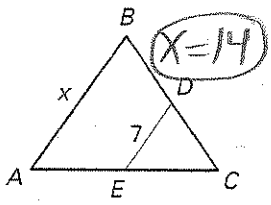
Adv. Geometry 5.1

Name Key

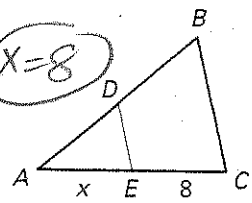
$\overline{DE}$ is a midsegment of $\triangle ABC$. Find the value of x.

1.



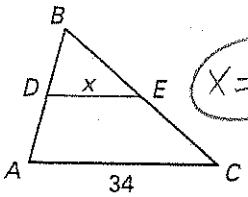
$x = 14$

2.



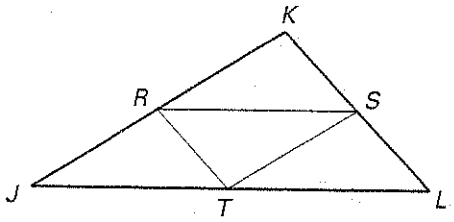
$x = 8$

3.



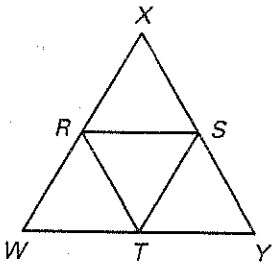
$x = 17$

In $\triangle JKL$, $\overline{JR} \cong \overline{RK}$, $\overline{KS} \cong \overline{SL}$, and $\overline{JT} \cong \overline{TL}$. Copy and complete the statement.



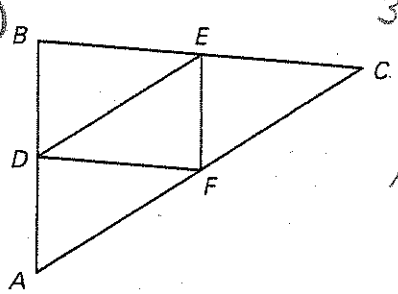
4. $\overline{RS} \parallel$? $\overline{JL}$
5. $\overline{ST} \parallel$? $\overline{JK}$
6. $\overline{KL} \parallel$? $\overline{RT}$
7. $\overline{SL} \cong$? $\cong$? $\overline{KS} \cong \overline{RT}$
8. $\overline{JR} \cong$? $\cong$? $\overline{RK} \cong \overline{TS}$
9. $\overline{JT} \cong$? $\cong$? $\overline{TL} \cong \overline{RS}$

Use $\triangle WXY$, where R, S, and T are midpoints of the sides.



1. $\overline{RS} \parallel$? $\overline{WY}$
2. $\overline{ST} \parallel$? $\overline{WX}$
3. If $TY = 4$, then $RS =$? . 4
4. If $RT = 7$, then $XY =$? . 14

Use the diagram of $\triangle ABC$ where D, E, and F are the midpoints of the sides.



5. If $FE = 6.5x - 10$ and $AB = 3x + 20$, then $AB =$? . 32
6. If $DF = 3.5x + 6$ and $BC = 3x + 36$, then $DF =$? . 27

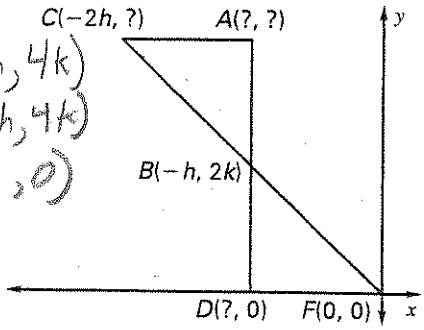
$BC = 2(DF)$
$3x + 36 = 2(3.5x + 6)$
$3x + 36 = 7x + 12$
$24 = 4x$
$6 = x$

$DF = 3.5(6) + 6$
$= 27$

5 $AB = 2(FE)$
$3x + 20 = 2(6.5x - 10)$
$3x + 20 = 13x - 20$
$40 = 10x$
$4 = x$
$AB = 3(4) + 20$
$AB = 32$

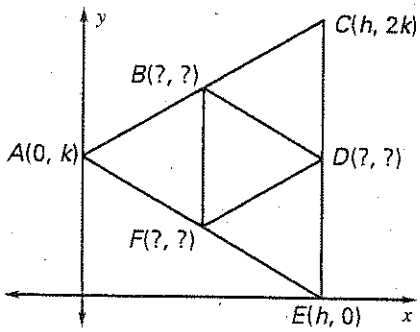
Find the unknown coordinates of the points in the figure.

7.



$A(-h, 4k)$
$C(-2h, 4k)$
$D(-h, 0)$

8.



$B(\frac{1}{2}h, \frac{3}{2}k)$
$D(h, k)$
$F(\frac{1}{2}h, \frac{1}{2}k)$

In Exercises 10 and 11, write a coordinate proof.

10. **GIVEN:** Coordinates of $\triangle DEF$
G is the midpoint of $\overline{DE}$.
H is the midpoint of $\overline{EF}$.

PROVE: $GH = \frac{1}{2}DF$

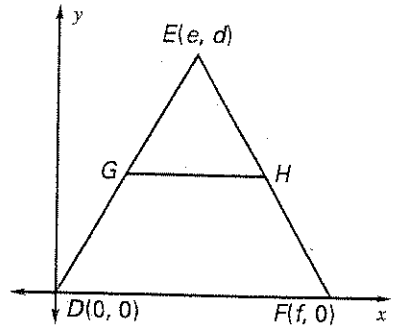
$DF = |f - 0| = f$

$G\left(\frac{1}{2}e, \frac{1}{2}d\right)$

$H\left(\frac{e+f}{2}, \frac{1}{2}d\right)$

$\downarrow$

$H\left(\frac{1}{2}e + \frac{1}{2}f, \frac{1}{2}d\right)$



$GH = \sqrt{\left(\frac{1}{2}e - \left(\frac{1}{2}e + \frac{1}{2}f\right)\right)^2 + \left(\frac{1}{2}d - \frac{1}{2}d\right)^2}$

$= \sqrt{\left(\frac{-1}{2}f\right)^2 + 0^2}$

$= \sqrt{\frac{1}{4}f^2} = \frac{1}{2}f = GH$

$GH = \frac{1}{2}f = \frac{1}{2}DF$

11. **GIVEN:** $\overline{DB}$ bisects $\angle ABC$.

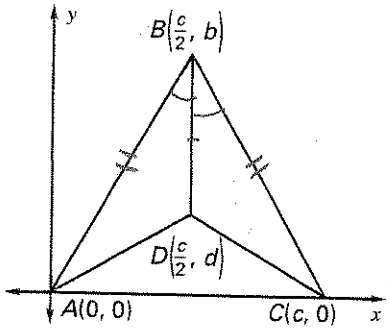
PROVE: $\triangle ABD \cong \triangle CBD$

$AB = \sqrt{\left(\frac{c}{2}\right)^2 + b^2}$

$AB = \sqrt{\frac{c^2}{4} + b^2}$

$CB = \sqrt{\left(c - \frac{c}{2}\right)^2 + (0 - b)^2} = \sqrt{\left(\frac{c}{2}\right)^2 + (-b)^2}$

$= \sqrt{\frac{c^2}{4} + b^2}$



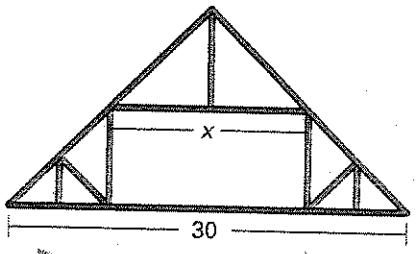
$\angle ABD \cong \angle CBD$

$\overline{BD} \cong \overline{BD}$

$\overline{AB} \cong \overline{CB}$

$\triangle ABD \cong \triangle CBD$ by SAS

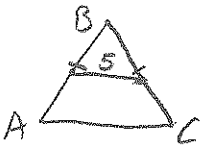
12. **Roof Trusses** An attic truss provides storage space within the roof of a house. The midsegment of the truss is the ceiling of the storage space. If the base of the truss is 30 feet, find the width x of the storage space. *Explain.*



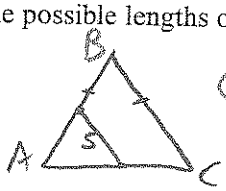
$x = 15$ ft

Midsegment is $\frac{1}{2}$ third side of $\triangle$

1. Suppose $\triangle ABC$ is isosceles with a perimeter of 24 inches. If a midsegment of $\triangle ABC$ is 5 inches, find the possible lengths of the sides of the triangle. You should get two answers.



or



$BC = 10 = AB \rightarrow AC = 4$

$AC = 10 \rightarrow AB = BC = 7$

2. In the diagram, A is located at (0, 0), G is located at (5, 4), and I is located at (8, 4). Find the coordinates of B, C, D, E, F, and H. Assume that D, E, F, G, H, and I are midpoints.

$B(8, 16)$

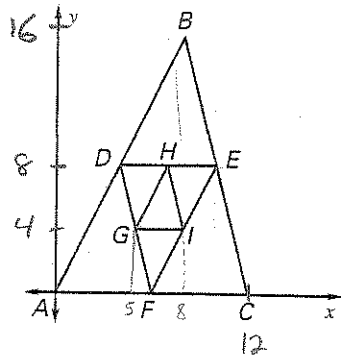
$C(12, 0)$

$D(4, 8)$

$E(10, 8)$

$F(6, 0)$

$H(7, 8)$



$DE = 6$