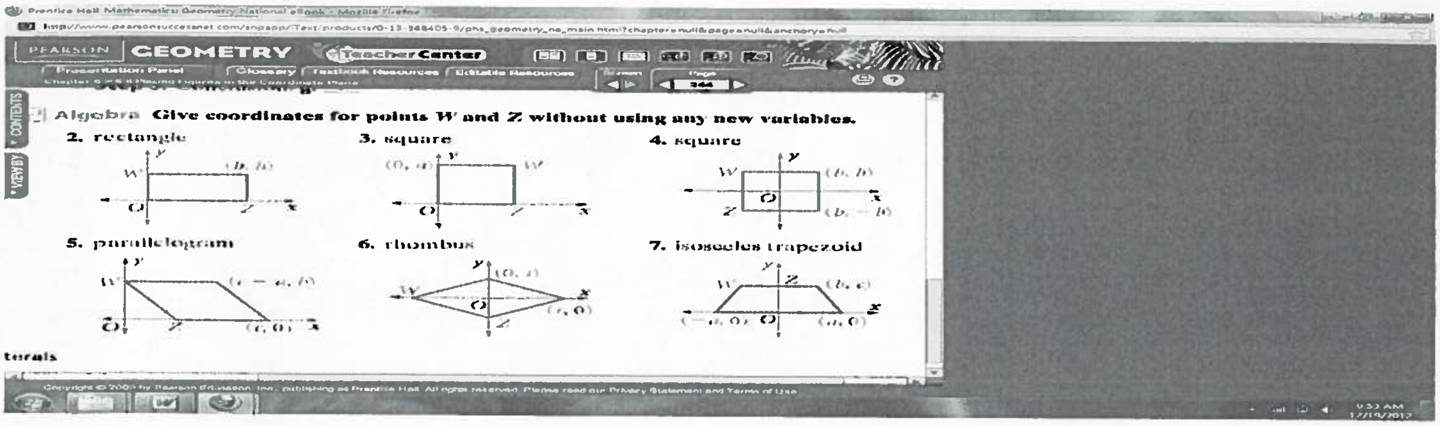
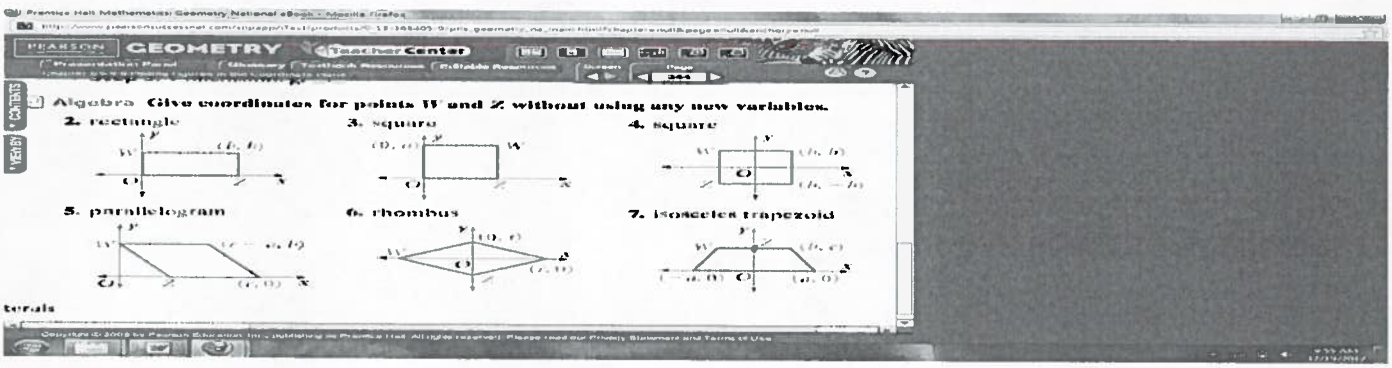
Name: Key Hour:

Quadrilaterals on the Coordinate Plane

6.6 #s 2-7, 23-25

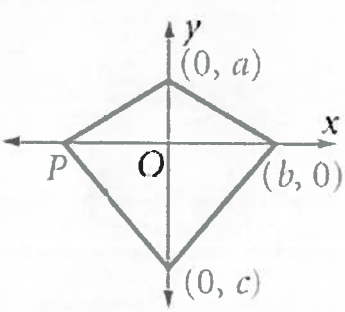


W: (0, h), Z: (b, 0) W: (a, 0), Z: (a, a) W: (-b, b), Z: (-b, -b)

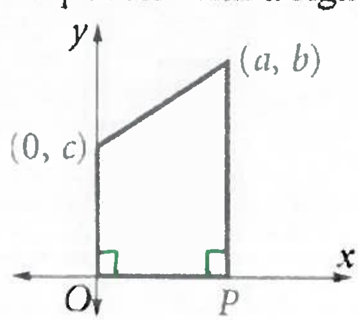


W: (0, b), Z: (a, 0) W: (-r, 0), Z: (0, -t) W: (-b, c), Z: (0, c)

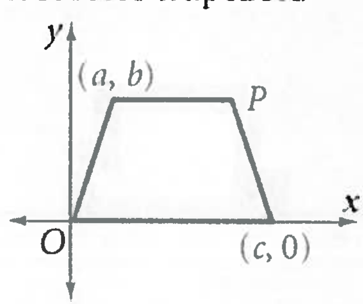
25. kite



24. trapezoid with a right ∠



23. isosceles trapezoid

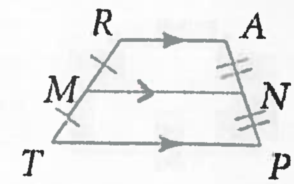


P= (-b, 0) P= (a, 0) P= (c-a, b)

Theorem 6-18	Trapezoid Midsegment Theorem

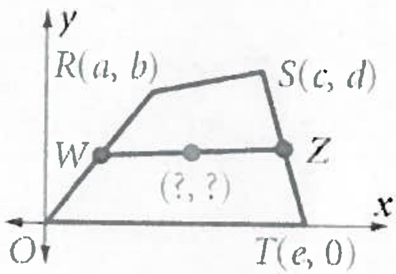
(1) The midsegment of a trapezoid is parallel to the bases.
(2) The length of the midsegment of a trapezoid is half the sum of the lengths of the bases.

$\overline{MN} \parallel \overline{TP}$, $\overline{MN} \parallel \overline{RA}$, and $MN = \frac{1}{2}(TP + RA)$.



1. W and Z are the midpoints of $\overline{OR}$ and $\overline{ST}$, respectively. In parts (a)–(c), find the coordinates of W and Z.

a.

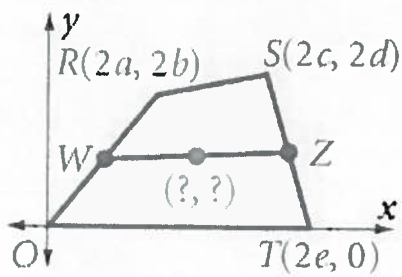


midpt of $\overline{RO} = \left(\frac{a-0}{2}, \frac{b-0}{2}\right) = \left(\frac{a}{2}, \frac{b}{2}\right)$

midpt of $\overline{ST} = \left(\frac{c-e}{2}, \frac{d-0}{2}\right) = \left(\frac{c-e}{2}, \frac{d}{2}\right)$

W: $\left(\frac{a}{2}, \frac{b}{2}\right)$, Z: $\left(\frac{c-e}{2}, \frac{d}{2}\right)$

b.

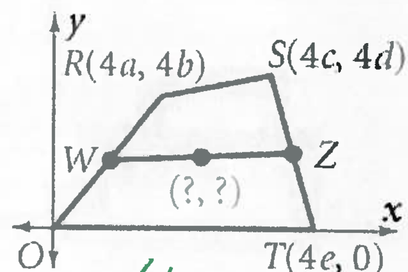


$W = \left(\frac{2a}{2}, \frac{2b}{2}\right) = (a, b)$

$Z = \left(\frac{2c-2e}{2}, \frac{2d-0}{2}\right) = (c-e, d)$

W: (a, b), Z: $(c-e, d)$

c.

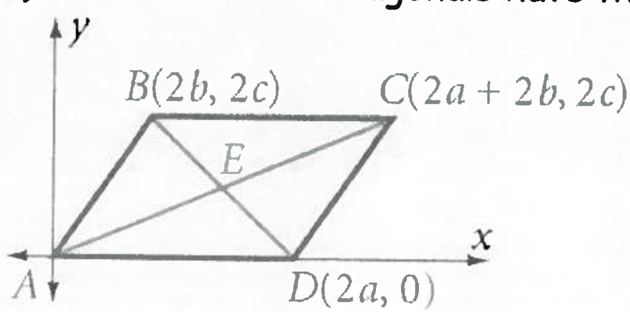


$W = \left(\frac{4a-0}{2}, \frac{4b-0}{2}\right) = (2a, 2$

$Z = \left(\frac{4c-4e}{2}, \frac{4d-0}{2}\right) = (2c-2e,$

W: $(2a, 2b)$, Z: $(2c-2e, 2d)$

2.) Show that both diagonals have the same midpoint.



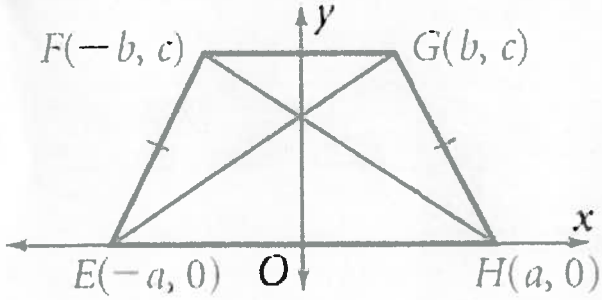
midpt $\overline{BD} = \left(\frac{2b+2a}{2}, \frac{2c+0}{2}\right) = (b+a, c)$

midpt $\overline{AC} = \left(\frac{2a+\cancel{2b+0}}{2}, \frac{2c}{2}\right) = (a+b, c)$

So diagonals bisect each other

If the diagonals have the same midpoint, then the quadrilateral is a $\boxed{\text{parallelogram}}$

3.) Use the distance formula to show both diagonals are congruent.



$\overline{FH} = \sqrt{(-b-a)^2+(c-0)^2} = \sqrt{(-b-a)^2+c^2} = \sqrt{b^2+2ab+a^2+c^2}$

$\overline{GE} = \sqrt{(b+a)^2+(c-0)^2} = \sqrt{(b+a)^2+c^2} = \sqrt{b^2+2ab+a^2+c^2}$

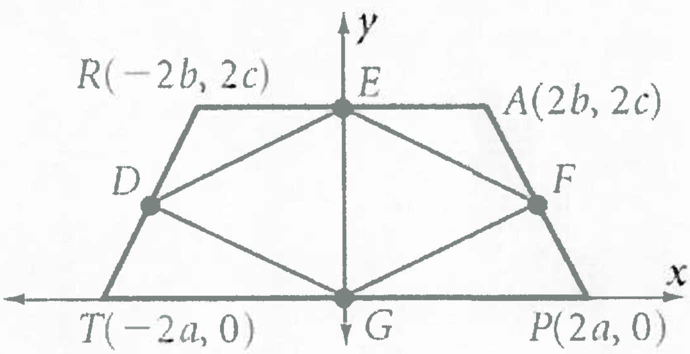
thus, $\overline{FH} \cong \overline{GE}$

If a trapezoid is Isosceles, then the diagonals are congruent.

4.) TRAP is an isosceles trapezoid. DEFG is a quadrilateral formed by connecting the midpoints of the sides of TRAP.

a.) Find the coordinates of points D, E, F, and G.

$D(-b-a,\ c)$ $E(0,\ 2c)$ $F(b+a,\ c)$ $G(0,\ 0)$



midpt. $D = \left(\frac{-2b+-2a}{2}, \frac{2c+0}{2}\right) = (-b-a,\ c)$

midpt $F = \left(\frac{2b+2a}{2}, \frac{2c+0}{2}\right) = (b+a,\ c)$

b.) Prove DEFG is rhombus. (Be sure to show work and state your conclusion clearly.)

~~slope~~

$\overline{DE} = \sqrt{(-b-a-0)^2+(c-2c)^2} = \sqrt{(-b-a)^2+c^2} = \sqrt{b^2+2ab+a^2+c^2}$

$\overline{EF} = \sqrt{(0-(b+a))^2+(2c-c)^2} = \sqrt{(-b-a)^2+c^2} = \sqrt{b^2+2ab+a^2+c^2}$

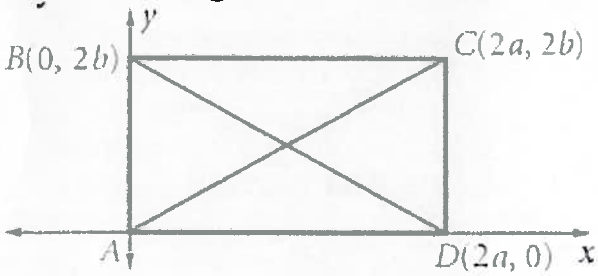
$\overline{FG} = \sqrt{(b+a-0)^2+(c-0)^2} = \sqrt{(b+a)^2+c^2} = \sqrt{b^2+2ab+a^2+c^2}$

$\overline{GD} = \sqrt{(0-(-b-a))^2+(0-c)^2} = \sqrt{(b+a)^2+c^2} = \sqrt{b^2+2ab+a^2+c^2}$

$\boxed{\text{So } \overline{DE} \cong \overline{EF} \cong \overline{FG} \cong \overline{GD}}$

Since all sides are congruent. DEFG is a rhombus.

5.) Prove that the diagonals of rectangle are congruent <u>and</u> bisect each other (i.e. prove that segments AC and BD are the same length and have the same midpoint).



$\overline{BD} = \sqrt{(0-2a)^2+(2b-0)^2} = \sqrt{(-2a)^2+(2b)^2}$

$\overline{AC} = \sqrt{(2a-0)^2+(2b-0)^2} = \sqrt{(2a)^2+(2b)^2}$

so $\overline{BD} \cong \overline{AC}$

midpt of $\overline{BD} = \left(\frac{0+2a}{2}, \frac{2b+0}{2}\right) = (a, b)$

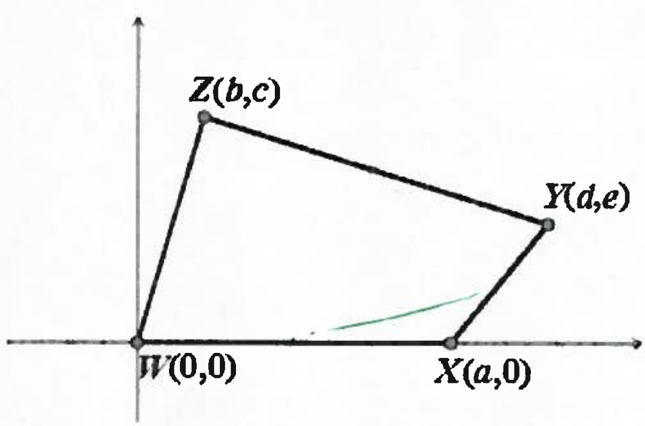
midpt. of $\overline{AC} = \left(\frac{2a+0}{2}, \frac{2b+0}{2}\right) = (a, b)$

If the diagonals of a quadrilateral are congruent and bisect each other, then the quadrilateral is a rectangle.

6.) Quadrilateral WXYZ has no special characteristics.

a.) Find the midpoints of each side of WXYZ and name them A, B, C, and D.

mid WZ $\left(\frac{b}{2}, \frac{c}{2}\right)$ mid ZY $\left(\frac{b+d}{2}, \frac{c+e}{2}\right)$ mid YX $\left(\frac{d+a}{2}, \frac{e}{2}\right)$ mid XW $\left(\frac{a}{2}, 0\right)$



b.) Find the slopes of the sides of quadrilateral ABCD.

slope of WZ is $\frac{c-0}{b-0} = \boxed{\frac{c}{b}}$

slope of ZY is $\boxed{\frac{d-b}{e-c}}$

slope of YX is $\frac{a-d}{0-e} = \boxed{\frac{a-d}{-e}}$

slope of XW is $\cancel{\frac{a-0}{0-0}}$ ~~or undefined~~ $\frac{0-0}{a-0} = \boxed{0}$

c.) If you connect the midpoints of the sides of any quadrilateral, the new quadrilateral that is formed will be a parallelogram.