Important Concepts . . .

Preview Review

Mathematics Grade 6 TEACHER KEY

W2 - Lesson 3: Perimeter and Area

V5-07

Important Concepts of Grade 6 Mathematics

W1 - Lesson 1 ..... Basic Facts, Basic Operations, and Integers
W1 - Lesson 2 ..... Place Value, Whole Numbers, Decimals, and Common Fractions
W1 - Lesson 3 ..... Improper Fractions and Mixed Numbers
W1 - Lesson 4 ..... Ratios and Percents
W1 - Lesson 5 ..... Number Operations with Decimals
W1 - Quiz
W2 - Lesson 1 ..... Factors, Multiples, and Prime Factorizations
W2 - Lesson 2 ..... Metric Measurement
W2 - Lesson 3 ..... Perimeter and Area
W2 - Lesson 4 ..... Surface Area and Volume
W2 - Lesson 5 ..... Working with Angles and Drawing Objects and Shapes
W2 - Quiz
W3 - Lesson 1 ..... Transformations
W3 - Lesson 2 ..... Bar Graphs, Line Graphs, and Circle Graphs
W3 - Lesson 3 ..... Collecting and Analyzing Data
W3 - Lesson 4 ..... Number Patterns, Magic Squares, and Problem Solving
W3 - Lesson 5 ..... Probability and Outcomes
W3 - Quiz

Materials Required: A textbook is not needed. This is a stand-alone course.

Mathematics Grade 6
Version 5
Preview/Review W2 - Lesson 3 TEACHER KEY

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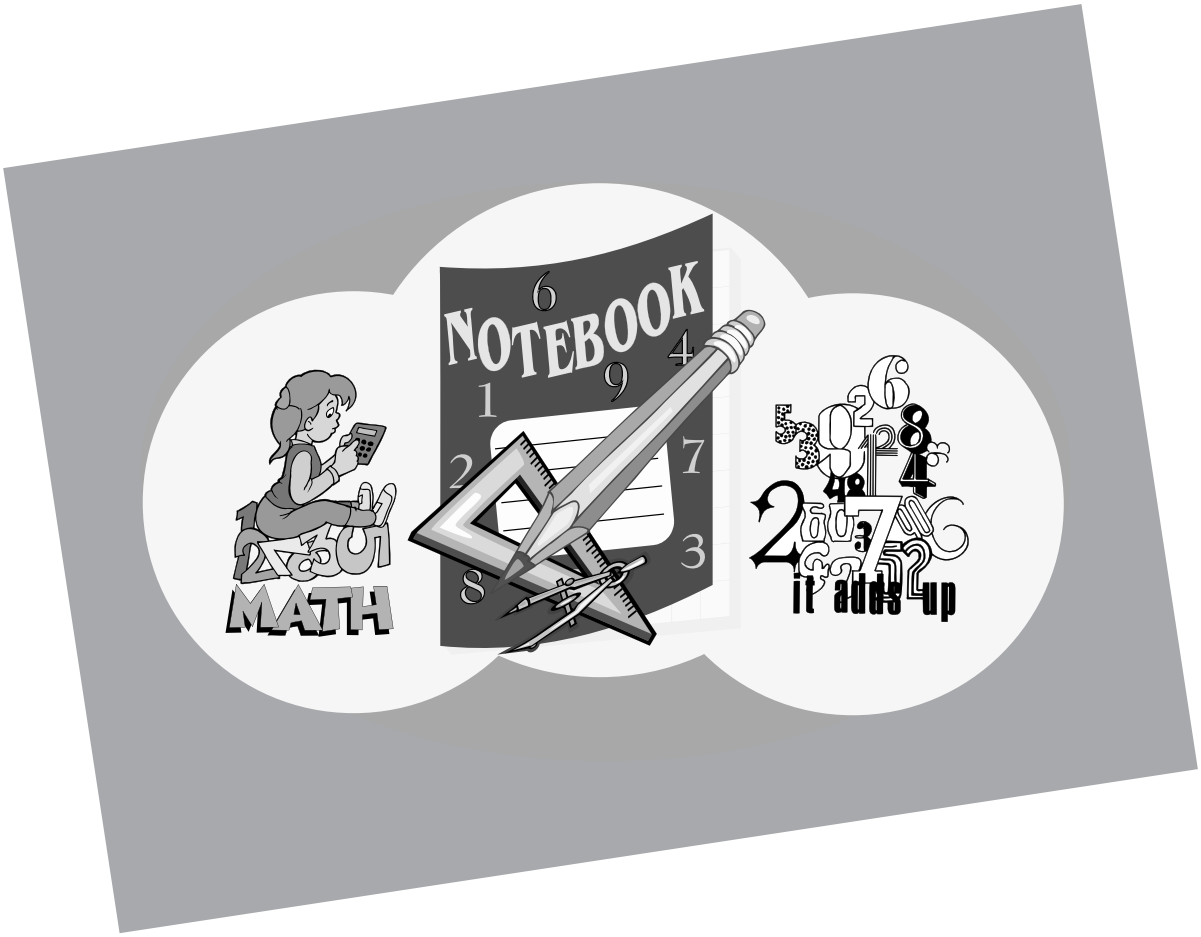
Preview/Review Concepts for Grade Six Mathematics

TEACHER KEY



W2 - Lesson 3:
Perimeter and Area

OBJECTIVES

By the end of this lesson, you should

- understand the perimeter as the distance around a figure
- understand area as the size of a surface
- use metric units of measure to determine perimeter and area

GLOSSARY

area - the amount of surface a figure covers

parallelogram - a variation of a rectangle, but opposite angles are equal

perimeter - distance around any shape

polygon - a straight-sided figure with three or more sides

quadrilateral - a straight-sided figure with four sides

rectangle - a variation of a square, but opposite sides are equal

square - a figure with four equal sides and angles

W2 - Lesson 3: Perimeter and Area

Welcome to W2 - Lesson 3! This lesson is about perimeter and area. You will use your skills in metric measurement to find lengths and areas. The lesson has three topics:

- Perimeter
- Area
- Areas of Irregular Shapes

Have fun with shapes and sizes!

Perimeter

The distance around any shape is its **perimeter**. Perimeter is found by adding the lengths of all sides of the figure. Perimeter is usually measured in kilometres, metres, centimetres, or millimetres.

All straight-sided figures with three or more sides are called polygons. The names of some common polygons are given in this chart.

Number of Sides	Name of Polygon
3-sided figure	triangle
4-sided figure	quadrilateral
5-sided figure	pentagon
6-sided figure	hexagon
7-sided figure	heptagon
8-sided figure	octagon

Special **quadrilaterals** that you can see frequently include the following:

Square - All four sides and angles (corners) are equal.

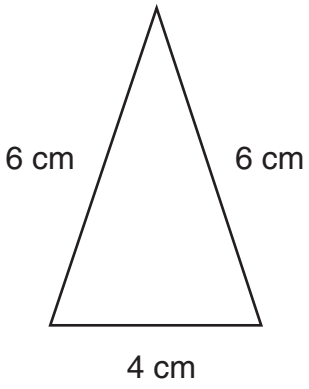
Rectangle - Opposite sides are equal, and all angles are equal.

Parallelogram - Opposite sides are parallel and equal, but pairs of opposite angles are equal.

Questions

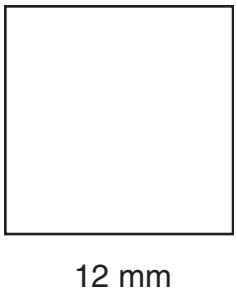
1. Find the perimeter of the following polygons. Write the formula (such as 8 + 4 + 4 = 16) each time and always write the units of measurement in your answer. (km, m, cm, or mm)

a.



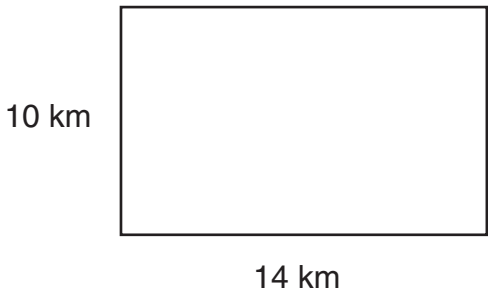
6 + 6 + 4 = 16 cm

b.



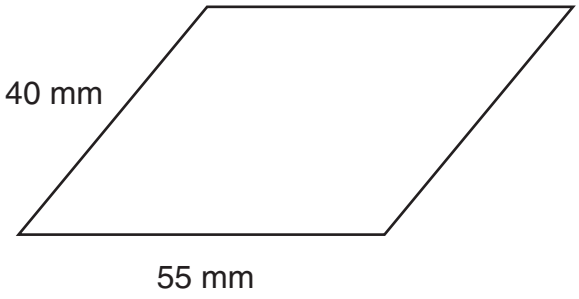
12 + 12 + 12 + 12 = 48 mm

c.



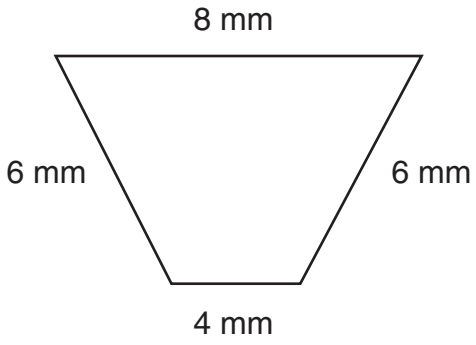
10 + 10 + 14 + 14 = 48 km

d.



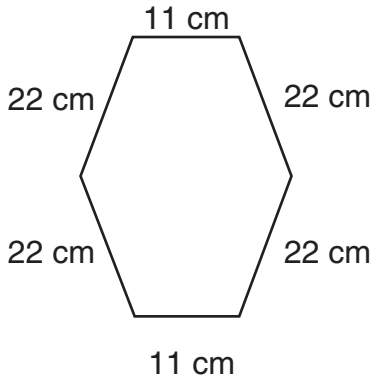
40 + 40 + 55 + 55 = 190 mm

e.



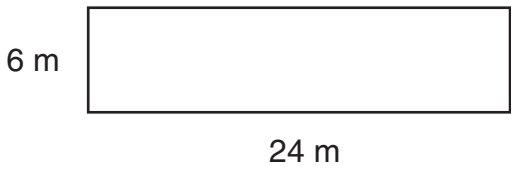
6 + 8 + 6 + 4 = 24 mm

f.



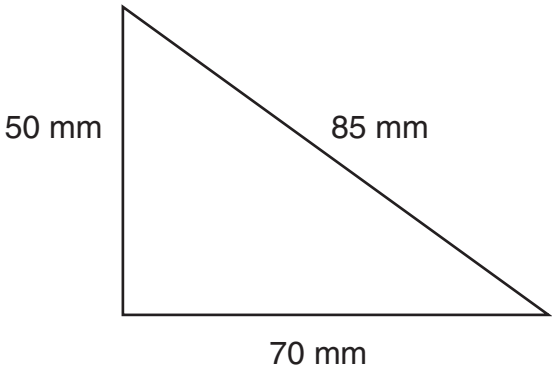
11 + 22 + 22 + 11 + 22 + 22 + = 110 cm

g.



6 + 24 + 6 + 24 = 60 m

h.



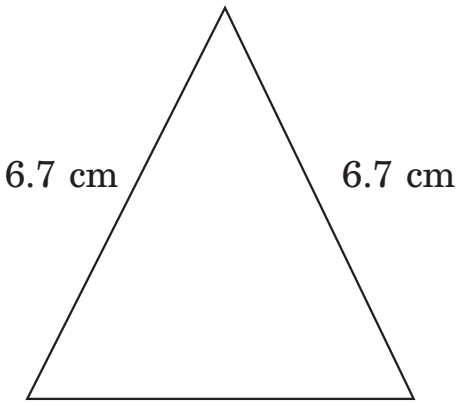
50 + 85 + 70 = 205 mm

2. Use a ruler to measure the sides of the following polygons, and write the lengths on the figure. Then, find the perimeter of each. Write your answers in centimetres.

a.

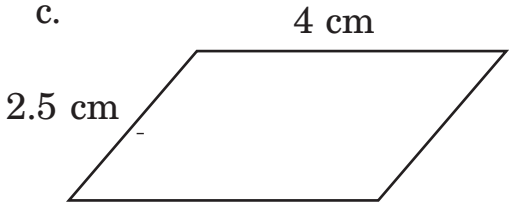
P = 12 cm

b.



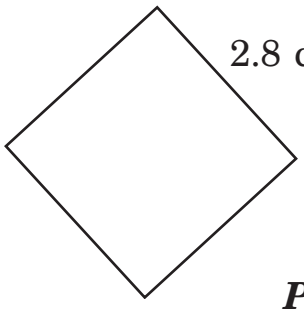
P = 19.4 cm

c.



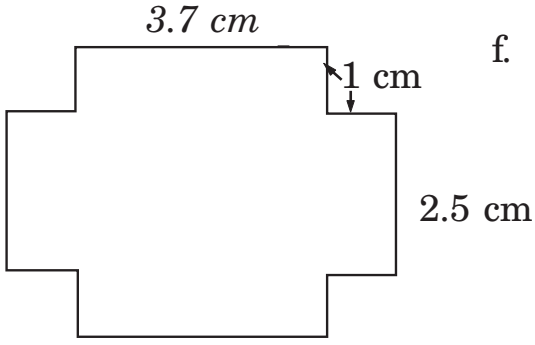
P = 13 cm

d.



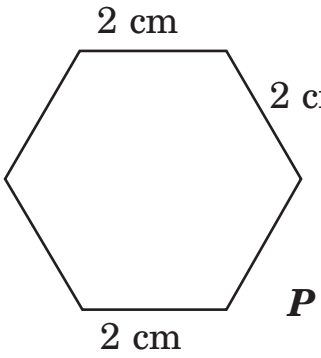
P = 11.2 cm

e.



P = 20.4 cm

f.



P = 12 cm

3. Calculte the perimeter for each polygon. Use the space below to do your calculations.

Figure	Type of Polygon	Length of Sides	Perimeter
A	triangle	13.1 m, 17.8 m, 14.4 m	***45.3 m***
B	square	55 mm	***220 mm***
C	rectangle	4.7 cm, 7.6 cm	***24.6 cm***
D	parallelogram	63 cm, 24 cm	***174 cm***
E	regular octagon*	16 m	***128 m***
F	hexagon	1.5 m, 4.0 m, 3.6 m, 5.2 m, 5.8 m, 2.8 m	***22.9 m***
* A regular octagon has eight equal sides.			

4. Calculate the perimeter for each polygon. Note carefully the units of measurement. Write all the answers in centimetres. Use the space below to do your calculations.

Figure	Type of Polygon	Length of Sides	Perimeter (cm)
A	triangle	3.1 m, 178 cm, 144 cm	***310 cm + 178 cm + 144 cm = 632 cm***
B	quadrilateral	65 mm, 123 mm 15 cm, 18.5 cm	***6.5 cm + 12.3 cm + 15 cm + 18.5 cm = 52.3 cm***
C	pentagon	67 cm, 7.6 cm, 67cm 54 cm, 54 cm	***67 cm + 7.6 cm + 67 cm + 54 cm + 54 cm = 249.6 cm***
D	hexagon	63 cm, 24 cm, 122 mm, 134 mm, 51 cm, 33 cm	***63 cm + 24 cm + 12.2 cm + 13.4 cm + 51 cm + 33 cm = 196.6 cm***
E	octagon	16 m, 9 m, 18 m, 7 m, 234 cm, 543 cm, 430 cm, 742 cm	***1600 cm + 900 cm + 1800 cm + 700 cm + 234 cm + 543 cm + 430 cm + 742 cm = 6949 cm***

Area

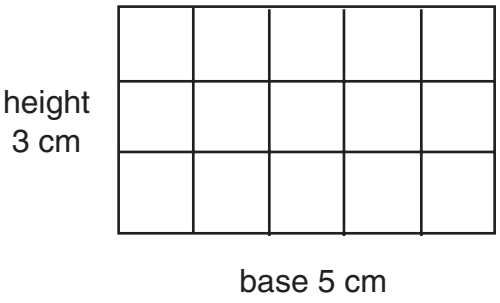
Area is the amount of surface a figure covers. **Square** units are used to measure area.

mm^2 = square millimetres
cm^2 = square centimetres
m^2 = square metres
km^2 = square kilometres

Formula for Area of Quadrilaterals

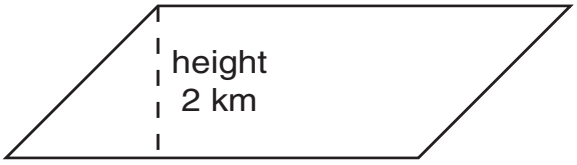
Because quadrilaterals are regular figures, formulas are useful to calculate area.

Rectangle:
Area = base $\times$ height
A = b $\times$ h (abbreviated form)
A = 5 $\times$ 3 = 15 cm^2
(Count the squares.)



Parallelogram:
Remember: Height means the vertical height - the distance up and down.

A = b $\times$ h
A = 5 $\times$ 2 = 10 km^2

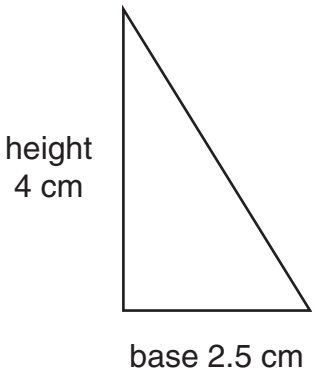


Triangle:
A triangle is one half a rectangle.

$$\text{Area} = \frac{1}{2} \text{ base} \times \text{height}$$

$$A = \frac{1}{2} b \times h$$

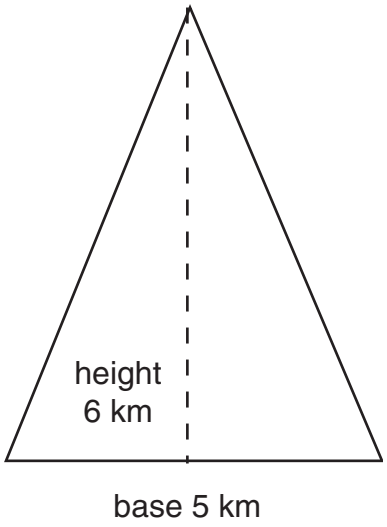
$$A = \frac{1}{2} (2.5 \times 4) = \frac{1}{2} (10) = 5 \text{ cm}^2$$



$$A = \frac{1}{2}\ b \times h$$

$$A = \frac{1}{2}\ (5 \times 6) = \frac{1}{2}\ (30) = 15\ km^2$$

Note: The height is the vertical height.

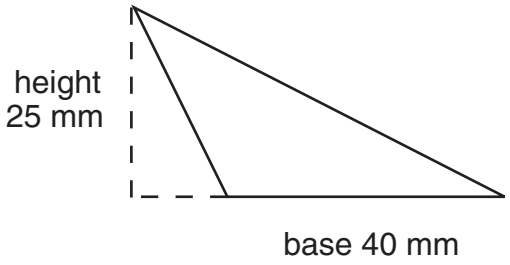


$$A = \frac{1}{2}\ b \times h$$

$$A = \frac{1}{2}\ (25 \times 40)$$

$$A = \frac{1}{2}\ (1\ 000)$$

$$A = 500\ mm^2$$

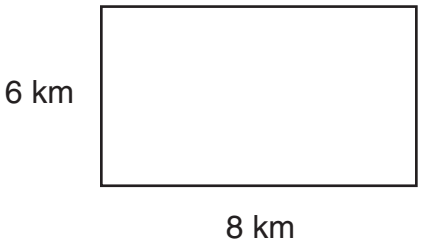


***Remember**: The height is the vertical height.*

Questions

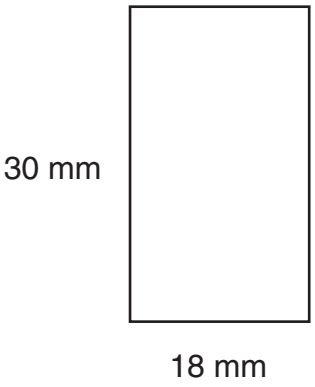
1. Use the correct formula to calculate the area of each of the following polygons. Write your answer in square units (mm^2, cm^2, m^2, or km^2).

a.



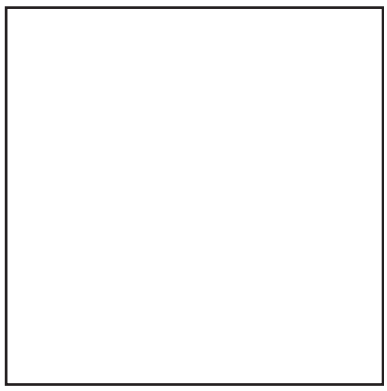
$A = b \times h$
$= 8\ km \times 6\ km$
$= 48\ km^2$

b.



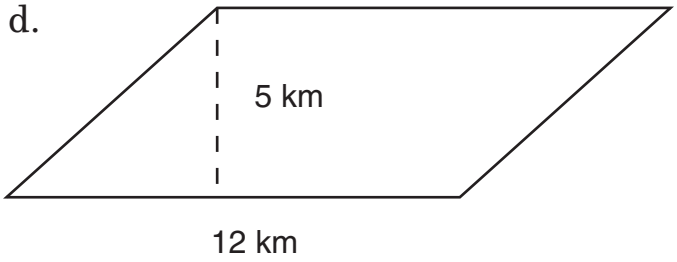
$A = b \times h$
$= 18\ mm \times 30\ mm$
$= 540\ mm^2$

c.



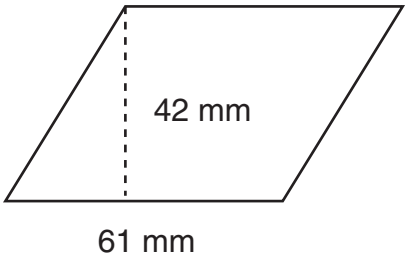
$A = b \times h$
$= 4\ cm \times 4\ cm$
$= 16\ cm^2$

d.



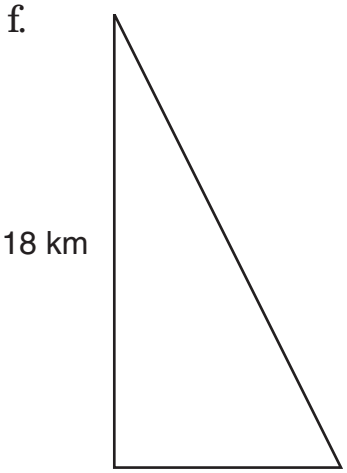
$A = b \times h$
$= 12\ km \times 5\ km$
$= 60\ km^2$

e.



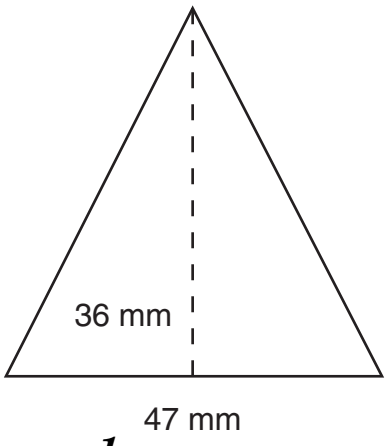
$$A = b \times h$$
$$= 61\ mm \times 42\ mm$$
$$= 2\ 562\ mm^2$$

f.



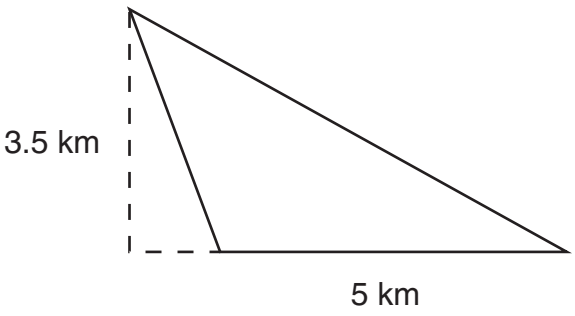
$$A = \frac{1}{2}(b \times h)$$
$$A = \frac{1}{2}(10\ km \times 18\ km)$$
$$A = \frac{1}{2}(180\ km^2)$$
$$A = 90\ km^2$$

g.



$$A = \frac{1}{2}(b \times h)$$
$$A = \frac{1}{2}(36\ mm \times 47\ mm)$$
$$A = \frac{1}{2}(1692\ mm^2)$$
$$A = 846 mm^2$$

h.



$$A = \frac{1}{2}(b \times h)$$
$$A = \frac{1}{2}(5\ km \times 3.5\ km)$$
$$A = \frac{1}{2}(17.5\ km^2)$$
$$A = 8.75\ km^2$$

2. Calculate the area of each polygon. Write your answer in square units (mm^2, cm^2, m^2, or km^2). Use the space below to do your calculations.

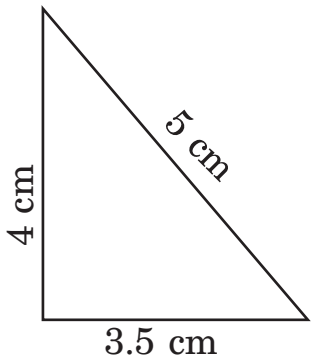
Figure	Type of Polygon	Base	Height	Area
A	triangle	22 mm	12 mm	***132 mm^2***
B	square	17 cm		***289 cm^2***
C	rectangle	23 m	11 m	***253 m^2***
D	parallelogram	18 km	25 km	***450 km^2***
E	triangle	30 m	22 m	***330 m^2***
F	rectangle	112 mm	200 mm	***22 400 mm^2***
G	parallelogram	33 cm	44 cm	***1 452 cm^2***

3. Determine the area of each polygon. Note carefully the units of measurement. Write your answer in square centimetres (cm^2).
Hint: You should convert all mesurements to cm before completing the calculations.

Figure	Type of Polygon	Base	Height	Area (cm^2)
A	triangle	80 mm	12 cm	***48 cm^2***
B	square	0.4 m	0.4 m	***1 600 cm^2***
C	rectangle	0.35 m	55 m	***192.5 m^2***
D	parallelogram	24 mm	4 dm	***96 cm^2***
E	triangle	1.0 m	2.2 cm	***110 cm^2***
F	rectangle	92 mm	32 cm	***294.4 cm^2***
G	parallelogram	43 cm	14 cm	***602 cm^2***

4. Use a ruler to measure the base and height of each of the following polygons and then calculate the area. Your measurements should be within 2 mm of the correct answer. Measure carefully!

a.



PERIMETER

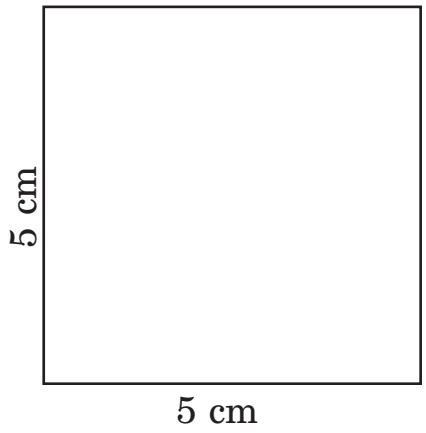
12. 5 cm (approx)

AREA

$= \frac{1}{2} \times 3.5 \times 4$

$= 7\ cm^2$

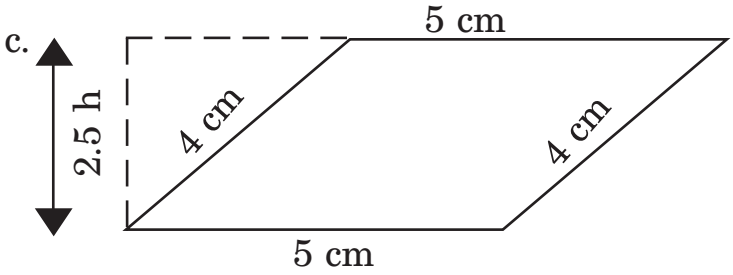
b.



20 cm

$5 \times 5 = 25\ cm^2$

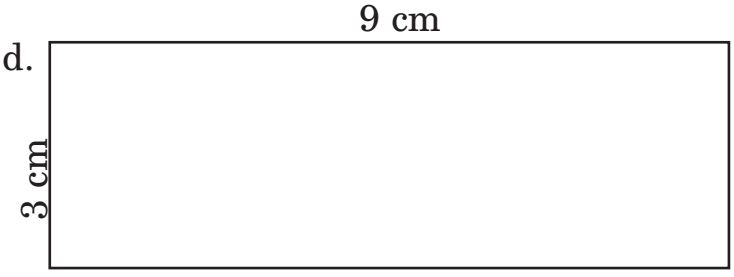
c.



18 cm

$2.5 \times 5 = 12.5\ cm^2$

d.



24 cm

$3 \times 9 = 27\ cm^2$

Areas of Irregular Shapes

Finding the areas of figures that are not triangles, rectangles, or parallelograms is a challenge for you. You likely see that this figure below is actually two rectangles–one larger than the other.

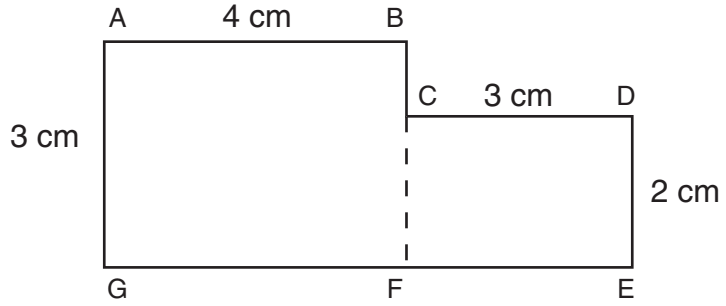
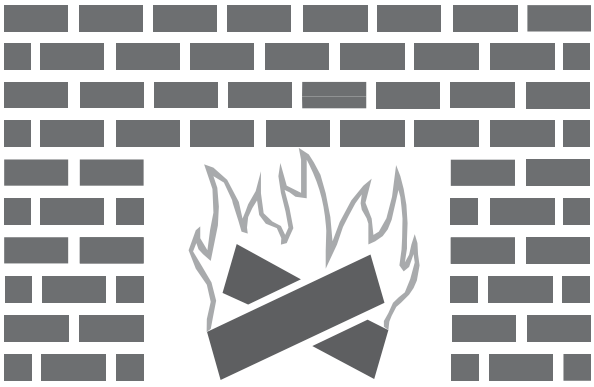


Figure ABCDEFG is not a regular polygon but it can be viewed as two rectangles. Then, the areas can be added to find the total.

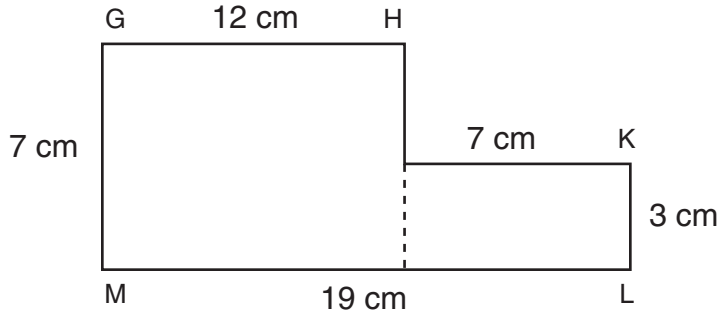
Area of rectangle ABFG = b $\times$ h = 4 $\times$ 3 = 12 cm^2
Area of rectangle CDEF = b $\times$ h = 3 $\times$ 2 = 6 cm^2
Total area = 18 cm^2



Questions

1. Find the perimeter and area of each of the figures below.

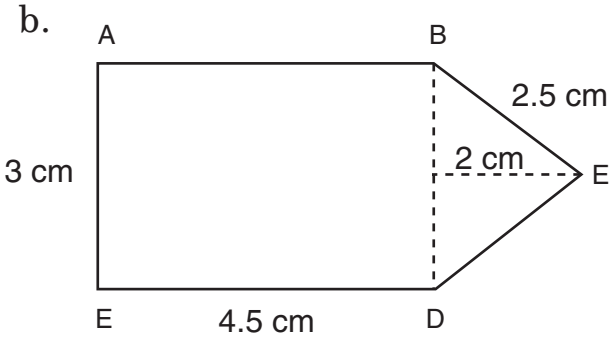
a.



$$A = (b \times h) + (b \times h)$$
$$A = (12 \times 7) + (7 \times 3)$$
$$A = 84 + 21$$
$$A = 105\ cm^2$$

$$Perimeter = 52\ cm$$

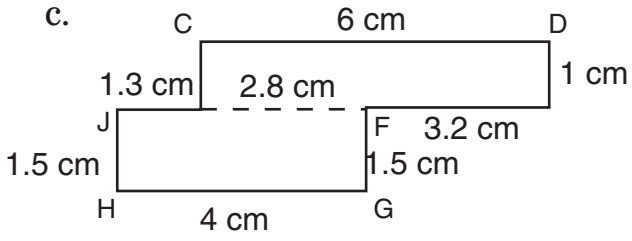
b.



$$A = (b \times h) + \frac{1}{2}(b \times h)$$
$$A = (4.5\ cm \times 3\ cm) + \frac{1}{2}(3\ cm \times 2\ cm)$$
$$A = 13.5\ cm^2 + 3\ cm^2$$
$$A = 16.5\ cm^2$$

$$Perimeter = 17\ cm$$

c.



$$A = (b \times h) + (b \times h)$$
$$A = (6\ cm \times 1\ cm) + (4\ cm \times 1.5\ cm)$$
$$A = 6\ cm^2 + 6\ cm^2$$
$$A = 12\ cm^2$$

$$Perimeter = 19.5\ cm$$

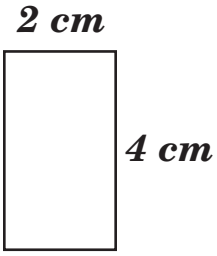
2. Draw a polygon with the following characteristics.

a. rectangle with a perimeter of 12 cm and an area of 8 cm^2

Exact measurement of 2 cm by 4 cm rectangle.

P = 4 cm + 4 cm + 2 cm + 2 cm = 12 cm.

A = b × h
= 4 cm × 2 cm
= 8 cm^2

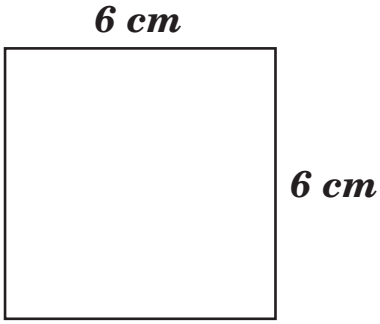


b. square with a perimeter of 24 cm and an area of 36 cm^2

Exact measurement of 6 cm on each side.

P = 6 + 6 + 6 + 6

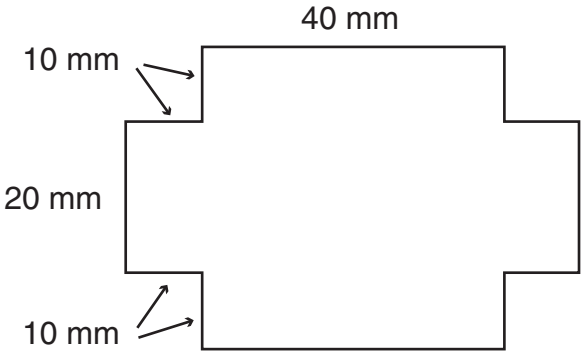
P = 24 cm



Homework Assignment

1. Find the perimeter and area of the following figures.

a.

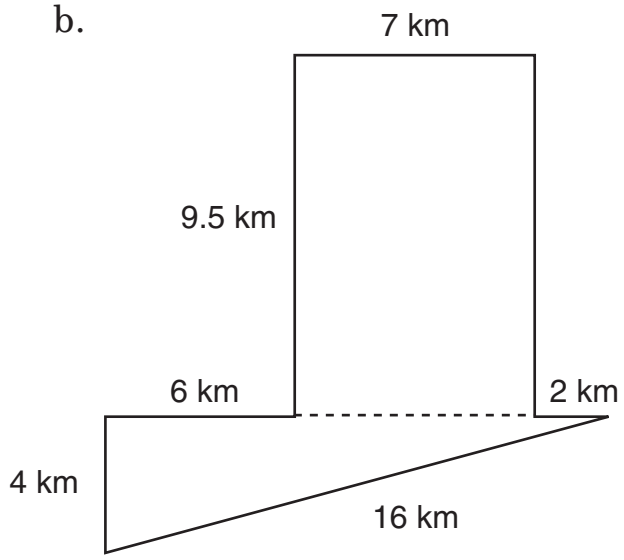


$$P = 200\ mm$$

$$A = 40\ mm \times 40\ mm = 1600\ mm^2$$
$$= 20\ mm \times 10\ mm = 200\ mm^2$$
$$= 20\ mm \times 10\ mm = \underline{200\ mm^2}$$
$$2000\ mm^2$$

$$A = 2000\ mm^2$$

b.



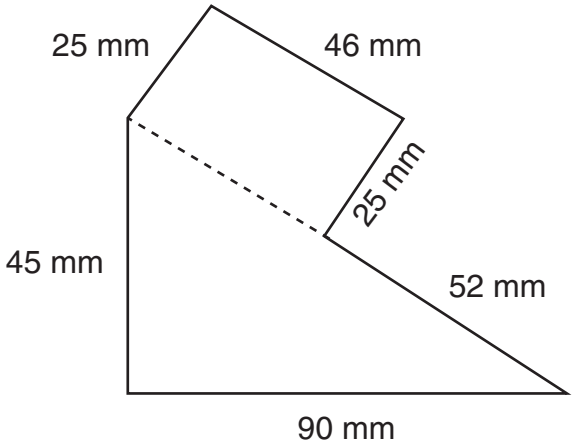
$$A = (7\ km \times 9.5\ km) + \frac{1}{2}(4\ km \times 15\ km)$$

$$A = 66.5\ km^2 + 30\ cm^2$$

$$A = 96.5\ km^2$$

$$Perimeter = 54\ km$$

c.



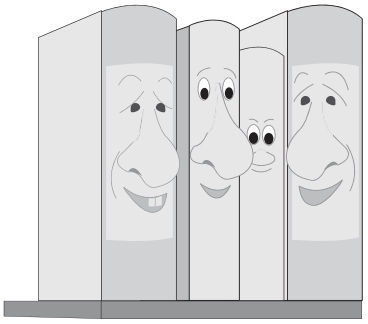
$$A = (b \times h) + \frac{1}{2}(b \times h)$$

$$A = (25\ mm \times 46\ mm) + \frac{1}{2}(90\ mm \times 45\ mm)$$

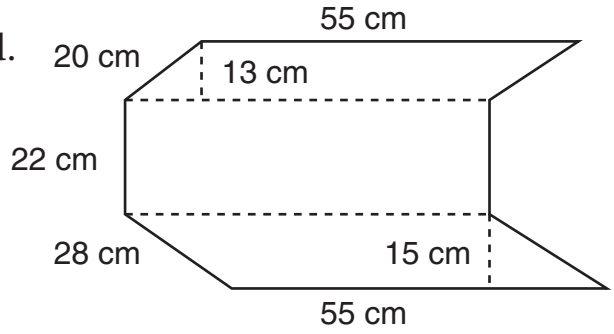
$$A = 1150\ mm^2 + 2025\ mm^2$$

$$A = 3175\ mm^2$$

$$Perimeter = 283\ mm$$



d.



$$A = (b \times h) + (b \times h) + (b \times h)$$

$$A = (55\ cm \times 13\ cm) + (55\ cm \times 22\ cm) + (55\ cm \times 15\ cm)$$

$$A = 715\ cm^2 + 1210\ cm^2 + 825\ cm^2$$

$$A = 2750\ cm^2$$

$$Perimeter = 250\ cm$$

Self-Evaluation

Ask yourself some important questions. Write your answers in sentences for your teacher.

1. In this lesson, what part of your work was **excellent**?

2. In this lesson, what part of your work **needs improvement**?

3. If you want help for some of the work in this lesson, ask your teacher in this space.