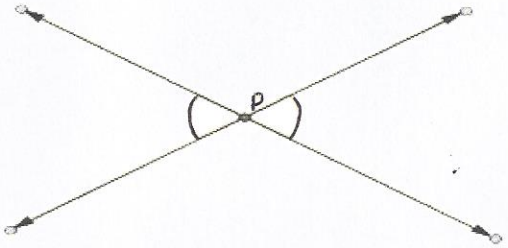
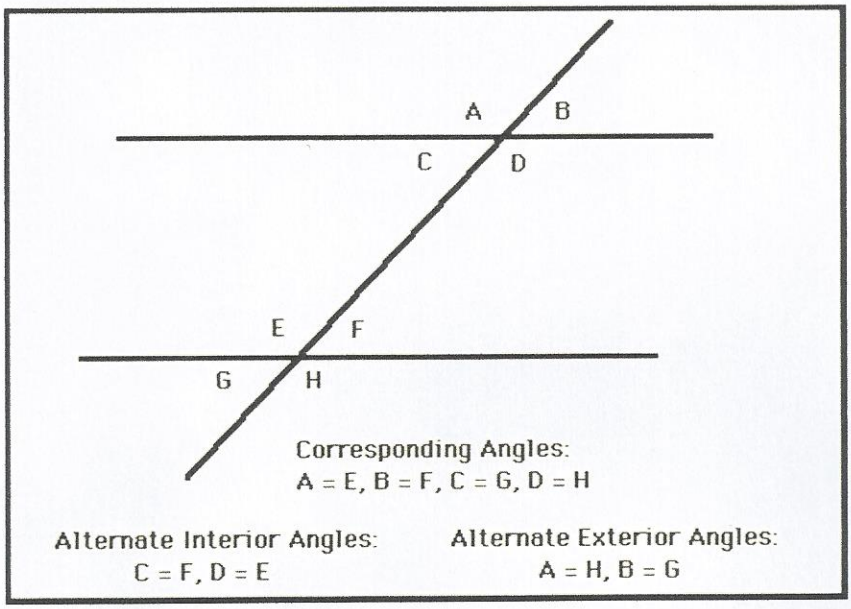
Math III Proving Geometric Theorems Review

Key

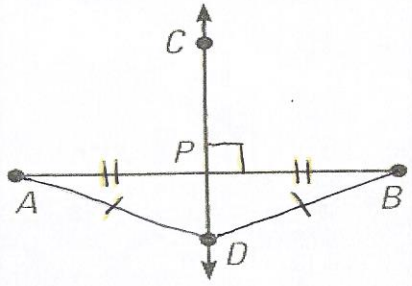
Vertical Angles – When two lines intersect, the angles across from each other are vertical angles and are congruent



Parallel lines cut by a transversal produce congruent alternate interior and corresponding angles.

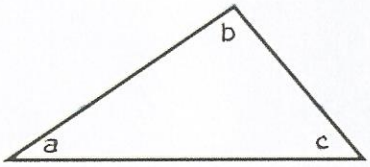


Perpendicular bisector – Points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints



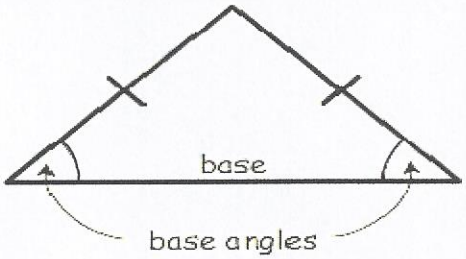
***D* is on $\overleftrightarrow{CP}$.**

Interior angles of a triangle add up to 180^0

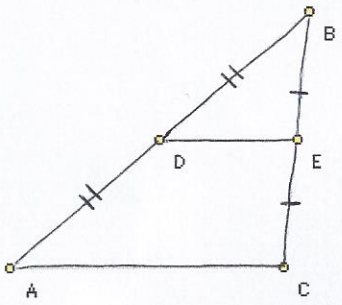


a + b + c = 180 degrees

Isosceles Triangle – base angles are congruent

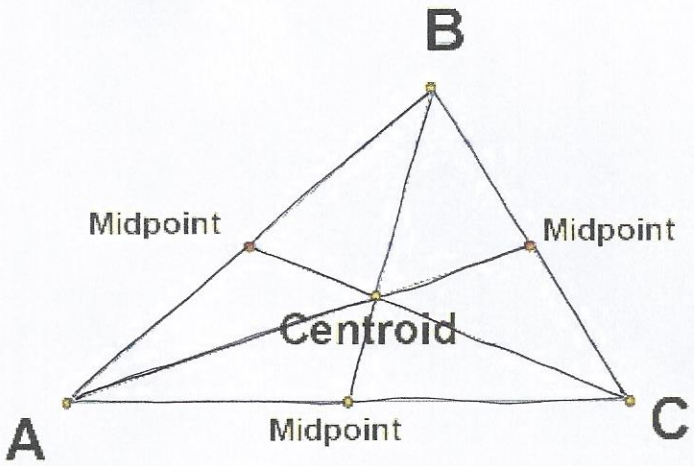


Triangle mid-segment theorem



$\overline{DE}$ is parallel to $\overline{AC}$.
$\overline{DE}$ is also half the length of $\overline{AC}$.

Centroid – where the medians of a triangle meet



The vertex to the centroid is $^2/_3$ the length of the whole segment

Parallelograms

Properties

- Opposite sides are parallel
- Opposite angles are congruent
- Opposite sides are congruent
- Diagonals bisect each other

Rectangles

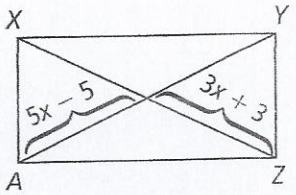
A rectangle is a type of parallelogram and it holds all the properties of a parallelogram but adds...

4 right angles
Diagonals are congruent

1. Which of the following conditions or set of conditions must be met for a parallelogram to be a rectangle?
   A. Diagonals are perpendicular
   (B.) Diagonals are congruent
   C. All sides are congruent
   D. The length of a diagonal is equal to the length of a side

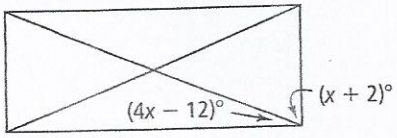
2. For what value of x is $XYZA$ a rectangle?
   A. 2
   B. 3
   (C.) 4
   D. 5

$5x-5=3x+3$
$-3x \quad -3x$
$2x-5=3$
$+5 \quad +5$
$2x=8 \quad x=4$



3. What is the value of x for the rectangle?

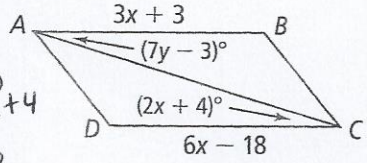
$x+2+4x-12=90$
$5x-10=90$
$5x=100$
$x=20$



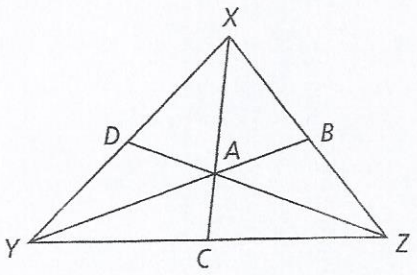
4. What is the value of x and y for the parallelogram?

$3x+3=6x-18$
$3=3x-18$
$21=3x$
$x=7$

$7y-3=2x+4$ (-4)
$7y-3=18$
$7y=21$
$y=3$



5. In ΔXYZ, A is the centroid.



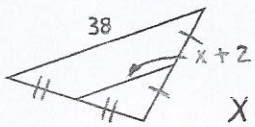
A. If DZ=12, find ZA and AD.

$ZA = 8 \quad AD = 4$

B. If ZB is 5, what other segment length can you prove? Explain how you can prove the length.

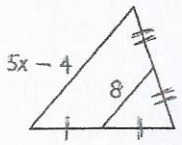
$XB = 5$, since A is a centroid YB intersects XZ at the midpoint. So $ZB \cong XB$

6. Find the value of x



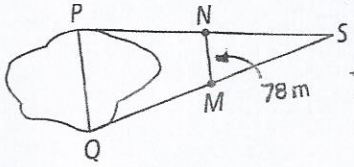
$x+2 = \frac{1}{2}(38)$
$x+2 = 19$
$x = 17$

7. Find the value of x



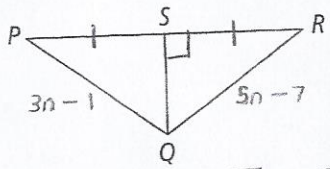
$5x-4 = 16$
$5x = 20$
$x = 4$

8. A surveyor needs to measure the distance PQ across the lake. Beginning at point S, she locates the midpoints, of $\overline{SQ}$ and $\overline{SP}$ at M and N. She then measures $\overline{NM}$. What is PQ?



$78(2)$
$= 156$

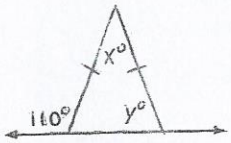
9. What is the length of $\overline{QR}$?



$3n-1 = 5n-7$
$-3n \quad -3n$
$-1 = 2n-7$
$6 = 2n$
$n = 3$

$\overline{QR} = 5n-7$
$= 5(3)-7$
$= 15-7$
$= 8$

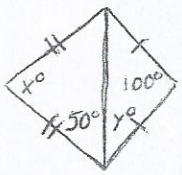
10. Solve for x and y.



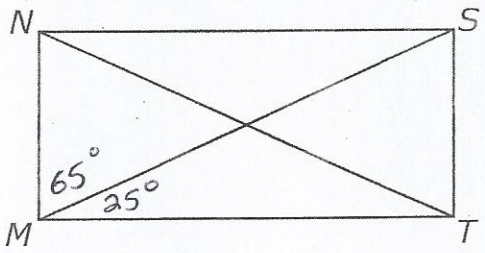
$180-110 = 70$

$y = 70^\circ$
$x = 40^\circ$

11. Solve for x and y.



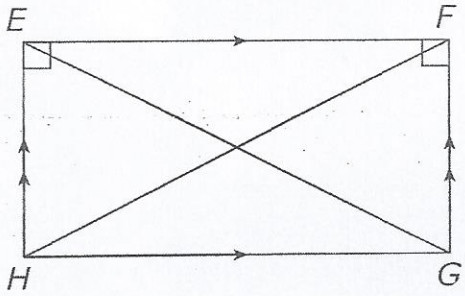
12. In the figure below, $NSTM$ is a rectangle and $m < SMN = 65$.



What is $m < NTM$?

A. 12.5 (B.) 25 C. 50 D. 65

13. Given:



$FG = 2x + 4$
$EG = 3x + 9$
$FH = 7x - 3$

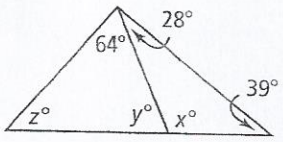
EG = FH
3x + 9 = 7x - 3
-3x -3x
9 = 4x - 3
12 = 4x
x = 3

FG = EH
= 2x + 4
= 2(3) + 4
= 6 + 4
= 10

What is the length of $\overline{EH}$?

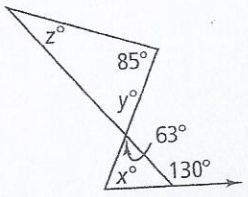
A. 18 (B.) 10 C. 9 D. 5

14. Find x, y, and z.



x = 113
y = 67
z = 49

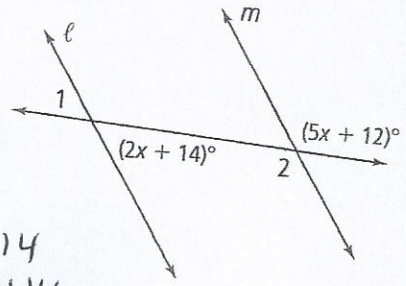
15. Find x, y, and z.



x = 67
y = 63
z = 32

16. Use the figure at the right. If $l \| m$, what is the $m < 1$?

A. 22 B. 58 C. 122 D. 130



$5x+12+2x+14=180$

$7x+26=180$

$7x=154$

$x=22$

$m\angle 1 = 2x+14$

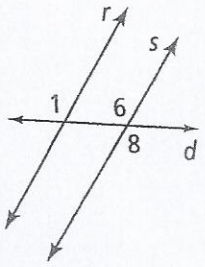
$=2(22)+14$

$=58$

17. Using the figure at the right, prove $< 1 \cong < 8$

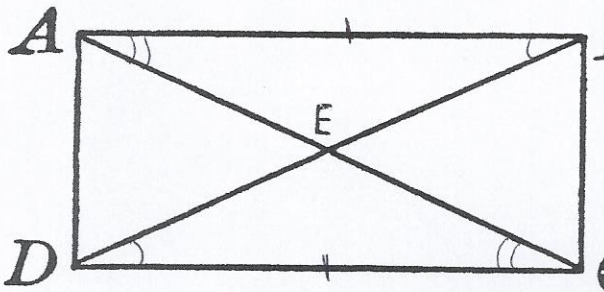
Given: $r \| s$

Prove: $\angle 1 \cong \angle 8$



S	R
① $r \| d$	① Given
② $\angle 1 \cong \angle 6$	② corresponding $\angle$'s
③ $\angle 6 \cong \angle 8$	③ vert. $\angle$'s
④ $\angle 1 \cong \angle 8$	④ Transitive property

18. Using the rectangle below, prove $\Delta ABE \cong \Delta CDE$.



S	R
① ABCD is a rectangle	① Given
② $\overline{AB} \cong \overline{CD}$	② opp. sides are $\cong$ Prop. of rectangle
③ $\overline{AB} \| \overline{CD}$ $\overline{AD} \| \overline{BC}$	③ opp. sides are $\|$ Prop. of rectangle
④ $\angle ABD \cong \angle CDB$ $\angle BAC \cong \angle DCA$	④ alt. interior $\angle$'s
⑤ $\Delta ABE \cong \Delta CDE$	⑤ ASA