

The scale factor is _____.

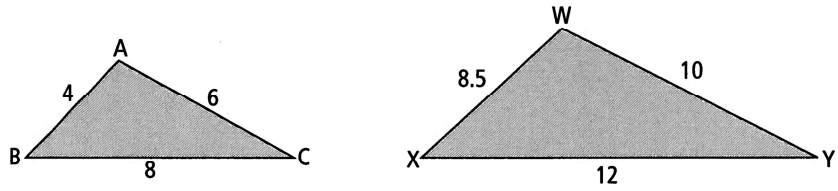
$$\frac{x}{8} = \underline{\hspace{2cm}}$$

$x =$ _____

The missing side length is _____ units.



6. Determine if the triangles are similar.



$\frac{AB}{WX} = \frac{BC}{\square} = \frac{AC}{\square}$

Find the scale factor for each pair of corresponding sides.

$\frac{AB}{WX} = \frac{\square}{\square}$

$\frac{BC}{\square} = \frac{\square}{\square}$

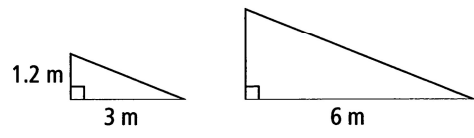
$\frac{AC}{\square} = \frac{\square}{\square}$

= _____ = _____ = _____

Are the triangles similar? Circle YES or NO. Give 1 reason for your answer.

Apply

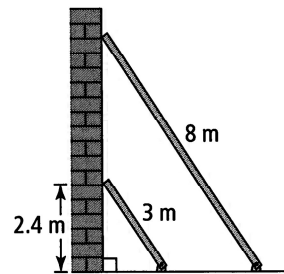
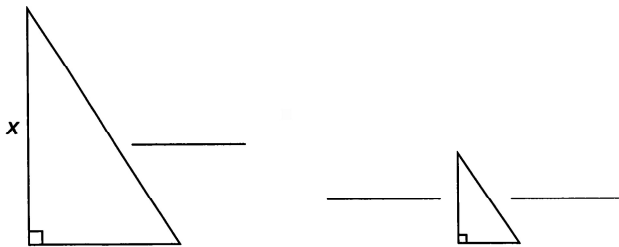
7. Sam is building 2 bike ramps. They are different sizes, but they are similar. How high is the larger ramp?



Sentence: _____

8. Two ladders are leaning against a wall. They each create a similar right triangle with the wall.

a) Label the dimensions on the similar right triangles.



b) How far up the wall does the longer ladder reach? Use a scale factor to solve.

Sentence: _____

c) How much farther up the wall does the longer ladder reach than the shorter ladder?

Sentence: _____

9. Are the triangles similar?

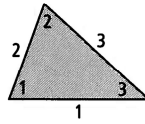
a) The angles of the first triangle are 45° and 75° .
The angles of the second triangle are 45° and 60° .

The sum of the angles in a triangle = 180° .
Find the measure of the third angle.

b) The angles of the first triangle are 60° and 70° .
The angles of the second triangle are 50° and 80° .

Math Link

Draw a logo for your drum company.
Include a triangle similar to the one shown here.



a) Measure the angles and side lengths of the triangle.



$\angle 1 = \underline{\hspace{2cm}}^\circ$

$\angle 2 = \underline{\hspace{2cm}}^\circ$

$\angle 3 = \underline{\hspace{2cm}}^\circ$

Side 1 = cm

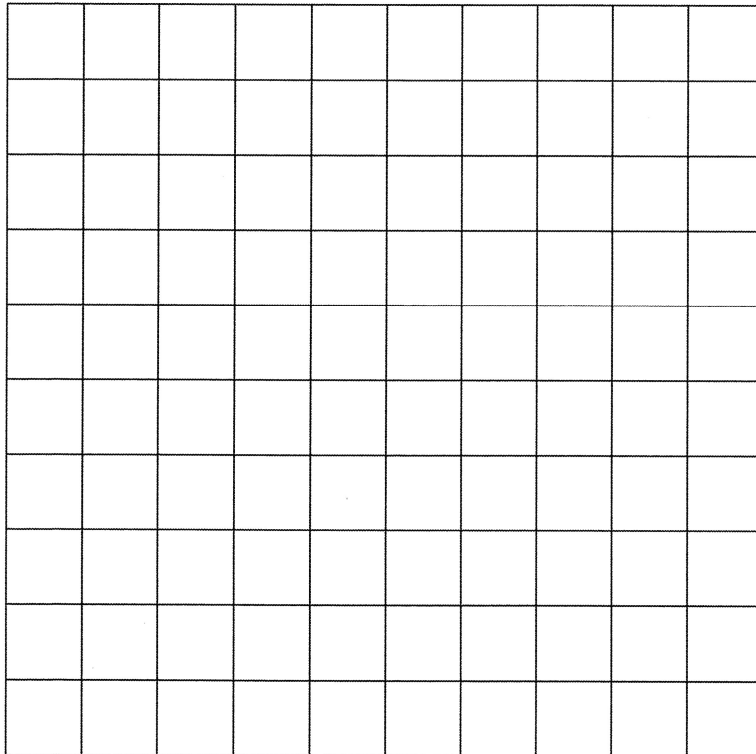
Side 2 = cm

Side 3 = cm

b) Design your logo on a sheet of 8.5×11 paper.
Include a triangle that is similar to the one shown.

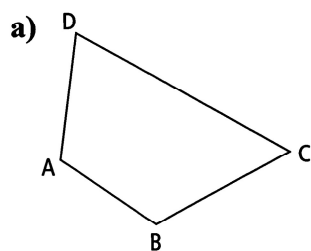
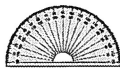
The angles must have the same measurement but the sides can be different lengths.

c) Draw a smaller scale diagram of the logo to fit your design project.
Calculate the scale factor.



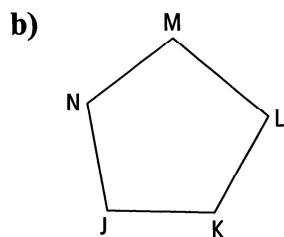
4.4 Warm Up

1. Measure the angles in each polygon.



$$\angle A = \underline{\hspace{2cm}}^\circ \quad \angle B = \underline{\hspace{2cm}}^\circ$$

$$\angle C = \underline{\hspace{2cm}}^\circ \quad \angle D = \underline{\hspace{2cm}}^\circ$$

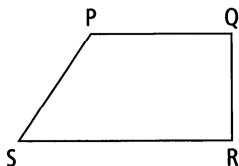


$$\angle J = \underline{\hspace{2cm}}^\circ \quad \angle K = \underline{\hspace{2cm}}^\circ$$

$$\angle L = \underline{\hspace{2cm}}^\circ \quad \angle M = \underline{\hspace{2cm}}^\circ$$

$$\angle N = \underline{\hspace{2cm}}^\circ$$

2. Measure the angles and the sides of the trapezoid.



$$\angle P = \underline{\hspace{2cm}}^\circ \quad \angle Q = \underline{\hspace{2cm}}^\circ$$

$$\angle R = \underline{\hspace{2cm}}^\circ \quad \angle S = \underline{\hspace{2cm}}^\circ$$

$$PQ = \underline{\hspace{2cm}} \text{ cm} \quad QR = \underline{\hspace{2cm}} \text{ cm}$$

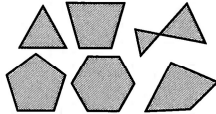
$$RS = \underline{\hspace{2cm}} \text{ cm} \quad PS = \underline{\hspace{2cm}} \text{ cm}$$

4.4 Similar Polygons



polygon

- a 2-dimensional figure with 3 or more sides
- examples:



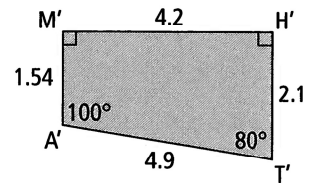
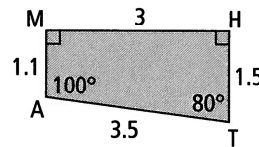
Link the Ideas

Similar polygons have

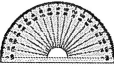
- corresponding angles that are equal
- corresponding side lengths with the same scale factor

Working Example 1: Identify Similar Polygons

The 2 quadrilaterals look similar.
Is M'A'T'H' a true enlargement of MATH? Explain.



Solution

Compare corresponding angles: 

$\angle M = \underline{\hspace{2cm}}^\circ$ and $\angle M' = \underline{\hspace{2cm}}^\circ$ $\angle A = \underline{\hspace{2cm}}^\circ$ and $\angle A' = \underline{\hspace{2cm}}^\circ$
 $\angle T = \underline{\hspace{2cm}}^\circ$ and $\angle T' = \underline{\hspace{2cm}}^\circ$ $\angle H = \underline{\hspace{2cm}}^\circ$ and $\angle H' = \underline{\hspace{2cm}}^\circ$

Literacy Link
A quadrilateral is a shape with 4 sides.

Compare corresponding sides:

MA corresponds to _____. AT corresponds to _____.

HT corresponds to _____. MH corresponds to _____.

Find the scale factor.

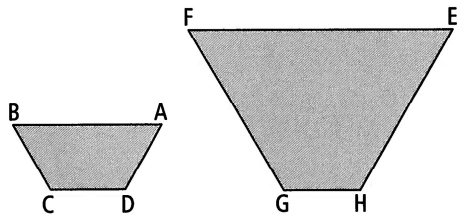
$\frac{M'A'}{MA} = \frac{1.54}{1.1}$	$\frac{A'T'}{\hspace{1cm}} = \frac{4.9}{\hspace{1cm}}$	$\frac{H'T'}{\hspace{1cm}} = \frac{2.1}{\hspace{1cm}}$	$\frac{M'H'}{\hspace{1cm}} = \frac{4.2}{\hspace{1cm}}$
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
= _____	= _____	= _____	= _____

The scale factor is _____.

M'A'T'H' is an enlargement of MATH by a scale factor of _____.

Show You Know

Determine if the trapezoids are similar.



$\angle A = \underline{\hspace{2cm}}^\circ$ and $\angle E = \underline{\hspace{2cm}}^\circ$

$\angle D = \underline{\hspace{2cm}}^\circ$ and $\angle H = \underline{\hspace{2cm}}^\circ$

$\angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$ and $\angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$

$\angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$ and $\angle \underline{\hspace{2cm}} = \underline{\hspace{2cm}}^\circ$

Are the corresponding angles equal? Circle YES or NO.

$$\frac{AB}{EF} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{BC}{FG} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{CD}{GH} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{AD}{EH} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

= _____

= _____

= _____

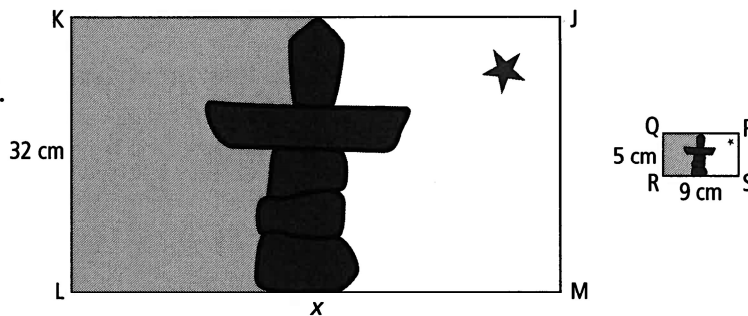
= _____

Is the scale factor the same for all 4 sides? Circle YES or NO.

Is trapezoid ABCD similar to trapezoid EFGH? Circle YES or NO.
Give 1 reason for your answer.

Working Example 2: Determine a Missing Side Length

Jason has 2 Nunavut flags.
 Rectangle JKLM is similar to rectangle PQRS.
 Find the missing side length of rectangle JKLM.



Solution

Since the rectangles are similar, set up a proportion to find the missing side length.

$$\frac{KL}{QR} = \frac{LM}{RS}$$

$\times 1.8$ 9 ÷ 5 = 1.8
 $\frac{32}{5} = \frac{x}{9}$
 $\times 1.8$

$$32 \times 1.8 = x$$

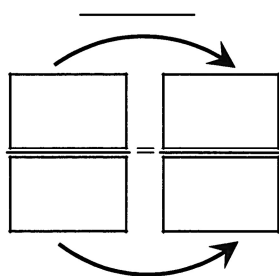
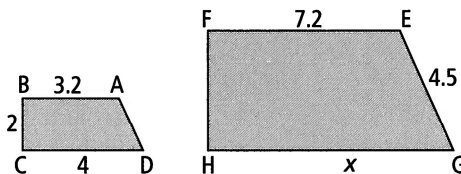
$$\underline{\hspace{2cm}} = x$$

The missing side length is _____ cm.

Show You Know

The 2 trapezoids are similar.
 Find the missing side length.

$$\frac{AB}{EF} = \frac{DC}{GH}$$

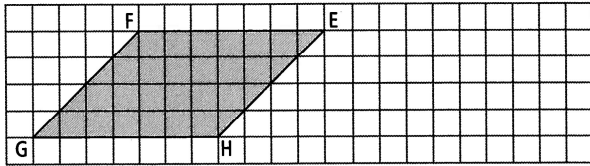


The missing side length is _____ units.

Check Your Understanding

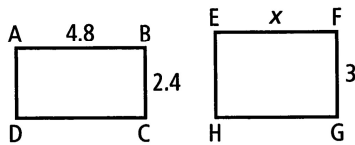
Communicate the Ideas

1. Draw a parallelogram similar to this one. Explain how you know they are similar.



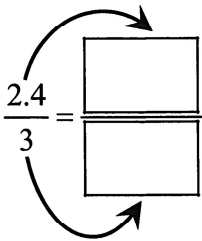
Practise

2. Use a proportion to find the missing side length of the similar polygons.



$$\frac{BC}{FG} = \frac{AB}{EF}$$

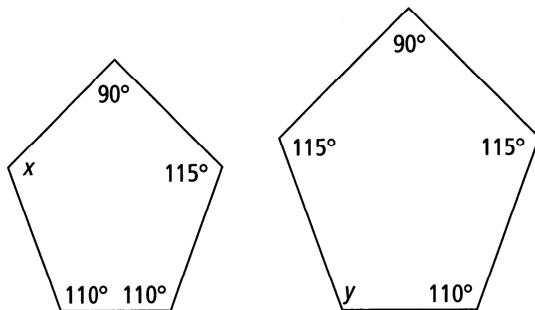
× _____



× _____

The missing side length is _____ units.

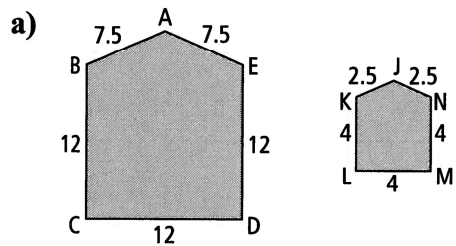
3. Find the missing angles of the similar polygons.



$x =$ _____

$y =$ _____

4. Is each pair of polygons similar?



Compare the angles.



$\angle A = \underline{\hspace{2cm}}^\circ$ and $\angle J = \underline{\hspace{2cm}}^\circ$ $\angle B = \underline{\hspace{2cm}}^\circ$ and $\angle K = \underline{\hspace{2cm}}^\circ$

$\angle C = \underline{\hspace{2cm}}^\circ$ and $\angle L = \underline{\hspace{2cm}}^\circ$ $\angle D = \underline{\hspace{2cm}}^\circ$ and $\angle M = \underline{\hspace{2cm}}^\circ$

$\angle E = \underline{\hspace{2cm}}^\circ$ and $\angle N = \underline{\hspace{2cm}}^\circ$

$$\frac{AE}{JN} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{ED}{NM} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

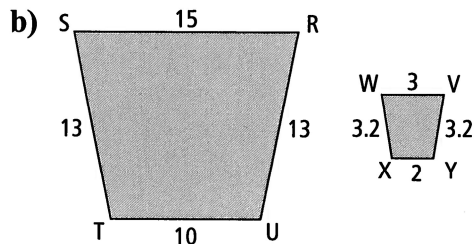
$$\frac{CD}{LM} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

= _____

= _____

= _____

Are the polygons similar? Circle YES or NO. Give 1 reason for your answer.



$\angle R = \underline{\hspace{2cm}}^\circ$ and $\angle V = \underline{\hspace{2cm}}^\circ$ $\angle S = \underline{\hspace{2cm}}^\circ$ and $\angle W = \underline{\hspace{2cm}}^\circ$

$\angle T = \underline{\hspace{2cm}}^\circ$ and $\angle X = \underline{\hspace{2cm}}^\circ$ $\angle U = \underline{\hspace{2cm}}^\circ$ and $\angle Y = \underline{\hspace{2cm}}^\circ$

$$\frac{SR}{WV} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{RU}{VY} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{TU}{XY} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

$$\frac{ST}{\boxed{\hspace{2cm}}} = \frac{\boxed{\hspace{2cm}}}{\boxed{\hspace{2cm}}}$$

= _____

= _____

= _____

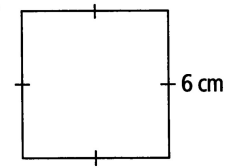
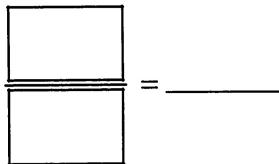
= _____

Are the polygons similar? Circle YES or NO. Give 1 reason for your answer.

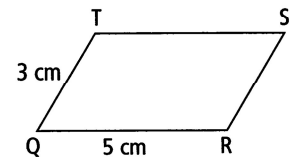
Apply

5. If 2 polygons have the same side lengths, are they similar? Circle YES or NO.
Give 1 reason for your answer.

6. What scale factor should you use to reduce the side length of the square to 2.4 cm?
Show how you know.

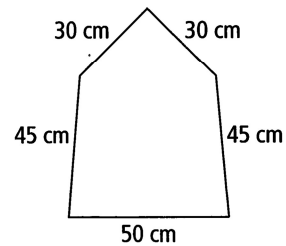


7. Find the dimensions of a similar parallelogram using a scale factor of 0.8.



The dimensions of the similar parallelogram are _____.

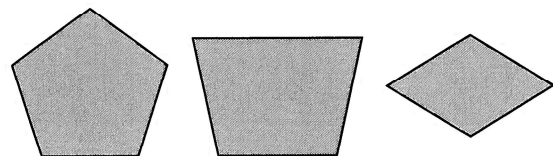
8. Tracy is building a dog house.
The dimensions on the blueprints are too small.
She wants to enlarge the house by a scale factor of 3.5.
Find the new dimensions of the dog house.



Math Link

Add a polygon similar to the ones shown here to your drum design on page 187.

What scale factor did you use? _____



Answers

Get Ready, pages 174–175

1.

	Ratio Notation	Equivalent Fraction in Lowest Terms	Decimal	Percent
a)	2 : 6	$\frac{2}{6} = \frac{1}{3}$ ÷ 2	0. $\overline{3}$	33. $\overline{3}$ %
b)	4 : 10	$\frac{4}{10} = \frac{2}{5}$ ÷ 2	0.4	40 %

2. a) 10 b) 1

3. a) $\frac{28}{2800}$ b) $\frac{1}{30} = \frac{6}{180}$

4. $\frac{4}{12} = \frac{0.4}{1.2}$; 1.2 m

Math Link

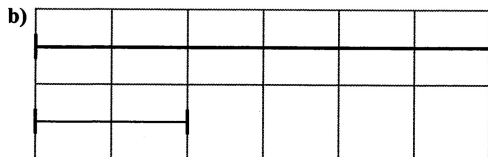
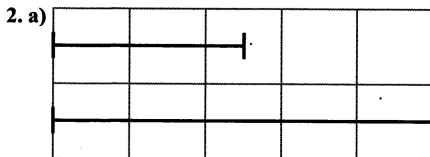
1. a) 840 000 cm² Answers may vary due to measuring. Example:
b) 36.52 cm² c) 23001.1

2. a) 150 000 cm² Answers may vary due to measuring. Example:
b) 6.3 cm² c) 23809.5

3. Answers will vary. Example: The ratios are approximately the same.

4.1 Warm Up, page 177

1. a) length: 4 cm; width: 3 cm b) length of base: 5 cm; height: 1 cm



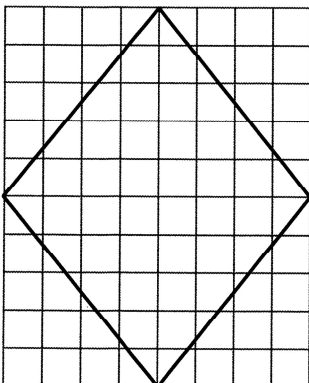
3. a) 12 b) 1 c) 1 d) 7.2

4. a) 10.2 b) 24 c) 24 d) 18

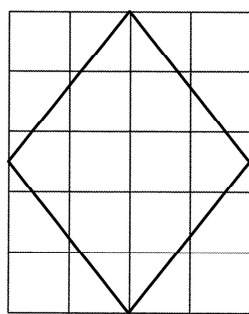
4.1 Enlargements and Reductions, pages 178–187

Working Example 1: Show You Know

1-cm grid paper:

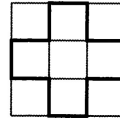


2-cm grid paper:



Working Example 2: Show You Know

0.5-cm grid paper:



Communicate the Ideas

1. YES. Answers may vary. Example: The objects in the book are smaller than they would be in real life.

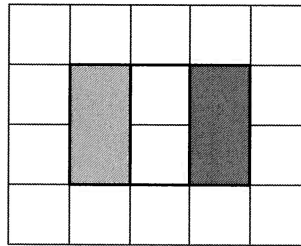
2. NO. Mary only enlarged the 3-cm side of the rectangle. The enlargement for the 5-cm side length should be 15 cm.

3. a) The photo will be reduced to half the size. b) The photo will be enlarged to 8 times the size. c) Use scale factor of 1 to keep the photo the same size.

Practise

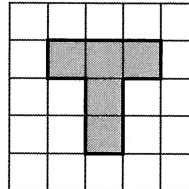
4. length = 6 cm, width = 4 cm

2-cm grid paper:



5. measurements of sides = 1.5 cm; 0.5 cm; 1 cm; 0.5 cm

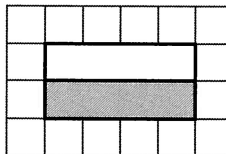
0.5-cm grid paper:



6. a) greater than 1 b) equal to 1 c) less than 1

7. length = 2 cm, width = 1 cm

0.5-cm grid paper:

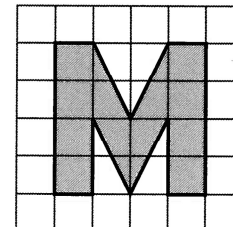


Apply

8. a) reduction b) Answers may vary. Example: 0.1

9. a) The flag is 4 cm wide. b) The new dimensions are 12 cm by 24 cm.
c) The new dimensions are 2 cm by 1 cm.

10. 1-cm grid paper:



Math Link

Answers will vary.

4.2 Warm Up, page 188

1. a) 30 b) 800 c) 3 d) 6

2. a) $\frac{1}{15}$ b) $\frac{1}{1000}$

3. a) 24.9 b) 159.2

4. a) 1124.83 b) 58.25

5. a) 3000 b) 3 c) 14 000 d) 40

4.2 Scale Diagrams, pages 189–195

Working Example 1: Show You Know

46 cm

Working Example 2: Show You Know

a) 180 b) $\frac{1}{18\,000\,000}$

Communicate the Ideas

1. a) 15 b) 1 : 15 000 000

2. Answers will vary. Example: Measure the length of the planes in both photos and determine the scale factor. Measure the wingspan of both photos and determine the scale factor. If the scale factor is the equal, the planes are proportional.

Practise

3. a) 12 b) 4 c) 10 d) 12 e) 200 f) 100

4. a) 2 b) 0.15 c) 0.02 d) 0.5

5. a) 1500 cm b) 16 mm

6. $\frac{1}{16\,000\,000}$

Apply

7. a) $\frac{1}{15}$ b) 3.2 cm c) The length of the bear's foot is 48 cm.

8. The length of the eagle's wingspan is 200 cm or 2 m.

9. a) 2 b) 3 c) 0.5 or $\frac{1}{2}$ d) $0.\bar{3}$ or $\frac{1}{3}$

10. Her volcano will be 25 m tall. It will not fit into the classroom.

Math Link

Answers will vary.

4.3 Warm Up, page 196

1. a) 50° b) 20°

2. 63°

3. a) 8 b) 312

4. a) 30 b) 4

5. a) 54 b) 5

4.3 Similar Triangles, pages 197–207

Working Example 1: Show You Know

a) The corresponding angles are equal. The scale factor is 0.5. YES. The corresponding angles are equal and the corresponding sides are proportional. b) NO. The corresponding sides are not proportional.

Working Example 2: Show You Know

a) The scale factor is 4; The missing side length is 2.5. b) 2.5

Communicate the Ideas

1. Answers may vary. Examples: a) The corresponding angles are equal. b) The corresponding sides are proportional in length.

2. NO. Answers may vary. Example: Side XY and LM are not proportional in length.

Practise

3. a) $\angle T$; $\angle Q$ corresponds to $\angle U$; $\angle R$ corresponds to $\angle V$; TU; QR corresponds to UV; PR corresponds to TV b) $\angle A$ corresponds to $\angle Y$; $\angle B$ corresponds to $\angle W$; $\angle C$ corresponds to $\angle X$; AB corresponds to YW; AC corresponds to YX; BC corresponds to WX

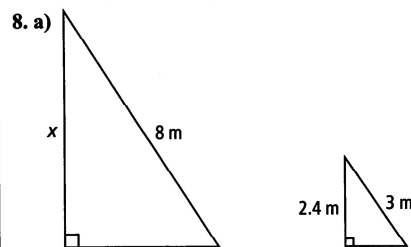
4. YES. The triangles are similar because the corresponding sides are proportional in length.

5. 56

6. NO. The triangles are not similar because the corresponding sides are not proportional in length.

Apply

7. The ramp is 2.4 m high.



b) The longer ladder reaches 6.4 m up the wall. c) It reaches 4 m further.

9. a) Yes, they are similar. b) No, they are not similar.

Math Link

a) $\angle 1 = 70^\circ$, $\angle 2 = 70^\circ$, $\angle 3 = 40^\circ$, Side 1 = 1.9 cm, Side 2 = 1.8 cm, Side 3 = 1.9 cm b) and c) Answers will vary.

4.4 Warm Up, page 208

Answers may vary due to measuring. Examples:

1. a) $\angle A = 118^\circ$; $\angle B = 118^\circ$; $\angle C = 57^\circ$; $\angle D = 67^\circ$ b) $\angle J = 101^\circ$; $\angle K = 121^\circ$; $\angle L = 100^\circ$; $\angle M = 102^\circ$; $\angle N = 116^\circ$

2. $\angle P = 125^\circ$; $\angle Q = 90^\circ$; $\angle R = 90^\circ$; $\angle S = 55^\circ$; PQ = 1.9 cm; QR = 1.4 cm; RS = 2.9 cm; PS = 1.7 cm

4.4 Similar Polygons, pages 209–214

Working Example 1: Show You Know

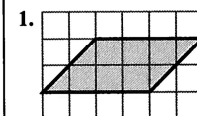
NO. The scale factor is not the same for all 4 sides.

NO. The trapezoids are not similar; the corresponding sides are not proportional.

Working Example 2: Show You Know

9

Communicate the Ideas



Answers will vary. Example: They are similar if the corresponding angles are equal, or if all corresponding sides are proportional.

Practise

2. 6

3. $x = 115^\circ$; $y = 110^\circ$

4. a) YES. Answers will vary. Example: All corresponding sides are proportional with a scale factor of 3.

b) NO. Answers will vary. Example: The corresponding side ST is not proportional to side WX.

Apply

5. YES. The corresponding sides are proportional by a scale factor of 1.

6. The scale factor is 0.4.

7. $4\text{ cm} \times 2.4\text{ cm}$

8. The roof is 105 cm, the walls are 157.5 cm, and the floor is 175 cm.

Math Link

Answers will vary.

Graphic Organizer, page 215

Left side:

scale: a comparison between the actual size of an object and the size of its diagram

scale diagram: a drawing that is similar to the actual figure or object

proportion: a relationship that shows that 2 ratios are equal

corresponding angles: angles that have the same relative position in the object

corresponding sides: sides that have the same relative position in the object

similar: have the same shape but different size

Right side:

enlargement: an increase in the size of an object by a constant factor

scale factor: the constant factor by which all dimensions of an object are enlarged or reduced

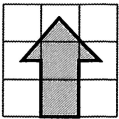
reduction: a decrease in the size of an object by a constant factor

polygon: a two-dimensional closed figure made of three or more line segments

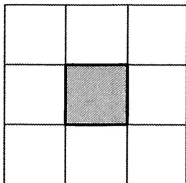
Chapter 4 Review, pages 216–219

1. polygon 2. reduction 3. scale factor 4. similar 5. proportion

6. 1-cm grid paper:



7. a) 2-cm grid:



8. The scale factor is 7.

9. a) 14 cm b) 13.5 cm

10. a) 1 cm on the map is 100 km. b) The scale factor is $\frac{1}{10\,000\,000}$ or 0.0000001.

11. Yes, they are similar because the corresponding sides are proportional by a scale factor of 5.

12. The length of YZ is 11.

13. 3

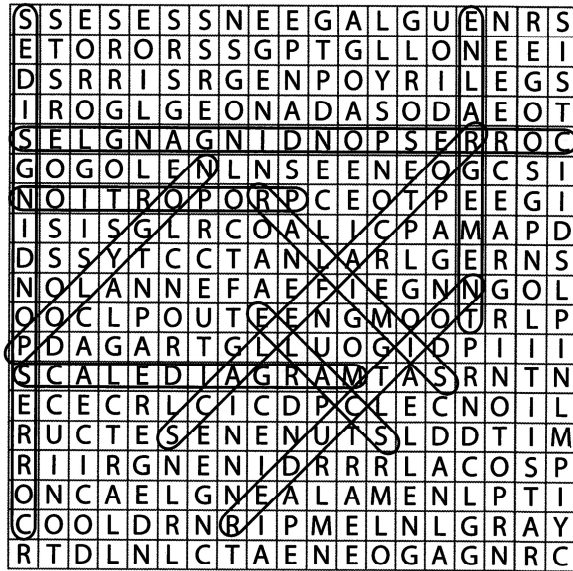
14. not similar

15. 18 cm

16. EF = 7.2 ; FG = 9.6

Key Word Builder, page 220

1. J 2. B 3. G 4. A 5. H 6. C 7. D 8. F 9. E 10. I



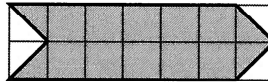
Chapter 4 Practice Test, pages 221–223

1. C 2. B 3. D 4. B

5. scale factor

6. reduction

7. 0.5-cm grid:



8. The scale factor is 4.5.

9. The drawing is 21.3 mm long.

10. a) $\angle A = 70^\circ, \angle B = 70^\circ, \angle C = 110^\circ, \angle D = 110^\circ, \angle W = 70^\circ, \angle X = 70^\circ, \angle Y = 110^\circ, \angle Z = 110^\circ$
 AB = 4 cm, BC = 3 cm, CD = 2 cm, DA = 3 cm,
 WX = 3 cm, XY = 2.3 cm, YZ = 1.5 cm, ZW = 2.3 cm

b) YES. The scale factors are approximately equal. c) 0.75

Math Link: Wrap It Up!

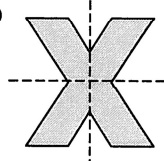
Answers will vary.

Challenge, page 224–225

Answers will vary.

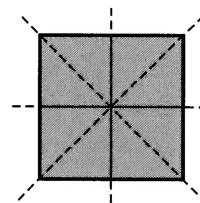
Chapters 1–4 Review, pages 226–231

1. a)



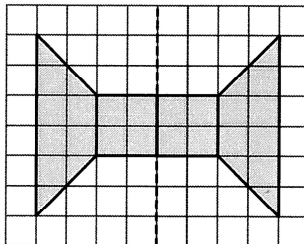
1 horizontal and 1 vertical

b)

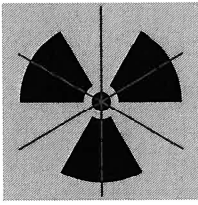


1 horizontal, 1 vertical, and 2 oblique

2.



3. a) 3



b) 3 c) 120° ; $\frac{1}{3}$

4. a) 25 cm^2 b) 450 cm^2 c) 400 cm^2

5. $-\frac{3}{4}$, $-\frac{1}{2}$, -0.1 , 0.51 , $0.\bar{6}$

6. Answers may vary. Example: $\frac{9}{10}$

7. Estimates may vary. Examples: a) Estimate: 0; Calculate: $-\frac{3}{20}$

b) Estimate: 4; Calculate: 3.6 c) Estimate: $\frac{1}{2}$; Calculate: $\frac{29}{40}$

d) Estimate: 1; Calculate: $\frac{20}{21}$ e) Estimate: 0; Calculate: $\frac{1}{3}$

8. 0.9 cm

9. a) $(3 \times 3) \times (3 \times 3 \times 3) = 3^5 = 243$

b) $(4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4) \div (4 \times 4 \times 4 \times 4 \times 4) = 4^2 = 16$

c) $(2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) = 2^8 = 256$

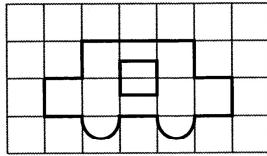
d) $-[(-6) \times (-6)] = -36$

10. a) 3 b) 28

11. $(3 \times 7) \times (3 \times 7) \times (3 \times 7) = 3^3 \times 7^3$

12. a) 400 b) 1600

13. 1-cm grid paper:



14. a) 3.5 b) 25

15. 2.9

16. The actual distance is 600 km.

17. NO. The corresponding sides do not have the same scale factors.

Task, page 232

Answers will vary. Examples:

1. 1 mm, 1.5 mm, 2 mm

2. a) 5, 4, 3 b) 5 times

Number of Folds	Thickness of Stack, t	Area of Stack, a
0	t	a
1	$2t$	$\frac{1}{2}a$
2	$4t$	$\frac{1}{4}a$
3	$8t$	$\frac{1}{8}a$
4	$16t$	$\frac{1}{16}a$
5	$32t$	$\frac{1}{32}a$

4. Answers will vary. Example: On the third fold, the thickness is 8 times the original, making the paper hard to fold again. Also, the area is $\frac{1}{8}$ the original size, making it harder to fold.