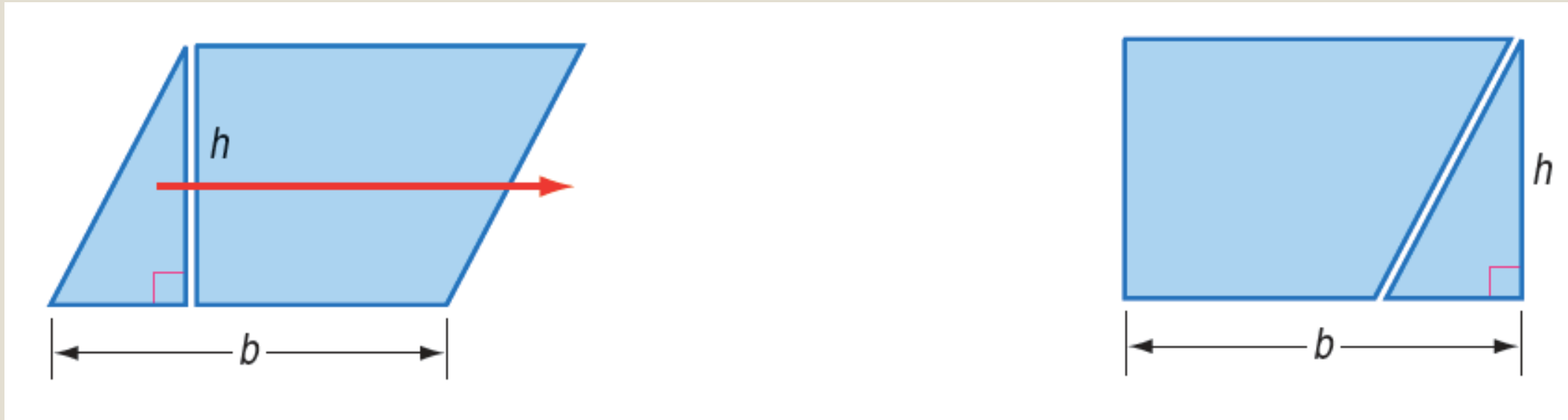# CHAPTER 11: AREAS OF POLYGONS AND CIRCLES

1

11.1 – AREAS OF PARALLELOGRAMS AND TRIANGLES

Parallelogram

3

Parallelogram

KeyConcept Area of a Parallelogram

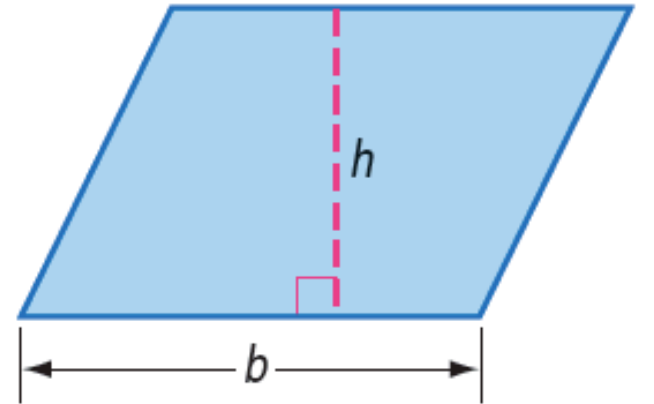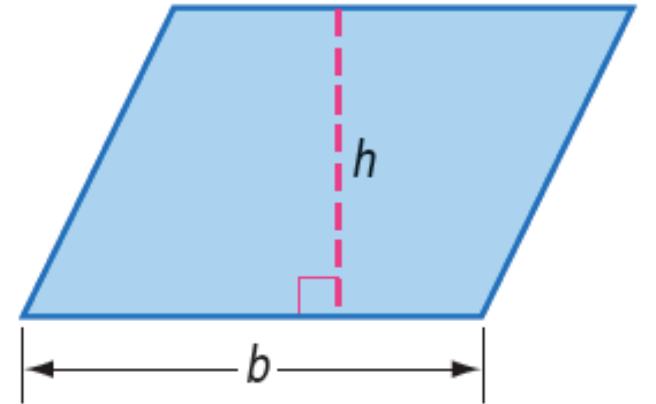|	
Words	The area A of a parallelogram is the product of a base b and its corresponding height h.
Symbols	$A = bh$

Parallelogram
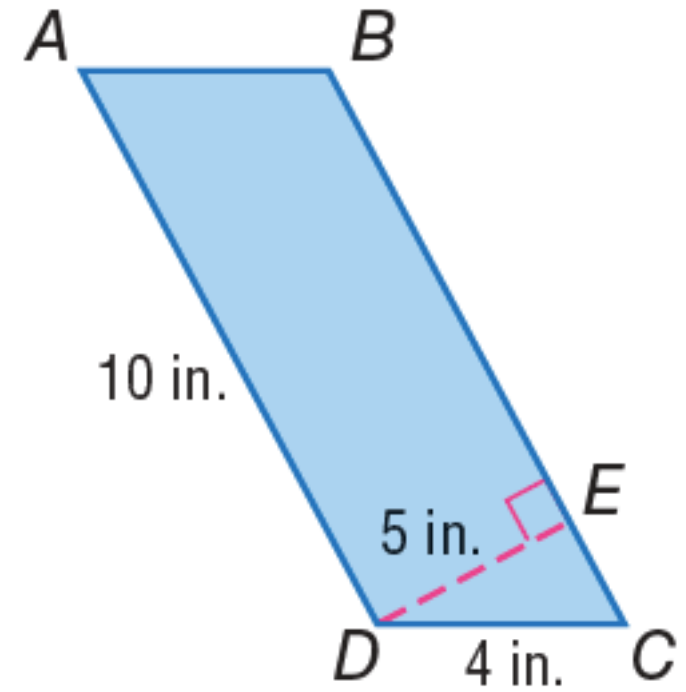
KeyConcept Area of a Parallelogram

Words: The area A of a parallelogram is the product of a base b and its corresponding height h.
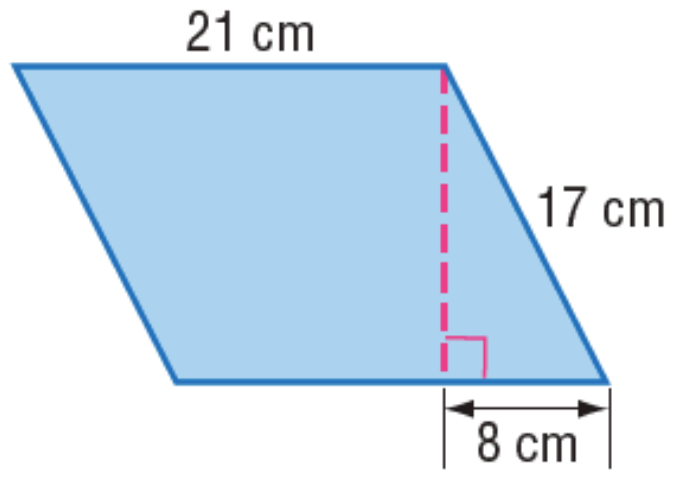
Symbols: $A = bh$
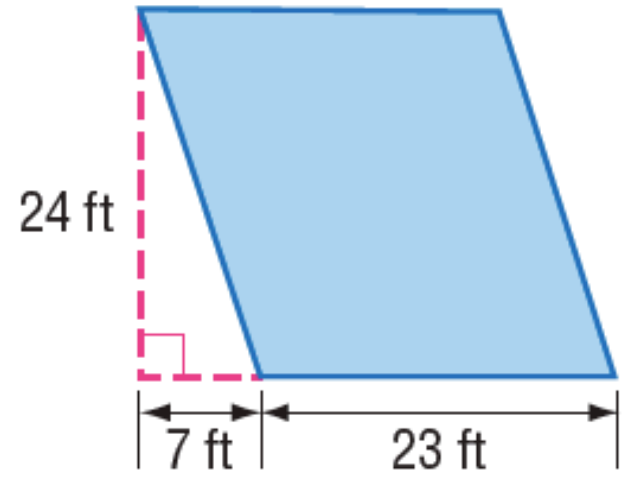
Parallelogram

Find the perimeter and area of □ABCD.

Find the perimeter and area of each parallelogram.
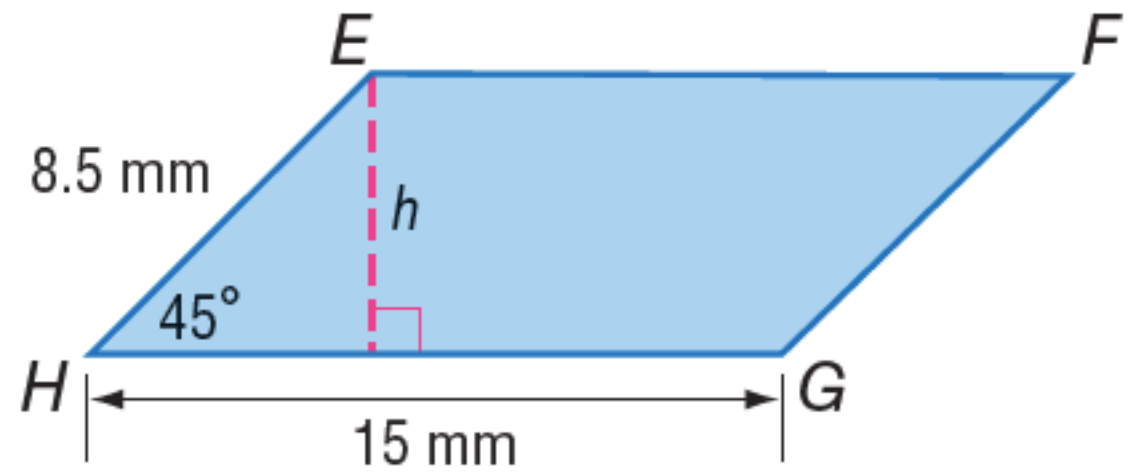
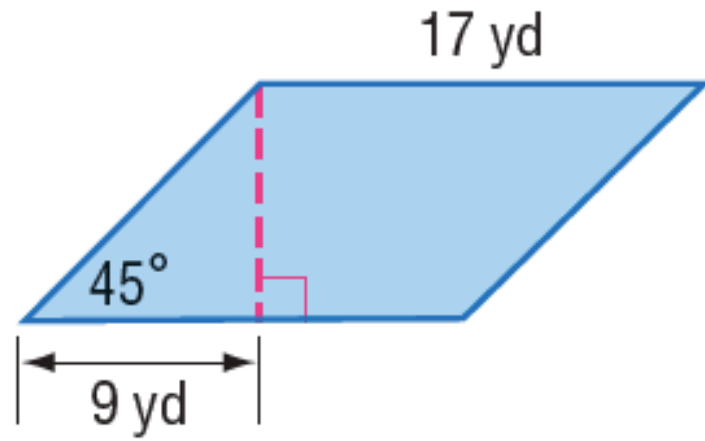**1A.**

21 cm

17 cm

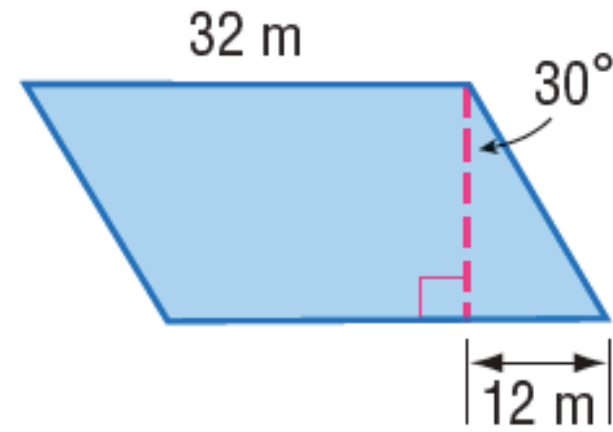8 cm

1B.

24 ft

7 ft

23 ft

Find the area of □EFGH.

8

Find the area of each parallelogram. Round to the nearest tenth if necessary.
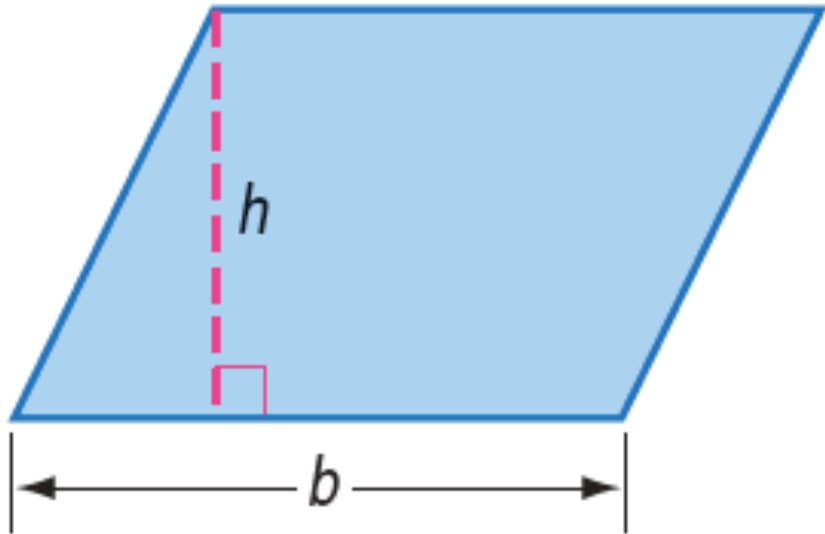
2A.

17 yd

45°

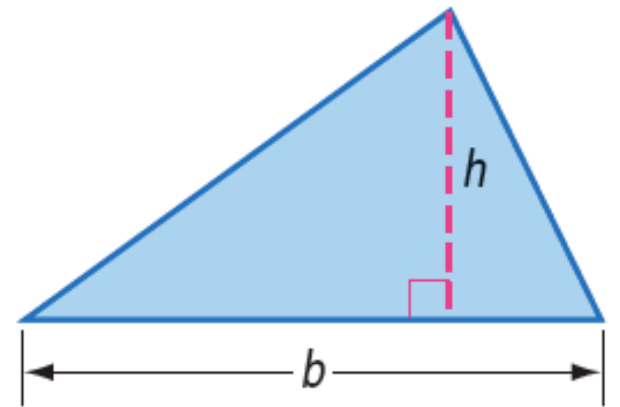9 yd
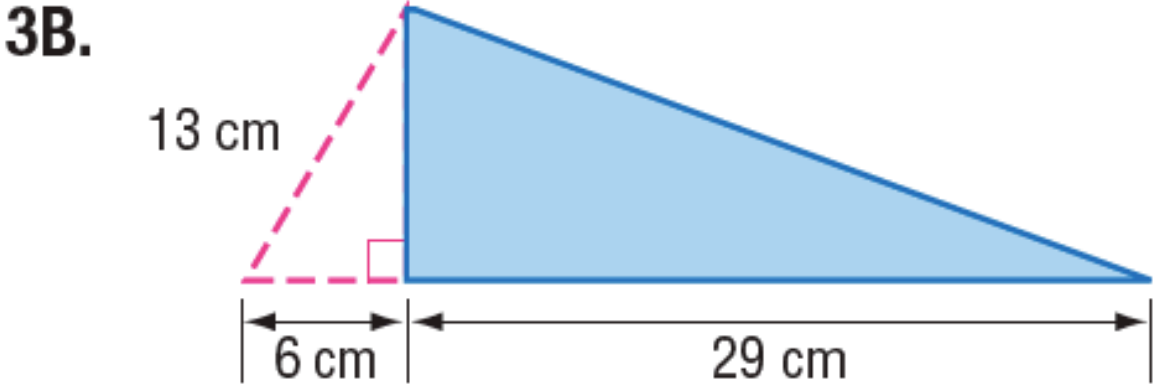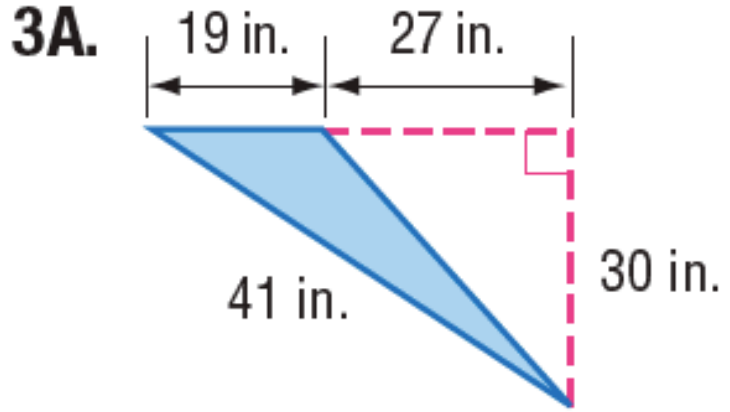
2B.

32 m

30°

12 m
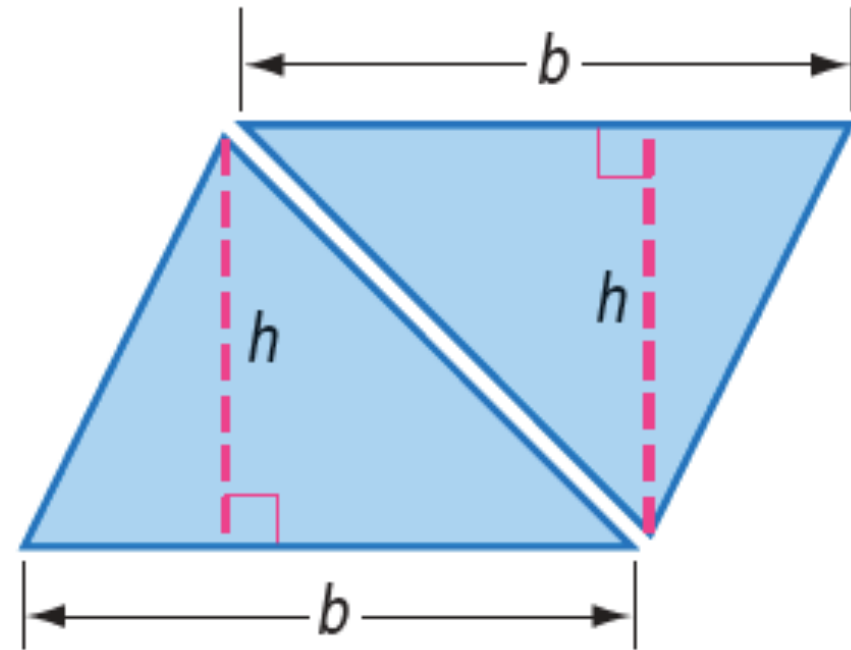
Triangles

Triangles

KeyConcept Area of a Triangle

Words

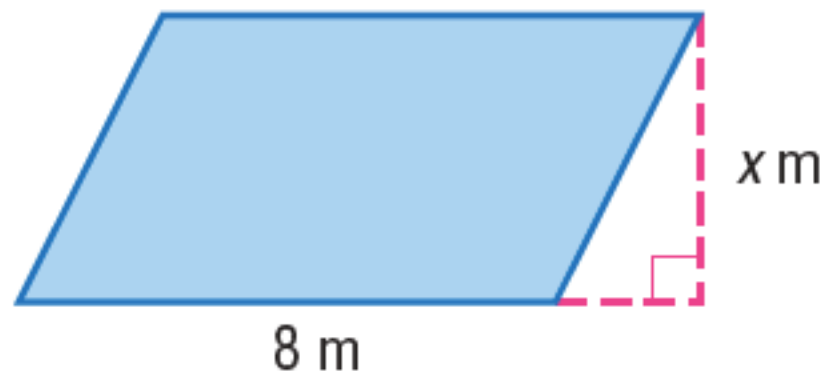The area A of a triangle is one half the product of a base b and its corresponding height h.
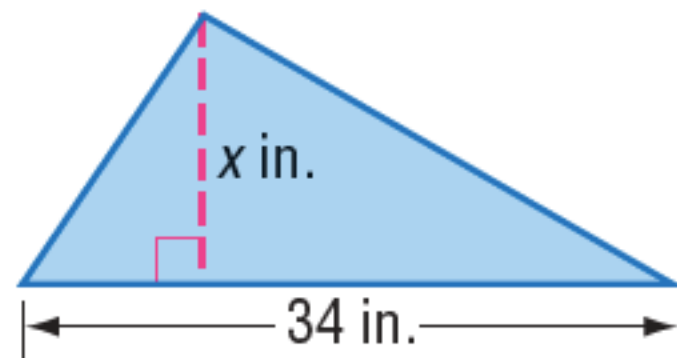
Symbols

$A = \dfrac{1}{2}bh$ or $A = \dfrac{bh}{2}$

Find the perimeter and area of each triangle.

3A.

19 in.   27 in.
41 in.   30 in.

3B.

13 cm
6 cm   29 cm

12

4A. $A = 148 \text{ m}^2$

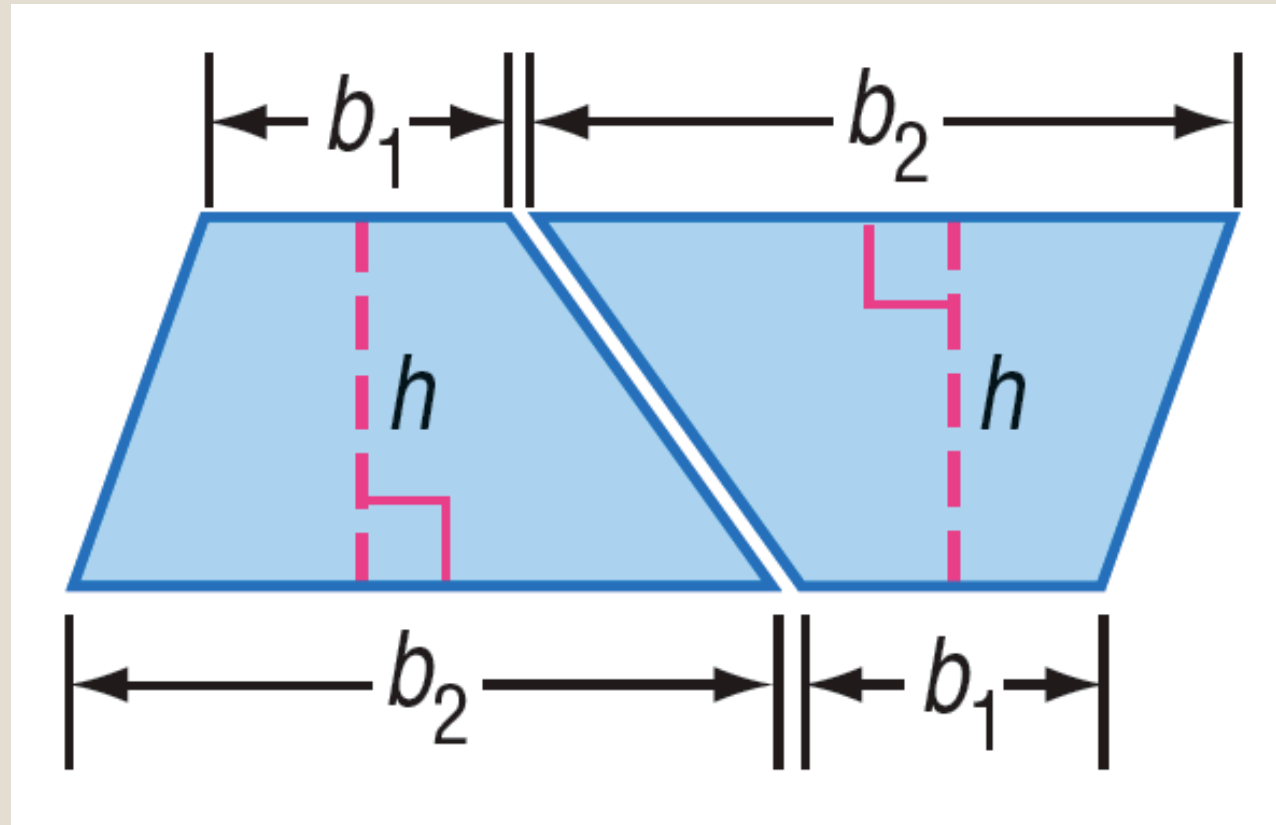
x m

8 m

4B. $A = 357 \text{ in}^2$

x in.

34 in.

4C. ALGEBRA The base of a parallelogram is twice its height. If the area of the parallelogram is 72 square feet, find its base and height.

13

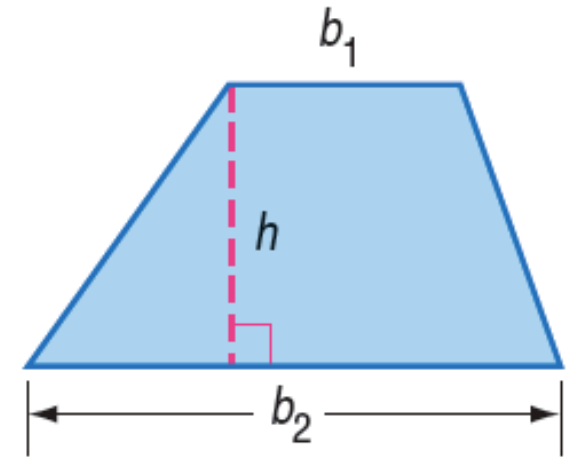# 11.2 – AREAS OF TRAPEZOIDS, RHOMBI AND KITES

Trapezoid
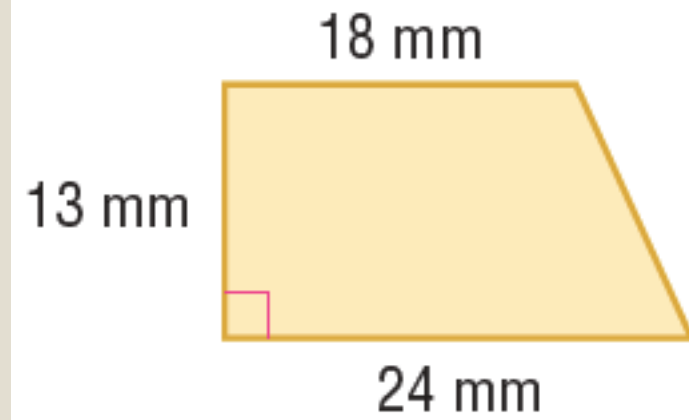
Trapezoid

KeyConcept Area of a Trapezoid

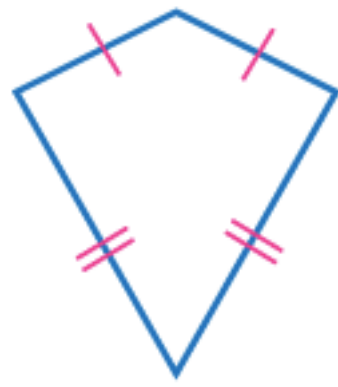|	
Words	The area A of a trapezoid is one half the product of the height h and the sum of its bases, b_1 and b_2.
Symbols	$A = \frac{1}{2}h(b_1 + b_2)$

Find the area of each trapezoid

16 ft

12 ft

6 ft

18 mm

13 mm
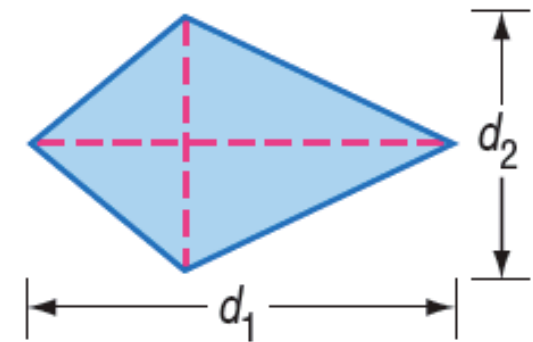
24 mm
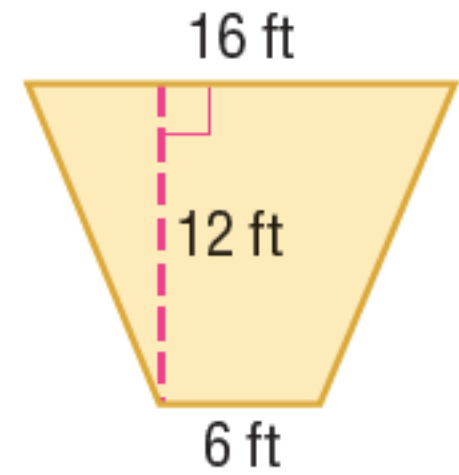
Rhombus and Kite
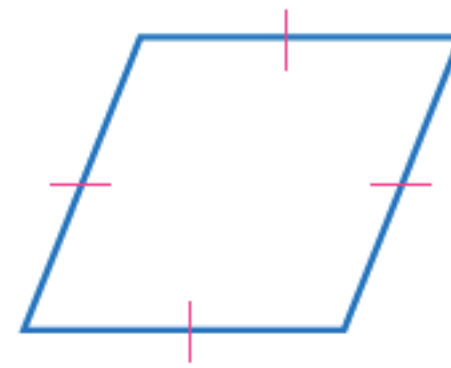
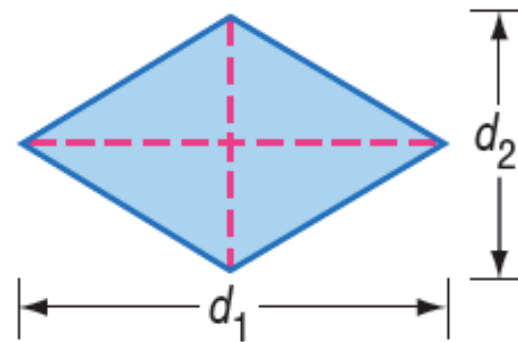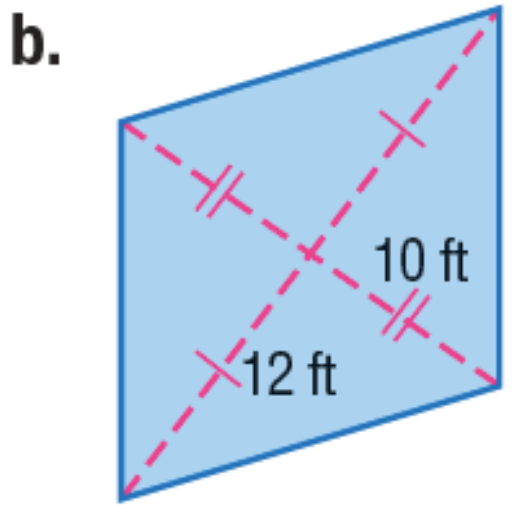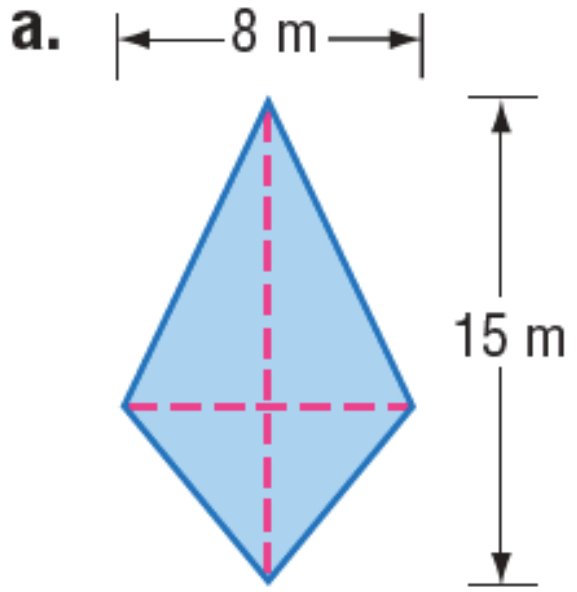rhombus   kite

KeyConcept Area of a Rhombus or Kite

Words   The area A of a rhombus or kite is one half the product of the lengths of its diagonals, d_1 and d_2.

Symbols $A = \dfrac{1}{2}d_1 d_2$

d_2 d_2

d_1 d_1

Find the area of each rhombus or kite.

a.

8 m

15 m

b.

10 ft
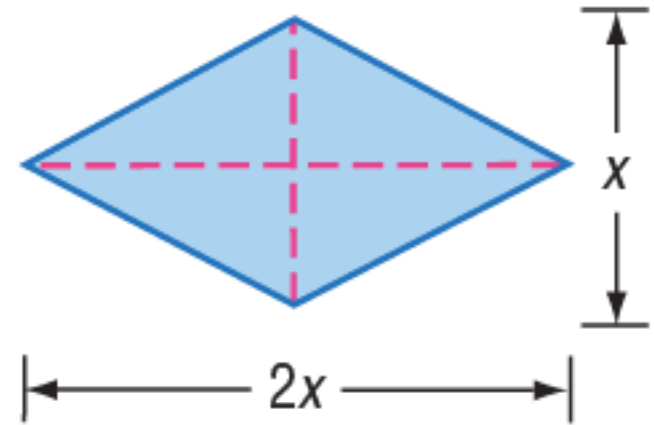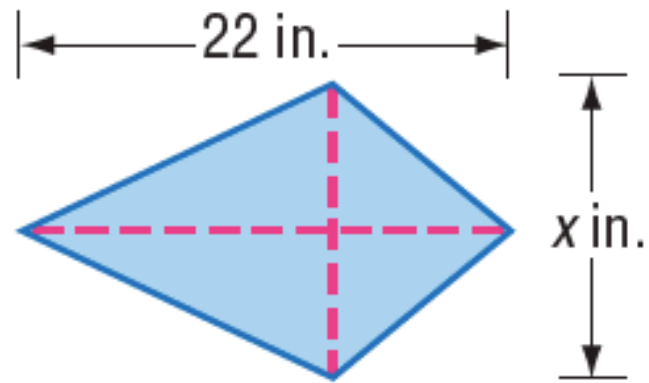
12 ft

19

Solving for unknowns

ALGEBRA One diagonal of a rhombus is twice as long as the other diagonal. If the area of the rhombus is 169 square millimeters, what are the lengths of the diagonals?
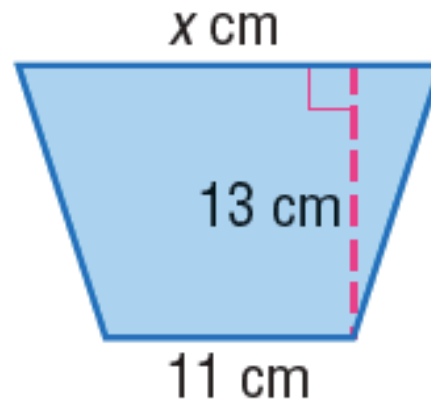
ALGEBRA Find x.

4A. $A = 92 \text{ in}^2$

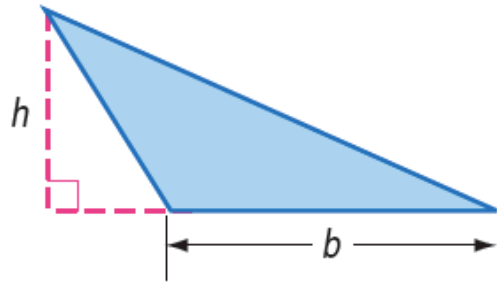

22 in.

x in.

4B. $A = 177 \text{ cm}^2$

x cm

13 cm

11 cm

ConceptSummary Areas of Polygons
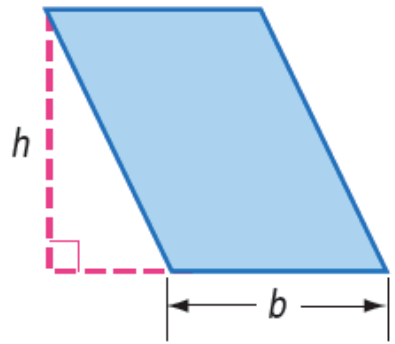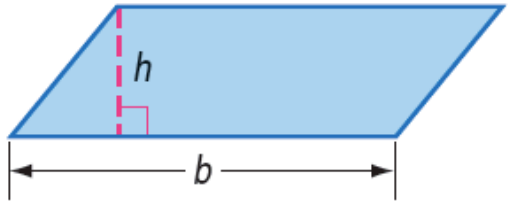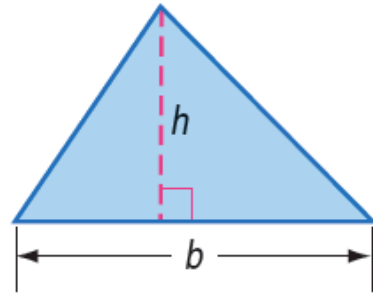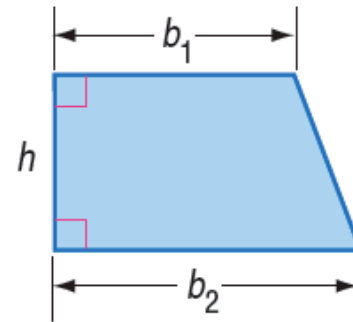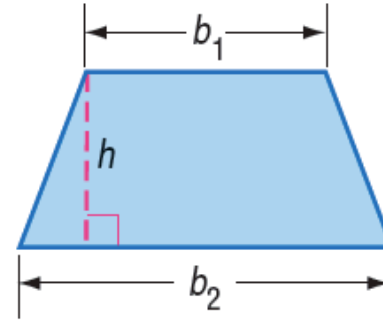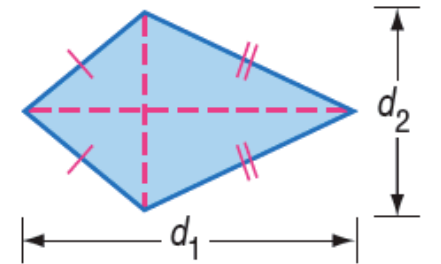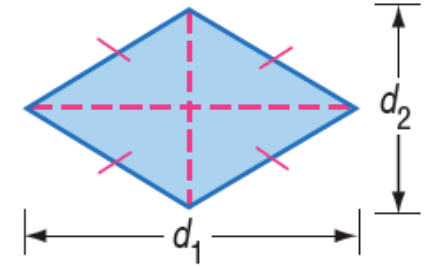
Parallelogram	Triangles	Trapezoids	Rhombi and Kites
$A = bh$	$A = \frac{1}{2}bh$	$A = \frac{1}{2}h(b_1 + b_2)$	$A = \frac{1}{2}d_1 d_2$

11.3 – AREAS OF CIRCLES AND SECTORS

KeyConcept Area of a Circle

Words

The area A of a circle is equal to π times the square of the radius r.

Symbols

$A = \pi r^2$

1.

21 yd

2.

0.4 km
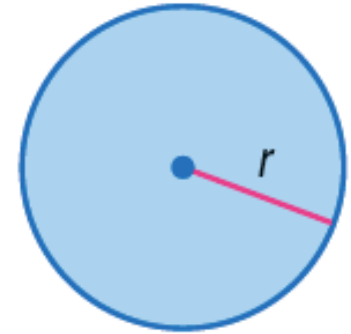
Finding missing measures

ALGEBRA **Find the radius of a circle with an area of 95 square centimeters.**

ALGEBRA The area of a circle is 196π square yards. Find the diameter.

Find the area of each shaded region.

9 cm

Find the area of each shaded region.

-12 in.-

Area of sectors

The ratio of the **area A of a sector** to the **area of the whole circle, πr^2**, is equal to the ratio of the **degree measure of the intercepted arc x** to 360.

Proportion: $\dfrac{A}{\pi r^2} = \dfrac{x}{360}$

Equation: $A = \dfrac{x}{360} \cdot \pi r^2$
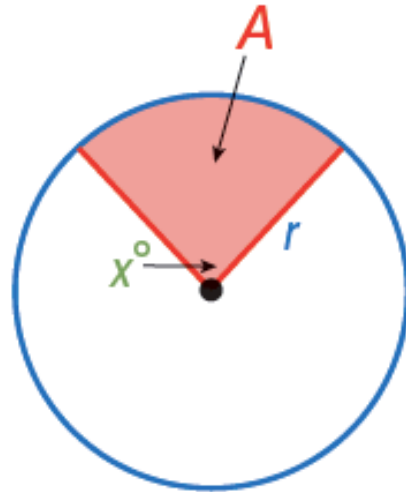
PIZZA A circular pizza has a diameter of 12 inches and is cut into 8 congruent slices. What is the area of one slice to the nearest hundredth?

Find the area of the shaded sector. Round to the nearest tenth.

3A.

4 ft
53°
J
K
L

3B.

148°
6 m
K
L
J

3C.

11 in.
65°
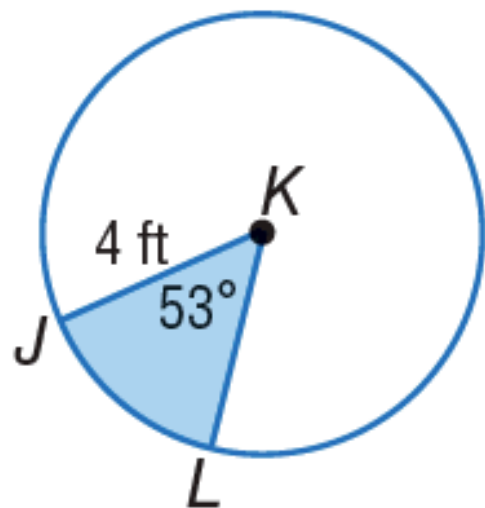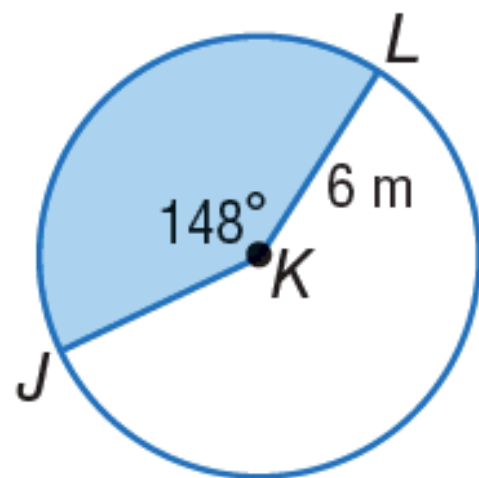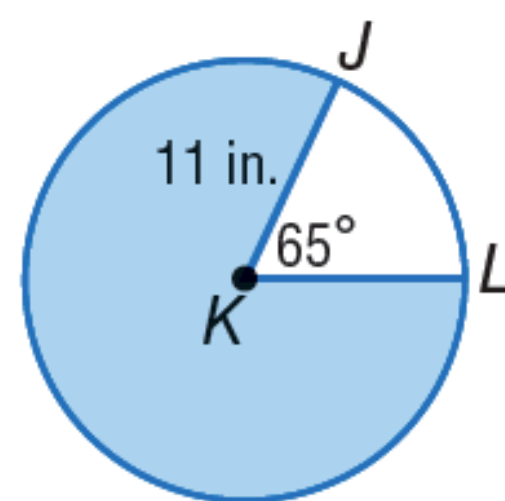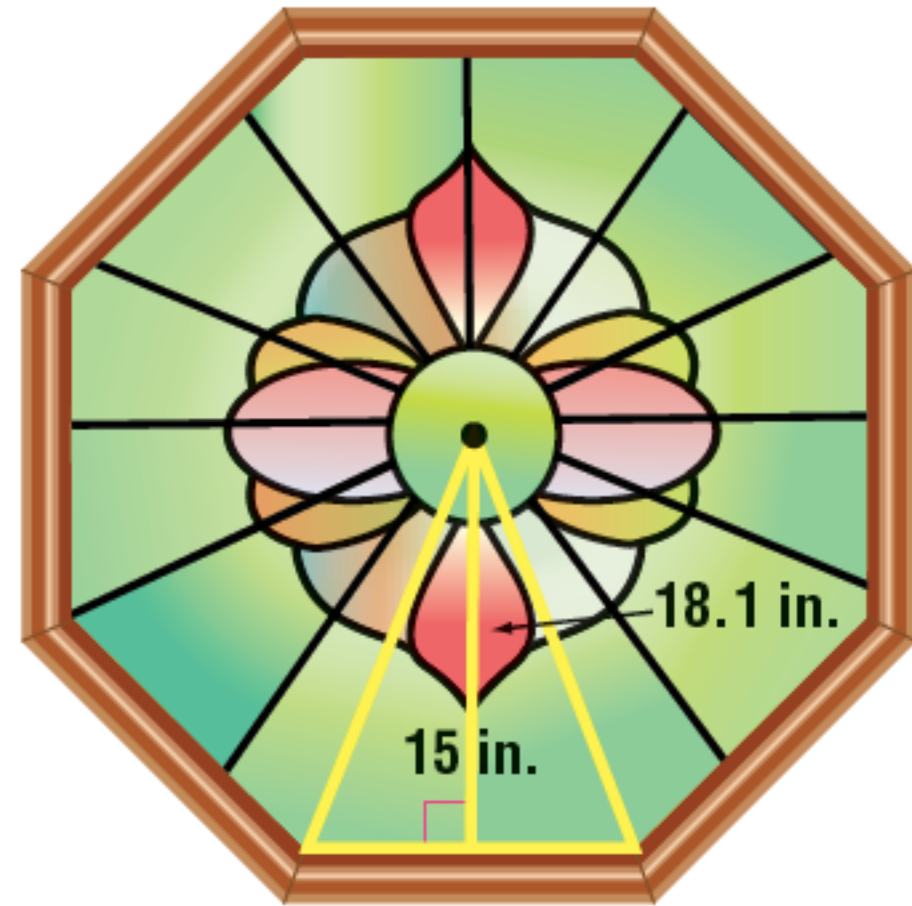J
K
L

11.4 – AREAS OF REGULAR POLYGONS AND COMPOSITE FIGURES

ART Kang created the stained glass window shown. The window is a regular octagon with a side length of 15 inches and an apothem of 18.1 inches. What is the area covered by the window?

18.1 in.

15 in.

Parts of a polygon
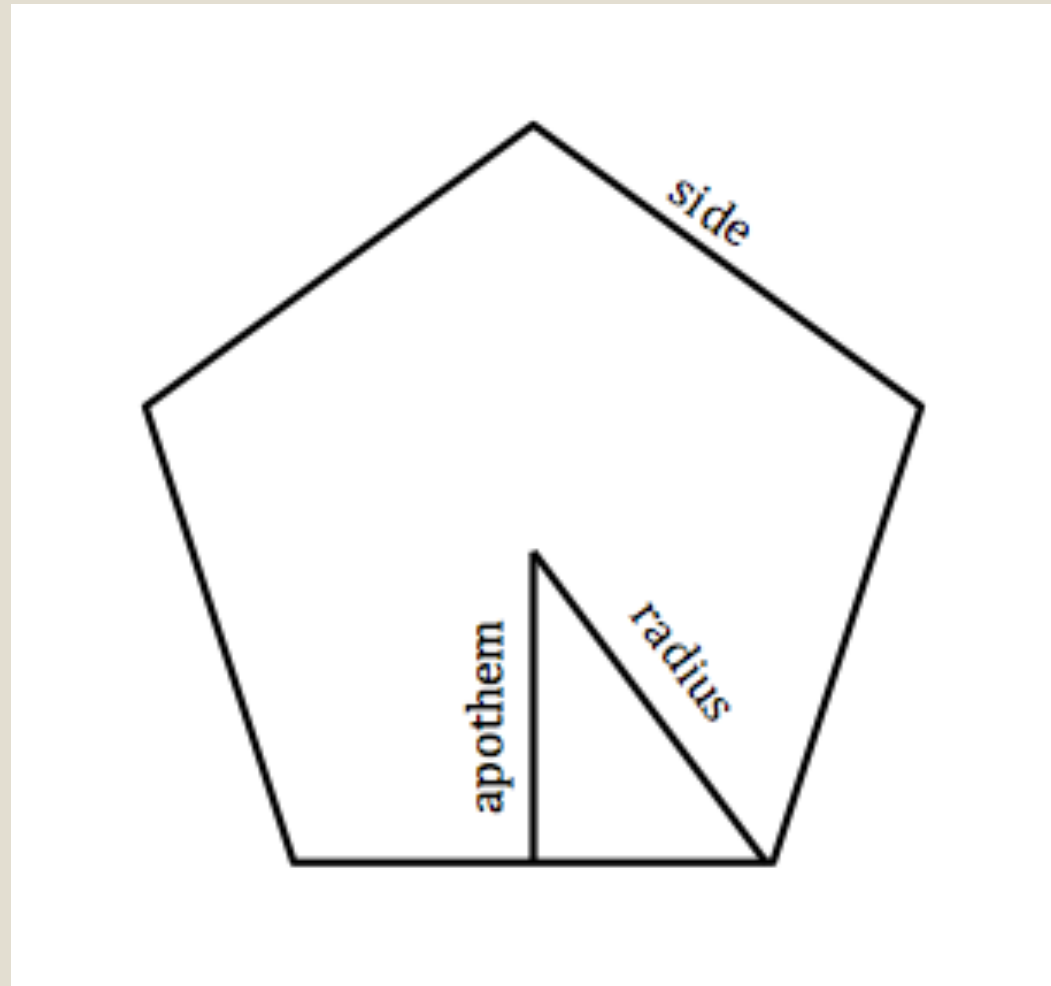
Area of a regular polygon

KeyConcept **Area of a Regular Polygon**

Words   The area A of a regular n-gon with side length s is one half the product of the apothem a and perimeter P.

Symbols $A = \frac{1}{2}a(ns)$ or $A = \frac{1}{2}aP$.

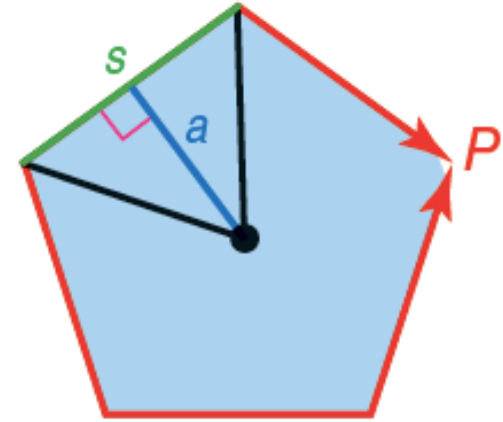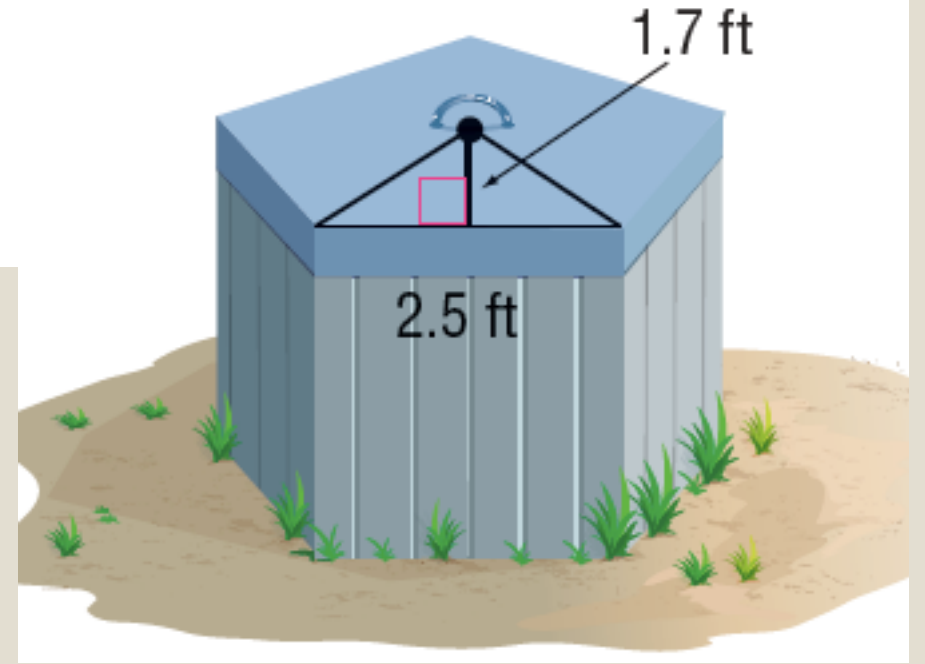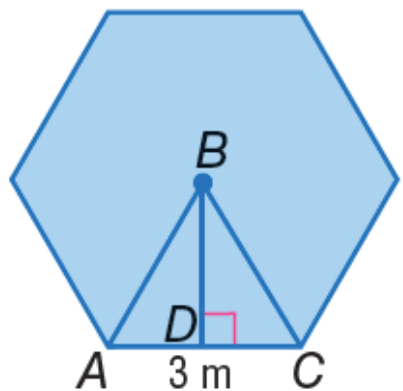**HOT TUBS** The cover of the hot tub shown is a regular pentagon. If the side length is 2.5 feet and the apothem is 1.7 feet, find the area of the lid to the nearest tenth.
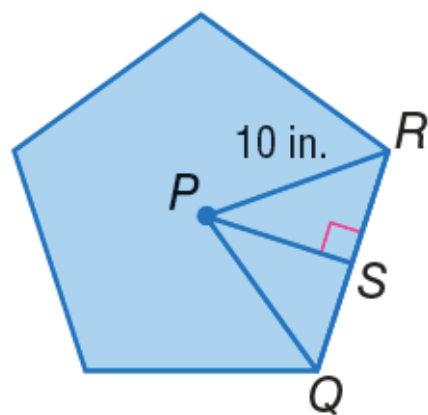

1.7 ft

2.5 ft

Find the area of each regular polygon. Round to the nearest tenth.
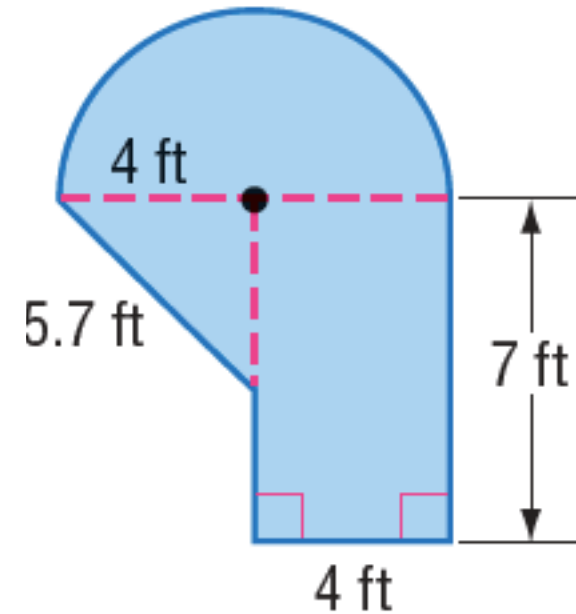
a. regular hexagon
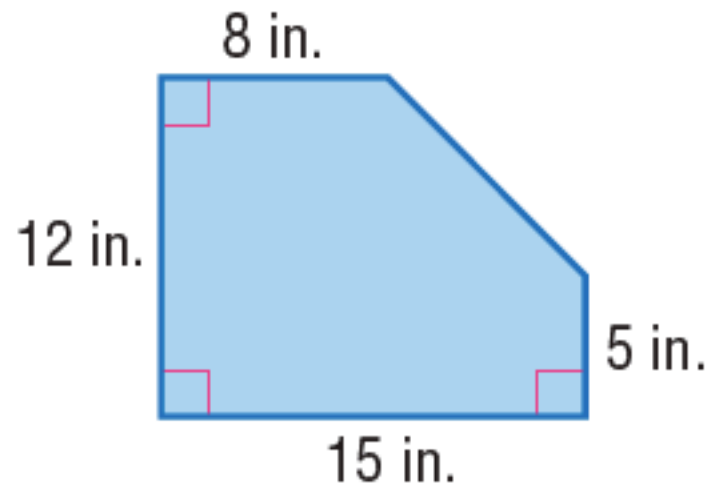

b. regular pentagon

Area of composite figures

MINIATURE GOLF The dimensions of a putting green at a miniature golf course are shown. How many square feet of carpet are needed to cover this green?
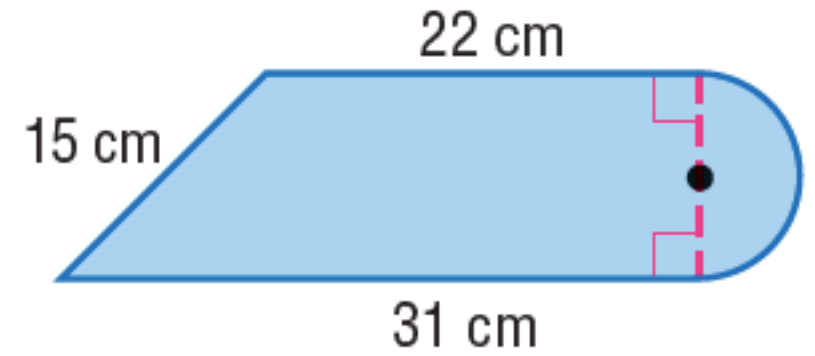
Find the area of each figure. Round to the nearest tenth if necessary.

4A.

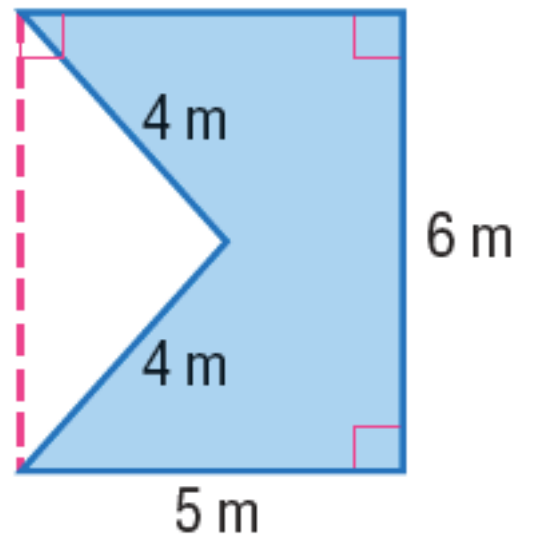

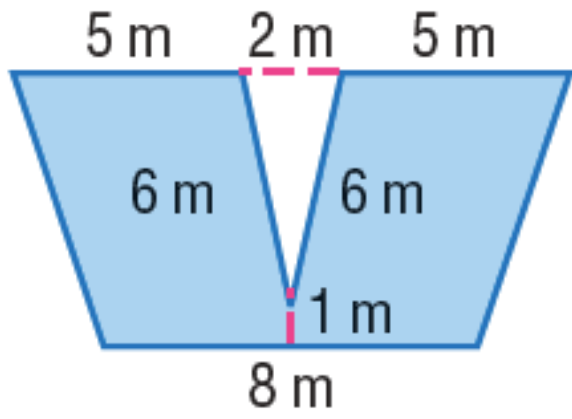8 in.

12 in.

5 in.

15 in.

4B.

22 cm

15 cm

31 cm

39

Find the area of the figure. Round to the nearest tenth if necessary.

4 m

6 m

4 m

5 m

40

5A.

5 m 2 m 5 m

6 m 6 m

1 m

8 m

5B.

14 ft

9 ft

41
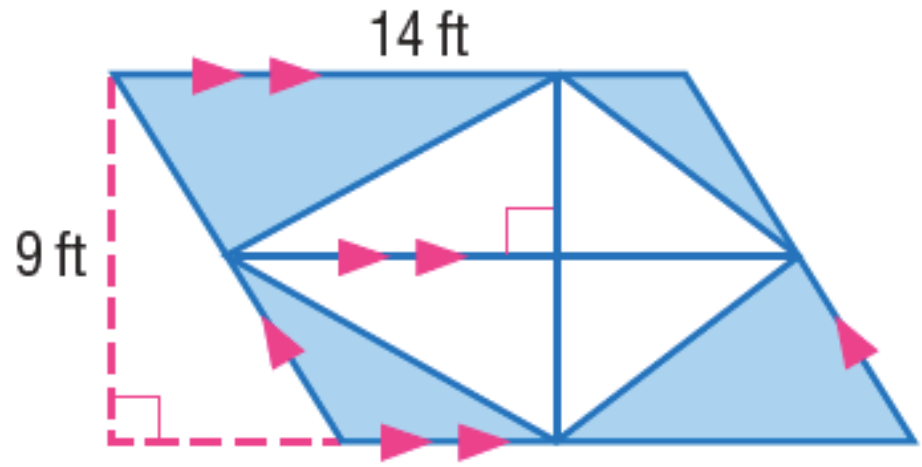
11.5 – AREAS OF SIMILAR FIGURES

Similar figures

- Two figures are similar when their corresponding sides are proportional → the ratio is called the **scale factor.**

- The perimeter of these figures is also proportional.

Area of Similar figures

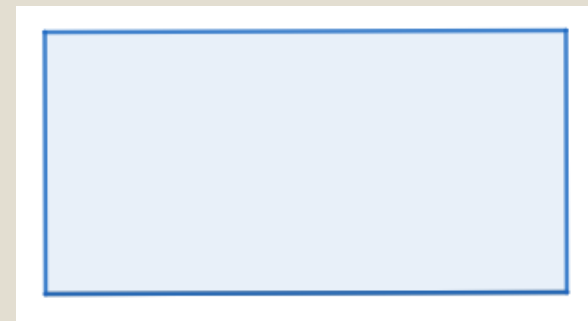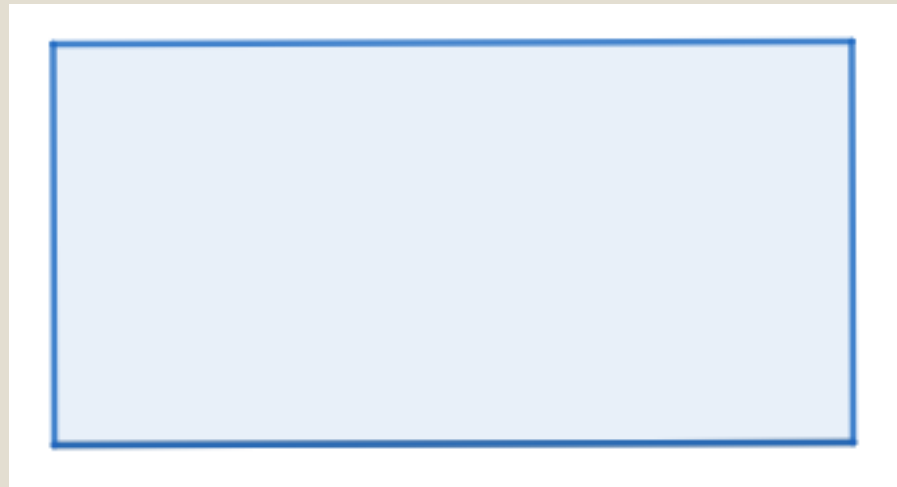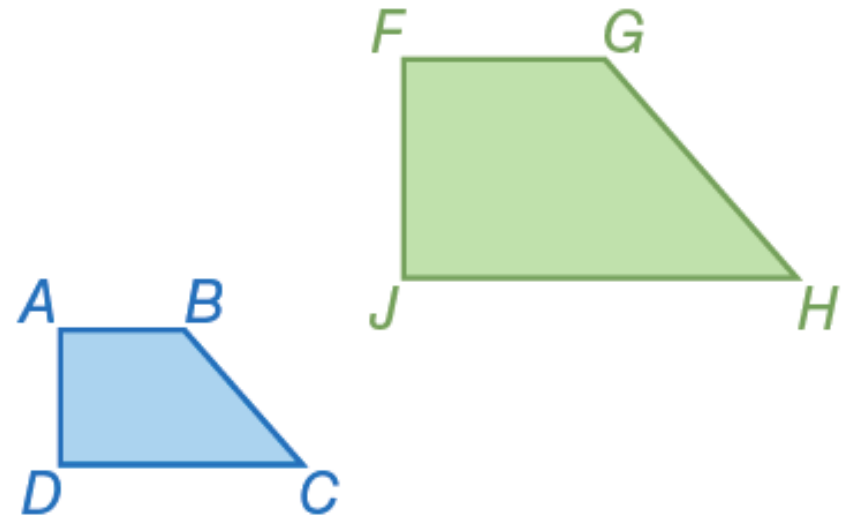The areas of similar figures are **proportional to the square of the scale factor.**

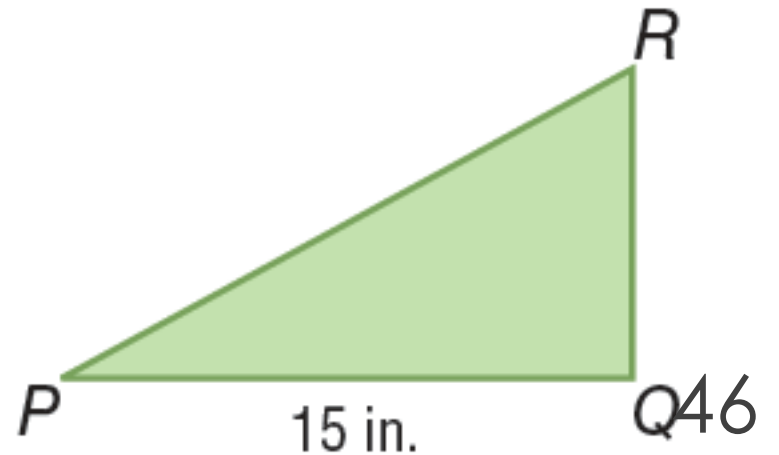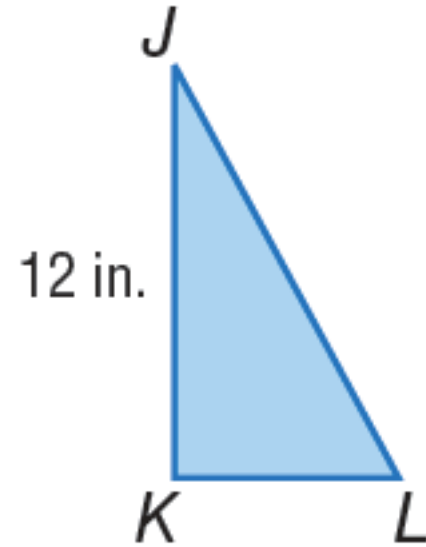## Theorem 11.1 Areas of Similar Polygons

Words   If two polygons are similar, then their areas are proportional to the square of the scale factor between them.

Example   If $ABCD \sim FGHJ$, then

$$\frac{\text{area of } FGHJ}{\text{area of } ABCD} = \left(\frac{FG}{AB}\right)^2.$$
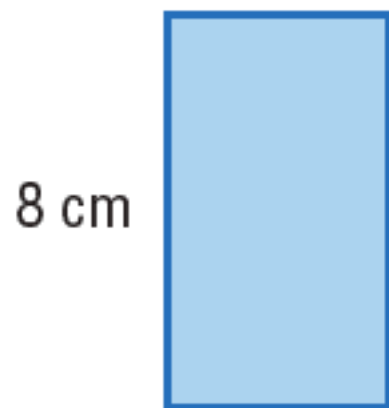
45

Finding the area from length measures.

If $\triangle JKL \sim \triangle PQR$ and the area of $\triangle JKL$ is 30 square inches, find the area of $\triangle PQR$.

12 in.

J

K   L

R

P   15 in.   Q

46

For each pair of similar figures, find the area of the green figure.
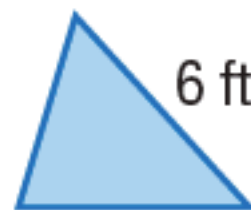
1A.

8 cm

5 cm

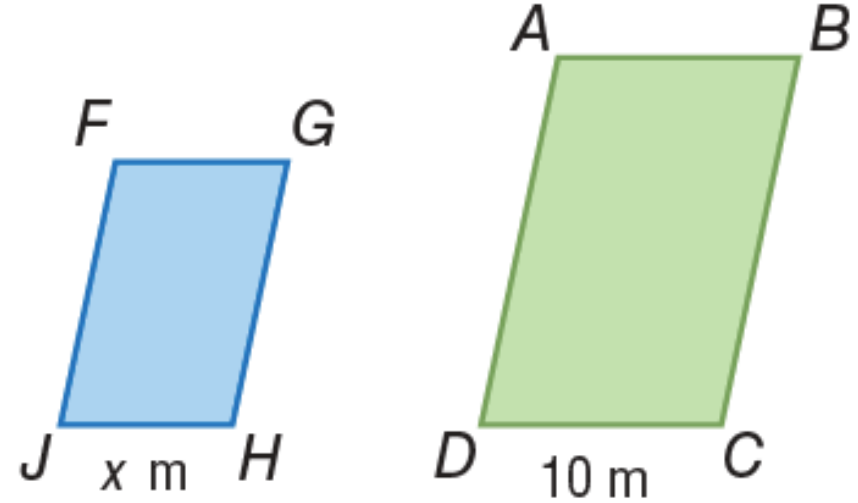$A = 32 \text{ cm}^2$

1B.

6 ft

8 ft

$A = 13.5 \text{ ft}^2$

Finding lengths from areas.
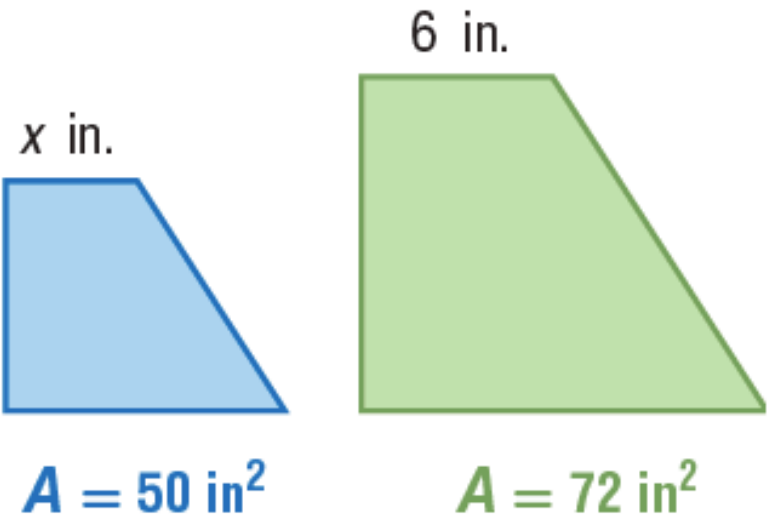
The area of $\square ABCD$ is 150 square meters.
The area of $\square FGHJ$ is 54 square meters.
If $\square ABCD \sim \square FGHJ$, find the scale factor of $\square FGHJ$ to $\square ABCD$ and the value of x.

For each pair of similar figures, use the given areas to find the scale factor of the blue to the green figure. Then find x.

2A.

6 in.

x in.

$A = 50 \text{ in}^2$ $A = 72 \text{ in}^2$

2B.

40 mm

x mm

$A = 400 \text{ mm}^2$ $A = 64 \text{ mm}^2$

49