

Trapezoids

Trapezoids are quadrilaterals, but they are **not parallelograms**. They don't follow parallelogram rules. They have rules of their own.

RULE #1: **ONE SET** of opposite sides is **parallel**, but the other set is not.

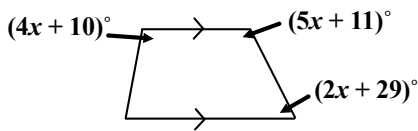
RULE #2: The opposite parts do not have to be congruent.

RULE #3: There are **TWO SETS** of **same-side interior angles**. They are supplementary.

RULE #4: On **Isosceles Trapezoids**, the measures and angles related to one non-parallel side are a reflection of (and therefore congruent to) the matching measures on the other non-parallel side.

The figures below are trapezoids. Determine the value of x .

EXAMPLE



The same side interior angles are supplementary (the ones that are on the line going through both parallels). Ignore $(4x+10)^\circ$. The other two add to equal 180° .

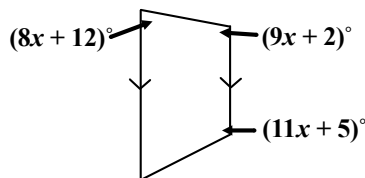
$$5x + 11 + 2x + 29 = 180$$

$$7x + 40 = 180$$

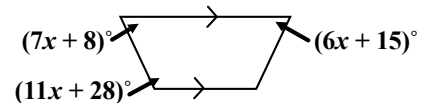
$$7x = 140$$

$$x = \boxed{20}$$

1.

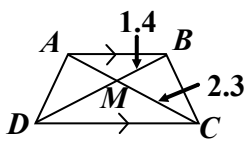


2.



EXAMPLE

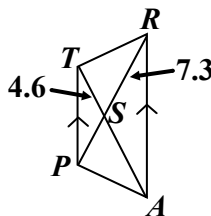
$ABCD$ is an **isosceles trapezoid**.
 $AC = ?$



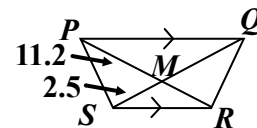
Since it's isosceles, one side reflects the other (the non-parallel parts).
 $SO, AM = BM \dots AM = 1.4$

$$AC = AM + MC = 1.4 + 2.3 = \boxed{3.7}$$

3. $TRAP$ is an **isosceles trapezoid**.
 $RP = ?$



4. $PQRS$ is an **isosceles trapezoid**.
 $PR = ?$



Kites

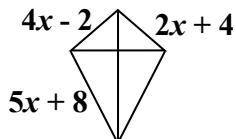
A **kite** is another kind of quadrilateral that is not a parallelogram. Kites follow two rules:

RULE #1: The diagonals cross at a right angle.

RULE #2: The parts on one side of the longer diagonal are a reflection of the parts on the other (congruent)

The figures below are kites. Determine the value of x .

EXAMPLE



The left matches the right (because the long diagonal goes down).

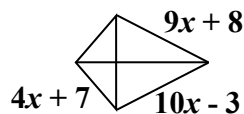
$$4x - 2 = 2x + 4$$

$$2x - 2 = 4$$

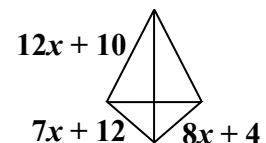
$$2x = 6$$

$$x = \boxed{3}$$

5.




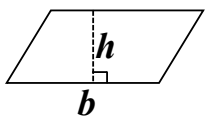
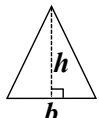
6.





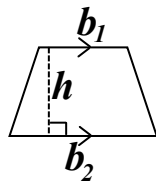
Determining Area

Solving for area is all about following the formula. If you have the formula, then you have everything that you need.




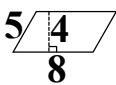
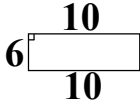
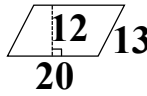
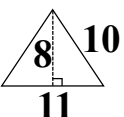
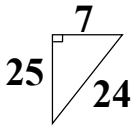
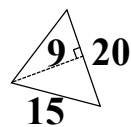
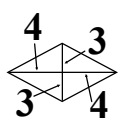
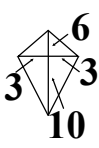

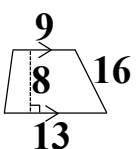
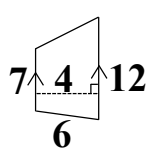
Three area formulas that you already know:

<p>Circle</p>  $A = \pi r^2$	<p>Parallelogram</p>  $A = bh$	<p>Triangle</p>  $A = \frac{bh}{2}$
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And two new ones:

<p>Rhombus and Kite</p>  $A = \frac{d_1 d_2}{2}$  <p><i>(d₁ & d₂ are the total lengths of the diagonals)</i></p>	<p>Trapezoid</p>  $A = \frac{(b_1 + b_2)h}{2}$
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Once you have your formulas, all you have to do is plug in the information and solve. Determine the area of each.

<p>EXAMPLE Leave your answer in terms of π.</p>  $A = \pi r^2 = \pi(5)^2 = \boxed{25\pi}$	<p>7. Leave your answer in terms of π.</p> 	<p>8. Leave your answer in terms of π.</p> 
<p>EXAMPLE</p>  $A = bh = (8)(4) = \boxed{32}$	<p>9.</p> 	<p>10.</p> 
<p>EXAMPLE</p>  $A = \frac{bh}{2} = \frac{(11)(8)}{2} = \frac{88}{2} = \boxed{44}$	<p>11.</p> 	<p>12.</p> 
<p>EXAMPLE</p>  $A = \frac{d_1 d_2}{2} = \frac{(4+4)(3+3)}{2} = \frac{(8)(6)}{2} = \frac{48}{2} = \boxed{24}$	<p>13.</p> 	<p>14.</p> 
<p>EXAMPLE</p>  $A = \frac{(b_1 + b_2)h}{2} = \frac{(9+13)(8)}{2} = \frac{(22)(8)}{2} = \frac{176}{2} = \boxed{88}$	<p>15.</p> 	<p>16.</p> 