7.4 Setting Up for Coordinate Geometry Proofs

Name: ______________________________

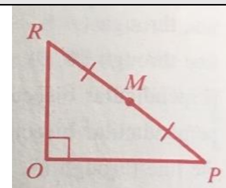
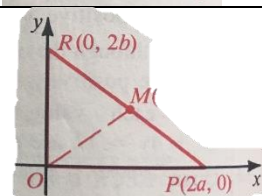
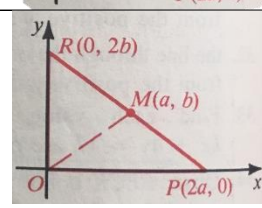
Write your questions here!

Before we dive right into completing coordinate proofs, I want to illustrate the need to make convenient choices for our vertices on the coordinate plane.

Let's look at an example proof worked out for you.

Prove: ***The midpoint of the hypotenuse of a right triangle is equidistant from the three vertices.***

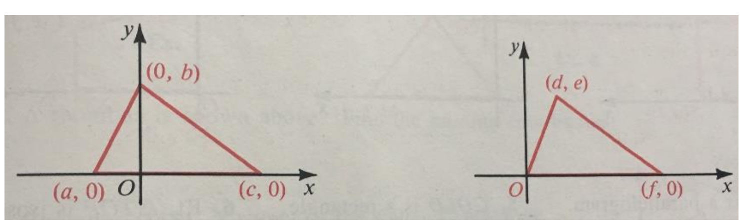
Notice that 2a and 2b are convenient choices for coordinates since they lead to expressions that do not contain fractions for the coordinate of M.

Statements	Picture	Reasons
1) ΔROP is a right triangle		1. Given
2) M is the Midpoint of $\overline{RP}$		2. Given
3) ____ = ____		3. Definition of Midpoint
4) Let $\overleftrightarrow{OP}$ and $\overleftrightarrow{OR}$ be the x-axis and y-axis. Let P and R have the coordinates shown.		Let statements don't need reasons.
5) The coordinate of M are (a, b)		5. By using the midpoint formula. $M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ $M = \left(\frac{\quad+\quad}{2}, \frac{\quad+\quad}{2}\right)$ $M = \left(\frac{\quad}{2}, \frac{\quad}{2}\right)$ $M = (a, b)$
6) $\overline{MO} = \sqrt{(\quad - \quad)^2 + (\quad - \quad)^2}$ $\overline{MP} = \sqrt{(\quad - \quad)^2 + (\quad - \quad)^2}$		6. By using the distance formula. $d = \sqrt{\left(\frac{x_2 - x_1}{2}\right)^2 + \left(\frac{y_2 - y_1}{2}\right)^2}$
7) $\overline{MO} = \overline{MP}$		7. ________________________
8) $\overline{MO} = \overline{MP} = \overline{MR}$		8. Transitive Property
9) *Thus, the midpoint of the hypotenuse of a right triangle is equidistant from the three vertices.*		9. Definition of Equidistant

<u>Organizing Coordinate Proofs</u>

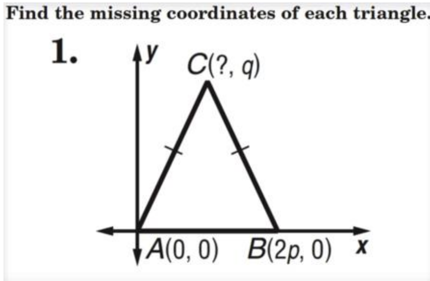
Notice that these locations for the axes maximize the number of times zero is a coordinate vertex.

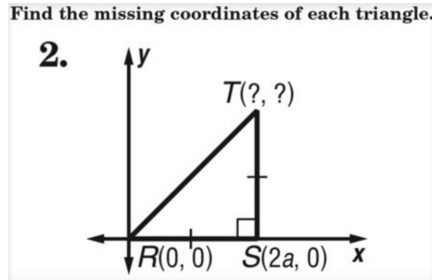
If you have a right triangle, the most convenient place to put the x-axis and the y-axis is usually along the legs of the triangle (like in the example above). If the triangle is not a right triangle, the two most convenient ways to place your axes are shown below.

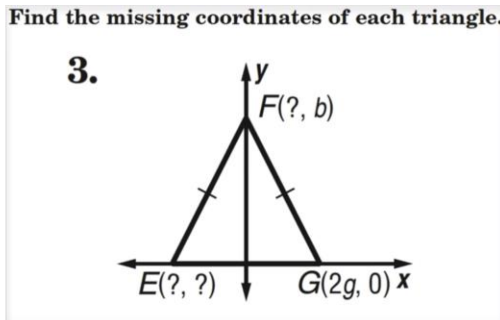


Write your questions here!

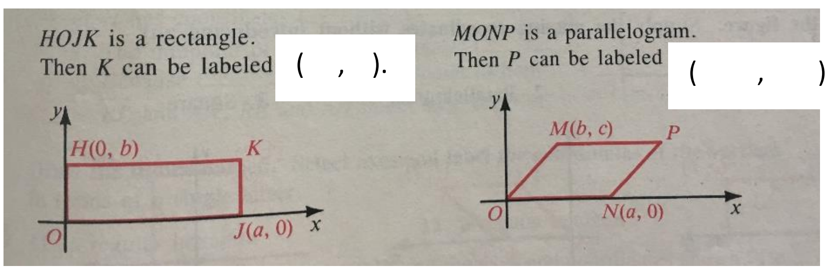
Other common ways of placing coordinate axes on other triangles:

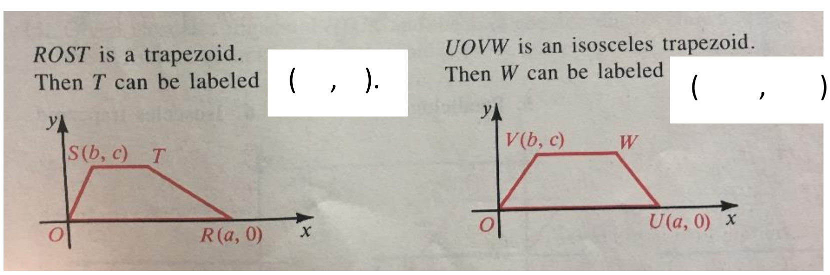






Some common ways of placing coordinate axes on other special figures are shown below.





Summary/Comments/Notes: ____

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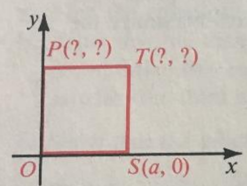
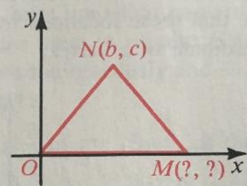
7.3 Problem Set

Supply the missing coordinates without introducing any new letters.

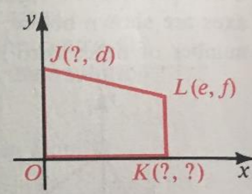
1. *POST* is a square.



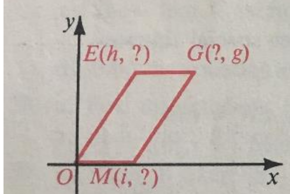
2. $\triangle MON$ is isosceles.



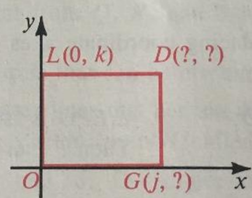
3. *JOKL* is a trapezoid.



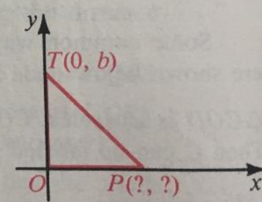
4. *GEOM* is a parallelogram.



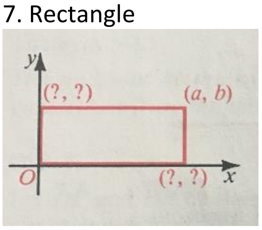
5. *GOLD* is a rectangle.



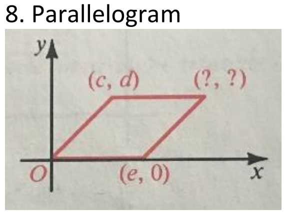
6. Rt. $\triangle TOP$ is isosceles.



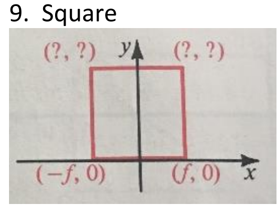
7. Rectangle



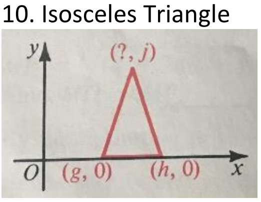
8. Parallelogram



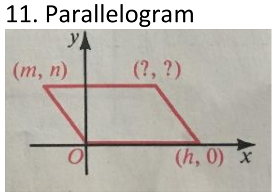
9. Square



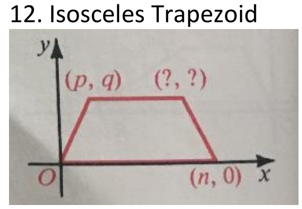
10. Isosceles Triangle



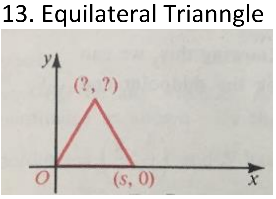
11. Parallelogram



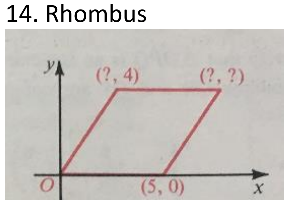
12. Isosceles Trapezoid



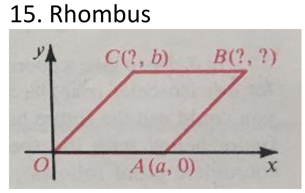
13. Equilateral Trianngle



14. Rhombus

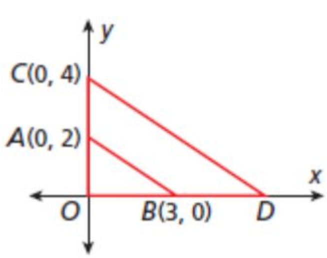


15. Rhombus

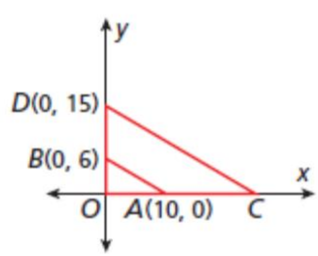


Given that $\Delta AOB \sim \Delta COD$, find the missing coordinates and the scale factor.

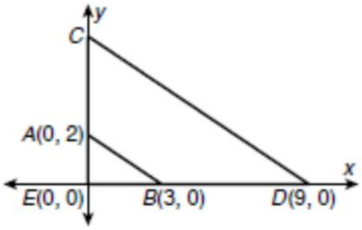
16.



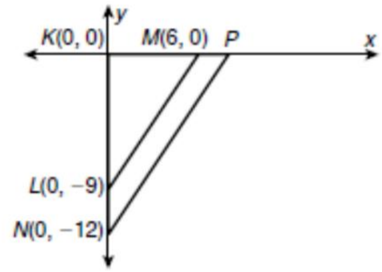
17.



18. Given that $\triangle AEB \sim \triangle CED$, find the coordinates of C and the scale factor.



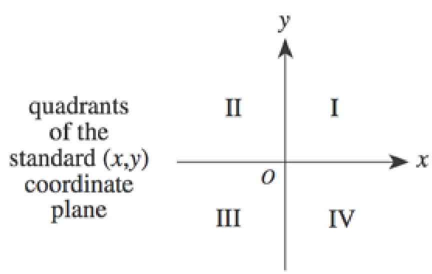
19. Given that $\triangle LKM \sim \triangle NKP$, find the coordinates of P and the scale factor.



SKILLZ REVIEW

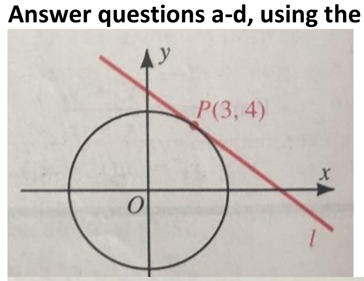
Multiple Choice

If point M has a nonzero x-coordinate and a nonzero y-coordinate and the coordinates have opposite signs, then point M *must* be located in which of the 4 quadrants labeled below?



A. I only
B. III only
C. I or III only
D. I or IV only
E. II or IV only

Answer questions a-d, using the picture below:



Line l is tangent to $\odot O$ at point $P(3, 4)$.

a. Find the radius of the circle.
b. Give an equation of the circle.
c. Find the slope of line l.
d. Give an equation of line l.

State the slope of the line and name two points on the line

$$y = -(x + 7)$$

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

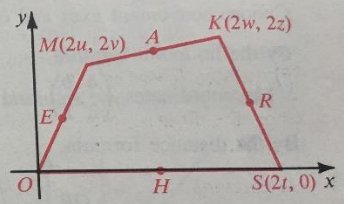
7.4 Applications

1. Supply the missing coordinates to prove:

The segments that join the midpoints of opposite sides of any quadrilateral bisect each other.

Let *H, E, A,* and *R* be midpoints of the sides of the quadrilateral *SOMK*. Choose axes and coordinates as shown.

a. R has coordinates (_?_, _?_).
b. E has coordinates (_?_, _?_).
c. The midpoint of $\overline{RE}$ has coordinates (_?_, _?_).
d. A has coordinates (_?_, _?_).
e. H has coordinates (_?_, _?_).
f. The midpoint of $\overline{AH}$ has coordinates (_?_, _?_).
g. Because (_?_, _?_) is the midpoint of both $\overline{RE}$ and $\overline{AH}$, $\overline{RE}$ and $\overline{AH}$ bisect each other.



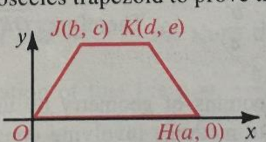
Draw the figure named. Select axes and label the coordinates of the vertices in terms of a <u>single</u> letter.

2. A regular hexagon

3. A regular octagon

4. PROOF:

Given isosceles trapezoid $HOJK$ and the axes and coordinates shown, use the definition of an isosceles trapezoid to prove that $e = c$ and $d = a - b$.



5. PROOF:

Given points $A(1, 1)$, $B(13, 9)$, and $C(3, 7)$. D is the midpoint of $\overline{AB}$, and E is the midpoint of $\overline{AC}$.
a. Find the coordinates of D and E.
b. Use slopes to show that $\overline{DE} \parallel \overline{BC}$.
c. Use the distance formula to show that $DE = \frac{1}{2}BC$.

6. PROOF:

a. Find the coordinates of the midpoints J, K, L, and M.
b. What kind of figure is $JKLM$? Prove it.