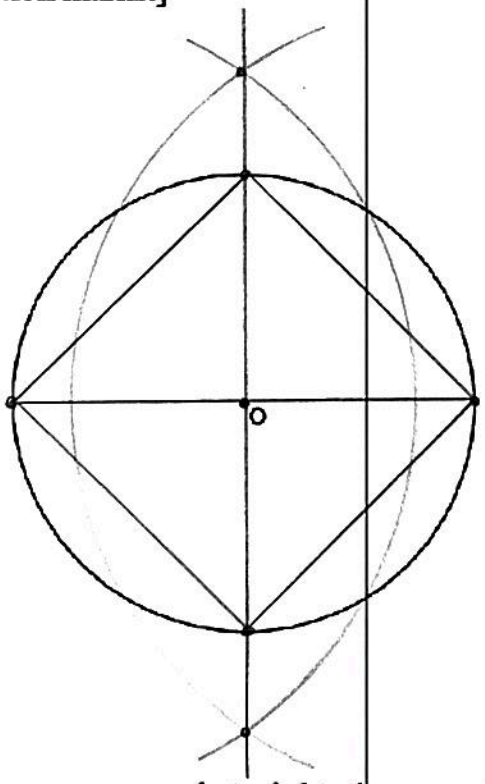
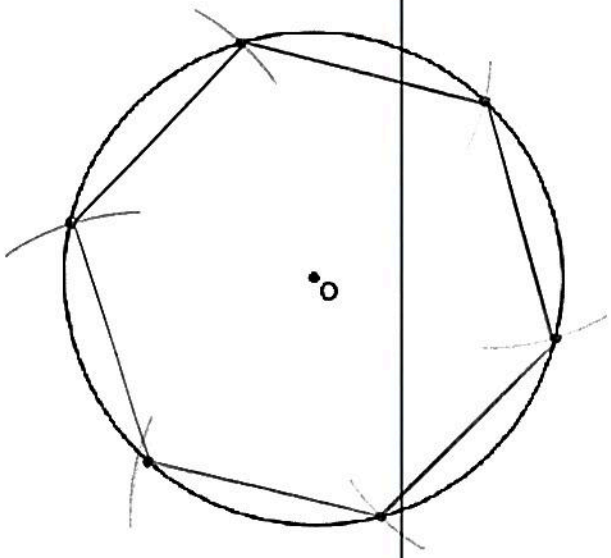
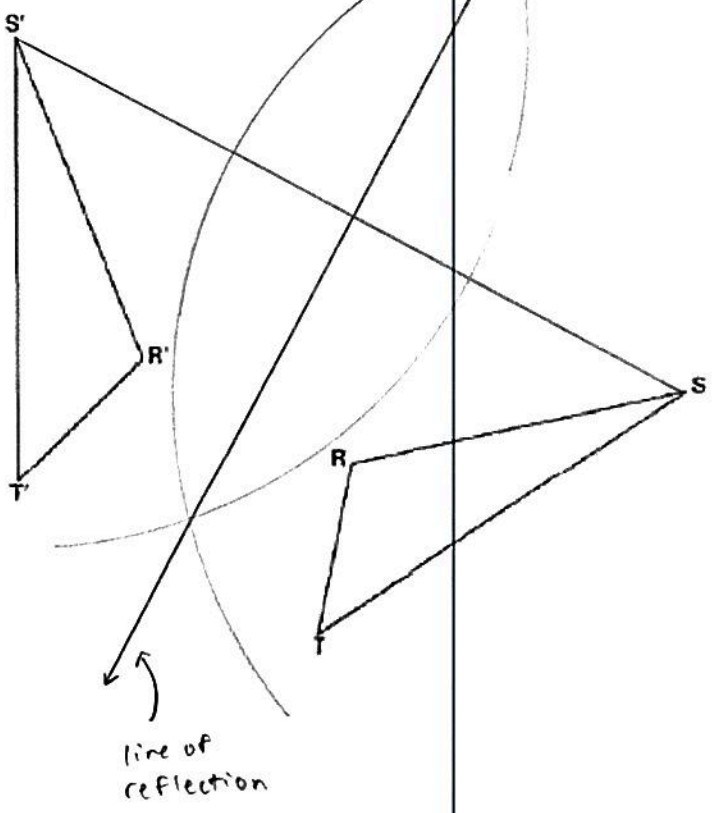
1. **Using a straightedge and compass, construct a square inscribed in circle *O* below. [Leave all construction marks.]**



2. **Using a compass and straightedge, construct a regular hexagon inscribed in circle *O* below. Label it *ABCDEF*. [Leave all construction marks.]**



3. **Using a compass and straightedge, construct the line of reflection over which triangle *RST* reflects onto triangle R'S'T'. [Leave all construction marks.]**



1. The endpoints of $\overline{DEF}$ are $D(1,4)$ and $F(16,14)$. Determine and state the coordinates of point E, if $DE:EF = 2:3$.

$(x_1 + k(x_2 - x_1),\ y_1 + k(y_2 - y_1))$

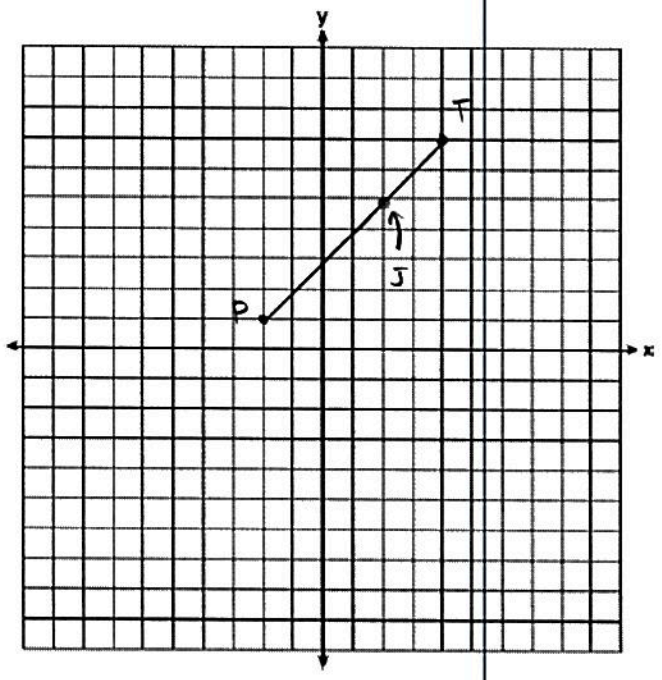
$(1 + \frac{2}{5}(16-1),\ 4 + \frac{2}{5}(14-4))$

$(1 + \frac{2}{5}(15),\ 4 + \frac{2}{5}(10))$

$(1+6,\ 4+4)$

$(7,8)$

2. Directed line segment PT has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 1. [The use of the set of axes below is optional.]



$(-2 + \frac{2}{3}(4-(-2)),\ 1 + \frac{2}{3}(7-1))$

$(-2 + \frac{2}{3}(6),\ 1 + \frac{2}{3}(6))$

$(-2+4,\ 1+4)$

$(2,5)$

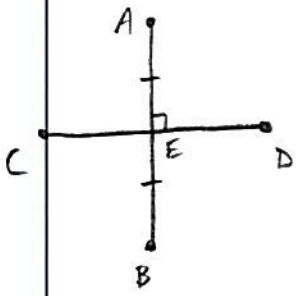
3. Segment CD is the perpendicular bisector of $\overline{AB}$ at E. Which pair of segments does *not* have to be congruent?

1 $\overline{AD}, \overline{BD}$

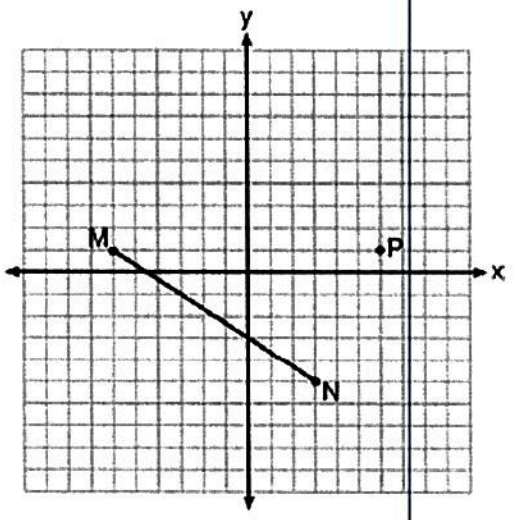
2 $\overline{AC}, \overline{BC}$

3 $\overline{AE}, \overline{BE}$

(4) $\overline{DE}, \overline{CE}$



4. Given $\overline{MN}$ shown below, with $M(-6,1)$ and $N(3,-5)$, what is an equation of the line that passes through point $P(6,1)$ and is parallel to $\overline{MN}$?



$\text{slope}_{MN} = \frac{\Delta y}{\Delta x}$

$= \frac{-5-1}{3-(-6)} = \frac{-6}{9} = -\frac{2}{3}$

$y = mx+b$

$y = -\frac{2}{3}x+b$

$1 = -\frac{2}{3}(6)+b$

$1 = -\frac{12}{3}+b$

$1 = -4+b$

$5 = b$

$y = -\frac{2}{3}x+5$

(1) $y = -\frac{2}{3}x+5$

2 $y = -\frac{2}{3}x-3$

3 $y = \frac{3}{2}x+7$

4 $y = \frac{3}{2}x-8$

5. Line segment NY has endpoints $N(-11,5)$ and $Y(5,-7)$. What is the equation of the perpendicular bisector of $\overline{NY}$?

(1) $y+1 = \frac{4}{3}(x+3)$ $\quad y+1 = \frac{4}{3}x+4$, $y = \frac{4}{3}x+3$

~~2~~ $y+1 = -\frac{3}{4}(x+3)$

3 $y-6 = \frac{4}{3}(x-8)$ $\quad y-6 = \frac{4}{3}x+\frac{32}{3}$

~~4~~ $y-6 = -\frac{3}{4}(x-8)$

$\text{slope}_{NY} = \frac{\Delta y}{\Delta x}$

$= \frac{-7-5}{5-(-11)} = \frac{-12}{16} = -\frac{3}{4}$ → negative reciprocal $\frac{4}{3}$

midpoint Formula

$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{5+(-11)}{2}, \frac{-7+5}{2}\right)$

$\left(\frac{-6}{2}, \frac{-2}{2}\right)$

must go through this point → $(-3,-1)$

$y = \frac{4}{3}x+b$

$-1 = \frac{4}{3}(-3)+b$

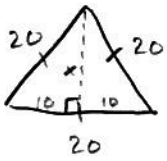
$-1 = \frac{-12}{3}+b$

$-1 = -4+b$

$3 = b$

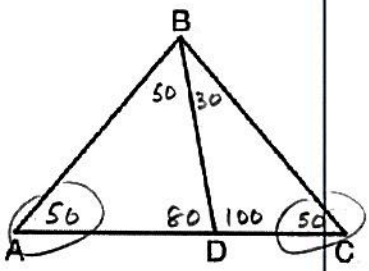
$y = \frac{4}{3}x+3$

1. An equilateral triangle has sides of length 20. To the *nearest tenth*, what is the height of the equilateral triangle?
   1 10.0
   2 11.5
   (3) 17.3
   4 23.1



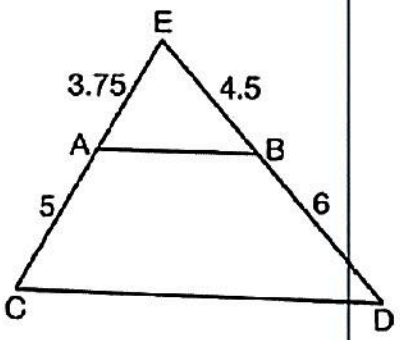
$10^2 + x^2 = 20^2$
$100 + x^2 = 400$
$\sqrt{x^2} = \sqrt{300}$
$x = 17.3$

2. In the diagram below, $m\angle BDC = 100°$, $m\angle A = 50°$, and $m\angle DBC = 30°$.



Which statement is true?
~~1~~ $\triangle ABD$ is obtuse.
(2) $\triangle ABC$ is isosceles. ✓
~~3~~ $m\angle ABD = 80°$
~~4~~ $\triangle ABD$ is scalene.

3. In $\triangle CED$ as shown below, points A and B are located on sides $\overline{CE}$ and $\overline{ED}$, respectively. Line segment AB is drawn such that $AE = 3.75$, $AC = 5$, $EB = 4.5$, and $BD = 6$.



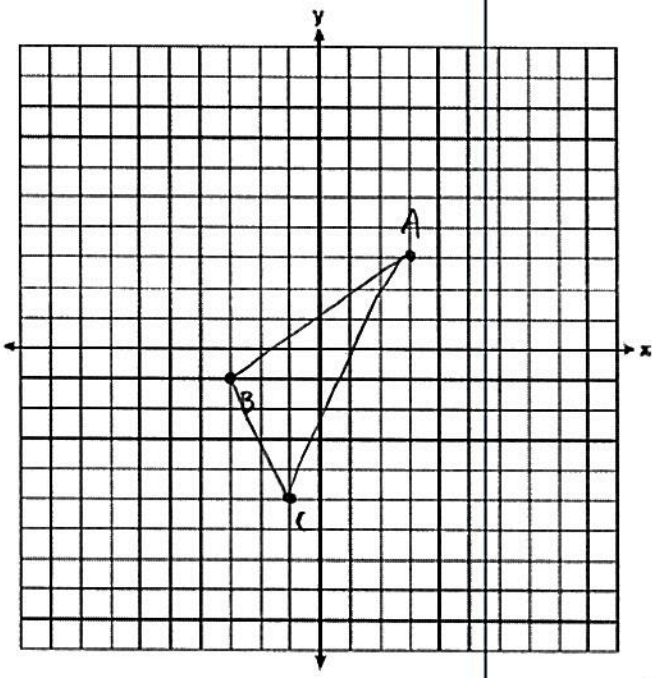
Explain why $\overline{AB}$ is parallel to $\overline{CD}$.

$\frac{3.75}{5} = \frac{4.5}{6}$ (Side Splitter)

$.75 = .75$

$\overline{AB}$ is parallel to $\overline{CD}$ because it divides the sides ($\overline{EC}$ and $\overline{ED}$) proportionally.

4. Triangle ABC has vertices with $A(x,3)$, $B(-3,-1)$, and $C(-1,-4)$. Determine and state a value of x that would make triangle ABC a right triangle. Justify why $\triangle ABC$ is a right triangle. [The use of the set of axes below is optional.]



$\text{slope}_{BC} = \frac{\Delta y}{\Delta x}$

$= \frac{-4-(-1)}{-1-(-3)}$

$= \frac{-3}{2}$

slope of AB must be neg. reciprocal $(\frac{2}{3})$

$\frac{2}{3} = \frac{\Delta y}{\Delta x}$

$\frac{2}{3} = \frac{-1-3}{-3-x}$

$\frac{2}{3} = \frac{-4}{-3-x}$

$2(-3-x) = -12$

$-6-2x = -12$

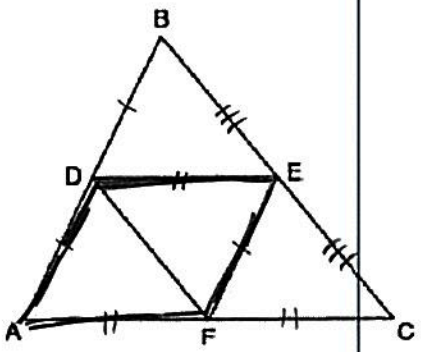
$-2x = -6$

$x = 3$

(3, 3)

$\triangle ABC$ is a right $\triangle$ because two of its sides have neg. reciprocal slopes which means it has a right $\angle$.

5. In the diagram below, $\overline{DE}$, $\overline{DF}$, and $\overline{EF}$ are midsegments of $\triangle ABC$.



The perimeter of quadrilateral $ADEF$ is equivalent to

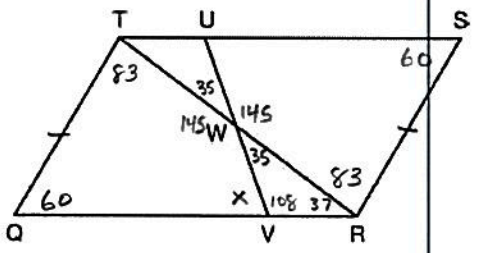
1 $AB+BC+AC$

2 $\frac{1}{2}AB+\frac{1}{2}AC$

3 $2AB+2AC$

(4) $AB+AC$

1. In parallelogram $QRST$ shown below, diagonal $\overline{TR}$ is drawn, U and V are points on $\overline{TS}$ and $\overline{QR}$, respectively, and $\overline{UV}$ intersects $\overline{TR}$ at W.



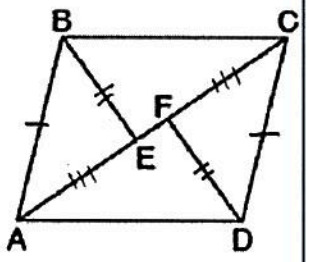
$60+83+145+x=360$

$x=72$

If $m\angle S = 60°$, $m\angle SRT = 83°$, and $m\angle TWU = 35°$, what is $m\angle WVQ$?

1 37°
2 60°
(3) 72°
4 83°

2. **In the diagram below, if $\triangle ABE \cong \triangle CDF$ and $\overline{AEFC}$ is drawn, then it could be proven that quadrilateral $ABCD$ is a**

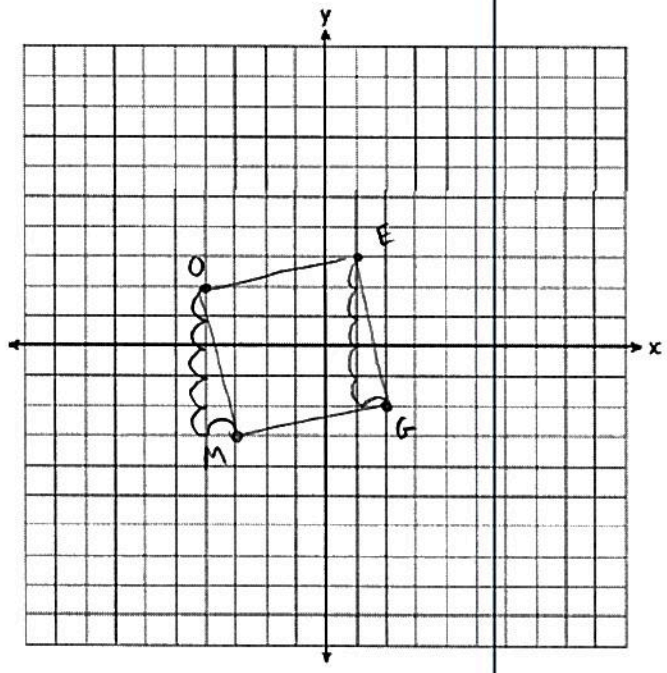


~~1~~ square
~~2~~ rhombus
~~3~~ rectangle
(4) parallelogram

3. **A parallelogram must be a rectangle when its**

1 diagonals are perpendicular
(2) diagonals are congruent
3 opposite sides are parallel
4 opposite sides are congruent

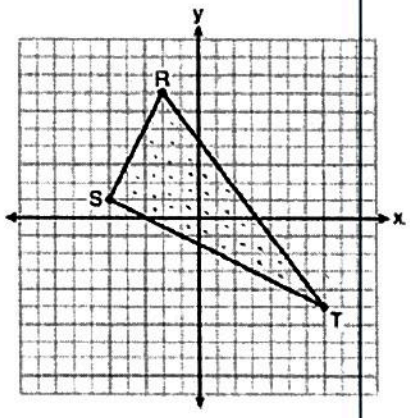
4. In square *GEOM*, the coordinates of *G* are (2,–2) and the coordinates of *O* are (–4,2). Determine and state the coordinates of vertices *E* and *M*. [The use of the set of axes below is optional.]



M (-3,-3)

E (1,3)

5. Triangle *RST* is graphed on the set of axes below.



How many square units are in the area of ΔRST?

1 $9\sqrt{3}+15$

2 $9\sqrt{5}+15$

(3) 45

~~4~~ 90

Even if you count boxes you can rule out 90

SHOELACE

S (-5,1) $(-5\cdot7)+(-2\cdot-5)$

R (-2,7) $+(7\cdot1)=|-18|\to18$

T (7,-5) $(1\cdot-2)+(7\cdot7)+$

(-5,1) $(-5\cdot-5)=72$

$\frac{18+72}{2}=45$