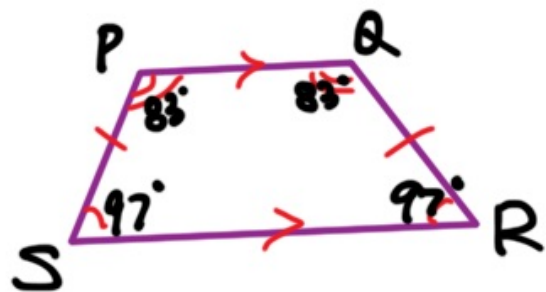
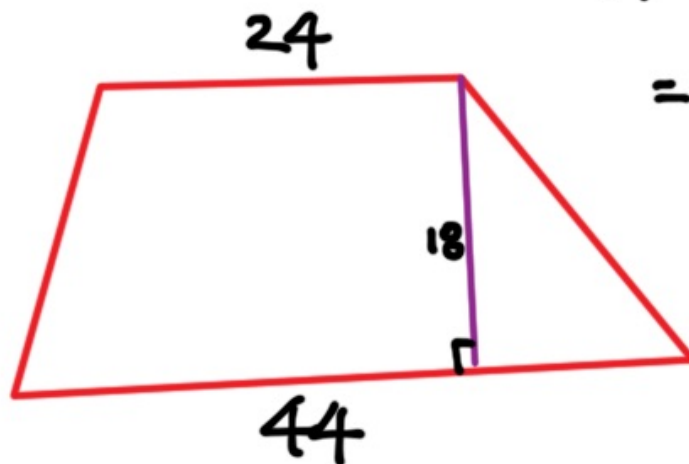


## Trapezoids

8.2.1 In quadrilateral  $PQRS$ ,  $\overline{PQ} \parallel \overline{RS}$ ,  $\overline{PS}$  is not parallel to  $\overline{QR}$ ,  $QR = PS$ , and  $\angle P = 83^\circ$ . Find the rest of the angles of the trapezoid.



8.2.2 Find the area of a trapezoid with bases 44 and 24 and with height 18.

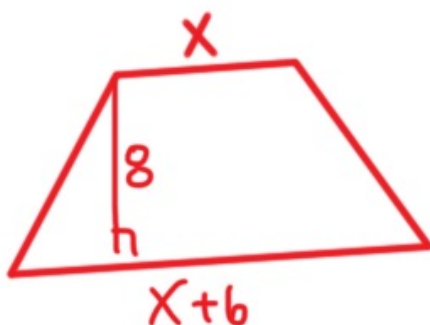


$$A = \frac{(b_1 + b_2)h}{2}$$

$$= \frac{(24 + 44)18}{2}$$

$$= \boxed{612}$$

8.2.3 The area of trapezoid  $ABCD$  is 96. One base is 6 units longer than the other, and the height of the trapezoid is 8. Find the length of the shorter base.

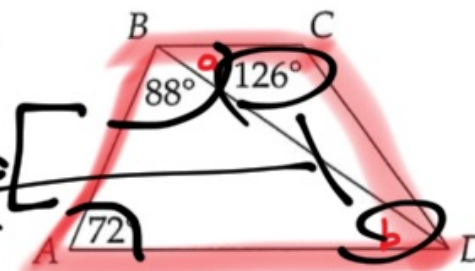


$$A = 96$$
$$= \frac{(x + x + 6) 8}{2}$$

$$24 = 2x + 6$$

$$9 = x$$

8.2.4  $ABCD$  shown at right is a trapezoid with  $\overline{BC} \parallel \overline{AD}$ ,  $\angle ABD = 88^\circ$ ,  $\angle A = 72^\circ$ , and  $\angle C = 126^\circ$ . Find  $\angle ADC$  and  $\angle CBD$ .



$$126 + m\angle ADC = 180 \quad \underline{180^\circ}$$

$$m\angle ADC = \boxed{54^\circ}$$

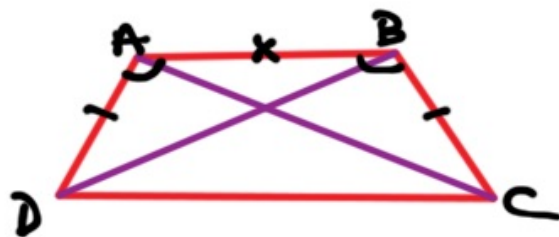
$$72 + 88 + a = 180$$

$$160 + a = 180$$

$$a = 20$$

$$m\angle CBD = 20$$

8.2.5 Prove that the diagonals of an isosceles trapezoid are congruent.



$$\triangle ABD \cong \triangle BAC$$

by SAS

$$\overline{AC} \cong \overline{BD} \text{ by CPCTC}$$

## Mixed Review

8.8.1 In rectangle  $ABCD$ ,  $H$  is the midpoint of  $\overline{BC}$ ,  $E$  lies on  $\overline{AD}$ , and  $F$  lies on  $\overline{AB}$ . In rectangle  $CEFG$ ,  $H$  lies on  $\overline{FG}$  and  $HG = 3$ . Given  $\angle DEC = 45^\circ$ , what is the positive difference between the areas of these two rectangles?

$x^2 + x^2 = 3^2$   
 $x^2 = \frac{9}{2}$   
 $x = \frac{3}{\sqrt{2}}$

$(3\sqrt{2})^2 + (3\sqrt{2})^2 = a^2$   
 $18 + 18 = a^2$   
 $6 = a$

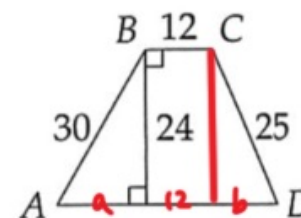
$A_{CEFG} = 3 \cdot 9 = 27$

$AB = \frac{3}{\sqrt{2}} + 3\sqrt{2}$   
 $BC = 3\sqrt{2} + 3\sqrt{2}$   
 $A_{ABCD} = 6\sqrt{2} \left( \frac{3}{\sqrt{2}} + 3\sqrt{2} \right)$   
 $= 18 + 36 = 54$

$54 - 27 = \boxed{27}$

8.8.2 Find the area of trapezoid  $ABCD$  shown at right.

$$A = \frac{(12 + 37)24}{2} = 588$$



$$a^2 + 24^2 = 30^2$$

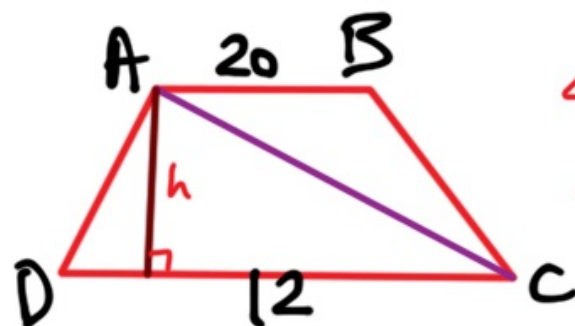
$$a = 18$$

$$b^2 + 24^2 = 25^2$$

$$b = 7$$

$$\begin{aligned} \text{Base} &= 7 + 18 + 12 \\ &= 37 \end{aligned}$$

8.8.3 Quadrilateral  $ABCD$  is a trapezoid with  $\overline{AB} \parallel \overline{CD}$ . We know  $AB = 20$  and  $CD = 12$ . What is the ratio of the area of  $\triangle ACB$  to the area of  $ABCD$ ? (Source: MATHCOUNTS) Hints: 376



$$\text{Trapezoid Area} = \frac{(12+20)h}{2} = 16h$$

$$\triangle ABC \text{ Area} = \frac{20 \cdot h}{2} = 10h$$

$$\frac{10h}{16h} = \boxed{\frac{5}{8}}$$

8.8.4 The diagonals of  $EFGH$  are perpendicular. Prove that  $EF^2 + GH^2 = FG^2 + EH^2$ .  
 (A quadrilateral with perpendicular diagonals is sometimes referred to as **orthodiagonal**.) Hints: 572

