Parallelogram Parking
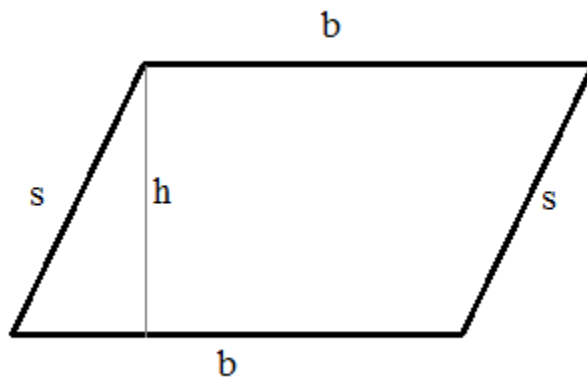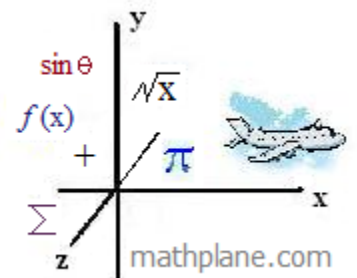
Includes properties, illustrations, and applications of parallelograms.

The parallelogram is an important geometric figure. (For example, the Parallelogram Law is used to verify vector addition.) Yet, in the everyday world, --- perhaps, because of its lack of symmetry --- it appears less often than other shapes.

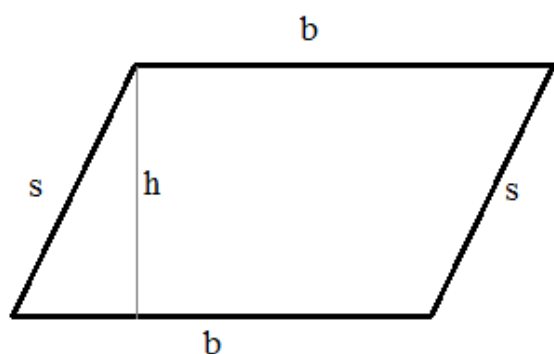In this space, find different aspects of this unique quadrilateral...

Parallelogram Properties

- Opposite Sides are Parallel

- Opposite Angles are Congruent

- Opposite Sides are Congruent

- Consecutive Angles are Supplementary

- Diagonals Bisect each other

Area and Perimeter of a Parallelogram

Area = bh

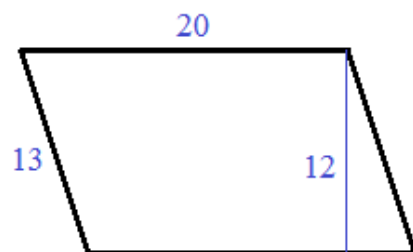Perimeter = s + b + s + b = 2(b + s)

s = side
b = base
h = height

Example:

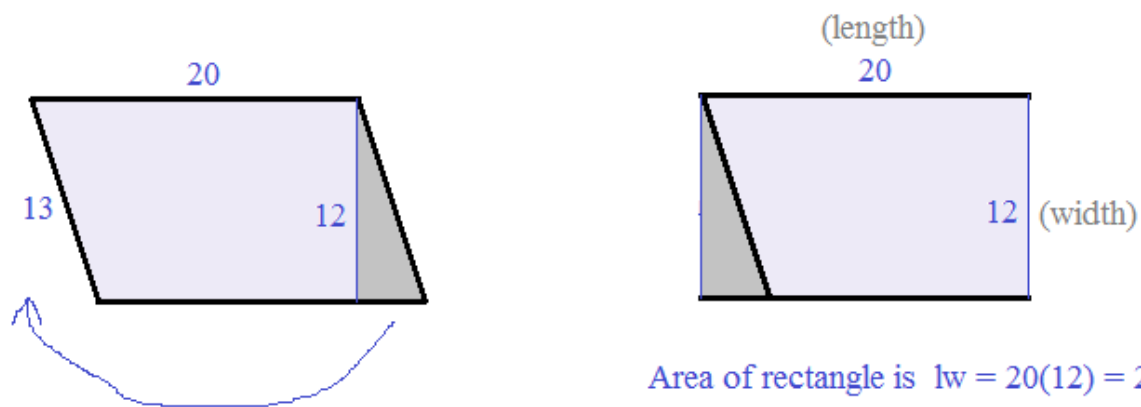Area = bh = 20(12) = 240 square units

Perimeter = 2(b + s) = 66 units
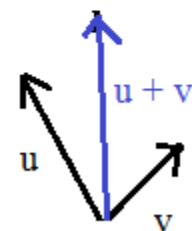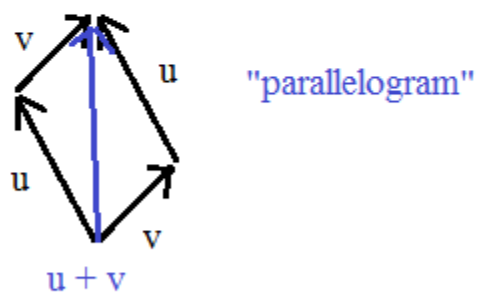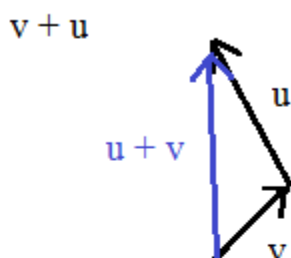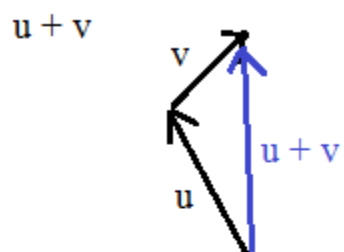
Observation: To verify the area of a parallelogram, transform the figure into a rectangle!

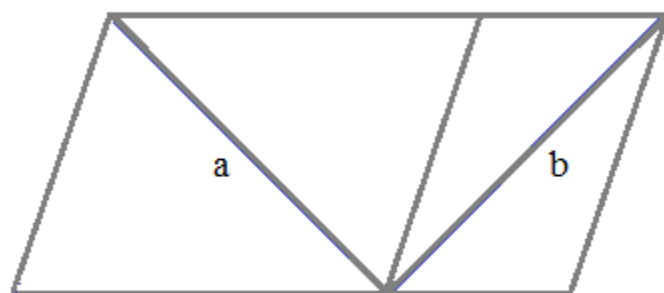Area of rectangle is lw = 20(12) = 240 square units

u + v

v

u + v

u

v + u

u

u + v

v

v

u

"parallelogram"
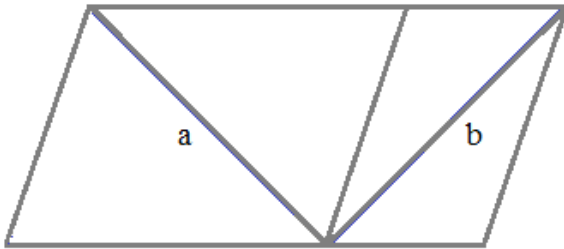
u

v

u + v

u + v

u

v

(note: the diagonal is the sum of the
two vectors)

THE PARALLELOGRAM ILLUSION

a

b

Which line segment is longer?   a or b?

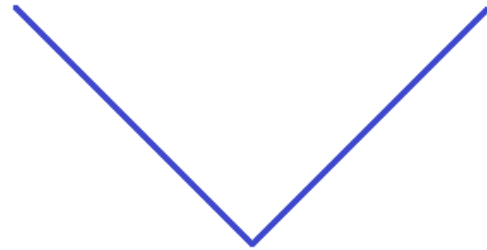# THE (SANDER) PARALLELOGRAM ILLUSION

In the diagram, diagonal 'a' bisects the left parallelogram. And, diagonal 'b' bisects the right parallelogram.

Which line segment is longer?   a or b?

Neither. They are the same length!
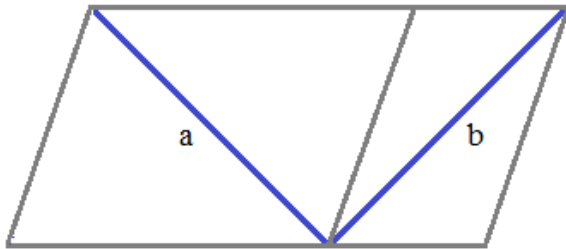
The blue angles are identical...

ANOTHER PARALLELOGRAM ILLUSION...

The interior line segments are congruent...

SHEPARD'S PARALLELOGRAM ILLUSION

Are the parallelograms the same size?

Is the height of the above figure the
same and the "narrowness" of the side figure?

(Snickers Candy Bar Logo)

Secret Admirer

"Flowers and a special delivery for Miss Boxley."

"In the next room.."
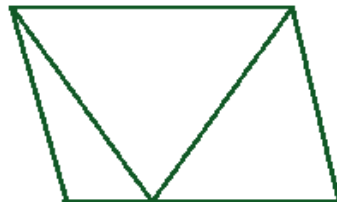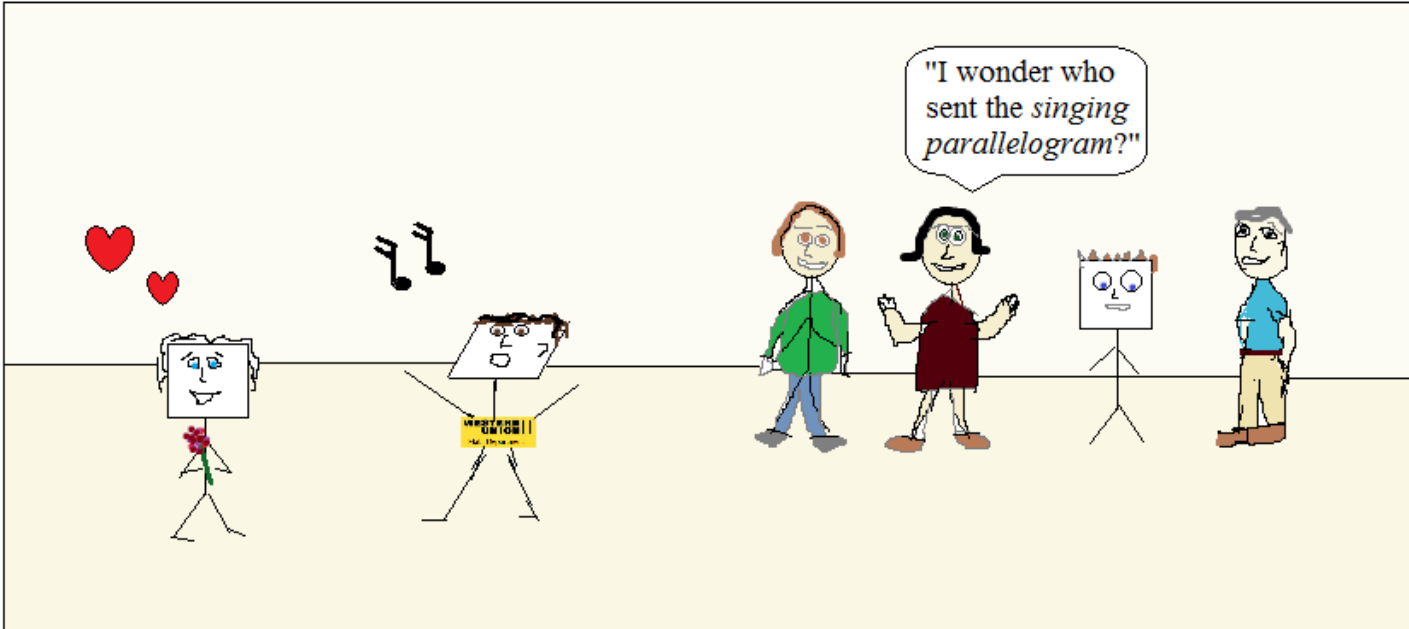
Today is 14 February

"I wonder who sent the *singing parallelogram?*"

Busiest day of the year for florists....
(and, math messengers!)

LanceAF #71 2-14-13
www.mathplane.com
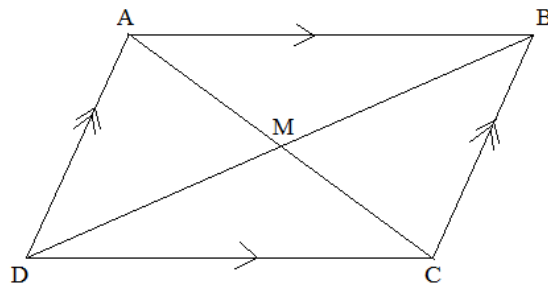
I. List 5 properties of parallelograms.
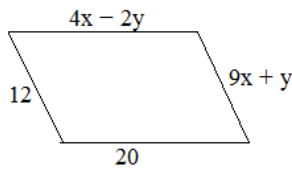
1) Opposite sides are parallel

2)

3)

4)

5)

II. For parallelogram ABCD, answer and explain why:

1) $\overline{AB} \cong$ _____

2) $\overline{DM} \cong$ _____

3) $\angle AMD \cong$ _____

4) $\angle BCD \cong$ _____

5) $180^{\circ} - m\angle BAD = \underline{\quad m\angle \quad}$

6) $2\overline{AM} =$ _____

III. Solve:

(Assume each quadrilateral is a parallelogram)

4x − 2y

12

9x + y

20

Find x and y:

30°

Q   U

43°

D   A

Find: $\angle UDA$

$\angle UQD$

42 − 11x

P   R

x^2

L   A

Find the length of $\overline{LR}$:

ANSWERS at the end of the packet…

(Building in Copenhagen – courtesy of Flickr)

(Building in Hamburg – courtesy of Flickr)

Thanks for visiting. Hope this introduction offered something a bit different.
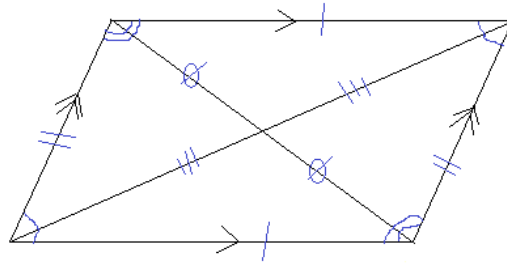
If you have questions, suggestions, or requests, let us know.

Enjoy,

Mathplane.com

Parallelograms Quiz

I. List 5 properties of parallelograms.

1) Opposite sides are parallel

2) Opposite sides are congruent

3) Opposite angles are congruent

4) Consecutive angles are supplementary

5) Diagonals bisect each other

II. For parallelogram ABCD, answer and explain why:

1) $\overline{AB} \cong$ ___$\overline{DC}$___   opposite sides are congruent

2) $\overline{DM} \cong$ ___$\overline{BM}$___   diagonals bisect each other

3) $\angle AMD \cong$ ___$\angle BMC$___   vertical angles congruent

4) $\angle BCD \cong$ ___$\angle BAD$___   opposite angles congruent

5) $180^{\circ} - m\angle BAD =$ ___$m\angle ABC$___ OR ___$\angle ADC$___
     consecutive angles are supplementary

6) $2\overline{AM} =$ ___$\overline{AC}$___   diagonals bisect each other...
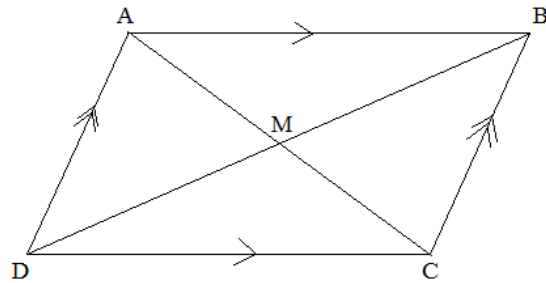
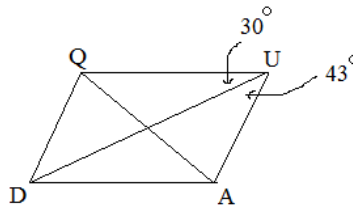**III.** Solve:

(Assume each quadrilateral is a parallelogram)
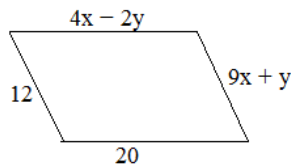
Find x and y:

$4x - 2y$
12
$9x + y$
20

$9x + y = 12$
$4x - 2y = 20$

use combination method

$18x + 2y = 24$
$4x - 2y = 20$

$22x = 44$
$x = 2$
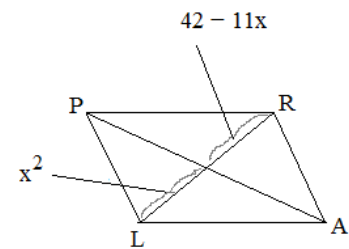
If x = 2, then
y = −6

Find: $\angle UDA$ 30 degrees
     (because alternate interior
     angles are congruent)

$\angle UQD$
107 degrees
(because QUA is 73 degrees, and
consecutive angles are supplementary)

30°
43°

Q   U
D   A

since x = 3, the lengths are
9 and 9.... $\overline{LR} = 18$

Find the length of $\overline{LR}$:

$42 - 11x$
x^2
P   R
L   A

since diagonal is bisected,
the segments are congruent:
$x^2 = 42 - 11x$
$x^2 + 11x - 42 = 0$
$(x + 14)(x - 3) = 0$
$x = -14$ or 3
or, if x = -14, lengths are 196 and
196.... $\overline{LR} = 392$